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# Release Notes

## Continuent Ltd

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### Abstract

This document provides release notes for all [active] released versions of Continuent software.

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Up to date builds of this document: [Release Notes \[Online\]](#), [Release Notes \[PDF\]](#)

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## 1. Tungsten Clustering v8.x Release Notes

### 1.1. Tungsten Clustering 8.0.3 GA [23 Feb 2026]

Version End of Life. Not Yet Set

Release 8.0.3 contains an important bug fix to handle a behavior change in newer versions of Java, stability improvements with the Manager to fix a number of memory leaks, and a new feature for tracking slow queries through the replicator.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- The `tpm ini check` command now checks for two new rules:
  - There MUST be a `witnesses=` entry in EVERY stanza if `enable-active-witnesses=true` exists in `[defaults]`
  - There MUST be a `witnesses=` entry in a stanza that contains `enable-active-witnesses=true`

*Issues:* CT-2625

#### Improvements, new features and functionality

##### Core Replicator

- The replicator now includes real-time performance monitoring to track and identify slow database operations during replication. The feature provides visibility into transaction, event, and statement execution times with configurable thresholds for alerting. For more information on configuring and using this feature, see [trepctl perflog Command](#)

*Issues:* CT-2629

##### Security

- Updated log4j libraries to mitigate security threats found in earlier versions. Note that these issues do not affect Tungsten installations when configured with the default log4j properties files.

*Issues:* CT-2674

##### Bug Fixes

##### Installation and Deployment

- Fixed an installation issue when using MariaDB 10.6 with SSL. Previously, this would have failed to install showing an error message like :

```
Unable to connect to the MySQL server using tungsten@db1:13306 (WITH PASSWORD) (MySQLLoginCheck)
```

*Issues:* CT-2624

##### Command-line Tools

- Fixed a bug that would cause `tprovision` to fail if the password contained double-quotes.

*Issues:* CT-2673

##### Backup and Restore

- Fixes an issue when, in certain cases, a newly provisioned database would be left in the `offline_mode`.

*Issues:* CT-2660

#### Core Replicator

- Recent java versions changed a default that now enable endpoint identification in secured RMI calls. As a quick turnaround, this release restores the default of disabling identification in various Tungsten scripts.

*Issues:* CT-2666

#### Tungsten Connector

- Fixed a null pointer exception error showing up in rare cases at startup time.

*Issues:* CT-2656

#### Tungsten Manager

- A number of bugs have been resolved that would cause the managers to suffer frequent OutOfMemory issues.

*Issues:* CT-2667

## 1.2. Tungsten Clustering 8.0.2 GA [13 Jan 2026]

Version End of Life. Not Yet Set

Release 8.0.2 contains a number of bug fixes, stability improvements and new features.

### Important

This release contains bug fix CT-2632, CT-2638 and CT-2640 that fixes a bug in handling of - (hyphens) and mixed case in hostnames and servicenames.

If you have -'s in either of these areas, or you are running a Composite Active/Active topology, please do NOT upgrade to v8.0.0 or v8.0.1 and instead upgrade directly to this v8.0.2 release

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Installation and Deployment

- `tpm validate` now verifies localhost is defined in `/etc/hosts`

*Issues:* CT-2564

#### Command-line Tools

- The `tpm provision` command now deletes only binary log files listed in the index if the binary log directory is not the same as the mysql data directory.

*Issues:* CT-2631

### Improvements, new features and functionality

#### Installation and Deployment

- New feature: `tungsten.ini` backup and history.

When enabled with the `tpm` flag `tungsten-ini-backup` [false by default], the `tpm update` command will create a copy of the current INI file [default: `/etc/tungsten/tungsten.ini`] as `$CONTINUED_ROOT/history/ini/tungsten.ini.YYYYMMDDhhmmss`

When enabled with the `tpm` flag `tungsten-ini-backup`, the `tpm install` command will create the first history file and the history subdir, if needed.

A new sub-command, `tpm ini diff` has been added to compare the current INI file [default: `/etc/tungsten/tungsten.ini`] and a history file [default: latest history file found], and can also accept `--stamp {YYYYMMDDhhmmss}` to specify which file to diff by timestamp.

A new sub-command, `tpm ini backup` has been added to manually invoke the same copy that the `tpm update` command does.

Added two new [tpm](#) configuration flags:

- [tungsten-ini-backup](#) (default: false) : Enable the [tungsten.ini](#) automatic backup feature during [tpm install](#) and [tpm update](#)
- [tungsten-ini-history-dir](#) (default: `$CONTINUED_ROOT/history/ini`) : Define the location for [tungsten.ini](#) backup/history files

*Issues:* CT-2635

#### Command-line Tools

- A new subcommand `tpm ini defaults` has been added to list any `tpm` option that actually has a default value defined in the [tools/tpm\\_options\\_db.txt](#) file, along with the default value.

Additionally, documentation has been updated to show defaults and options for all properties where applicable.

*Issues:* CT-2634

- New feature `tpm copy --example` will show the manual steps taken by `tpm copy --init` to copy the cluster certificate files to other nodes.

*Issues:* CT-2636

#### Platform Specific Deployments

- This release is now certified with the following OS releases:

- RHEL 10
- Rocky Linux 10
- Oracle Linux 10

*Issues:* CT-2642

#### Bug Fixes

##### Installation and Deployment

- Fixed an issue where `-` (hyphens) in hostnames combined with a Composite Active/Active topology, would cause the replicators to reconfigure against the wrong tracking schema.

*Issues:* CT-2632

- Fixed an issue where mixed case letters in hostnames combined with a Composite Active/Active topology, would cause the replicators to reconfigure against the wrong tracking schema.

*Issues:* CT-2638

- The use of the `-` character in datasource service names is now properly handled.

In versions 7.x of [tungsten](#), the `-` character, internally, was converted to an `_`. From v8 onwards the `-` character is maintained, however this led to an issue where [tpm](#) would fail during an upgrade as it was unable to correctly identify the service names.

If you use the `-` in your servicenames and you are currently running v7.x, you will need to replace the `-` with an `_` in your [/etc/tungsten/tungsten.ini](#) file and upgrade directly to v8.0.2. If you wish to maintain the `-` please contact Continuent Support who will assist in the upgrade process.

*Issues:* CT-2640

##### Command-line Tools

- The [tprovision](#) command now correctly honors the mountpoint override flag when not using method [rsync](#).

*Issues:* CT-2651

##### Tungsten Connector

- Fixed an issue in the Drizzle driver that could cause memory errors when handling large string parameters.

*Issues:* CT-2627

- Connector configuration files to execute Tungsten-specific show slave status request now get the right schema to select from.

*Issues:* CT-2639

- Fixed issue introduced by CT-2511 (dual certificate support) where the keystore was reloaded at every new connection.

*Issues:* CT-2652

#### Tungsten Manager

- If a cluster was idle for more than 15 minutes and a failure occurred, the failover would fail to complete.

*Issues:* CT-2637

## 1.3. Tungsten Clustering 8.0.1 GA [6 Oct 2025]

Version End of Life. Not Yet Set

Release 8.0.1 contains a number of bug fixes and improvements.

### Warning

There is a known issue in this release that will result in a misconfiguration of the replication services for both new installations and upgrades, under the following conditions:

- Composite Active/Active topology, AND
- Your hostnames contain a dash symbol [-] and/or a mix of UPPER and lower case characters.

All other topologies are unaffected. If the above applies to your installation please use v8.0.2 when available. For any questions or concerns, or if you feel you may already be impacted by this, please contact Continuent Support.

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Installation and Deployment

- `tpm` now only reads `/etc/tungsten/tungsten.ini` (no longer looking in `$HOME` directory and `/etc/tungsten.ini`)

For a different path, different filename or multiple files, use the `--ini` supplying a comma-separated list

*Issues:* CT-2612

#### Command-line Tools

- The `tprovision` command no longer requires the external tool `tungsten_get_mysql_datadir`.

Additionally, the tool has been significantly re-factored for greater stability, performance and functionality.

*Issues:* CT-2597

#### Security

- Now providing adequate error message when TLS certificates differ between connector and managers, or when manager refuses the SSL handshake.

*Issues:* CT-2579

#### Known Issue

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Cluster. They will be addressed in a subsequent patch release.

#### Core Clustering

- If your hostname contains a dash symbol [-] and/or a mix of UPPER and lower case characters, AND you are running a Composite Active/Active topology, then upgrading to or installing this release may cause a misconfiguration of the replication services.

*Issues:* CT-2632

#### Improvements, new features and functionality

#### Command-line Tools

- New Feature: `tpm ini upgrade --ini {fullpath}` will display all changes to the specified INI file that would be performed by the `tpm update` commands during a version upgrade. Adding the `--write` argument would apply the changes to the specified file as well.

*Issues:* CT-2601

- The `tpm ini check` command now validates composite topologies.

*Issues:* CT-2606

- New `tpm` flag `--add-ssl` now allows to force generate certificates when doing an upgrade. This allows configurations with security disabled to be upgraded to 8.0.1 AND switched to using SSL/TLS communications at the same time. Example:

```
shell> tools/tpm update --replace-release --add-ssl
```

*Issues:* CT-2619

## Security

- Tungsten can now hold two MySQL database SSL Certificates, allowing rotation of certificates without the need for downtime. A new command line tool, `rotate_certs`, is provided to aid in this process.

*Issues:* CT-2511

## Monitoring

- Additional prometheus metrics have been added to the Replicator:
  - `tungsten_replicator_service_online_duration_seconds` gauge show duration in seconds since the replicator was put online.
  - `tungsten_replicator_task_total` counter shows statistics by service, stage and task as shown in the following example:

```
tungsten_replicator_task_total{service="alpha",stage="q-to-dbms",task_id="1",stat="extract_time",} 250.015
```

In this case, this is the extract time spent by the task #1 of the q-to-dbms stage of the alpha service. This is similar to the new `treptcl perf` output.

*Issues:* CT-2514

## Platform Specific Deployments

- LTS MariaDB 11.4 is now certified.

*Issues:* CT-2337

## Bug Fixes

### Command-line Tools

- Corrected debug outputs in the Perl `tpm` framework.

*Issues:* CT-2497

- The `tapi` command now handles various payload outputs properly.

*Issues:* CT-2553

- The `tpm purge-thl` command now works properly when run against environments where there are multiple THL files, but the lowest `seqno` returned exists in the very first THL file.

*Issues:* CT-2561

- The `tapi` command no longer issues an error when the quantity of command-line arguments is larger than expected.

*Issues:* CT-2580

- The `tungsten_send_diag` now uses AWS Signature Version 4 to upload files.

*Issues:* CT-2589

- The `tpm ini check` command now handles a variety of edge cases.

*Issues:* CT-2613

- Fixed a regression where network partition would lead to connector partial site outage.

Issues: CT-2615

- The `tpm cert gen` command now works during version upgrades when a security configuration file may not have existed before (`passwords.store`).

Issues: CT-2618

#### Backup and Restore

- Fixed an edge case issue with xtrabackup running against the primary node and MySQL 8+.

#### Note

Generally we do not recommend taking backups from primary nodes, and instead backups should be taken from replicas.

Issues: CT-2602

#### Core Replicator

- Fixed an issue where timestamp columns would not match between source and target when using the `privileged-slave=false` property to replicate from a source database using MIXED binlog mode.

Issues: CT-2594

- With recent SELinux changes, MySQL might be unable to read from `/tmp`.

This directory is used when applying a `LOAD DATA INFILE` command that was logged using Statement Based Replication (warning : this is considered as unsafe by MySQL).

In order to avoid any issues, a new setting has been added to indicate a directory to use : `svc-applier-ldi-temp-dir=/tmp/mysqltmp`

In this case, `mysqltmp` is a new subdirectory that should be set with the following permissions and SELinux context

```
mkdir -p /tmp/mysqltmp
sudo chown -R mysql: /tmp/mysqltmp
sudo chmod -R g+r /tmp/mysqltmp
sudo semanage fcontext -a -t mysqld_db_t '/tmp/mysqltmp(/.*)?'
sudo restorecon -Rv /tmp/mysqltmp
```

Another improvement was also added to force the use of LOCAL when applying a `LOAD DATA INFILE` command that was logged using SBR. This is useful when applying to a remote MySQL host. To enable, set the value of the `svc-applier-ldi-use-local=true` (default : false)

Issues: CT-2603

#### Tungsten Connector

- No longer printing broken pipe errors (typically generated by haproxy or hardware loadbalancer checks) when `printConnectionWarnings=false` (the default)

Issues: CT-2576

- The `treptcl backup` command would fail using xtrabackup.

Issues: CT-2600

- Connector bridge mode would fail to route connections to data source ports other than 13306.

Issues: CT-2609

- Fixes `NullPointerException` upon I/O errors in router gateway.

Issues: CT-2610

- Fixed an issue with witness nodes not being accepted by older connectors when running with newer managers, triggering manager/connector reconnections in loop.

Issues: CT-2620

#### Tungsten Manager

- Fixed a `NullPointerException` error that may have prevented failovers occurring in some scenarios.

*Issues:* CT-2607

- Fixed an SSL configuration misconfiguration between manager and connector communication.

*Issues:* CT-2608

#### Security

- `tungsten_mysql_ssl_setup` now properly generates v3 self signed CA certificates for openssl 3 found in RHEL9 Linux flavors.

*Issues:* CT-2581

#### API

- Fixed an issue with log4j2 library embedded in tungsten-api jar which could trigger a warning in cctrl and other log files.

*Issues:* CT-2604

## 1.4. Tungsten Clustering 8.0.0 GA [28 Apr 2025]

Version End of Life. Not Yet Set

Release 8.0.0 is the first major v8 release and contain a wide range of bug fixes, and improvements.

Additional, this release marks the first release that will be required for Tungsten Operator and the subsequent deployment of Tungsten Clustering within a Kubernetes environment.

Build 8.0.0-305 was initially release on 28 Apr 2025, and re-released as 8.0.0-308 on 12 Sept 2025

### Warning

There is a known issue in this release that will result in a misconfiguration of the replication services for both new installations and upgrades, under the following conditions:

- Composite Active/Active topology, AND
- Your hostnames contain a dash symbol [-] and/or a mix of UPPER and lower case characters.

All other topologies are unaffected. If the above applies to your installation please use v8.0.2 when available. For any questions or concerns, or if you feel you may already be impacted by this, please contact Continuent Support.

### Deprecation Notices

The following features/tools have been deprecated from this release and will be removed in future releases. Any self written scripts that utilise these features should be updated.

#### Command-line Tools

- `tungsten_health_check` and `tungsten_provision_thl` have been deprecated and will be removed in a future release.

*Issues:* CT-2509

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Installation and Deployment

- All Tungsten components now use log4j version 2

*Issues:* CT-1410, CT-1412

- Added a TPM check for MySQL 8+ to error out if the application user has `CONNECTION_ADMIN` privilege.

*Issues:* CT-2325

- The `rest-api-admin-user` and `rest-api-admin-password` TPM properties are now now required during a default installation or when explicitly setting the various `manager-rest-api=true`, `connector-rest-api=true`, `replicator-rest-api=true` OR `rest-apis=true` properties.

*Issues:* CT-2409

- Upgraded the JGroup communication library to the v4.2.30

*Issues:* CT-2435

#### Command-line Tools

- Additional validation has been added to `tprovision` when parallel apply is in use.

*Issues:* CT-2275

- When provisioning a replica using `mysqldump`, the database will be set to offline mode until loading is complete to prevent accidental writes during the load.

*Issues:* CT-2305

- The `tungsten_send_diag` command has been updated with new security keys and the ability to accept security keys on the CLI.

*Issues:* CT-2438

- Removed `sigtrap` module dependency from `tungsten_find_orphaned`.

*Issues:* CT-2451

- The `tpm` command now allows hyphens in dataservice names.

*Issues:* CT-2453

- A new cli argument has been added (`--apiver 8`) to allow the `tapi` command to use APIv8. By default, `tapi` will continue to use APIv2 against v8 installations, using the `--apiver 8` option is experimental and should be used with care. Full APIv8 functionality will be included in `tapi` in a future release.

*Issues:* CT-2456

- The `tpm ask` command now returns the appropriate values for keys: `stagingdir`, `stagingpath`, `staginghost` and `staginguser`.

Additionally, the `tpm ask staging` command will return a JSON structure with all values. All values are the same as the output of the `tpm query staging` command, just presented differently for easier machine usage.

*Issues:* CT-2510

- The `tpm cert info` command now provides better error messages when a specified `typeSpec` file does not exist.

*Issues:* CT-2530

#### Tungsten Connector

- Connector now always reads its dynamic [auto-detect] configuration from primary node by default. Reading from a replica is still possible using `property=readAutodetectConfigFromPrimary=false` `tpm` flag.

*Issues:* CT-2527

#### Core Clustering

- Manager and Replicator now get higher CPU priority [-9 nice value] through `systemd` configuration file. When not using `systemd`, we advised to use the `sudo renice <pid>` command to avoid monitoring and processing pauses during high CPU usage periods. Note that this command has to be run as a privileged user, which is why the command cannot be part of the regular manager and replicator scripts

*Issues:* CT-2330

- Added protection against misconfigured applications or loadbalancers connecting repeatably to the Manager<->Connector port (11999). Such uncontrolled traffic would affect manager performance over time

*Issues:* CT-2411

#### Security

- As of version 7.2.0 onwards, when providing custom keystores, the alias of the mysql certificate must be provided as `java-mysql-alias=xxx` and must have the same name in both `tungsten_keystore` and `tungsten_connector_keystore`.

*Issues:* CT-2598

#### Known Issue

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Cluster. They will be addressed in a subsequent patch release.

#### Tungsten Connector

- Connector bridge fails to route connections to data source ports other than 13306.

This is fixed in v8.0.1 and it is advised to NOT use v8.0.0 if your MySQL port is configured to anything other than 13306.

*Issues:* CT-2609

#### Core Clustering

- If your hostname contains a dash symbol [-] and/or a mix of UPPER and lower case characters, AND you are running a Composite Active/Active topology, then upgrading to or installing this release may cause a misconfiguration of the replication services.

*Issues:* CT-2632

#### Security

- `tungsten_mysql_ssl_setup` incorrectly generates self signed CA certificates on RHEL9 Linux flavors.

This will be fixed in v7.2.0 and v8.0.1

*Issues:* CT-2581

### Improvements, new features and functionality

#### Installation and Deployment

- Introduced a new set of `tpm` group aliases to control the rest api configuration when the same value needs applying to multiple properties, as follows:
  - `rest-apis` will set `connector-rest-api`, `manager-rest-api` and `replicator-rest-api`
  - `rest-api-address` will set `connector-rest-api-address`, `manager-rest-api-address` and `replicator-rest-api-address`
  - `rest-api-authentication` will set `connector-rest-api-authentication`, `manager-rest-api-authentication` and `replicator-rest-api-authentication`
  - `rest-api-ssl` will set `connector-rest-api-ssl`, `manager-rest-api-ssl` and `replicator-rest-api-ssl`

For example, a before and after comparison of your `/etc/tungsten/tungsten.ini` may look like the following:

#### BEFORE

```
[defaults]
...
connector-rest-api=true
manager-rest-api=true
replicator-rest-api=true
connector-rest-api-address=0.0.0.0
manager-rest-api-address=0.0.0.0
replicator-rest-api-address=0.0.0.0
connector-rest-api-authentication=true
manager-rest-api-authentication=true
replicator-rest-api-authentication=true
connector-rest-api-ssl=true
manager-rest-api-ssl=true
replicator-rest-api-ssl=true
...
```

#### AFTER

```
[defaults]
...
rest-apis=true
rest-api-address=0.0.0.0
rest-api-authentication=true
rest-api-ssl=true
...
```

Issues: CT-2459

#### Command-line Tools

- The `tpm post-process` command has a new argument `--statemap` which processes `property=statemap.*` entries in the INI defaults section (only) to update the matching entries in the `cluster-home/conf/statemap.properties.defaults` file.

Once done, `tpm post-process --statemap` will exit without invoking the old functionality.

Issues: CT-1906

- The `tapi` command is now able to provision a Connector database target (both MySQL Server and PostgreSQL) using a JSON payload or command-line arguments. For more information see [The tapi Command](#)

Issues: CT-2306

- The new `tpm ini` command allows for easy creation, checking and administration of the `/etc/tungsten/tungsten.ini` configuration file.

Issues: CT-2366

- The `tpm ask` command now supports the `-s|--service` option for `dsrole`, `dsstate`, `trrole` and `trstate` keys. The option alias for `--short` is now `-S` [capitalized], was previously lower-case. Example: `tpm ask dsrole --service east_from_west`

Issues: CT-2400

- The `tpm cert` command will now handle public key files. The command `tpm cert gen public` will create `$CONTINUENT_HOME/generated/tungsten_public.jks` from the `$CONTINUENT_HOME/share/tungsten_keystore.jks` file and the `tpm cert list public` command will show the contents, etc.

Issues: CT-2434

- A new `-z` option has been added to `tprovision` which will enable compression when using the `rsync` method.

Issues: CT-2489

- The `tpm diag` command now gathers the output of `cctrl system summary`

Issues: CT-2492

- The `tpm diag` command now gathers the output of the `tpm ini check -x` command as the `tpmINICheck` call.

Issues: CT-2499

- Added missing help text for the `router` command within `cctrl`.

Issues: CT-2500

- The `tpm ini` command now handles all new tpm options.

Issues: CT-2543

- The `tpm ask` command will now convert values `0` and `false` to `No` and values `1` and `true` to `Yes` as human output when given `--human` or `-n` cli args.

Issues: CT-2559

#### Core Replicator

- Replicator now recognizes the new MySQL 8.4 `show binary log status` syntax (As well as `show master status`) and will run replacement configured request appropriately.

Issues: CT-2291

- A new `applying` field has been added to the output of `trepctl status`.

```
...
applying : 3 / 0 (92.86%)
...
```

In the above example, the applier is processing seqno 3 / fragno 0 and already applied 92.86% [this represents a percentage of rows and statements that were already applied].

When parallel apply is enabled, there will be one applying field per channel configured, for example the following shows 2 channels:

```
...
applying.0 :
applying.1 : 25 / 0 (92.86%)
...
```

*Issues:* CT-2315

- A new `thl apply` command is available which provides the ability to pull/push a range of transactions from source THL to a destination. The command can apply the THL either directly into the destination database (MySQL or PostgreSQL) or it can simply write the THL to the filesystem.

The destination does not need to be running Tungsten Replicator services for this to be used and provides a way of applying data outside of normal Tungsten operations and can be used to extend backup/recovery operations in some scenarios.

See [thl apply Command](#) for more information.

*Issues:* CT-2347

- The `trepctl perf` output has been improved when parallel apply is enabled to show granular statistics per channel.

*Issues:* CT-2517

#### Tungsten Connector

- Listeners now support the `protocol` setting to switch between mysql and postgres dialects.

*Issues:* CT-2324

- Advanced Listeners can now be accessed from the Connector REST API v8.

*Issues:* CT-2329

- Fixed a bug where connections properly disconnecting with quit command would get an empty database change request.

*Issues:* CT-2395

- Connector now recognizes the new MySQL 8.4 `show replica status` syntax (As well as `show slave status`) and will run replacement configured request appropriately.

*Issues:* CT-2401

#### Tungsten Manager

- Upgrade of Drools libraries to v7.74.1.Final.

*Issues:* CT-2206

#### Documentation

- API documentation has been updated to reflect changes to many of the endpoints, including updated examples of expected inputs and outputs.

*Issues:* CT-2339

#### API

- Added `/api/v8/manager/quorum` REST API endpoint

*Issues:* CT-2281

- The `/api/v8/manager/control/service/<service>/datasource/<datasource>/shun` call now checks if the datasource exists before shun. It returns an error if does not exist.

*Issues:* CT-2447

#### Bug Fixes

#### Installation and Deployment

- Hyphens are now allowed in service names by tpm.

*Issues:* CT-2367

- The `tpm update` command no longer displays the message "`common::diffPasswordsDotStore: No custom source passwords.store file defined - SKIP-PING`"

*Issues:* CT-2406

- `tpm` now properly detects MariaDB default settings.

*Issues:* CT-2424

- `tpm` flags `datasource-log-directory` and `repl-direct-datasource-log-directory` will now use the value of each other as a default if only one is specified

*Issues:* CT-2425

#### Command-line Tools

- `cctrl` now validates input correctly for the set policy command

*Issues:* CT-678

- In certain instances, when provisioning from a primary using `tprovision`, the remote replication service would not get reset.

*Issues:* CT-2138

- `tprovision` now supports provisioning from a cluster to stand-alone replicator host

*Issues:* CT-2199, CT-2483

- New shortcut options are available with `tprovision`

- `--primary` and `--create-primary` as an additional alias for `-c`

- `-C`, `--mysqlclone` as aliases for `-m mysqlclone`

- `-D`, `--mysqldump` as aliases for `-m mysqldump`

- `-R`, `--rsync` as aliases for `-m rsync`

- `-X`, `--xtrabackup` as aliases for `-m xtrabackup`

*Issues:* CT-2311

- The `tpm diag` command now properly gathers the uptime command.

*Issues:* CT-2319

- `tprovision` was incorrectly setting to the MySQL datadir to `tungsten` group ownership..

*Issues:* CT-2322

- When using the `-m rsync` option with `tprovision`, the `rsync` command now includes the `oStrictHostKeyChecking=no` options.

*Issues:* CT-2348

- The `tpm report` command now uses the correct API endpoint for Channel 3, Communications from the Connector to the Manager.

*Issues:* CT-2354

- The `tpm diag` command no longer displays a NOTICE for missing optional files.

*Issues:* CT-2355

- The `tpm check ports` and `tpm check ports -c` commands are now able to handle replicator-only nodes. By default, it will automatically try to discover the node type, and you may manually specify the node type with `-r|--replicator` or `-c|--cluster`.

*Issues:* CT-2356

- The `tapi` command now creates proper URL's for these standard endpoints when `-C`, `-M` or `-R` are specified along with one of the following strings: `ping`, `tungstenVersion`, `createAdminUser`, `deleteAdminUser`, `listAdminUsers`, `rmiSecurity` OR `user`.

*Issues:* CT-2391

- The `tpm diag` command now gathers:

- [tungsten-replicator/log/replicator-api.log](#)
- [tungsten-connector/log/connector-api.log](#)
- [tungsten-manager/log/manager-api.log](#)

Issues: CT-2397

- The [tpm delete-service](#) and [tpm update](#) commands now correctly remove Composite Active/Active cross-site subservices from `cctrl`  
Issues: CT-2404
- The [tungsten\\_get\\_status](#) command now passes the correct number of arguments to the `printf` function in various places, preventing "Redundant argument" warnings.  
Issues: CT-2407
- The [tapi](#) command now accepts non-standard ports on the command line, and also properly accepts a user/password pair on the CLI.  
Issues: CT-2420
- The [tpm update](#) command now properly identifies and removes services with mixed-case service names.  
Issues: CT-2426
- The [tpm keep](#) command is now properly called by [tpm uninstall](#), and a regression in a call to the mysql cli has been fixed as well.  
Issues: CT-2462
- [executable-prefix](#) is now applied to [deployall](#) and [undeployall](#) script names. For example, when [executable-prefix=mm](#), [deployall](#) would be named `mm_deployall`.  
Issues: CT-2467
- Fixed an issue where the database could potentially get locked in certain cases when using the [rsync](#) method with [tprovision](#)  
Issues: CT-2470
- The `cctrl ls` command now correctly displays relative applied latency based on the [use-relative-latency](#) settings in the INI.  
Issues: CT-2472
- [tprovision](#) will now correctly handle, and support, [selinux](#) if enabled.  
Issues: CT-2473
- The [tpm ask version](#) and `tpm ask versions` commands now display values.  
Issues: CT-2475
- During a [tpm uninstall](#), when skipping data services not managed locally, [tpm](#) will now print a notice rather than a warning, since this is the expected behavior  
Issues: CT-2479
- The [cctrl system summary](#) command now works correctly to display useful information regarding the host on which the command is executed.  
Issues: CT-2486
- The [tungsten\\_send\\_diag](#) command now handles curl and AWS S3 errors separately and displays the proper message back.  
Issues: CT-2488
- [cctrl router](#) invalid completion arguments have been removed.  
Issues: CT-2501
- Fixes an issue where [dsctl set](#) with the `-reset` option could show warnings when run several times in a row, as shown:

```
WARNING: Could not execute query DROP TABLE `tungsten_alpha`.`heartbeat` : Unknown table 'tungsten_alpha.heartbeat'
```

Issues: CT-2502

- The `tpm cert aliases --running` command now properly handles the `tls_passwordstore` and `jmx_passwordstore` typeSpecs.  
*Issues:* CT-2512
- The `tpm policy` command now selects the correct service to act upon in Composite clusters.  
*Issues:* CT-2525
- The `tpm cert info` command now properly handles all available typeSpecs.  
*Issues:* CT-2532
- The `tpm delete-service` command now sets `MAINTENANCE` mode before operations, then sets back to `AUTOMATIC` if it was `AUTOMATIC` to start with.  
*Issues:* CT-2555

#### Core Replicator

- Fixed an issue that would wrongly flag a SQL statement starting with a `#` comment as `bidi_unsafe`  
*Issues:* CT-2405
- The replicator will now properly rollback an XA transaction in case of failure.  
*Issues:* CT-2410
- Fixed an issue where a cluster could display a wrong latency after MySQL and the replicator were stopped and restarted. This would only show under no load conditions.  
*Issues:* CT-2485

#### Tungsten Connector

- Fixed an exception when a `user.map @default` entry would not contain the expected username, password and dataservice parameters.  
*Issues:* CT-2368
- Fixed an issue with PHP and `caching_sha2_password` when using proxy mode: the protocol part "fast path" was not handled properly by the connector, php would hang after reading an unexpected packet. Workaround for this issue (for earlier tungsten versions) is to set `property=defaultAuthPlugin=mysql_native_password` within `/etc/tungsten/tungsten.ini`.  
*Issues:* CT-2471
- In active/active setups, no longer using global data service for show slave latency connector intercept.  
*Issues:* CT-2554
- Closed a window where the Connector might let writes go to the old primary during a switch with networking issues.  
*Issues:* CT-2556
- The `treptcl backup` command would fail using xtrabackup.  
*Issues:* CT-2600
- Connector bridge mode would fail to route connections to data source ports other than 13306.  
*Issues:* CT-2609

#### Tungsten Manager

- Improved performance in manager client connection processing. The fix optimizes queue traversal time when searching for or deleting sessions, enhancing the handling of client (specifically manager or cctrl) connections.  
*Issues:* CT-2201
- Under the conditions of a network outage between a primary site and a relay site, where a failover or switch operation was performed on the primary site, the relay replicator on the relay site was not being correctly updated at the time of the failover/switch.  

This issue has been resolved by detecting whether or not the relay replicator is correctly configured to replicate from the primary data-source on the primary site and, if not, reconfigures the replicator accordingly.

*Issues:* CT-2225

- There were cases where the state of a connector [router] was shown as `UNKNOWN`. The issue was resolved by either reporting the reason that the state is unknown i.e. a read timed out etc. or the connector will simply not be shown since it has been disconnected from all managers i.e. either is not running or not reachable due to a network issue.

*Issues:* CT-2338

- A datasource can now be removed from the manager configuration (including disk) when in `MAINTENANCE` mode.

### Note

If the Replicator and Database are still online on the removed host, and the cluster returned to `AUTOMATIC` mode, the datasource will be recreated. Ensure at least one of the components are also stopped to prevent this.

*Issues:* CT-2372

- Fixed a manager state machine unhandled case when receiving a view update while joining the cluster.

*Issues:* CT-2449

- Fixed a race condition that aborted if an error happened when setting MySQL to read-only or read-write. Now the command retries until the MySQL is left in the desired state.

*Issues:* CT-2452

- The `cctrl` commands to set routers into the online and offline state were not functioning. This only affected manual execution of these commands from `cctrl` and did not affect other operations like `switch`, `failover` etc. This issue has been resolved.

*Issues:* CT-2526

### API

- Fixed REST API ping method in a composite cluster.

*Issues:* CT-2270

- Fixed a bug when the `/manager/cluster/status` REST API call returned `unknown` for the replicator state.

*Issues:* CT-2353

- The manager REST API `/api/v8/manager/cluster/status` now correctly displays the connector active/total number of connections.

*Issues:* CT-2423

- Fixed an issue where a component [replicator/connector] stopped through through the API would wrongly indicate "unable to stop"

*Issues:* CT-2515

## 2. Tungsten Replicator v8.x Release Notes

### 2.1. Tungsten Replicator 8.0.3 GA [23 Feb 2026]

Version End of Life. Not Yet Set

Release 8.0.3 contains an important bug fix to handle a behavior change in newer versions of Java along with a new feature for tracking slow queries through the replicator.

Improvements, new features and functionality

#### Core Replicator

- The replicator now includes real-time performance monitoring to track and identify slow database operations during replication. The feature provides visibility into transaction, event, and statement execution times with configurable thresholds for alerting. For more information on configuring and using this feature, see [trepctl perflog Command](#)

*Issues:* CT-2629

#### Security

- Updated log4j libraries to mitigate security threats found in earlier versions. Note that these issues do not affect Tungsten installations when configured with the default log4j properties files.

*Issues:* CT-2674

#### Bug Fixes

##### Installation and Deployment

- Fixed an installation issue when using MariaDB 10.6 with SSL. Previously, this would have failed to install showing an error message like :

```
Unable to connect to the MySQL server using tungsten@db1:13306 (WITH PASSWORD) (MySQLLoginCheck)
```

*Issues:* CT-2624

##### Command-line Tools

- Fixed a bug that would cause `tprovision` to fail if the password contained double-quotes.

*Issues:* CT-2673

##### Backup and Restore

- Fixes an issue when, in certain cases, a newly provisioned database would be left in the `offline_mode`.

*Issues:* CT-2660

##### Core Replicator

- Recent java versions changed a default that now enable endpoint identification in secured RMI calls. As a quick turnaround, this release restores the default of disabling identification in various Tungsten scripts.

*Issues:* CT-2666

## 2.2. Tungsten Replicator 8.0.2 GA [13 Jan 2026]

Version End of Life. Not Yet Set

Release 8.0.2 contains a number of bug fixes, stability improvements and new features.

### Important

This release contains bug fix CT-2632, CT-2638 and CT-2640 that fixes a bug in handling of - (hyphens) and mixed case in hostnames and servicenames.

If you have -'s in either of these areas, please do NOT upgrade to v8.0.0 or v8.0.1 and instead upgrade directly to this v8.0.2 release

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Installation and Deployment

- `tpm validate` now verifies localhost is defined in `/etc/hosts`

*Issues:* CT-2564

#### Command-line Tools

- The `tprovision` command now deletes only binary log files listed in the index if the binary log directory is not the same as the mysql data directory.

*Issues:* CT-2631

### Improvements, new features and functionality

#### Installation and Deployment

- New feature: `tungsten.ini` backup and history.

When enabled with the tpm flag `tungsten-ini-backup` [false by default], the `tpm update` command will create a copy of the current INI file [default: `/etc/tungsten/tungsten.ini`] as `$CONTINUENT_ROOT/history/ini/tungsten.ini.YYYYMMDDhhmmss`

When enabled with the tpm flag `tungsten-ini-backup`, the `tpm install` command will create the first history file and the history subdir, if needed.

A new sub-command, `tpm ini diff` has been added to compare the current INI file (default: `/etc/tungsten/tungsten.ini`) and a history file (default: latest history file found), and can also accept `--stamp {YYMMDDhhmmss}` to specify which file to diff by timestamp.

A new sub-command, `tpm ini backup` has been added to manually invoke the same copy that the `tpm update` command does.

Added two new `tpm` configuration flags:

- `tungsten-ini-backup` (default: false) : Enable the `tungsten.ini` automatic backup feature during `tpm install` and `tpm update`
- `tungsten-ini-history-dir` (default: `$CONTINUED_ROOT/history/ini`) : Define the location for `tungsten.ini` backup/history files

*Issues:* CT-2635

#### Command-line Tools

- A new subcommand `tpm ini defaults` has been added to list any tpm option that actually has a default value defined in the `tools/tpm_options_db.txt` file, along with the default value.

Additionally, documentation has been updated to show defaults and options for all properties where applicable.

*Issues:* CT-2634

- New feature `tpm copy --example` will show the manual steps taken by `tpm copy --init` to copy the certificate files to other nodes.

*Issues:* CT-2636

#### Platform Specific Deployments

- This release is now certified with the following OS releases:

- RHEL 10
- Rocky Linux 10
- Oracle Linux 10

*Issues:* CT-2642

#### Bug Fixes

##### Installation and Deployment

- The use of the `-` character in datasource service names is now properly handled.

In versions 7.x of tungsten, the `-` character, internally, was converted to an `_`. From v8 onwards the `-` character is maintained, however this led to an issue where `tpm` would fail during an upgrade as it was unable to correctly identify the service names.

If you use the `-` in your servicenames and you are currently running v7.x, you will need to replace the `-` with an `_` in your `/etc/tungsten/tungsten.ini` file and upgrade directly to v8.0.2. If you wish to maintain the `-` please contact COntinuent Support who will assist in the upgrade process.

*Issues:* CT-2640

##### Command-line Tools

- The `tpm provision` command now correctly honors the mountpoint override flag when not using method `rsync`.

*Issues:* CT-2651

## 2.3. Tungsten Replicator 8.0.1 GA [6 Oct 2025]

Version End of Life. Not Yet Set

Release 8.0.1 contains a number of bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- `tpm` now only reads `/etc/tungsten/tungsten.ini` (no longer looking in `$HOME` directory and `/etc/tungsten.ini`)

For a different path, different filename or multiple files, use the `--ini` supplying a comma-separated list

*Issues:* CT-2612

### Command-line Tools

- The `tprovision` command no longer requires the external tool `tungsten_get_mysql_datadir`.

Additionally, the tool has been significantly re-factored for greater stability, performance and functionality.

*Issues:* CT-2597

### Improvements, new features and functionality

#### Command-line Tools

- New Feature: `tpm ini upgrade --ini {fullpath}` will display all changes to the specified INI file that would be performed by the `tpm update` commands during a version upgrade. Adding the `--write` argument would apply the changes to the specified file as well.

*Issues:* CT-2601

- New `tpm` flag `--add-ssl` now allows to force generate certificates when doing an upgrade. This allows configurations with security disabled to be upgraded to 8.0.1 AND switched to using SSL/TLS communications at the same time. Example:

```
shell> tools/tpm update --replace-release --add-ssl
```

*Issues:* CT-2619

#### Monitoring

- Additional prometheus metrics have been added to the Replicator:
  - `tungsten_replicator_service_online_duration_seconds` gauge show duration in seconds since the replicator was put online.
  - `tungsten_replicator_task_total` counter shows statistics by service, stage and task as shown in the following example:

```
tungsten_replicator_task_total{service="alpha",stage="q-to-dbms",task_id="1",stat="extract_time",} 250.015
```

In this case, this is the extract time spent by the task #1 of the q-to-dbms stage of the alpha service. This is similar to the new `trepctl perf` output.

*Issues:* CT-2514

#### Platform Specific Deployments

- LTS MariaDB 11.4 is now certified.

*Issues:* CT-2337

#### Bug Fixes

#### Command-line Tools

- Corrected debug outputs in the Perl `tpm` framework.

*Issues:* CT-2497

- The `tapi` command now handles various payload outputs properly.

*Issues:* CT-2553

- The `tpm purge-thl` command now works properly when run against environments where there are multiple THL files, but the lowest `seqno` returned exists in the very first THL file.

*Issues:* CT-2561

- The `tapi` command no longer issues an error when the quantity of command-line arguments is larger than expected.

*Issues:* CT-2580

- The `tungsten_send_diag` now uses AWS Signature Version 4 to upload files.

*Issues:* CT-2589

- The `tpm ini check` command now handles a variety of edge cases.

*Issues:* CT-2613

- The `tpm cert gen` command now works during version upgrades when a security configuration file may not have existed before (`password-s.store`).

*Issues:* CT-2618

#### Backup and Restore

- Fixed an issue with backups that would fail on hosts whose name contains a '-' (hyphen)

*Issues:* CT-2600

- Fixed an edge case issue with xtrabackup running against the primary node and MySQL 8+.

#### Note

Generally we do not recommend taking backups from primary nodes, and instead backups should be taken from replicas.

*Issues:* CT-2602

#### Core Replicator

- Fixed an issue where timestamp columns would not match between source and target when using the `privileged-slave=false` property to replicate from a source database using MIXED binlog mode.

*Issues:* CT-2594

- With recent SELinux changes, MySQL might be unable to read from `/tmp`.

This directory is used when applying a `LOAD DATA INFILE` command that was logged using Statement Based Replication (warning : this is considered as unsafe by MySQL).

In order to avoid any issues, a new setting has been added to indicate a directory to use : `svc-applier-ldi-temp-dir=/tmp/mysqltmp`

In this case, `mysqltmp` is a new subdirectory that should be set with the following permissions and SELinux context

```
mkdir -p /tmp/mysqltmp
sudo chown -R mysql: /tmp/mysqltmp
sudo chmod -R g+r /tmp/mysqltmp
sudo semanage fcontext -a -t mysqld_db_t '/tmp/mysqltmp(/.*)?'
sudo restorecon -Rv /tmp/mysqltmp
```

Another improvement was also added to force the use of LOCAL when applying a `LOAD DATA INFILE` command that was logged using SBR. This is useful when applying to a remote MySQL host. To enable, set the value of the `svc-applier-ldi-use-local=true` (default : false)

*Issues:* CT-2603

#### Security

- `tungsten_mysql_ssl_setup` now properly generates v3 self signed CA certificates for openssl 3 found in RHEL9 Linux flavors.

*Issues:* CT-2581

#### API

- Fixed an issue with log4j2 library embedded in `tungsten-api` jar which could trigger a warning in log files.

*Issues:* CT-2604

## 2.4. Tungsten Replicator 8.0.0 GA [28 Apr 2025]

Version End of Life. Not Yet Set

Release 8.0.0 is the first major v8 release and contain a wide range of bug fixes, and improvements.

## Deprecation Notices

The following features/tools have been deprecated from this release and will be removed in future releases. Any self written scripts that utilise these features should be updated.

### Command-line Tools

- `tungsten_health_check` and `tungsten_provision_thl` have been deprecated and will be removed in a future release.

*Issues:* CT-2509

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- All Tungsten components now use `log4j` version 2

*Issues:* CT-1410, CT-1412

- The `rest-api-admin-user` and `rest-api-admin-password` TPM properties are now now required during a default installation or when explicitly setting the `replicator-rest-api=true` or `rest-apis=true` property.

*Issues:* CT-2409

### Command-line Tools

- Additional validation has been added to `tprovision` when parallel apply is in use.

*Issues:* CT-2275

- When provisioning a replica using `mysqldump`, the database will be set to offline mode until loading is complete to prevent accidental writes during the load.

*Issues:* CT-2305

- The `tungsten_send_diag` command has been updated with new security keys and the ability to accept security keys on the CLI.

*Issues:* CT-2438

- Removed `sigtrap` module dependency from `tungsten_find_orphaned`.

*Issues:* CT-2451

- The `tpm` command now allows hyphens in dataservice names.

*Issues:* CT-2453

- A new cli argument has been added [`--apiver 8`] to allow the `tapi` command to use APIv8. By default, `tapi` will continue to use APIv2 against v8 installations, using the `--apiver 8` option is experimental and should be used with care. Full APIv8 functionality will be included in `tapi` in a future release.

*Issues:* CT-2456

- The `tpm ask` command now returns the appropriate values for keys: `stagingdir`, `stagingpath`, `staginghost` and `staginguser`.

Additionally, the `tpm ask staging` command will return a JSON structure with all values. All values are the same as the output of the `tpm query staging` command, just presented differently for easier machine usage.

*Issues:* CT-2510

- The `tpm cert info` command now provides better error messages when a specified `typeSpec` file does not exist.

*Issues:* CT-2530

### Core Replicator

- Replicator now gets higher CPU priority [-9 nice value] through `systemd` configuration file. When not using `systemd`, we advised to use the `sudo renice <pid>` command to avoid monitoring and processing pauses during high CPU usage periods. Note that this command has to be run as a privileged user, which is why the command cannot be part of the regular replicator scripts

Issues: CT-2330

#### Security

- As of version 7.2.0 onwards, when providing custom keystores, the alias of the mysql certificate must be provided as `java-mysql-alias=xxx` and must have the same name in both `tungsten_keystore` and `tungsten_connector_keystore`.

Issues: CT-2598

#### Known Issues

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Replicator. They will be addressed in a subsequent patch release.

#### Security

- `tungsten_mysql_ssl_setup` incorrectly generates self signed CA certificates on RHEL9 Linux flavors.

This will be fixed in v7.2.0 and v8.0.1

Issues: CT-2581

#### Improvements, new features and functionality

##### Command-line Tools

- The `tpm ask` command now supports the `-s|--service` option for `trrole` and `trstate` keys. The option alias for `--short` is now `-s` (capitalized), was previously lower-case. Example: `tpm ask trrole --service alpha`

Issues: CT-2400

- The `tpm cert` command will now handle public key files. The command `tpm cert gen public` will create `$(CONTINUENT_HOME)/generated/tungsten_public.jks` from the `$(CONTINUENT_HOME)/share/tungsten_keystore.jks` file and the `tpm cert list public` command will show the contents, etc.

Issues: CT-2434

- A new `-z` option has been added to `tprovision` which will enable compression when using the `rsync` method.

Issues: CT-2489

- The `tpm diag` command now gathers the output of the `tpm ini check -x` command as the `tpmINIcheck` call.

Issues: CT-2499

- The `tpm ini` command now handles all new tpm options.

Issues: CT-2543

- The `tpm ask` command will now convert values `0` and `false` to `No` and values `1` and `true` to `Yes` as human output when given `--human` or `-n` cli args.

Issues: CT-2559

#### Core Replicator

- Replicator now recognizes the new MySQL 8.4 `show binary log status` syntax (As well as `show master status`) and will run replacement configured request appropriately.

Issues: CT-2291

- A new `applying` field has been added to the output of `trepctl status`.

```
...
applying : 3 / 0 (92.86%)
...
```

In the above example, the applier is processing seqno 3 / fragno 0 and already applied 92.86% [this represents a percentage of rows and statements that were already applied].

When parallel apply in enabled, there will be one applying field per channel configured, for example the following shows 2 channels:

```
...
applying.0 :
applying.1 : 25 / 0 (92.86%)
```

Issues: CT-2315

- Introduced a new `cloud-install` tpm flag that will skip checks for hostname entry in `/etc/hosts`, allowing smoother installations against cloud based sources or targets such as Amazon Aurora or Google Cloud SQL.

Issues: CT-2317

- A new `thl apply` command is available which provides the ability to pull/push a range of transactions from source THL to a destination. The command can apply the THL either directly into the destination database (MySQL or PostgreSQL) or it can simply write the THL to the filesystem.

The destination does not need to be running Tungsten Replicator services for this to be used and provides a way of applying data outside of normal Tungsten operations and can be used to extend backup/recovery operations in some scenarios.

See [thl apply Command](#) for more information.

Issues: CT-2347

- The `trepctl perf` output has been improved when parallel apply is enabled to show granular statistics per channel.

Issues: CT-2517

#### Documentation

- API documentation has been updated to reflect changes to many of the endpoints, including updated examples of expected inputs and outputs.

Issues: CT-2339

#### Bug Fixes

#### Installation and Deployment

- Hyphens are now allowed in service names by tpm.

Issues: CT-2367

- The `tpm update` command no longer displays the message `"common::diffPasswordsDotStore: No custom source passwords.store file defined - SKIPPING"`

Issues: CT-2406

- `tpm` now properly detects MariaDB default settings.

Issues: CT-2424

- `tpm` flags `datasource-log-directory` and `repl-direct-datasource-log-directory` will now use the value of each other as a default if only one is specified

Issues: CT-2425

#### Command-line Tools

- New shortcut options are available with `tprovision`
  - `--primary` and `--create-primary` as an additional alias for `-c`
  - `-C, --mysqlclone` as aliases for `-m mysqlclone`
  - `-D, --mysqldump` as aliases for `-m mysqldump`
  - `-R, --rsync` as aliases for `-m rsync`
  - `-X, --xtrabackup` as aliases for `-m xtrabackup`

Issues: CT-2311

- The `tpm diag` command now properly gathers the uptime command.

Issues: CT-2319

- `tprovision` was incorrectly setting to the MySQL datadir to `tungsten` group ownership..

Issues: CT-2322

- When using the `-m rsync` option with `tprovision`, the `rsync` command now includes the `oStrictHostKeyChecking=no` options.

Issues: CT-2348

- The `tpm diag` command no longer displays a NOTICE for missing optional files.

Issues: CT-2355

- The `tpm check ports` and `tpm check ports -c` commands are now able to handle replicator-only nodes. By default, it will automatically try to discover the node type, and you may manually specify the node type with `-r|--replicator` or `-c|--cluster`.

Issues: CT-2356

- The `tpm update` command now properly deletes services when run in a standalone Tungsten Replicator deployment.

Issues: CT-2383

- The `tapi` command now creates proper URL's for the standard endpoints when `-R` is specified along with one of the following strings: `ping`, `tungstenVersion`, `createAdminUser`, `deleteAdminUser`, `listAdminUsers`, `rmiSecurity` OR `user`.

Issues: CT-2391

- The `tpm diag` command now gathers:

- `tungsten-replicator/log/replicator-api.log`

Issues: CT-2397

- The `tpm diag` command now correctly connects to an off-host database when run under standalone Tungsten Replicator.

Issues: CT-2402

- The `tapi` command now accepts non-standard ports on the command line, and also properly accepts a user/password pair on the CLI.

Issues: CT-2420

- The `tpm update` command now properly identifies and removes services with mixed-case service names.

Issues: CT-2426

- The `tpm uninstall` command now properly calls the `tpm keep` command for standalone Tungsten Replicator deployments.

Issues: CT-2436

- The `tpm keep` command is now properly called by `tpm uninstall`, and a regression in a call to the `mysql cli` has been fixed as well.

Issues: CT-2462

- `executable-prefix` is now applied to `deployall` and `undeployall` script names. For example, when `executable-prefix=mm`, `deployall` would be named `mm_deployall`.

Issues: CT-2467

- Fixed an issue where the database could potentially get locked in certain cases when using the `rsync` method with `tprovision`

Issues: CT-2470

- `tprovision` will now correctly handle, and support, `selinux` if enabled.

Issues: CT-2473

- The `tpm ask version` and `tpm ask versions` commands now display values.

Issues: CT-2475

- During a `tpm uninstall`, when skipping data services not managed locally, `tpm` will now print a notice rather than a warning, since this is the expected behavior

Issues: CT-2479

- The `tungsten_send_diag` command now handles `curl` and `AWS S3` errors separately and displays the proper message back.

Issues: CT-2488

- Fixes an issue where `dsctl set` with the `--reset` option could show warnings when run several times in a row, as shown:

```
WARNING: Could not execute query DROP TABLE `tungsten_alpha`.`heartbeat` : Unknown table 'tungsten_alpha.heartbeat'
```

Issues: CT-2502

- The `tpm cert aliases --running` command now properly handles the `tls_passwordstore` and `jmx_passwordstore` typeSpecs.

Issues: CT-2512

- The `tpm cert info` command now properly handles all available typeSpecs.

Issues: CT-2532

MongoDB Applier

- The replicator now reads the TLS certificate for Mongo Atlas connectivity from the correct keystore (`tungsten_truststore.ts`)

Issues: CT-2227

Core Replicator

- Fixed an issue that would wrongly flag a SQL statement starting with a `#` comment as `bidi_unsafe`

Issues: CT-2405

- The replicator will now properly rollback an XA transaction in case of failure.

Issues: CT-2410

API

- Fixed an issue where a component stopped through through the API would wrongly indicate "unable to stop"

Issues: CT-2515

## 3. Tungsten Operator v8.x Release Notes

### 3.1. Tungsten Operator 8.0.0 GA [6 May 2025]

Version End of Life. Not Yet Set

Release 8.0.0 marks the first release of the Tungsten Operator.

## 4. Tungsten Clustering v7.x Release Notes

### 4.1. Tungsten Clustering 7.2.1 GA [3 Feb 2026]

Version End of Life. Not Yet Set

Release 7.2.1 contains a number of key bug fixes and improvements.

Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

Installation and Deployment

- `tpm` now only reads `/etc/tungsten/tungsten.ini` (no longer looking in `$HOME` directory and `/etc/tungsten.ini`)

For a different path, different filename or multiple files, use the `--ini` supplying a comma-separated list

Issues: CT-2612

Command-line Tools

- The `tprovision` command no longer requires the external tool `tungsten_get_mysql_datadir`.

Additionally, the tool has been significantly re-factored for greater stability, performance and functionality.

*Issues:* CT-2597

- The `tpm ini check` command now checks for two new rules:
  - There MUST be a `witnesses=` entry in EVERY stanza if `enable-active-witnesses=true` exists in [defaults]
  - There MUST be a `witnesses=` entry in a stanza that contains `enable-active-witnesses=true`

*Issues:* CT-2625

- The `tpm provision` command now deletes only binary log files listed in the index if the binary log directory is not the same as the mysql data directory.

*Issues:* CT-2631

## Improvements, new features and functionality

### Installation and Deployment

- New feature: `tungsten.ini` backup and history.

When enabled with the `tpm` flag `tungsten-ini-backup` (false by default), the `tpm update` command will create a copy of the current INI file (default: `/etc/tungsten/tungsten.ini`) as `$CONTINUENT_ROOT/history/ini/tungsten.ini.YYYYMMDDhhmmss`

When enabled with the `tpm` flag `tungsten-ini-backup`, the `tpm install` command will create the first history file and the history subdir, if needed.

A new sub-command, `tpm ini diff` has been added to compare the current INI file (default: `/etc/tungsten/tungsten.ini`) and a history file (default: latest history file found), and can also accept `--stamp {YYYYMMDDhhmmss}` to specify which file to diff by timestamp.

A new sub-command, `tpm ini backup` has been added to manually invoke the same copy that the `tpm update` command does.

Added two new `tpm` configuration flags:

- `tungsten-ini-backup` (default: false) : Enable the `tungsten.ini` automatic backup feature during `tpm install` and `tpm update`
- `tungsten-ini-history-dir` (default: `$CONTINUENT_ROOT/history/ini`) : Define the location for `tungsten.ini` backup/history files

*Issues:* CT-2635

### Command-line Tools

- New Feature: `tpm ini upgrade --ini {fullpath}` will display all changes to the specified INI file that would be performed by the `tpm update` commands during a version upgrade. Adding the `--write` argument would apply the changes to the specified file as well.

*Issues:* CT-2601

- The `tpm ini check` command now validates composite topologies.

*Issues:* CT-2606

- New `tpm` flag `--add-ssl` now allows to force generate certificates when doing an upgrade. This allows configurations with security disabled to be upgraded to 8.0.1 AND switched to using SSL/TLS communications at the same time. Example:

```
shell> tools/tpm update --replace-release --add-ssl
```

*Issues:* CT-2619

- A new subcommand `tpm ini defaults` has been added to list any `tpm` option that actually has a default value defined in the `tools/tpm_options_db.txt` file, along with the default value.

Additionally, documentation has been updated to show defaults and options for all properties where applicable.

*Issues:* CT-2634

- New feature `tpm copy --example` will show the manual steps taken by `tpm copy --init` to copy the cluster certificate files to other nodes.

*Issues:* CT-2636

### Core Replicator

- The replicator now includes real-time performance monitoring to track and identify slow database operations during replication. The feature provides visibility into transaction, event, and statement execution times with configurable thresholds for alerting. For more information on configuring and using this feature, see [trepctl perflog Command](#)

*Issues:* CT-2629

## Bug Fixes

### Installation and Deployment

- Fixed an installation issue when using MariaDB 10.6 with SSL. Previously, this would have failed to install showing an error message like :

```
Unable to connect to the MySQL server using tungsten@db1:13306 (WITH PASSWORD) (MySQLLoginCheck)
```

*Issues:* CT-2624

### Command-line Tools

- The [tungsten\\_send\\_diag](#) now uses AWS Signature Version 4 to upload files.

*Issues:* CT-2589

- The [tpm cert gen](#) command now works during version upgrades when a security configuration file may not have existed before (`password.s.store`).

*Issues:* CT-2618

- The [tprovision](#) command now correctly honors the mountpoint override flag when not using method [rsync](#).

*Issues:* CT-2651

### Backup and Restore

- Fixed an edge case issue with xtrabackup running against the primary node and MySQL 8+.

#### Note

Generally we do not recommend taking backups from primary nodes, and instead backups should be taken from replicas.

*Issues:* CT-2602

### Core Replicator

- Fixed an issue where timestamp columns would not match between source and target when using the `privileged-slave=false` property to replicate from a source database using MIXED binlog mode.

*Issues:* CT-2594

- With recent SELinux changes, MySQL might be unable to read from `/tmp`.

This directory is used when applying a `LOAD DATA INFILE` command that was logged using Statement Based Replication (warning : this is considered as unsafe by MySQL).

In order to avoid any issues, a new setting has been added to indicate a directory to use : `svc-applier-ldi-temp-dir=/tmp/mysqltmp`

In this case, `mysqltmp` is a new subdirectory that should be set with the following permissions and SELinux context

```
mkdir -p /tmp/mysqltmp
sudo chown -R mysql: /tmp/mysqltmp
sudo chmod -R g+r /tmp/mysqltmp
sudo semanage fcontext -a -t mysqld_db_t '/tmp/mysqltmp(/.*)?'
sudo restorecon -Rv /tmp/mysqltmp
```

Another improvement was also added to force the use of LOCAL when applying a `LOAD DATA INFILE` command that was logged using SBR. This is useful when applying to a remote MySQL host. To enable, set the value of the `svc-applier-ldi-use-local=true` (default : false)

*Issues:* CT-2603

### Tungsten Connector

- No longer printing broken pipe errors (typically generated by haproxy or hardware loadbalancer checks) when `printConnectionWarnings=false` (the default)

*Issues:* CT-2576

- Fixed an issue in the Drizzle driver that could cause memory errors when handling large string parameters.

*Issues:* CT-2627

- In rare cases, a synchronization issue would prevent the connector from recovering from a site outage.

*Issues:* CT-2633

- Connector configuration files to execute Tungsten-specific show slave status request now get the right schema to select from.

*Issues:* CT-2639

- Fixed issue introduced by CT-2511 (dual certificate support) where the keystore was reloaded at every new connection.

*Issues:* CT-2652

- Fixed a null pointer exception error showing up in rare cases at startup time.

*Issues:* CT-2656

#### Core Clustering

- Recent java versions changed a default that now enable endpoint identification in secured RMI calls. As a quick turnaround, this release restores the default of disabling identification in various Tungsten scripts.

*Issues:* CT-2666

#### Tungsten Manager

- If a cluster was idle for more than 15 minutes and a failure occurred, the failover would fail to complete.

*Issues:* CT-2637

#### Security

- Upgraded jackson libraries to latest version to plug potential security holes.

*Issues:* CT-2655

## 4.2. Tungsten Clustering 7.2.0 GA [8 Jul 2025]

Version End of Life. Not Yet Set

Release 7.2.0 contains a number of key bug fixes and improvements, along with the upgrade of log4j libraries.

#### Deprecation Notices

The following features/tools have been deprecated from this release and will be removed in future releases. Any self written scripts that utilise these features should be updated.

#### Command-line Tools

- `tungsten_health_check` and `tungsten_provision_thl` have been deprecated and will be removed in a future release.

*Issues:* CT-2506

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Installation and Deployment

- All Tungsten components now use log4j version 2

*Issues:* CT-1410, CT-1412

- `tpm validate` now verifies localhost is defined in `/etc/hosts`

*Issues:* CT-2564

## Command-line Tools

- The `tungsten_send_diag` command has been updated with new security keys and the ability to accept security keys on the CLI.

*Issues:* CT-2438

- Removed `sigtrap` module dependency from `tungsten_find_orphaned`.

*Issues:* CT-2451

- The `tpm ask` command now returns the appropriate values for keys: `stagingdir`, `stagingpath`, `staginghost` and `staginguser`.

Additionally, the `tpm ask staging` command will return a JSON structure with all values. All values are the same as the output of the `tpm query staging` command, just presented differently for easier machine usage.

*Issues:* CT-2510

- The `tpm cert info` command now provides better error messages when a specified `typeSpec` file does not exist.

*Issues:* CT-2530

## Tungsten Connector

- Connector now always reads its dynamic (auto-detect) configuration from primary node by default.

*Issues:* CT-2527

## Security

- Now providing adequate error message when TLS certificates differ between connector and managers, or when manager refuses the SSL handshake.

*Issues:* CT-2579

- As of version 7.2.0 onwards, when providing custom keystores, the alias of the mysql certificate must be provided as `java-mysql-alias=xxx` and must have the same name in both `tungsten_keystore` and `tungsten_connector_keystore`.

*Issues:* CT-2598

## API

- The Manager APIv2 now returns a 404 error instead of 500 when a task status is requested for a TaskID that does not exist inside that Manager process.

*Issues:* CT-2430

## Improvements, new features and functionality

## Installation and Deployment

- Introduced a new set of `tpm` group aliases to control the rest api configuration when the same value needs applying to multiple properties, as follows:

- `rest-apis` will set `connector-rest-api`, `manager-rest-api` and `replicator-rest-api`
- `rest-api-address` will set `connector-rest-api-address`, `manager-rest-api-address` and `replicator-rest-api-address`
- `rest-api-authentication` will set `connector-rest-api-authentication`, `manager-rest-api-authentication` and `replicator-rest-api-authentication`
- `rest-api-ssl` will set `connector-rest-api-ssl`, `manager-rest-api-ssl` and `replicator-rest-api-ssl`

For example, a before and after comparison of your `/etc/tungsten/tungsten.ini` may look like the following:

## BEFORE

```
[defaults]
...
connector-rest-api=true
manager-rest-api=true
replicator-rest-api=true
connector-rest-api-address=0.0.0.0
manager-rest-api-address=0.0.0.0
replicator-rest-api-address=0.0.0.0
```

```
connector-rest-api-authentication=true
manager-rest-api-authentication=true
replicator-rest-api-authentication=true
connector-rest-api-ssl=true
manager-rest-api-ssl=true
replicator-rest-api-ssl=true
...
```

#### AFTER

```
[defaults]
...
rest-apis=true
rest-api-address=0.0.0.0
rest-api-authentication=true
rest-api-ssl=true
...
```

*Issues:* CT-2459

#### Command-line Tools

- The new `tpm ini` command allows for easy creation, checking and administration of the `/etc/tungsten/tungsten.ini` configuration file.

*Issues:* CT-2366

- The `tpm ask` command now supports the `-s|--service` option for `dsrole`, `dsstate`, `trrole` and `trstate` keys. The option alias for `--short` is now `-S` [capitalized], was previously lower-case. Example: `tpm ask dsrole --service east_from_west`

*Issues:* CT-2400

- The `tpm cert` command will now handle public key files. The command `tpm cert gen public` will create `$CONTINUENT_HOME/generated/tungsten_public.jks` from the `$CONTINUENT_HOME/share/tungsten_keystore.jks` file and the `tpm cert list public` command will show the contents, etc.

*Issues:* CT-2434

- The `tpm diag` command now gathers the output of the `tpm ini check -x` command as the `tpmINICheck` call.

*Issues:* CT-2499

- The `tpm ini` command now handles all new `tpm` options.

*Issues:* CT-2543

- The `tpm ask` command will now convert values `0` and `false` to `No` and values `1` and `true` to `Yes` as human output when given `--human` or `-n` cli args.

*Issues:* CT-2559

#### Core Replicator

- Replicator now recognizes the new MySQL 8.4 `show binary log status` syntax (As well as `show master status`) and will run replacement configured request appropriately.

*Issues:* CT-2291

- The `trepctl perf` output has been improved when parallel apply is enabled to show granular statistics per channel.

*Issues:* CT-2517

#### Tungsten Connector

- Fixed a bug where connections properly disconnecting with quit command would get an empty database change request.

*Issues:* CT-2395

- Connector now recognizes the new MySQL 8.4 `show replica status` syntax (As well as `show slave status`) and will run replacement configured request appropriately.

*Issues:* CT-2401

#### Security

- Tungsten can now hold two MySQL database SSL Certificates, allowing rotation of certificates without the need for downtime. A new command line tool, `rotate_certs`, is provided to aid in this process.

Issues: CT-2511

### Monitoring

- Additional prometheus metrics have been added to the Replicator:
  - `tungsten_replicator_service_online_duration_seconds` gauge show duration in seconds since the replicator was put online.
  - `tungsten_replicator_task_total` counter shows statistics by service, stage and task as shown in the following example:

```
tungsten_replicator_task_total{service="alpha",stage="q-to-dbms",task_id="1",stat="extract_time",} 250.015
```

In this case, this is the extract time spent by the task #1 of the q-to-dbms stage of the alpha service. This is similar to the new `trepctl perf` output.

Issues: CT-2514

### Bug Fixes

#### Installation and Deployment

- The `tpm update` command no longer displays the message `"common::diffPasswordsDotStore: No custom source passwords.store file defined - SKIPPING"`

Issues: CT-2406

- `tpm` now properly detects MariaDB default settings.

Issues: CT-2424

- `tpm` flags `datasource-log-directory` and `repl-direct-datasource-log-directory` will now use the value of each other as a default if only one is specified

Issues: CT-2425

#### Command-line Tools

- The `tpm diag` command no longer displays a NOTICE for missing optional files.

Issues: CT-2355

- The `tpm check ports` and `tpm check ports -c` commands are now able to handle replicator-only nodes. By default, it will automatically try to discover the node type, and you may manually specify the node type with `-r|--replicator` or `-c|--cluster`.

Issues: CT-2356

- The `tapi` command now creates proper URL's for these standard endpoints when `-c`, `-M` or `-R` are specified along with one of the following strings: `ping`, `tungstenVersion`, `createAdminUser`, `deleteAdminUser`, `listAdminUsers`, `rmiSecurity` or `user`.

Issues: CT-2391

- The `tpm diag` command now gathers:
  - `tungsten-replicator/log/replicator-api.log`
  - `tungsten-connector/log/connector-api.log`
  - `tungsten-manager/log/manager-api.log`

Issues: CT-2397

- The `tpm delete-service` and `tpm update` commands now correctly remove Composite Active/Active cross-site subservices from `cctrl`

Issues: CT-2404

- The `tungsten_get_status` command now passes the correct number of arguments to the `printf` function in various places, preventing `"Redundant argument"` warnings.

Issues: CT-2407

- The `tapi` command now accepts non-standard ports on the command line, and also properly accepts a user/password pair on the CLI.

Issues: CT-2420

- The `tpm update` command now properly identifies and removes services with mixed-case service names.  
*Issues:* CT-2426
  - The `tpm keep` command is now properly called by `tpm uninstall`, and a regression in a call to the mysql cli has been fixed as well.  
*Issues:* CT-2462
  - `executable-prefix` is now applied to `deployall` and `undeployall` script names. For example, when `executable-prefix=mm`, `deployall` would be named `mm_deployall`.  
*Issues:* CT-2467
  - The `tpm ask version` and `tpm ask versions` commands now display values.  
*Issues:* CT-2475
  - During a `tpm uninstall`, when skipping data services not managed locally, `tpm` will now print a notice rather than a warning, since this is the expected behavior.  
*Issues:* CT-2479
  - The `tungsten_send_diag` command now handles curl and AWS S3 errors separately and displays the proper message back.  
*Issues:* CT-2488
  - Fixes an issue where `dsctl set` with the `--reset` option could show warnings when run several times in a row, as shown:  

```
WARNING: Could not execute query DROP TABLE `tungsten_alpha`.`heartbeat` : Unknown table 'tungsten_alpha.heartbeat'
```

  
*Issues:* CT-2502
  - The `tpm cert aliases --running` command now properly handles the `tls_passwordstore` and `jmx_passwordstore` typeSpecs.  
*Issues:* CT-2512
  - The `tpm cert info` command now properly handles all available typeSpecs.  
*Issues:* CT-2532
  - The `tpm delete-service` command now sets `MAINTENANCE` mode before operations, then sets back to `AUTOMATIC` if it was `AUTOMATIC` to start with.  
*Issues:* CT-2555
  - The `tpm purge-thl` command now works properly when run against environments where there are multiple THL files, but the lowest seqno returned exists in the very first THL file.  
*Issues:* CT-2561
  - The `tapi` command no longer issues an error when the quantity of command-line arguments is larger than expected.  
*Issues:* CT-2580
- #### Core Replicator
- Fixed an issue that would wrongly flag a SQL statement starting with a `#` comment as `bidi_unsafe`.  
*Issues:* CT-2405
  - The replicator will now properly rollback an XA transaction in case of failure.  
*Issues:* CT-2410
  - Fixed an issue where a cluster could display a wrong latency after MySQL and the replicator were stopped and restarted. This would only show under no load conditions.  
*Issues:* CT-2485
- #### Tungsten Connector
- Fixed an issue with PHP and `caching_sha2_password` when using proxy mode: the protocol part "fast path" was not handled properly by the connector, php would hang after reading an unexpected packet. Workaround for this issue (for earlier tungsten versions) is to set `proper-ty=defaultAuthPlugin=mysql_native_password` within `/etc/tungsten/tungsten.ini`.

*Issues:* CT-2471

- In active/active setups, no longer using global data service for show slave latency connector intercept.

*Issues:* CT-2554

#### Security

- `tungsten_mysql_ssl_setup` now properly generates v3 self signed CA certificates for openssl 3 found in RHEL9 Linux flavors.

*Issues:* CT-2581

## 4.3. Tungsten Clustering 7.1.4 GA [1 Oct 2024]

Version End of Life. Not Yet Set

Release 7.1.4 contains a number of key bug fixes and improvements.

### Warning

Due to JGroup libraries being updated in the 7.1.0 release, managers running releases older than 7.1.0 will not communicate with managers running 7.1.0+ therefore when upgrading to this release from anything older than 7.1.0, all nodes must be upgraded before proper cluster communication will be restored. Ensure the cluster is in [MAINTENANCE](#) before beginning the upgrade and do NOT SHUN nodes whilst a mix of manager versions are running.

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- Global calls to sudo in `tpm` are now sensitive to the `tpm` option and alias `root-command-prefix/enable-sudo-access` when set to false.

*Issues:* CT-2310

- The `check_tungsten_progress` command now aborts with exit code 3 and displays the UNKNOWN status when run on Witness nodes.

*Issues:* CT-2320

- The `tpm copy` command now accepts the `--install` argument as an alias for `--share`.

*Issues:* CT-2332

- The `tpm purge-thl` command is now Composite Cluster-aware.

*Issues:* CT-2343

#### Monitoring

- Tungsten monitoring scripts no longer rely upon the `bc` command, removing the dependency because recent distros do not have `bc` available.

*Issues:* CT-2371

### Improvements, new features and functionality

#### Command-line Tools

- The `tpm diag` command now gathers the mount and hostname commands.

*Issues:* CT-2314

- Added the `-last` and `-first` options to `thl dsctl` command

*Issues:* CT-2318

- The `tpm diag` command now gathers the output of `crontab -l`.

*Issues:* CT-2344

- The `tungsten_find_orphaned` command now accepts the `--sql` option when using the `--epoch` option for Scenario 2. This will output the full SQL statements instead of just the headers. For use with `--epoch` only. Not available with ROW-based replication, only with STATEMENT or MIXED.

*Issues:* CT-2345

- The `tpm diag` command now gathers `service_logs/tpvision.log` and `service_logs/trestore.log`, if they exist

*Issues:* CT-2385

- The `tpm diag` command now gathers show global status; from the MySQL server.

*Issues:* CT-2387

#### Filters

- A new `maskData` filter has been added, allowing basic level data obsfucation capabilities.

*Issues:* CT-849

#### Bug Fixes

##### Command-line Tools

- The `tpm check ini` command now properly handles `property=` INI entries.

*Issues:* CT-2352

- The `tungsten_mysql_ssl_setup` command no longer tries to `ls` any `.p12` file unless `--p12` has been given on the cli

*Issues:* CT-2357

- The `tpm copy --doini` command now functions properly from the staging directory before the initial installation of Tungsten.

*Issues:* CT-2362

- The `tpm cert` command now easily imports certificate bundles into various files, and correctly reads a file name as the proper `typeSpec` in various subcommands.

*Issues:* CT-2369

- The `tpm check ini` command now honors the `--short` and `--valid` options

*Issues:* CT-2373

##### Core Replicator

- Fixed a bug preventing the auto-recovery feature to put the service back online if it failed to connect to database during a retry.

*Issues:* CT-2377

- Fixed an issue where the replicator was not able to build a valid DELETE statement, when `enable-heterogeneous-service` was set to true.

*Issues:* CT-2379

- Fixed a bug in latency calculations that in some circumstances could appear as though the latency on the applier stages was "flapping".

*Issues:* CT-2386

## 4.4. Tungsten Clustering 7.1.3 GA [25 Jun 2024]

Version End of Life. Not Yet Set

Release 7.1.3 contains a number of key bug fixes and improvements.

### Warning

Due to JGroup libraries being updated in the 7.1.0 release, managers running releases older than 7.1.0 will not communicate with managers running 7.1.0+ therefore when upgrading to this release from anything older than 7.1.0, all nodes must be upgraded before proper cluster communication will be restored. Ensure the cluster is in `MAINTENANCE` before beginning the upgrade and do NOT SHUN nodes whilst a mix of manager versions are running.

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- The `tpm cert` command now properly accepts the full file name as a typeSpec.

*Issues:* CT-2213

- The `tpm update` command now checks for a custom `passwords.store` file in the INI and exits with an error if the running file does not match the custom file.

*Issues:* CT-2216

- All scripts that call `cctrl` have been updated to use `cctrl -no-routers` when possible to improve performance.

*Issues:* CT-2228

- The `tpm diag` command now checks the `my_print_defaults` command for the MySQL error log value if the direct query `SELECT @@GLOBAL.log_error`; fails to gather a value for any reason.

*Issues:* CT-2229

- The `tpm cert` command now accepts `--basedir` and `--certsdir` as aliases for `--dir` to specify the target directory for generation

*Issues:* CT-2267

- The `tpm cert` command now accepts an absolute path filename as a typeSpec.

*Issues:* CT-2268

- The `tapi` command Connector router module support has been removed.

*Issues:* CT-2277

- The `tapi` command option now prints a much easier-to-understand URL when specifying the `-u` option

*Issues:* CT-2279

- The default port in `tpm generate-haproxy-for-api` has been updated to 8201

*Issues:* CT-2282

- Improved support for the `--nosudo` argument and the `sudo` command in `tpm diag`

*Issues:* CT-2308

### Improvements, new features and functionality

#### Installation and Deployment

- Added support for Ruby 3.2.

*Issues:* CT-2296

- Oracle Linux 9 has been certified for Tungsten products from version 7.1.3.

*Issues:* CT-2370

#### Command-line Tools

- Improved help text in the `tpm cert` command

*Issues:* CT-2222

- A new command has been added, `tpm check ini`, that will validate all options present in a `tungsten.ini` file. This command can be run prior to installation.

*Issues:* CT-2240

- `tpasswd` utility gets a new switch `-c` or `--compare.to` allowing password store file comparison for `tpm update` purpose.

*Issues:* CT-2278

- Added new `tpm check ports` command which will check port connectivity for standard Tungsten ports to a specified host

*Issues:* CT-2292

#### Tungsten Connector

- In proxy mode, kill queries are now intercepted by the connector in order to replace the given `thread_id` by the underlying database connection `thread_id`.

#### Note

While executing the kill command, you might get an error like "Could not execute query kill query <id>: Unknown thread id: <id>". This can be ignored, the connection will still be properly killed.

*Issues:* CT-2298

#### Bug Fixes

#### Installation and Deployment

- The `tpm update` command now passes the verbose and debug flags properly to `tpm delete-service`.

*Issues:* CT-2299

#### Command-line Tools

- The `tpm cert` and `tpm copy` commands now work from the staging directory before Tungsten is installed.

*Issues:* CT-2181

- All `tpm` commands now use the `--force` and `-f` arguments consistently.

*Issues:* CT-2224

- Fixes a regression in `tpm cert` that prevented `BASE_DIR` in `tungsten.env` from being used properly.

*Issues:* CT-2237

- The `tpm cert` command now works correctly with the `share/tungsten.env` configuration file prior to installation.

*Issues:* CT-2255

- The `tpm report` command now displays channel 2 output properly when in Bridge mode.

*Issues:* CT-2294

#### Monitoring

- The `zabbix_tungsten_online` monitoring tool now properly supports active witnesses.

*Issues:* CT-2300

- The `check_tungsten_progress` command now behaves properly on witness nodes by exiting with an error `CRITICAL: Replicator is not installed on Witness nodes`.

*Issues:* CT-2301

## 4.5. Tungsten Clustering 7.1.2 GA [3 Apr 2024]

Version End of Life. Not Yet Set

Release 7.1.2 contains a number of key bug fixes and improvements.

#### Note

v7.1.2 was re-released as build 81 on 13 May 2024 to fix two critical bugs that exist in the original build 42 release [CT-2284, CT-2285].

## Warning

Due to JGroup libraries being updated in the 7.1.0 release, managers running releases older than 7.1.0 will not communicate with managers running 7.1.0+ therefore when upgrading to this release from anything older than 7.1.0, all nodes must be upgraded before proper cluster communication will be restored. Ensure the cluster is in `MAINTENANCE` before beginning the upgrade and do NOT SHUN nodes whilst a mix of manager versions are running.

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- The systemd startup scripts will now have a dependency on the time-sync service (if available) being started before tungsten components.

*Issues:* CT-2257

### Improvements, new features and functionality

#### Installation and Deployment

- A new INI option has been added `rest-api-admin-password` which acts as an alias for the existing `rest-api-admin-pass` option.

*Issues:* CT-2246

#### Command-line Tools

- A new command, `tungsten_mysql_ssl_setup`, has been introduced to create all needed security files for the MySQL database server. `tungsten_mysql_ssl_setup` will act as a direct replacement for the `mysql_ssl_rsa_setup` command which is not included with either Percona Server or MariaDB. This command will now be called by `tpm cert gen mysqlcerts` instead of `mysql_ssl_rsa_setup`.

*Issues:* CT-2188

- The `tpm diag` command now captures the output of `sestatus` and `getenforce`.

*Issues:* CT-2243

#### Filters

- A new filter, `binarystringconversion`, was added to provide a way to convert varchar data from one charset into another.

*Issues:* CT-981

#### Bug Fixes

##### Installation and Deployment

- The `tpm update` command now properly recognizes the INI option `dataservice-composite-datasources` as an alias for `composite-datasources`.

*Issues:* CT-2241

##### Core Replicator

- Fixed an issue where the shard name of an event could be badly identified, which could potentially lead to deadlocks when parallel apply was enabled.

*Issues:* CT-2266

- Fixed an issue caused by a MySQL behavior change in how a `DROP TABLE` is logged in the binlog, that made the replicator unable to identify correctly if the query had tungsten metadata in it.

*Issues:* CT-2269

- Event extraction can sometimes generate an empty fragment (for a multi fragment transaction). This in turn can lead to bad shard detection. While empty fragment is expected, shard detection will now use the last non-empty fragment.

## Note

This bug was detected in v7.1.2 build 42, and fixed in v7.1.2 build 81

*Issues:* CT-2284

#### Tungsten Connector

- Fixed an issue where some applications won't be able to connect to the connector under bridge mode and ip filtering in place through `authorized_hosts`.

*Issues:* CT-2261

- Fixed a bug where any new connection to the connector would trigger a call to `hostname`, potentially exhausting CPU resources.

#### Note

This bug was detected in v7.1.2 build 42, and fixed in v7.1.2 build 81

*Issues:* CT-2285

#### Tungsten Manager

- Fixes an issue with data source monitoring when client and server don't share the same default authentication plugins.

*Issues:* CT-2233

- The `tpm diag` command no longer errors out on witness hosts installed with the Staging method.

*Issues:* CT-2262

- Fixes a bug that would cause a switch to fail if the cluster had been idle for more than 15 minutes.

*Issues:* CT-2263

## 4.6. Tungsten Clustering 7.1.1 GA [15 Dec 2023]

Version End of Life. Not Yet Set

Release 7.1.1 contains a number of key bug fixes including one major bug fix that prevents switches from working correctly after upgrading from v6.

#### Warning

Due to JGroup libraries being updated in the 7.1.0 release, managers running releases older than 7.1.0 will not communicate with managers running 7.1.0+ therefore when upgrading to this release from anything older than 7.1.0, all nodes must be upgraded before proper cluster communication will be restored. Ensure the cluster is in `MAINTENANCE` before beginning the upgrade and do NOT SHUN nodes whilst a mix of manager versions are running.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- The `tpm diag` command now collects `ps -aux` output in addition to `ps -efl` when possible.

*Issues:* CT-2119

#### Tungsten Connector

- Changed default value of `mgr-policy-fence-slave` setting so that a replica data source is put offline 60s after its replicator goes offline. This change will prevent routing traffic to replicas that are stale.

*Issues:* CT-2096

#### Improvements, new features and functionality

#### Command-line Tools

- The `tapi` command now supports the `?no-connectors=1` argument in APIv2 via the new cli argument `--no-connectors`

*Issues:* CT-2174

- The `tpm mysql` command now accepts the `--force` argument to function on Witness nodes that have a running database.

*Issues:* CT-2180

#### Bug Fixes

#### Installation and Deployment

- Installations will now succeed on hosts running Ruby 3.x

*Issues:* CT-2196

#### Command-line Tools

- The `tpm report` command now correctly displays security info tpm options as blank when none exists.

*Issues:* CT-2176

- The `tpm update` command no longer fails to display foreign-owned dot-files and directories.

*Issues:* CT-2190

- The `tpm mysql` command now properly accepts the `-e` argument as a shortcut for the `--execute mysql cli client` argument.

*Issues:* CT-2217

#### Tungsten Manager

- Fixed a thread synchronization issue that can cause memory leaks.

*Issues:* CT-2197

- v6 API configuration properties within the INI file, are now also recognised by v7.

*Issues:* CT-2231

- Fixed a bug when upgrading from 6.x to 7.x that prevented switches/failovers from working. Also the change of `datasource-group-id` in the INI will now be correctly reflected after a tpm update.

*Issues:* CT-2236

## 4.7. Tungsten Clustering 7.1.0 GA [16 Aug 2023]

Version End of Life. Not Yet Set

Release 7.1.0 is the next major v7 release containing a number of important bug fixes and key new features.

### Warning

Due to JGroup libraries being updated in this release, managers running releases older than 7.1.0 will not communicate with managers running 7.1.0+ therefore when upgrading to this release, all nodes must be upgraded before proper cluster communication will be restored. Ensure the cluster is in MAINTENANCE before beginning the upgrade and do NOT SHUN nodes whilst a mix of manager versions are running.

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- No longer using connector graceful-stop together with `systemd` for upgrades. The underlying change of binary confuses `systemd` scripts.

*Issues:* CT-2113

- `cctrl` now accepts services names with capital letters, dots and hyphens

*Issues:* CT-2163

- The `tpm copy-keys` command has been renamed to `tpm copy` and a new command has been created `tpm cert copy` with the same functionality.

*Issues:* CT-2186

#### Backup and Restore

- When performing a provision via rsync, `tprovision` will now sleep for 2 seconds after locking tables to make sure all transactions have finished writing to disk.

*Issues:* CT-2169

#### Improvements, new features and functionality

##### Behavior Changes

- Additional logging will now be added to the replicator logs during switchover/failover operations to enable better debugging in the event of issues.

*Issues:* CT-1448

#### Installation and Deployment

- Running `tpm uninstall` will now save all of the Tungsten database tracking schemas for later use. There is also a new `tpm keep` command, which allows the tracking schemas to be saved to disk at any time in multiple formats [.json, .dmp and .cmd]

*Issues:* CT-2131

- Added tpm flag `deploy-systemd` as a more meaningful alias to `install`

*Issues:* CT-2152

#### Command-line Tools

- Added a new option `--preserve-schema` to the `tpm uninstall` command in order to leave the tracking schema in the database.

*Issues:* CT-561

- A new command `tpm cert` has been added to aid in the creation, rotation and management of certificates for all areas of Tungsten.

Known limitations: Percona 5.6, and all versions of MariaDB do not provide the `mysql_ssl_rsa_setup` command required by `tpm cert gen mysqlcerts`.

*Issues:* CT-2085

- The `tpm report` command now displays the security-specific information for each channel shown, including file paths and tpm options. Security information and tpm options for each channel will also be shown when `--extra` is used with `--list`.

Also added the `tpm ask certs` command with expiry and sha2566 info per alias, along with the `tpm ask certtpm` and `tpm ask certlocations` commands with reference information about the `security.properties` file.

Added help text for `tpm ask --long` which shows the key/variable name along with the value. The `tmonitor -t test` command now shows only the actual Tungsten-specific metrics lines.

Added `tmonitor -T test` to show metrics help and headers along with actual `tungsten_*` metrics lines.

*Issues:* CT-2088

- `tungsten show processlist` could error with a disconnection message listing connections disconnected on the mysql server side.

*Issues:* CT-2112

- The `tpm diag` command now captures the output of `ctrl> cluster topology validate`

*Issues:* CT-2115

- The `tpm diag` command now supports the `--skipsudo` and `--nosudo` arguments to prevent operations from using the `sudo` command. Using this option may result in `tpm diag` skipping/failing various gathers due to a lack of access.

*Issues:* CT-2146

- The `tungsten_send_diag` command has a new argument `--all` which will tell the `tpm diag` command to gather all hosts with `-a`, and this replaces the previous method for gathering all hosts for `tungsten_send_diag, --args '--all'`

*Issues:* CT-2150

### Backup and Restore

- MySQL clone can now be used as an option for recovery using [tprovision](#).

*Issues:* CT-1417

- [tungsten\\_get\\_mysql\\_datadir](#) can now return additional mysql database directories.

*Issues:* CT-1985

- [tprovision](#) will now add a heartbeat after restore. This will ensure the replicator can be put back online when there is no load on the cluster.

*Issues:* CT-2005

- The [tprovision](#) script will sleep for 5 seconds by default when using the rsync method after issuing a flush logs. The sleep value is configurable as a command line option `--flush-after-sleep`.

*Issues:* CT-2101

### Filters

- A new [shardbyrules](#) filter has been added that will allow rule based sharding of replication based on user configurable rules that would allow sharding at table level, whereas previously sharding would only be handled at schema level.

For more information, see [shardbyrules Filter Documentation](#)

*Issues:* CT-2164

### Tungsten Connector

- Tungsten Connector now supports dual passwords, mirroring the MySQL v8.0.14+ functionality. When changing a user password, the previous password can be retained as long as needed in order to allow changing account passwords with no downtime.

*Issues:* CT-2127

- Added a flag to avoid generating and sending EOF packets to client applications when `CLIENT_DEPRECATED_EOF` is not set on both client and mysql server sides. This fixes an issue with Go-MySQL-Driver and prepared statements.

When using Go MySQL Driver, flag `--connector-generate-eof=false` should be specified. Default is set to true for backwards compatibility.

*Issues:* CT-2177

### Core Clustering

- Upgraded JGroups library to 4.2.22

*Issues:* CT-2011

- There is a new `datasource-group-id` TPM option. In a single cluster the nodes with the same `datasource-group-id` will form a Distributed Data-source Group (DDG).

*Issues:* CT-2051

### Monitoring

- Prometheus exporters now provide the ssl cert expiration date as an epoch value in addition to the label.

*Issues:* CT-2099

- Added Prometheus exporter metrics for composite parent and sub-services.

*Issues:* CT-2121

- Prometheus libraries have been upgraded from version 0.8.1 to 0.16.0

*Issues:* CT-2166

- The ability to configure the Java Virtual Machine (JVM) settings for the manager has been made easier, by the use of the `manager_java_settings.conf` file. For more information see [Adjusting JVM Settings for the Manager](#)

*Issues:* CT-2167

## Bug Fixes

### Installation and Deployment

- Fixed RPM package script to run `tpm install` instead of `tpm update` when installing the rpm

*Issues:* CT-2130

### Command-line Tools

- The `tpm` command now handles situations when the Manager process is not running.

*Issues:* CT-2103

- `tpm uninstall` would sometimes print `"ERROR >> db1 >> undefined method '+' for nil:NilClass"`

*Issues:* CT-2104

- The `tungsten_find_orphaned` command now handles some edge cases more gracefully.

*Issues:* CT-2107

- The `cctrl cluster topology validate` command now checks, in a CAA setup, if the relay in the subservice is on the same host as the primary, and reports if there is a mismatch.

*Issues:* CT-2114

- The `tpm` command now searches more places to locate shell commands that are called, especially useful when `$CONTINUENT_ROOT/share/env.sh` is not sourced.

*Issues:* CT-2182

### Backup and Restore

- `tprovision` would produce errors if the local hostname were different from the hostname used in the Tungsten install (short vs long names).

*Issues:* CT-1363

- `tprovision` will now print an error message and exit if the MySQL datadir does not exist.

*Issues:* CT-1901

- `tprovision` would accept bogus options and not produce an error. This has now been fixed.

*Issues:* CT-2045

- `tprovision` will now timeout if ssh is blocked from the target to the source host.

*Issues:* CT-2139

- Using `mysqldump` for `tprovision` could incorrectly create a new SSL key pair.

*Issues:* CT-2142

### Core Replicator

- Improved a query that is run by Tungsten when fetching tables metadata (column names, datatypes, etc). While it is not generally needed, the unoptimized query can run badly (especially) against old mysql versions with a lot of databases / tables. For now, the new optimized query is not used by default, but this could change in some future version.

This can be enabled by using the following property :

```
property=replicator.datasource.global.connectionSpec.usingOptimizedMetadataQuery=true
```

*Issues:* CT-2077

- Fixed an issue while processing geometry data with SRID 4326 that would swap longitude and latitude. This applies only to MySQL 8, as prior MySQL versions do not allow specifying the order when applying a WKB (Well-known binary) to MySQL

*Issues:* CT-2172

### Tungsten Connector

- Fixed `NullPointerException` when reading packets from disconnected client connections.

*Issues:* CT-2132

- Fixed a log4j configuration issue where the `connector-audit.log` and `connector-api.log` files that have been rotated will end up in `cluster-home/bin/directory` instead of `tungsten-connector/log/`.

*Issues:* CT-2137

- Fixed an issue with topology validation when running `tpm promote-connector` on a witness host

*Issues:* CT-2161

- Fixed an issue where a failover could hang in rare cases when security and Proxy mode are enabled. SSL connections to a failed data source could enter a deadlock and block failover for up to 15 minutes.

### Note

This issue only affects users running Java 11, and is related to <https://bugs.openjdk.org/browse/JDK-8241239>

*Issues:* CT-2183, CT-2187

#### Core Clustering

- In a Composite Active/Active topology, issuing SHUN/DRAIN or WELCOME on a node in `cctrl` would only affect the node in the main cluster service. This action will now also be applied to the same node within the `x_from_y` sub-service.

*Issues:* CT-2145

#### Tungsten Manager

- A set of changes to improve `cctrl` responsiveness
  - `cctrl` now properly lists responsive connectors even if some fail to return their status in a timely fashion (for example with slow networks)
  - Under the above condition, `cctrl` will return in 5-6 seconds rather than in up to 30 seconds when there is network congestion/partition.
  - Under normal conditions, `cctrl` responds significantly more quickly - up to 3x faster - due to optimized communications between `cctrl` and remote connectors.
  - `cctrl` commands are no longer slowed down/blocked by internal ping traffic to connectors.
  - Fixed an issue where individual connectors cannot be addressed in 'router' commands.

*Issues:* CT-1795

## 4.8. Tungsten Clustering 7.0.3 GA [4 Apr 2023]

Version End of Life. 28 Apr 2026

Release 7.0.3 contains a number of key bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Installation and Deployment

- Added `LimitNOFILE=infinity` in `systemd` scripts to workaround an issue with open files limit for clusters installed with `systemd`

*Issues:* CT-2023

#### Command-line Tools

- Deprecated `tungsten_get_position` and `tungsten_set_position` scripts have been removed.

*Issues:* CT-638

- The `tpm ssh-copy-cert` command has been deprecated and removed in this release.

*Issues:* CT-828

- The `tps.pl` backup tool now shows the available command-line arguments when the TAB key is pressed.

*Issues:* CT-1246

- The `tungsten_skip_all` command [along with alias `tungsten_skip_seqno`] now shows the full `pendingExceptionMessage` instead of just `pendingError`, and the `More` choice shows the `pendingErrorEventId` and the `pendingError`.

*Issues:* CT-2030

- Enabling a custom backup script does not require it to be made the default option anymore, i.e. Setting `--repl-backup-method` to the custom backup script is not required anymore.

*Issues:* CT-2039

- The `tungsten_find_seqno` command is now a wrapper for `tpm find-seqno`.

*Issues:* CT-2059

- The `tpm` command now prints a warning when running as the root OS user during operations that make changes.

*Issues:* CT-2064

- The `tpm report` command with `--extra` now shows the associated Connector listener ports and mode per port for when the connector mode is "listeners".

*Issues:* CT-2087

#### Tungsten Manager

- Increased the default manager liveness heartbeat interval from 1s to 3s.

*Issues:* CT-2095

#### Improvements, new features and functionality

##### Command-line Tools

- A new `thl tail` command has been added, allowing you to view the live THL changes as they are generated.

*Issues:* CT-405

- A new command, `tpm copy-keys`, has been added to assist with the distribution of security-related files after an INI-based installation. This tool requires ssh access between the cluster nodes for the copy to work.

*Issues:* CT-1910

- The `tungsten_get_ports` command now supports the `/opt/continuent/tungsten/tungsten-connector/conf/interfaces.json` file, if found.

*Issues:* CT-2003

- The `tungsten_get_ports` command now use values based on values obtained from `tpm query values` when possible for the greatest output accuracy.

*Issues:* CT-2008

- The `tpm ask summary` command has two new keys, `isSmartScale` and `isDirect`, which are also available individually on the command line.

*Issues:* CT-2035

- When in Connector Proxy mode, the `tpm report` command now displays the Direct and SmartScale status via Channel 2: Connector to Database

*Issues:* CT-2037

- Shell command tab completion for Tungsten-specific commands has been updated to support recent additions and changes.

*Issues:* CT-2057

##### Core Replicator

- THL transfer protocol can now be changed dynamically. This can be done using the `trepctl` command tool

```
shell> trepctl setdynamic -property replicator.thl.protocol.client.serialization -value DEFLATE
Property replicator.thl.protocol.client.serialization successfully set to DEFLATE
```

This can also be done through API v2

```
curl --user tungsten:secret --insecure --request POST 'https://127.0.0.1:8097/api/v2/replicator/service/alpha/thl/inflight-protocol' -d
'{
  "payloadType": "StringPayload",
  "payloadVersion": "1",
  "payload":
  {
    "value": "legacy"
  }
}'

{
  "payloadType": "StringPayload",
  "payloadVersion": "1",
  "payload":
  {
    "value": "THL inflight protocol is now set to legacy"
  }
}
```

*Issues:* CT-1862

#### Tungsten Connector

- Improved smart scale handling of session and global changes so they're all played against connected replica or in case of reconnection. As an example, `SET SESSION TRANSACTION READ ONLY` will be sent to both primary and replica connections so that a subsequent `SELECT @@SESSION.transaction_isolation` will return the expected value, even if executed on a replica.

*Issues:* CT-1600

- Added user-based authentication to existing host-based authentication to restrict connections per host and per user.

For more details, see [Host-based Authentication](#)

*Issues:* CT-1978

- A new advanced listeners feature has been added to the connector for even great control of client connectivity.

For more details, see [Advanced Listeners](#)

*Issues:* CT-2000

#### Bug Fixes

##### Command-line Tools

- Fixed rsync availability check in TPM to error out early when the executable is not found in the path

*Issues:* CT-1028

- The `tungsten_get_status` command now handles shunned nodes properly.

*Issues:* CT-2026

- The `tpm ask keys` command now lists all available keys properly.

*Issues:* CT-2041

- The `tpm update` command no longer aborts with a `Dataservice was NOT removed` error when service names with a hyphen are defined in the configuration. We strongly discourage the use of hyphens [-] in service names and recommend underscores [\_] instead.

*Issues:* CT-2052

- The `tpm validate-update` command now performs the delete-service checks properly.

*Issues:* CT-2054

- The `tungsten_find_events` command no longer fails with error `Undefined subroutine &main::info`

*Issues:* CT-2058

- `tpm` now builds affinity the same way in bridge and proxy modes.

*Issues:* CT-2060

- Fixes an issue when `tprovision` would delete the MySQL PEM files in the `datadir`.  
*Issues:* CT-2067
- The `tpm diag` command will now locate and kill any remaining `tpm diag` child processes on the calling host.  
*Issues:* CT-2068
- Suppressed wrong tpm errors with autodetect hosts.  
*Issues:* CT-2072
- Fixed a tpm issue trying to restore an empty policy.  
*Issues:* CT-2074

#### Core Replicator

- Fixed an issue that was occurring when an `ALTER USER` is applied on a mysql instance that uses lower case identifiers.  
*Issues:* CT-2024
- Fixed an issue where an extracted JSON field could be invalid, with doubled commas in JSON arrays.  
*Issues:* CT-2049
- Fixed an issue where status would fail if issued while a service was reconfiguring (in the middle of a `setrole` command for example).  
*Issues:* CT-2081

#### Tungsten Connector

- Fixed an issue with `CLIENT_QUERY_ATTRIBUTES` and/or `CLIENT_DEPRECATED_EOF` flags that would prevent fallback bridge mode to handle proxy connections properly.  
*Issues:* CT-2020
- Fixed an issue in Dynamic Active-Active environments where smartScale would always read from the site with write affinity, even if a different site is specified for read-affinity.  
*Issues:* CT-2040

## 4.9. Tungsten Clustering 7.0.2 GA [9 Dec 2022]

Version End of Life. 28 Apr 2026

Release 7.0.2 contains a number of key bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- The various `user-xxxx.log` files are no longer generated  
*Issues:* CT-1914
- The `check_tungsten.sh` was deprecated in release 6.1.18 and has now been removed from this release.  
*Issues:* CT-1939
- Both the `tungsten_get_ports` and `tpm report` commands have been updated to use the `ss` OS command when the `netstat` OS command is unavailable or deprecated.  
*Issues:* CT-2007

#### Core Replicator

- `repl_svc_extractor_multi_frag_service_detection` is now turned ON by default. Event shards are determined at extraction time. With fragmented events, the shard cannot be determined by only reading the first fragment, but needs to check the last fragment as well. With this setting turned OFF, there is no issue with pipelines that don't need it, i.e. no paral-

lel apply downstream replicas. However, as this is done at extract time, THL contains this information, and adding or changing a replica using parallel apply could introduce issues.

### Note

It can be disabled if you see a performance overhead but this should be done with caution. For Aurora<>Aurora Active/Active deployments it is essential that this property be left ON.

*Issues:* CT-1959

#### Tungsten Connector

- Improved tungsten show processlist by running underlying commands in parallel.

*Issues:* CT-1569

#### Core Clustering

- Changed the behavior of the connector and manager upon local site failover:

No longer sending write traffic to the remote site unless the local site is fully offline. In case of local failover, the connector will now pause connections until a new primary is elected. This will avoid risks of out-of-order apply after local failover

*Issues:* CT-2009

#### Tungsten Manager

- A failsafe shunned cluster (Caused by a network split) will be auto recovered after the network connection is re-established.

*Issues:* CT-241

### Improvements, new features and functionality

#### Command-line Tools

- rsync is now an option in [tprovision](#), in addition to using xtrabackup and mysqldump. To use rsync, specify `-m rsync`.

Using rsync by default will provision a replica in 2 passes:

- The first pass will live copy (seed) the replica from the source.
- The second pass will quiesce the source and run the rsync again, resulting in shorter down time than a single pass rsync

*Issues:* CT-338

- A new `-c` option is now available with some [trepctl](#) commands that can be used in conjunction with the `-r` option to indicate the number of times to refresh before automatically terminating. For example, the following command:

```
shell> trepctl perf -r 3 -c 10
```

Will refresh the output every 3 seconds, 10 times.

*Issues:* CT-679

- The [trepctl status](#) will now show the last known applied seqno and latency.

This information is stored on disk at regular intervals [10s minimum] so as not to overload the replicator, therefore the value can be shown as slightly old dependant on when the status command was issued.

By default, this feature is disabled. It can be enabled by setting the following parameter in the configuration :

```
svc-applier-last-applied-write-interval=20
```

This will write current position to disk every 20 seconds. This information is also exported by the Prometheus exporter.

If the service is online, it will display the current value (the same as `appliedLastSeqno` and `appliedLatency`)

```
shell> trepctl status
Processing status command...
NAME VALUE
----
appliedLastEventId : mysql-bin.000017:0000000151329854;70
```

```

appliedLastSeqno : 999
appliedLatency : 347707.0
...
lastKnownAppliedLatency: 347707.0
lastKnownAppliedSeqno : 999
...

```

*Issues:* CT-1823

- The `tungsten_merge_logs` command now supports the `--before` `TIMESTAMP` and `--after` `TIMESTAMP` filters

*Issues:* CT-1869

- Added a new log file (`tungsten-replicator/log/data-drift.log`) for data drift messages, i.e. :
  - an update statement was logged on primary, but did not update any row on replica
  - a delete statement was logged on primary, but did not delete any row on replica

*Issues:* CT-1873

- The `tpm ask` summary command now provides the coordinator host and the `isCoordinator` boolean if the Manager is running on that node.

Also, `tpm ask` now supports direct calls to coordinator, `\{isCoordinator|iscoordinator}` and `\{isBridgeMode|isBridge|bridge|isbridge|isbridgenode}`.

*Issues:* CT-1874

- The `tungsten_generate_haproxy_for_api` and `tpm generate-haproxy-for-api` commands now support using connector hosts in the backend definitions via `-c`, and extra backend flags to the backend hosts lines using `-f`.

*Issues:* CT-1909

- The `tungsten_generate_haproxy_for_api` and `tpm generate-haproxy-for-api` commands no longer call the `Perl Data::Dumper` module.

*Issues:* CT-1915

- The `tungsten_reset_manager` command now supports the ability to simply print out the path or paths to be cleared, one per line via the `-l` or `--list` arguments.

*Issues:* CT-1917

- The `tmonitor` command now accepts cli args to specify the ports and will auto-configure the ports if they have been changed via the Tungsten configuration.

*Issues:* CT-1919

- The `tpm` command calls to `glob` have been improved to be more strict and compliant.

*Issues:* CT-1940

- The `tpm ask` stages and `tpm ask allstages` commands have been added to display the Replicator stages for the current node [stages] and the stages for each role [allstages].

*Issues:* CT-1943

- The `tpm ask` command has five new variables available: `dsrole` & `dsstate` for the current datasource, and `trrole` & `trstate` for the current replicator, and `nodeinfo` which displays all 4 of the new variables.

*Issues:* CT-1944

- A new standalone status script has been added called `tungsten_get_status` that shows the datasources and replicators for all nodes in all services along with seqno and latency.

*Issues:* CT-1962

- The `tpm report` command now prints the hostname and listener ports where available when using the `--extra|-x` option or the new `--ports` option.

*Issues:* CT-1969

- A new `dsctl` option has been added to the `thl` command, and a new `-event` option added to `thl list`

Full details and examples of these new options can be found [here](#)

Issues: CT-2012

#### Core Replicator

- Added a new feature that enables pausing a replicator stage for some amount of time.

This will pause the given stage for 100 seconds.:

```
trepctl pause -stage thl-to-q -time 100
```

This will pause the stage indefinitely (or until restart, etc) Add -y to avoid the prompt message whether you are sure.

```
trepctl pause -stage thl-to-q
```

For the previous 2 commands, running a pause command again will override the previous command.

This will resume the suspended stage (Note that if the stage is not paused, this will have no effect):

```
trepctl resume -stage thl-to-q
```

#### Note

Please note this pause does not survive a replicator restart or a service offline/online.

Issues: CT-1912

- Per-service tuning of the replicator thl directory is now possible for multi-service replicator-only installs as well as for clustering. The given value should be the base directory, to which tungsten will add the service name. For example, the following entry in the tungsten.ini:

```
[alpha]
...
...
thl-directory=/drv1/thl
...
```

Would result in the THL being placed in /drv1/thl/alpha

#### Note

Update of thl directory is only available when tpm is called from the staging installation directory, NOT from the running directory.

Issues: CT-1927

- A new replicator role [thl-applier] has been added to allow a replicator service to apply its locally available THL, without pulling from a remote host

Issues: CT-1936

- Added a way to configure the maximum number of rows that can be grouped together when applying row based events for multiple insert or delete statements.

For these properties to be in effect, you must ensure that `optimize-row-events=true` is either explicitly set in your configuration, or not present (since it will be enabled by default)

For example, the following settings will limit the number of inserted or deleted rows applied at once to 10:

```
optimize-row-events-limit-insert-rows=10
optimize-row-events-limit-delete-rows=10
```

The default values if not specified will be 50 for inserts and 100 for deletes. Note that for deletes to be optimized, the affected table MUST have a single column PK.

Issues: CT-1980

#### Tungsten Connector

- The connector graceful-stop command now supports systemd service manager properly. The `connector stop` command now takes an optional argument that will make it a graceful stop. If `connector stop` is run without the parameter, it will stop the connector immediately. If a positive number of seconds is passed, it will wait, at most, this timeout for connections to disconnect (refusing new connections), after which it will force close all connections and shutdown the connector. connector graceful-stop behavior is unchanged: without the parameter, the connector will wait "forever" for connections to disconnect. A positive timeout in seconds can be passed to sever connections after the given delay

*Issues:* CT-1921

- Two new commands have been introduced to `cctrl` to provide better insight and control of the connectors. These are:

- `datasource <dsname> connections [-l]`

This command displays the current number of connections running to the given node through connectors.

- `datasource <dsname> drain [optional timeout]`

This command will prevent new connection to be made to the given data source, while ongoing connection remain untouched.

For more details on the usage and options, see [datasource Command](#)

*Issues:* CT-1949

- Added logging configuration example to print load balancers activity

*Issues:* CT-1966

#### Tungsten Manager

- Added a new option to TPM `manager-replicator-offline-timeout=<timeout_in_sec>` that configures the timeout for the manager to wait until the replicator goes offline. When parallel applier is in use the default timeout was too low, so it's now user configurable so that it can be adjusted to suit different topologies. If not supplied, the default is 180 (3 minutes). This value should be sufficient in most use cases.

*Issues:* CT-1892

#### API

- New logs files have been added for the REST API, these are as follows:

- `service_logs/connector-api.log`
- `service_logs/manager-api.log`
- `service_logs/replicator-api.log`

*Issues:* CT-1983

#### Bug Fixes

##### Installation and Deployment

- `ddlscan`, `dsctl` and `tungsten_send_diag` are now added to the `aliases.sh` script.

*Issues:* CT-813

- Fixes issues where fixed properties and filters passed to tpm in service stanzas were not being configured correctly

*Issues:* CT-1463

- No longer using Tanuki wrapper functionality to print jvm version, which was creating defunct java processes at startup, now using internal code.

*Issues:* CT-1876

- The `tpm install` and `tpm update` commands now properly support the `--thl-ports` option for cross-site subservices.

*Issues:* CT-1953

##### Command-line Tools

- The `tungsten_skip_seqno` command no longer fails when `-i` is specified, and now properly filters using `--filter` when there is a long error message.

*Issues:* CT-1877

- The `tpm` command now allows any case for section entries [i.e. `[alpha_FROM_beta]`] in the INI files.

*Issues:* CT-1879

- The `tpm diag` command now passes when the nodename defined in the `tungsten.ini` is the shortname, and DNS returns the FQDN.

*Issues:* CT-1908

- The `tpm diag` command now gathers the `mysql.log` file when SSL is enabled in the server.

*Issues:* CT-1920

- **Note**

This fix was released in Tungsten Clustering and Tungsten Replicator 7.0.2 Build 161.

The `tpm` command checks for the existence of the `mysql` command-line client when installing/upgrading. The process will no longer abort with an error on non-MySQL targets such as heterogeneous replicator appliers, or Active-Witness hosts.

*Issues:* CT-1924, CT-2018

- Fixes an issue that prevented `dsctl` from connecting to MySQL if SSL was enabled.

*Issues:* CT-1928

- The `tpm mysql` command will now gracefully handle being run on a non-database node.

*Issues:* CT-1946

- The `tpm mysql` command no longer aborts with an access denied error on CentOS 6.

*Issues:* CT-1977

- Both TungstenAPI and `tpasswd` now properly update `.passwords.store.orig` backup file so that proper manipulation of passwords won't trigger `tpm update` failure

*Issues:* CT-1981

#### Backup and Restore

- The `cluster_backup` script will no longer backup a replica if the replicator is in an ERROR state.

*Issues:* CT-1036

#### Core Replicator

- Fixes an issue that would prevent a service from going offline at a specified time (`trepctl online -until-time`) when parallel apply is enabled. This is a rework of CT-1243.

*Issues:* CT-1684

- Fixed a possible issue when recovering an old primary as a replica after failover when parallel apply is enabled, that could lead the replica to be unable to come online and require a reprovisioning of this replica.

*Issues:* CT-1890

- Fixes an issue that prevented geometry datatypes with SRID from being replicated.

*Issues:* CT-1904

- Fixed an issue where filtered events would trigger a useless update to the service `trep_commit_seqno` table while it is overwritten anyway once the last statement of the applied event is done, just prior to committing the whole block.

*Issues:* CT-1931

- Fixed an issue where the replicator would hang after applying a `DROP TABLE` event, that originally failed on the primary, but got logged into the binlog.

*Issues:* CT-1973

- Fixed a parsing issue that would prevent the replicator from correctly detecting a `CREATE TABLE` statement with `START TRANSACTION`

*Issues:* CT-1987

#### Filters

- Fixed an issue where the `dropsqlmodes` filter would fail to remove invalid sql modes from a multi-statement event

*Issues:* CT-1993

## Tungsten Connector

- Connector now auto detects default authentication plugin by retrieving MySQL data source variable `default_authentication_plugin` rather than just using MySQL server version

*Issues:* CT-1926

- No longer printing warning "`SequenceException: Parents differ`" when canceling connections of a composite data service

*Issues:* CT-1964

- Fixed connector logging configuration to show hostname and class printing logs

*Issues:* CT-1965

## Tungsten Manager

- The `cctrl` command `datasource <ds> slave` now sets the replicator role correctly. Previously, only the `datasource` role would change.

*Issues:* CT-1882

- A bug has been fixed that, in a few very rare cases, would allow replicas to continue to pull and apply THL from a failed primary whilst a failover was in the process of electing a new primary. This resulted in failovers being unable to complete fully. Whilst the new primary would be online and functioning, existing replicas in the cluster could experience errors due to THL discrepancies between the old and new primary nodes.

*Issues:* CT-1986

## API

- Fixed REST API `/api/v2/manager/control/service/{service}/switch` call. It will not switch anymore to a shunned node.

*Issues:* CT-796

- Calls to `/api/v2/manager/cluster/status` now return properly when a peer cluster is fully offline or unreachable.

*Issues:* CT-1945

- The REST API call `/api/v2/manager/control/service/{service}/datasource/{datasource}/slave` now sets the role of the replicator correctly.

*Issues:* CT-1975

## 4.10. Tungsten Clustering 7.0.1 GA [13 June 2022]

Version End of Life. 28 Apr 2026

Release 7.0.1 is the first minor release for the v7 release. This release contains a number of new features, minor bug fixes and a few key behavior changes, but importantly contains a critical bug fix for environments that use mixed-case table and database names, that could cause replication failures.

Customers already running v7.0.0 in production environments should upgrade to this release as soon as possible

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- A better error message is now provided when keystore password and enclosed private key password don't match.

*Issues:* CT-1853

### Command-line Tools

- The `cctrl` output now displays the SSL status of the group communication and the connection to the database.

```
$ cctrl
Tungsten Clustering 7.0.0
nyc: session established, encryption=true, authentication=true
jgroups: [un]encrypted, database: [un]encrypted
```

*Issues:* CT-1785, CT-1832

- The `tpm ask summary` command is now sorted by key when the Perl `Tie::IxHash` module is installed.

*Issues:* CT-1820

- The following commands which call `cctrl` now support the pass-through `-t seconds` timeout argument which specifies how long `cctrl` will wait for a connection to the Manager process before aborting:

- `check_tungsten_latency`
- `check_tungsten_online`
- `check_tungsten_policy`
- `check_tungsten_services`
- `tungsten_show_processlist`
- `zabbix_tungsten_latency`
- `zabbix_tungsten_online`
- `zabbix_tungsten_progress`
- `zabbix_tungsten_services`

*Issues:* CT-1822

- The `tpm diag` command now gathers the output of the `tpm ask summary` command

*Issues:* CT-1827

- The `tmonitor` command now calls `sudo` internally as needed, removing the need for the `tmonitor` command to be run with `sudo` for the `install` and `remove` sub-commands.

*Issues:* CT-1846

- The `tpm generate-haproxy-for-api` default starting port is now 8091.

*Issues:* CT-1865

- The `tungsten_find_orphaned` command now places the log file in `$CONTINUENT_ROOT/service_logs/`, not `/tmp/`

*Issues:* CT-1866

#### Core Replicator

- The default value for the `tpm` property `repl-svc-fail-on-zero-row-update` has been changed from `warn` to `stop`

#### Warning

This is a significant change in behavior and could cause replicators, specifically cross-site replicators, in an Active/Active environment to stop and error more frequently.

To maintain original behavior you will need to add this property with the value of `warn` to your configuration, providing you fully understand the inherent risk of ignoring such warnings.

*Issues:* CT-1856

#### API

- The manager REST API `/api/v2/manager/status` call now returns information regarding to security.

*Issues:* CT-1830

#### Known Issue

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Cluster. They will be addressed in a subsequent patch release.

#### Installation and Deployment

- After starting up Tungsten components, a `defunct` process for each running component can be found in the process listing.

Whilst this does not cause any issues, it could generate unnecessary alerts for customers monitoring.

The cause has been identified and affects version 7.0.0 and 7.0.1. This will be fixed in the next 7.0.2 release.

*Issues:* CT-1876

Improvements, new features and functionality

Command-line Tools

- Added the ability to turn auto recovery on or off dynamically, removing the need to run `tpm update`.

This is done by running the following command:

```
shell> trepctl -service servicename setdynamic -property replicator.autoRecoveryMaxAttempts -value <number>
```

### Note

The service must be offline before changing the property

*Issues:* CT-1088

- The new command `tungsten_upgrade_manager` will help clear specific cached SSL values, to be used only when specified by Continuent Support.

*Issues:* CT-1788

- A new `tpm report` sub-command has been added. By default, `tpm report` will generate a security report for all available communication channels on a per-node basis. The purpose of `tpm report` is to provide easy access to all of the settings that pertain to a specific topic. The default (and only) topic at this time is the security stance. More topics will be added over time.

*Issues:* CT-1793, CT-1857

- The `tapi` command now supports the creation and modification of multiple APIv2 admin users. Two new cli args have been added: `--create-user` and `--create-pass`.

*Issues:* CT-1801

- The `tapi` command now auto-detects the protocol, either http or https

*Issues:* CT-1803

- Added connector<->manager link encryption status in the output of `router * status` command in `cctrl`

*Issues:* CT-1811

- Added JMX encryption and authentication status to `trepctl -verbose` and connector command outputs

*Issues:* CT-1813

- The `tapi` command will now output service names with the new option `--includeServiceName`, or if there is more than one service name found.

*Issues:* CT-1860

Core Replicator

- The `thl list` command now displays an approximative field size in bytes for row-based replication.

*Issues:* CT-1847

Tungsten Connector

- Added a `connector mode` command to print which mode the connector is running in, either "bridge" or "proxy"

*Issues:* CT-1799

Security

- Replaced official log4j library with a secured version in which all vulnerable classes have been removed. This prevents exposing the software following a (user) misconfiguration of the log4j properties

Issues: CT-1810

#### API

- Added a way to retrieve service properties through the API, for example, to check a specific service parameter, run the following API call :

```
shell> curl https://127.0.0.1:8097/api/v2/replicator/service/alpha/properties?filter=replicator.global.db.sslEnabled
{
  "payloadType": "PropertiesListPayload",
  "payloadVersion": "1",
  "payload": {
    "replicator.global.db.sslEnabled": "false"
  }
}
```

Issues: CT-1802

- Added new top level REST API call to display RMI SSL status, run the following API call :

```
shell> curl https://127.0.0.1:8097/api/v2/rmiSecurity
```

Issues: CT-1812

#### Bug Fixes

##### Installation and Deployment

- The `tpm update` command now properly handles v7 -> v7 upgrades.

Issues: CT-1815

- `deployall` script now properly displays the executable prefix for restarting services, typically `mm_treplicator` in Multi-Site/Active-Active replicator-only installs, as well as the full path to component binaries

Issues: CT-1835

- `tpm` would fail on keystores containing special characters in alias names.

Issues: CT-1852

##### Command-line Tools

- Worked around a ruby issue where DNS name resolution was sometimes preferred to file-based resolution in TPM. The following logic now applies: first trying file-based host name resolution, upon failure try DNS, then through ping command

Issues: CT-1653

- The `tpm update` command now returns clusters to the proper mode (i.e. `MAINTENANCE` or `AUTOMATIC`) for staging-method upgrades (INI not affected).

Issues: CT-1784

- The `tpm policy` command now returns the proper policy in a composite cluster. There is also a new cli argument, `--all`, to show the policy for all cluster services.

Issues: CT-1787

- The `tpm update` command no longer aborts during a staging deployment when the actual hostname does not match what is configured for the node names in `tpm`

Issues: CT-1791

- Improves the `tpm diag` command so that it waits 2 seconds for replicator thread dump to complete.

Issues: CT-1792

- Fixed an Undefined subroutine `call' error in `tapi --create`

Issues: CT-1798

- The `tpm connector` command now properly passes the `-e` arguments to the `mysql` command.

Issues: CT-1816

- `tpm` now properly reports errors upon timeout executing commands. Typically, when a host is down, when upgrading or installing, `tpm` will now properly report that pinging this host failed.

*Issues:* CT-1819

- The `tpm update` command now properly determines services to be deleted.

*Issues:* CT-1825

- TPM would fail to validate data sources when using `ssl-capath [directory]` rather than `ssl-ca [file]` in `my.cnf`.

This fixes only the validation part, automated truststore creation by TPM will not be possible at this point, a full `tungsten-truststore.ts` will have to be passed through `--java-truststore-path`

*Issues:* CT-1826

- The `tapi` command now auto-switches protocol (http or https) properly.

*Issues:* CT-1829

- `replicator start offline` would not properly pass the offline argument to systemd scripts when installed through `deployall`.

*Issues:* CT-1836

- `undeployall` script would not properly uninstall `systemd` services on some distributions including amazon linux.

*Issues:* CT-1845

#### Backup and Restore

- Fixed an issue with latest xtrabackup 8.0.28

*Issues:* CT-1838

- During the backup/restore process the MySQL certificates are kept intact.

*Issues:* CT-1841

- Restore will now succeed even if only one incremental backup has been created.

*Issues:* CT-1842

- Incremental backups can now be restored more than once.

*Issues:* CT-1850

#### Core Replicator

- Fixed the EnumToString and pkey filters to renew their database connections (every hour by default). This can be changed with the following properties:

```
property=replicator.filter.enumtostring.reconnectTimeout=3600
property=replicator.filter.pkey.reconnectTimeout=3600
```

*Issues:* CT-1786

- `tpm update` would fail with message "The host is configured to be '' but it is currently operating as a 'master'" when a dynamic replicator configuration file is found

*Issues:* CT-1848

- Fixes issues with PrimaryKeyFilter:

- It could fail from correctly fetching primary key columns for tables with mixed upper and lower case letters in table names
- Alter user statements could make it fail

*Issues:* CT-1861

- Fixed a `NullPointerException` that could happen if a replicator was put offline during startup. This had mostly no consequence except the exception being logged.

*Issues:* CT-1863

### Tungsten Connector

- Fixed the output of `connector cluster-status` by adjusting log4 appender.

*Issues:* CT-1778

- An exception could occur while forcing shutdown of router gateways.

*Issues:* CT-1779

### Tungsten Manager

- Fixed an issue where the command system summary issued in `cctrl` would hang the managers in the cluster.

*Issues:* CT-1849

## 4.11. Tungsten Clustering 7.0.0 GA [29 Mar 2022]

Version End of Life. 28 Apr 2026

Release 7.0.0 is a major release introducing many new features including a fully documented API. There are a large number of bug fixes and improvements in all areas of the product, and a number of key behavior changes, most significantly being Security is now enabled by default.

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- An RPM update now issues `--replace-release`

*Issues:* CT-1708

### Command-line Tools

- The `tpm diag` command now uses `tar czf` instead of the `zip` command to compress the gathered files. The `zip` command is no longer a prerequisite for `tpm diag`.

*Issues:* CT-1253

- `tungsten_set_position` has been deprecated and no longer available in this release. `dsctl` should be used instead.

`tungsten_provision_slave` has now been renamed to `tprovision`

*Issues:* CT-1302

- The `tungsten_post_process` script functionality has been merged into the `tpm post-process` command. The `tungsten_post_process` script remains as a shell wrapper for `tpm post-process`.

*Issues:* CT-1314

- The `tungsten_find_orphaned` script now creates a log file every time it runs which is stored in the configured temporary directory (`/tmp/` by default, `tpm` query values `temp_directory`). This is to allow for easier troubleshooting and visibility during automatic execution.

*Issues:* CT-1447

- `tpm` now accepts `chrony` as a valid time synchronization software

*Issues:* CT-1462

- The `tpm diag` command now uses the `ss` (socket status) command in place of `netstat` on SUSE and other operating systems that have deprecated `netstat`.

*Issues:* CT-1483

- The `tpm diag` command now gathers the `/etc/os-release` file when located. Also now using the `ip` command on systems where `ifconfig` and/or `route` is deprecated.

*Issues:* CT-1496

- Changed output of `thl purge` command when no lower and upper bounds are given from 'Deleting events where' to 'Deleting all events'.

*Issues:* CT-1738

#### Backup and Restore

- `--user` and `--password` options have been added to the following scripts:

- `cluster_backup`
- `check_tungsten_backups`
- `tungsten_monitor`

If `manager-rest-api-authentication=true` (the default if not explicitly disabled) then these two new options must be supplied otherwise the scripts will fail with the following error: "ERROR >> Manager REST API authentication needed. Please specify the user name and password."

The internal ruby `api.rb` module can now also handle the `manager-rest-api-ssl=true` (the default if not explicitly disabled) and will use https instead of http to access the REST API

*Issues:* CT-1311

- From v8 of xtrabackup, the `--stream=tar` option was removed, meaning that backups could fail if using the newer release of the Percona tools

In this release, the backups will now create the backup and then manually compress it

#### Warning

This change will increase the required disk space for backups to allow the post-backup compression to complete.

*Issues:* CT-1346

- `tungsten_provision_slave` has now been renamed to `tprovision`.

*Issues:* CT-1436

- Additional messaging has been added to the output displayed when running `tprovision`.

*Issues:* CT-1689

#### Core Replicator

- Replicator will now check after extracting a mysql `STOP_EVENT` whether a new binlog file was created, actually handling this event as a `ROTATE_EVENT`.

This decreases the time that would be needed after `STOP_EVENT` to extract a new event..

*Issues:* CT-1349

#### Tungsten Connector

- Optimized transaction parsing by removing SQL transaction start recognition: in-transaction state is found in server status flags.

*Issues:* CT-1698

#### Tungsten Manager

- A new logfile, `console.log` is now generated in the `$CONTINUENT_ROOT/tungsten/tungsten-manager/Logs` directory which contains all output displayed via `cctrl`. This file will provide Continuent Support with more valuable information when assisting to diagnose support cases.

*Issues:* CT-1499

#### Other Issues

- Log files for each component now have the same date and time stamp format.

*Issues:* CT-1669

## API

- API calls triggering configuration changes are protected by a flag, `i-am-sure=true`, in order to avoid unwanted, potentially dramatic, configuration changes. This applies to:
  - `configuration/module/servicesmap`
  - `reset`
  - `offline`
  - `online`
  - `onhold`
  - `addDataService`
  - `addDataSource`

*Issues:* CT-1317

## Known Issue

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Cluster. They will be addressed in a subsequent patch release.

## Installation and Deployment

- After starting up Tungsten components, a `defunct` process for each running component can be found in the process listing.

Whilst this does not cause any issues, it could generate unnecessary alerts for customers monitoring.

The cause has been identified and affects version 7.0.0 and 7.0.1. This will be fixed in the next 7.0.2 release.

*Issues:* CT-1876

## Command-line Tools

- The `check_tungsten_online` command returns a Replicator offline error on active witness hosts.

*Issues:* CT-1783

- The `tpm policy` command may return the incorrect policy value for composite clusters.

As a result of this known issue, the `tungsten_reset_manager` command will also have issues on composite clusters because it calls `tpm policy`.

*Issues:* CT-1787

## Improvements, new features and functionality

### Installation and Deployment

- Two new `tpm` options have been included as part of the new API in this release.

The options are used for setting the API admin user credentials and are as follows:

- `rest-api-admin-user`
- `rest-api-admin-pass`

*Issues:* CT-1327

- Support now included for MariaDB 10.3+

*Issues:* CT-1276, CT-1433

- Support has been added for Java 17 LTS

*Issues:* CT-1706

### Command-line Tools

- A new `tpm` option `delete-service` is now available to simplify the removal of clusters and/or replicator services.

*Issues:* CT-210, CT-327, CT-1275

- Prometheus exporters `mysqld_exporter` and `node_exporter` are now included with the distribution packages.

A new command line tool `tmonitor` is now available for the management and testing of external Prometheus exporters (`node` and `mysqld`), and for the testing of internal exporters (Manager, Connector and Replicator).

*Issues:* CT-960

- A new `tpm` option `purge-thl` and a new script `tungsten_purge_thl` have been added to allow easier and more intelligent THL purging across all nodes in a topology.

This allow you to purge THL files based on the following rules:

- Gather the last applied `seqno` from all Replica nodes and take the lowest one
- Find the current THL file which contains that `seqno`, then locate the previous one
- Construct a `thl purge` command to remove `thl` thru the last `seqno` in the `prev` file

The default behavior is to display the needed commands for the admin to execute manually.

*Issues:* CT-1273

- `tpm diag` now collects routing table information via `route -n`, and has two new command-line arguments: `--include` and `--groups`.

`--include` specifies a comma-separated list of subroutines to include. Any gather subroutine not listed will be skipped.

`--groups` specifies a comma-separated list of subroutine groups to include. Any group not listed will be skipped.

*Issues:* CT-1322

- A new sub-command has been added, `tpm generate-haproxy-for-api`. This read-only action will read all available INI files and dump out corresponding `haproxy.cfg` entries with properly incrementing ports; the composite parent will come first, followed by the composite children in alphabetical order.

The `tungsten_generate_haproxy_for_api` script functionality has been merged into the `tpm generate-haproxy-for-api` command. The `tungsten_generate_haproxy_for_api` script remains as a shell wrapper for `tpm generate-haproxy-for-api`.

*Issues:* CT-1342

- `tungsten_send_diag` now supports a new command-line argument, `--cleanup`, which will cause the removal of the diagnostic archive file generated using the `--diag` argument.

*Issues:* CT-1360

- The `tungsten_reset_manager` command is now able to restart the Manager process when the `--start` or `-s` argument is passed in.

*Issues:* CT-1401

- With the release of APIv2, a new cli tool has been introduced to allow easier access called `tapi`.

In addition, the vast majority of Tungsten cli tools have been updated to optionally use the APIv2 interface when desired.

The Nagios and Zabbix checks are also available via APIv2 using the `tapi` tool.

*Issues:* CT-1454

- The `tungsten_purge_thl` command is now a wrapper for the `tpm purge-thl` command.

*Issues:* CT-1488

- The `tmonitor` command now has better help text and more options to ease usage, including `--filter` to allow easy viewing of the `tmonitor` test output.

*Issues:* CT-1585

- A new option to print the merged logs to `stdout` has been added to `tungsten_merge_logs` (`--stdout|-o`).

The `tpm` command suite now properly supports the `--profile` argument to specify a Tungsten json configuration file in place of the installed `tungsten.cfg`.

Issues: CT-1680

- The `tapi` command now supports the `--affinity` argument which will display all Connector-specific affinity settings, along with `--connectorstatus` to show all.

Issues: CT-1700

- The `cctrl.log` file is now accessible from the `$CONTINUED_ROOT/service_logs` directory

Issues: CT-1727

- A new command (error) has been added to `trepctl` to output a full stack trace of the last error, if any.

```
shell> trepctl -service <serviceName> error
```

```
Event application failed: seqno=10 fragno=0 message=Table hr.regions not found in database. Unable to generate a valid statement.
com.continuent.tungsten.replicator.applier.ApplierException: Table hr.regions not found in database. Unable to generate a valid statement.
at com.continuent.tungsten.replicator.applier.JdbcApplier.getTableMetadata(JdbcApplier.java:582)
at com.continuent.tungsten.replicator.applier.JdbcApplier.fillColumnNames(JdbcApplier.java:494)
at com.continuent.tungsten.replicator.applier.JdbcApplier.getColumnInformation(JdbcApplier.java:1236)
at com.continuent.tungsten.replicator.applier.MySQLApplier.applyOneRowChangePrepared(MySQLApplier.java:418)
at com.continuent.tungsten.replicator.applier.JdbcApplier.applyRowChangeData(JdbcApplier.java:1460)
at com.continuent.tungsten.replicator.applier.JdbcApplier.apply(JdbcApplier.java:1576)
at com.continuent.tungsten.replicator.applier.ApplierWrapper.apply(ApplierWrapper.java:100)
at com.continuent.tungsten.replicator.pipeline.SingleThreadStageTask.apply(SingleThreadStageTask.java:871)
at com.continuent.tungsten.replicator.pipeline.SingleThreadStageTask.runTask(SingleThreadStageTask.java:601)
at com.continuent.tungsten.replicator.pipeline.SingleThreadStageTask.run(SingleThreadStageTask.java:185)
at java.base/java.lang.Thread.run(Thread.java:834)
```

Issues: CT-1747

#### Backup and Restore

- Added support for mariabackup. Configurable tpm option:

```
backup-method=mariabackup
or
backup-method=mariabackup-incremental
```

Issues: CT-1100

- Fixes an issue where `tprovision` could remove the SSL certs for MySQL on reprovision

Issues: CT-1323

#### Core Replicator

- It is now possible to compress and/or encrypt THL on disk. For more information on using these features see <https://docs.continuent.com/tungsten-clustering-7.0/thl-compress-encrypt.html>

Issues: CT-630

- The replicator will now be able to handle new SQL\_MODES available in later releases of MySQL and MariaDB, these are as follows:

- MySQL: `TIME_TRUNCATE_FRACTIONAL`
- MariaDB: `TIME_ROUND_FRACTIONAL`, `SIMULTANEOUS_ASSIGNMENT`

Issues: CT-1362

- In-Flight THL Compression is now available.

For full details on enabling this feature, refer to [this page](#)

Issues: CT-1420

#### Tungsten Connector

- Audit Logging is now available in the Connector: it allows for logging data transferred between client application and MySQL servers to a file, database or socket.

For more details and steps to enable, see <https://docs.continuent.com/tungsten-clustering-7.0/connector-advanced-audit-logging.html>

Issues: CT-78

- Added support for TLSv1.3.

Note that TLS 1.3 was introduced in jdk 8u272. So `tpm` will only set it by default for java 8u272 and later versions. It is still possible to force the protocol to be used via `tpm` flag `--tls-enabled-protocols=TLSv1.xxx`

*Issues:* CT-1367

- A new Dynamic Active/Active feature has been added within the Proxy.

This new Proxy mode is for Composite Active/Active clusters only, and allows you to specifically configure writes to be directed to a single cluster by the use of the `tpm connector-write-affinity` flag.

For full details on this feature, and configuring it, see [link to be added]

*Issues:* CT-1540

- `connector drain [opt-timeout]` has been introduced as an alias to existing `connector graceful-stop` command and will prevent new connections, then shutdown the connector after an optional delay.

The `opt-timeout` parameter (seconds) can be specified to limit the wait before stopping the connector. Not passing this parameter implies infinite wait.

*Issues:* CT-1644

- `connector-reset-when-affinity-back` is now available with proxy mode.

*Issues:* CT-1763

## Security

- Tungsten can now install on default CentOS and RedHat 8 with tightened security settings thanks to support of TLSv1.3

*Issues:* CT-1359

- Tungsten software now undergoes a rigorous security scan during QA. We also check included open-source/3rd-party software.

*Issues:* CT-1579

## Monitoring

- A number of new metrics have been added to the Prometheus exporters.

*Issues:* CT-1266, CT-1615

## Platform Specific Deployments

- ARM 64 bit processor support added (linux aarch64)

### Note

Note that at time of release, there is currently no xtrabackup binary available for ARM.

*Issues:* CT-1619, CT-1620

## Other Issues

- General improvements in MySQL 8.0 support.

*Issues:* CT-1346

- IPv6 host addresses are now fully supported.

Can be enabled with the following configuration property:

```
prefer-ip-stack="6"
```

By default, IPv4 is enabled, which equates to the value of "4" in the above property.

*Issues:* CT-1537

## Bug Fixes

## Installation and Deployment

- Default systemd configuration files for Tungsten components no longer specifies the tungsten group to execute the command. This will prevent file access issues when tungsten user belongs to several groups.

*Issues:* CT-1550

- When services are deployed with systemd and MySQL could not start due to an error, `tpm` would not be able to later start MySQL

*Issues:* CT-1734

#### Command-line Tools

- In certain cases, `tprovision` would not be able to find the binary log position of the backup when taken from a primary. This has been fixed.

*Issues:* CT-1085

- Fixes a bug in `tprovision` when using xtrabackup version 8, due to changes in xtrabackup binaries.

*Issues:* CT-1248

- The `tpm connector` command now handles special characters in the password string.

*Issues:* CT-1258

- The `tpm update` command will now exit with an error if any files not owned by the configured Tungsten OS user are found in the Tungsten installation directory.

For example, if the OS user is tungsten and the installation directory is `/opt/continuent`, containing the file `/opt/continuent/thl/archived_thl.zip` owned by `root` would cause something like the following error to be produced, and `tpm update` would exit:

```
Foreign-owned files found!

Located files in the Tungsten installed directory /opt/continuent
that are not owned by the Tungsten OS user (tungsten):

/opt/continuent/thl/archived_thl.zip

Please change the ownership of these files to OS user "tungsten"
using the chown command as root via sudo, then rerun the 'tpm update' command.

For example:
shell> sudo chown -R tungsten:tungsten /opt/continuent
```

*Issues:* CT-1260

- The `tpm diag` command now behaves correctly on Connector-only nodes, where previously it would try to gather Manager and Replicator-specific items.

*Issues:* CT-1284

- Fixes a security issue within the `tpm diag` command.

*Issues:* CT-1295

- The number of created and active connections could be incorrect when listed from a composite data service

*Issues:* CT-1312

- `tungsten_send_diag` no longer prints an error about `Use of uninitialized value $diagArgs in concatenation`.

*Issues:* CT-1354

- The `tpm` command no longer prints an error when run with no other command-line arguments.

*Issues:* CT-1373

- The `tpm` command no longer aborts with a `Use of uninitialized value error` when a stray `tungsten.cfg` file exists under `$CONTINUED_ROOT`

*Issues:* CT-1394

- Fixes a monitoring bug with users using `caching_sha2_password`.

*Issues:* CT-1406

- `tprovision` [formerly `tungsten_provision_slave`] may fail to provision if the MySQL data directory was not accessible to the tungsten user.

*Issues:* CT-1475

- The `tpm generate-haproxy-for-api` command no longer fails on CentOS 8.

*Issues:* CT-1484

- The `tmonitor` command no longer fails on Debian 9 and Ubuntu.

*Issues:* CT-1485

- All `tpm` sub-commands now handle command-line arguments more intelligently.

*Issues:* CT-1487

- The `tpm purge-thl` command now handles command-line arguments more intelligently.

*Issues:* CT-1489

- The `tpm diag` command now properly collects the system information file on Debian systems.

*Issues:* CT-1492

- Database monitoring logs are now reporting the correct error number and SQL state when database errors occur.

*Issues:* CT-1497

- The `tpm update` command now handles updates/upgrades more gracefully when the previous version did not have the latest `tpm` framework.

*Issues:* CT-1506

- The `tpm update` command will now properly remove composite services.

*Issues:* CT-1519

- The `tungsten_find_orphaned` command no longer fails with an `'Can't exec "/bin/sh": Argument list too long'` error when there are too many THL files to parse.

*Issues:* CT-1545

- The `tpm ask` command no longer calls `Data::Dumper` when it is not available.

*Issues:* CT-1626

- `tpm` now parses the MYSQL SSL related setting correctly.

*Issues:* CT-1662

- Fixes an issue where the `deployall` command would create a root owned `wrapper.log` in the `./tools` directory.

*Issues:* CT-1664

- When MySQL services were badly installed, some distribution could show a `"not-found"` status within `systemctl`, confusing `tpm`

*Issues:* CT-1677

- The `tpm` command now communicates properly when there is no INI configuration file or staging-method `deploy.cfg` configuration defined.

*Issues:* CT-1712

- The `tpm diag` command now handles Multi-Site/Active-Active topologies better.

*Issues:* CT-1718

- `tungsten_monitor.rb` script no longer uses `sudo` to send emails if the configuration doesn't allow it.

*Issues:* CT-1737

- The `tpm diag` command now handles zero-length `mysqlld.log` files gracefully.

*Issues:* CT-1740

## Backup and Restore

- When running the `cluster_backup` in a Active/Active environment, when setting `require_master_backup` to false, the script would still attempt to backup the Primary as it would scan the wrong sub-service and incorrectly identify the Relay node as a candidate.

*Issues:* CT-1280

- Fixed an issue where an xtrabackup generated by the replicator would fail to be restored using `trepctl restore` command.

*Issues:* CT-1575

## Core Replicator

- The replicator metadata cache will now correctly handle table names when `lower_case_table_names=1` is set in the MySQL configuration.

*Issues:* CT-651

- When using parallel apply, the replicator would error with a Foreign Key constraint error if statements were issued against two or more objects that shared the same name, but with different case sensitivity, for example:

```
mysql> create table testtable;
mysql> drop table testtable;
mysql> create table TestTable;
```

*Issues:* CT-1259

- A change in the way MySQL logs `CREATE TABLE AS SELECT` in the Binary Logs from v8.0.20 onwards, meant these transactions would previously fail.

### Warning

Whilst these statements will now replicate, it must be noted that in the event of a failure during the data load, the initial CREATE statement won't be rolled back, and therefore care must be taken when using this type of DDL.

### Note

This only affects customers using MySQL v8.0.20+ running with `ROW` based replication. An alternative workaround to ensure correct rollback on failure, would be to run the statement with `STATEMENT` based replication for the session. This will also provide better performance for larger tables.

*Issues:* CT-1301

- Fixes occurrences of `NullPointerException` that would occur when bringing the replicator online before MySQL was started.

*Issues:* CT-1348

- For row based events, SQL modes were not displayed in the THL output. This is now fixed.

*Issues:* CT-1440

- When connecting to a THL server, a client will now connect to the next available host in its THL uri, if the first does not have the sequence number that the client requires. The client will then fail only if none of the hosts from the uri can provide the needed sequence number.

*Issues:* CT-1558

- Fixed an issue when using Parallel apply that would show a `NullPointerException` in case an event could either not be found or be corrupted in THL. This will now display a correct message `Missing or corrupted event from storage`

*Issues:* CT-1722

- Fixed an issue where `trepctl` was leaving JMX connections opened.

*Issues:* CT-1752

- Added more debug information for detecting possible hanging connections while a THL client connects to the THL server. Also, added socket timeout for the connection initialization

*Issues:* CT-1760

## Filters

- Includes previously missing template file to enable easy configuration of the `dbrename` filter.

*Issues:* CT-1350

- The `BidiRemoteSlaveFilter` could fail to correctly flag fragmented events in unprivileged environments (Aurora, for example) In such an environment (multi-active, unprivileged database access), a new setting was introduced to force extraction process to read ahead to the last fragment to detect the service name (false by default). Enabled with `repl_svc_extractor_multi_frag_service_detection=true`

Issues: CT-1351

#### Tungsten Connector

- By default, the connector will no longer transparently reconnect underlying connections to database servers when the data service changes.

This will prevent the following case: in Composite Active/Active topologies, a given connection starts to write data to a site. The site fails, connection gets reconnected the other site and resumes writing. However the data written to the 1st site has not reached the 2nd site, thus data will not be consistent.

Default is to reject reconnections that follow a write operation (`RW_STRICT` connection or SmartScale after a write) and to allow reconnection after a read operation (`RO_RELAXED` or SmartScale after a read) which translates to `--connector-allow-cross-site-reconnects-for-writes=false` and `--connector-allow-cross-site-reconnects-for-reads=true`

It is still possible to get the previous behavior (reconnecting transparently connections cross-site) by specifying both `--connector-allow-cross-site-reconnects-for-writes=true` and `--connector-allow-cross-site-reconnects-for-reads=true`, at your own risk

Issues: CT-1265

- With `@direct` r/w splitting in active/active configurations, the connector was not correctly redirecting connections to an active site after re-joining the cluster following a failure.

Issues: CT-1400

- The Connector now properly retries specific MySQL commands when possible: `INIT_DB`, `CHANGE_USER`, `STATISTICS` and prepared statement functions.

Issues: CT-1480

- Connector now forbids non-ssl connections when mysql server has `require_secure_transport=ON`

Issues: CT-1666

- Connector now mirrors the MySQL default `connect_timeout` by retrieving it from the primary when starting up. This timeout will apply to all connections made from the connector to MySQL servers.

This setting can be over-ridden by using the following tpm property

```
property=connectTimeout=VALUE
```

If `VALUE` set to autodetect, this value will mirror the MySQL `connect_timeout` system variable. Set to 0 for infinite timeout.

Issues: CT-1726

- Connector no longer requests cross-site services information from manager. In addition to removing extra network traffic, this cures a problem of connections counted twice in data source connection statistics

Issues: CT-1775

#### Tungsten Manager

- Fixes a `NullPointerException` error (NPE) in the manager logs.

Issues: CT-1132

- Fixes an edge case bug that would allow a Composite Active/Active cluster to contain 2 Primary nodes.

Issues: CT-1474

- Fixes a manager-internal connection check during recovery that was not properly using SSL when required.

Issues: CT-1661

- Early initialisation of the REST API sometimes caused the manager to hang and fail to startup correctly on new installations.

Issues: CT-1725

- Fixes an issue when the manager would wait longer than the timeout for replicator purge on a failover.

*Issues:* CT-1733

- Fixes an issue where datasource <datasourcename> welcome would fail to welcome a manually failed composite datasource.

*Issues:* CT-1771

#### Security

- log4j libraries updated to v2.17.1 specifically to mitigate risk of exposure to the 0-day vulnerability detected in log4j v2.14

*Issues:* CT-1703

## 5. Tungsten Replicator v7.x Release Notes

### 5.1. Tungsten Replicator 7.2.1 GA [3 Feb 2026]

Version End of Life. Not Yet Set

Release 7.2.1 contains a number of key bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Installation and Deployment

- `tpm` now only reads `/etc/tungsten/tungsten.ini` (no longer looking in `$HOME` directory and `/etc/tungsten.ini`)

For a different path, different filename or multiple files, use the `--ini` supplying a comma-separated list

*Issues:* CT-2612

#### Command-line Tools

- The `tprovision` command no longer requires the external tool `tungsten_get_mysql_datadir`.

Additionally, the tool has been significantly re-factored for greater stability, performance and functionality.

*Issues:* CT-2597

- The `tprovision` command now deletes only binary log files listed in the index if the binary log directory is not the same as the mysql data directory.

*Issues:* CT-2631

#### Improvements, new features and functionality

##### Installation and Deployment

- New feature: `tungsten.ini` backup and history.

When enabled with the `tpm` flag `tungsten-ini-backup` (false by default), the `tpm update` command will create a copy of the current INI file (default: `/etc/tungsten/tungsten.ini`) as `$CONTINUENT_ROOT/history/ini/tungsten.ini.YYYYMMDDhhmmss`

When enabled with the `tpm` flag `tungsten-ini-backup`, the `tpm install` command will create the first history file and the history subdir, if needed.

A new sub-command, `tpm ini diff` has been added to compare the current INI file (default: `/etc/tungsten/tungsten.ini`) and a history file (default: latest history file found), and can also accept `--stamp {YYYYMMDDhhmmss}` to specify which file to diff by timestamp.

A new sub-command, `tpm ini backup` has been added to manually invoke the same copy that the `tpm update` command does.

Added two new `tpm` configuration flags:

- `tungsten-ini-backup` (default: false) : Enable the `tungsten.ini` automatic backup feature during `tpm install` and `tpm update`
- `tungsten-ini-history-dir` (default: `$CONTINUENT_ROOT/history/ini`) : Define the location for `tungsten.ini` backup/history files

*Issues:* CT-2635

### Command-line Tools

- New Feature: `tpm ini upgrade --ini {fullpath}` will display all changes to the specified INI file that would be performed by the `tpm update` commands during a version upgrade. Adding the `--write` argument would apply the changes to the specified file as well.

*Issues:* CT-2601

- New `tpm` flag `--add-ssl` now allows to force generate certificates when doing an upgrade. This allows configurations with security disabled to be upgraded to 8.0.1 AND switched to using SSL/TLS communications at the same time. Example:

```
shell> tools/tpm update --replace-release --add-ssl
```

*Issues:* CT-2619

- A new subcommand `tpm ini defaults` has been added to list any `tpm` option that actually has a default value defined in the `tools/tpm_option-s_db.txt` file, along with the default value.

Additionally, documentation has been updated to show defaults and options for all properties where applicable.

*Issues:* CT-2634

- New feature `tpm copy --example` will show the manual steps taken by `tpm copy --init` to copy the certificate files to other nodes.

*Issues:* CT-2636

### Core Replicator

- The replicator now includes real-time performance monitoring to track and identify slow database operations during replication. The feature provides visibility into transaction, event, and statement execution times with configurable thresholds for alerting. For more information on configuring and using this feature, see [trepctl perflog Command](#)

*Issues:* CT-2629

### Bug Fixes

#### Installation and Deployment

- Fixed an installation issue when using MariaDB 10.6 with SSL. Previously, this would have failed to install showing an error message like :

```
Unable to connect to the MySQL server using tungsten@db1:13306 (WITH PASSWORD) (MySQLLoginCheck)
```

*Issues:* CT-2624

### Command-line Tools

- The `tungsten_send_diag` now uses AWS Signature Version 4 to upload files.

*Issues:* CT-2589

- The `tpm cert gen` command now works during version upgrades when a security configuration file may not have existed before (`password-s.store`).

*Issues:* CT-2618

- The `tprovision` command now correctly honors the mountpoint override flag when not using method `rsync`.

*Issues:* CT-2651

### Backup and Restore

- Fixed an edge case issue with `xtrabackup` running against the primary node and MySQL 8+.

#### Note

Generally we do not recommend taking backups from primary nodes, and instead backups should be taken from replicas.

*Issues:* CT-2602

### Core Replicator

- Fixed an issue where timestamp columns would not match between source and target when using the `privileged-slave=false` property to replicate from a source database using MIXED binlog mode.

*Issues:* CT-2594

- With recent SELinux changes, MySQL might be unable to read from `/tmp`.

This directory is used when applying a `LOAD DATA INFILE` command that was logged using Statement Based Replication (warning : this is considered as unsafe by MySQL).

In order to avoid any issues, a new setting has been added to indicate a directory to use : `svc-applier-ldi-temp-dir=/tmp/mysqltmp`

In this case, `mysqltmp` is a new subdirectory that should be set with the following permissions and SELinux context

```
mkdir -p /tmp/mysqltmp
sudo chown -R mysql: /tmp/mysqltmp
sudo chmod -R g+r /tmp/mysqltmp
sudo semanage fcontext -a -t mysqld_db_t '/tmp/mysqltmp(/.*)?'
sudo restorecon -Rv /tmp/mysqltmp
```

Another improvement was also added to force the use of LOCAL when applying a `LOAD DATA INFILE` command that was logged using SBR. This is useful when applying to a remote MySQL host. To enable, set the value of the `svc-applier-ldi-use-local=true` (default : false)

*Issues:* CT-2603

- Recent java versions changed a default that now enable endpoint identification in secured RMI calls. As a quick turnaround, this release restores the default of disabling identification in various Tungsten scripts.

*Issues:* CT-2666

#### Security

- Upgraded jackson libraries to latest version to plug potential security holes.

*Issues:* CT-2655

## 5.2. Tungsten Replicator 7.2.0 GA [8 Jul 2025]

Version End of Life. Not Yet Set

Release 7.2.0 contains a number of key bug fixes and improvements, along with the upgrade of log4j libraries.

#### Deprecation Notices

The following features/tools have been deprecated from this release and will be removed in future releases. Any self written scripts that utilise these features should be updated.

#### Command-line Tools

- `tungsten_health_check` and `tungsten_provision_thl` have been deprecated and will be removed in a future release.

*Issues:* CT-2506

#### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Installation and Deployment

- All Tungsten components now use log4j version 2

*Issues:* CT-1410, CT-1412

- `tpm validate` now verifies localhost is defined in `/etc/hosts`

*Issues:* CT-2564

#### Command-line Tools

- The `tungsten_send_diag` command has been updated with new security keys and the ability to accept security keys on the CLI.

*Issues:* CT-2438

- Removed `sigtrap` module dependency from `tungsten_find_orphaned`.

Issues: CT-2451

- The `tpm ask` command now returns the appropriate values for keys: `stagingdir`, `stagingpath`, `staginghost` and `staginguser`.

Additionally, the `tpm ask staging` command will return a JSON structure with all values. All values are the same as the output of the `tpm query staging` command, just presented differently for easier machine usage.

Issues: CT-2510

- The `tpm cert info` command now provides better error messages when a specified `typeSpec` file does not exist.

Issues: CT-2530

#### Security

- As of version 7.2.0 onwards, when providing custom keystores, the alias of the mysql certificate must be provided as `java-mysql-alias=xxx` and must have the same name in both `tungsten_keystore` and `tungsten_connector_keystore`.

Issues: CT-2598

#### Improvements, new features and functionality

##### Command-line Tools

- The `tpm ask` command now supports the `-s|--service` option for `trrole` and `trstate` keys. The option alias for `--short` is now `-S` (capitalized), was previously lower-case. Example: `tpm ask trrole --service alpha`

Issues: CT-2400

- The `tpm cert` command will now handle public key files. The command `tpm cert gen public` will create `$CONTINUENT_HOME/generated/tungsten_public.jks` from the `$CONTINUENT_HOME/share/tungsten_keystore.jks` file and the `tpm cert list public` command will show the contents, etc.

Issues: CT-2434

- The `tpm diag` command now gathers the output of the `tpm ini check -x` command as the `tpmINIcheck` call.

Issues: CT-2499

- The `tpm ini` command now handles all new tpm options.

Issues: CT-2543

- The `tpm ask` command will now convert values `0` and `false` to `No` and values `1` and `true` to `Yes` as human output when given `--human` or `-n cli args`.

Issues: CT-2559

##### Core Replicator

- Replicator now recognizes the new MySQL 8.4 `show binary log status` syntax (As well as `show master status`) and will run replacement configured request appropriately.

Issues: CT-2291

- The `treptcl perf` output has been improved when parallel apply is enabled to show granular statistics per channel.

Issues: CT-2517

##### Monitoring

- Additional prometheus metrics have been added to the Replicator:
  - `tungsten_replicator_service_online_duration_seconds` gauge show duration in seconds since the replicator was put online.
  - `tungsten_replicator_task_total` counter shows statistics by service, stage and task as shown in the following example:

```
tungsten_replicator_task_total{service="alpha",stage="q-to-dbms",task_id="1",stat="extract_time",} 250.015
```

In this case, this is the extract time spent by the task #1 of the q-to-dbms stage of the alpha service. This is similar to the new `treptcl perf` output.

Issues: CT-2514

## Bug Fixes

### Installation and Deployment

- The `tpm update` command no longer displays the message "`common::diffPasswordsDotStore: No custom source passwords.store file defined - SKIP-PING`"

*Issues:* CT-2406

- `tpm` now properly detects MariaDB default settings.

*Issues:* CT-2424

- `tpm` flags `datasource-log-directory` and `repl-direct-datasource-log-directory` will now use the value of each other as a default if only one is specified

*Issues:* CT-2425

### Command-line Tools

- The `tpm diag` command no longer displays a NOTICE for missing optional files.

*Issues:* CT-2355

- The `tpm check ports` and `tpm check ports -c` commands are now able to handle replicator-only nodes. By default, it will automatically try to discover the node type, and you may manually specify the node type with `-r|--replicator` or `-c|--cluster`.

*Issues:* CT-2356

- The `tpm update` command now properly deletes services when run in a standalone Tungsten Replicator deployment.

*Issues:* CT-2383

- The `tapi` command now creates proper URL's for the standard endpoints when `-R` is specified along with one of the following strings: `ping`, `tungstenVersion`, `createAdminUser`, `deleteAdminUser`, `listAdminUsers`, `rmiSecurity` or `user`.

*Issues:* CT-2391

- The `tpm diag` command now gathers:

- `tungsten-replicator/log/replicator-api.log`

*Issues:* CT-2397

- The `tpm diag` command now correctly connects to an off-host database when run under standalone Tungsten Replicator.

*Issues:* CT-2402

- The `tapi` command now accepts non-standard ports on the command line, and also properly accepts a user/password pair on the CLI.

*Issues:* CT-2420

- The `tpm update` command now properly identifies and removes services with mixed-case service names.

*Issues:* CT-2426

- The `tpm uninstall` command now properly calls the `tpm keep` command for standalone Tungsten Replicator deployments.

*Issues:* CT-2436

- The `tpm keep` command is now properly called by `tpm uninstall`, and a regression in a call to the mysql cli has been fixed as well.

*Issues:* CT-2462

- `executable-prefix` is now applied to `deployall` and `undeployall` script names. For example, when `executable-prefix=mm`, `deployall` would be named `mm_deployall`.

*Issues:* CT-2467

- The `tpm ask version` and `tpm ask versions` commands now display values.

*Issues:* CT-2475

- During a `tpm uninstall`, when skipping data services not managed locally, `tpm` will now print a notice rather than a warning, since this is the expected behavior

*Issues:* CT-2479

- The `tungsten_send_diag` command now handles curl and AWS S3 errors separately and displays the proper message back.

*Issues:* CT-2488

- Fixes an issue where `dsctl set` with the `-reset` option could show warnings when run several times in a row, as shown:

```
WARNING: Could not execute query DROP TABLE `tungsten_alpha`.`heartbeat` : Unknown table 'tungsten_alpha.heartbeat'
```

*Issues:* CT-2502

- The `tpm cert aliases --running` command now properly handles the `tls_passwordstore` and `jmx_passwordstore` typeSpecs.

*Issues:* CT-2512

- The `tpm cert info` command now properly handles all available typeSpecs.

*Issues:* CT-2532

- The `tpm purge-thl` command now works properly when run against environments where there are multiple THL files, but the lowest seqno returned exists in the very first THL file.

*Issues:* CT-2561

- The `tapi` command no longer issues an error when the quantity of command-line arguments is larger than expected.

*Issues:* CT-2580

#### MongoDB Applier

- The replicator now reads the TLS certificate for Mongo Atlas connectivity from the correct keystore (`tungsten_truststore.ts`)

*Issues:* CT-2227

#### Core Replicator

- Fixed an issue that would wrongly flag a SQL statement starting with a `#` comment as `bidi_unsafe`

*Issues:* CT-2405

- The replicator will now properly rollback an XA transaction in case of failure.

*Issues:* CT-2410

#### Security

- `tungsten_mysql_ssl_setup` now properly generates v3 self signed CA certificates for openssl 3 found in RHEL9 Linux flavors.

*Issues:* CT-2581

## 5.3. Tungsten Replicator 7.1.4 GA [1 Oct 2024]

Version End of Life. Not Yet Set

Release 7.1.4 contains a number of key bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- Global calls to `sudo` in `tpm` are now sensitive to the `tpm` option and alias `root-command-prefix/enable-sudo-access` when set to `false`.

*Issues:* CT-2310

- The `tpm copy` command now accepts the `--install` argument as an alias for `--share`.

*Issues:* CT-2332

#### Monitoring

- Tungsten monitoring scripts no longer rely upon the `bc` command, removing the dependency because recent distros do not have `bc` available.

*Issues:* CT-2371

#### Improvements, new features and functionality

##### Command-line Tools

- The `tpm diag` command now gathers the `mount` and `hostname` commands.

*Issues:* CT-2314

- Added the `-last` and `-first` options to `thl dsctl` command

*Issues:* CT-2318

- The `tpm diag` command now gathers the output of `crontab -l`.

*Issues:* CT-2344

- The `tpm diag` command now gathers `show global status`; from the MySQL server.

*Issues:* CT-2387

##### Filters

- A new `maskData` filter has been added, allowing basic level data obfuscation capabilities.

*Issues:* CT-849

##### Bug Fixes

##### Command-line Tools

- The `tpm check ini` command now properly handles `property=` INI entries.

*Issues:* CT-2352

- The `tungsten_mysql_ssl_setup` command no longer tries to `ls` any `.p12` file unless `--p12` has been given on the cli

*Issues:* CT-2357

- The `tpm copy --dojni` command now functions properly from the staging directory before the initial installation of Tungsten.

*Issues:* CT-2362

- The `tpm cert` command now easily imports certificate bundles into various files, and correctly reads a file name as the proper `typeSpec` in various subcommands.

*Issues:* CT-2369

- The `tpm check ini` command now honors the `--short` and `--valid` options

*Issues:* CT-2373

##### Core Replicator

- Fixed a bug preventing the auto-recovery feature to put the service back online if it failed to connect to database during a retry.

*Issues:* CT-2377

- Fixed an issue where the replicator was not able to build a valid DELETE statement, when `enable-heterogeneous-service` was set to true.

*Issues:* CT-2379

- Fixed a bug in latency calculations that in some circumstances could appear as though the latency on the applier stages was "flapping".

*Issues:* CT-2386

## 5.4. Tungsten Replicator 7.1.3 GA [25 Jun 2024]

Version End of Life. Not Yet Set

Release 7.1.3 contains a number of key bug fixes and improvements.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Command-line Tools

- The `tpm cert` command now properly accepts the full file name as a `typeSpec`.

*Issues:* CT-2213

- The `tpm update` command now checks for a custom `passwords.store` file in the INI and exits with an error if the running file does not match the custom file.

*Issues:* CT-2216

- The `tpm diag` command now checks the `my_print_defaults` command for the MySQL error log value if the direct query `SELECT @@GLOBAL.log_error`; fails to gather a value for any reason.

*Issues:* CT-2229

- The `tpm cert` command now accepts `--basedir` and `--certsdir` as aliases for `--dir` to specify the target directory for generation

*Issues:* CT-2267

- The `tpm cert` command now accepts an absolute path filename as a `typeSpec`.

*Issues:* CT-2268

- Improved support for the `--nosudo` argument and the `sudo` command in `tpm diag`

*Issues:* CT-2308

### Improvements, new features and functionality

### Installation and Deployment

- Added support for Ruby 3.2.

*Issues:* CT-2296

- Oracle Linux 9 has been certified for Tungsten products from version 7.1.3.

*Issues:* CT-2370

### Command-line Tools

- Improved help text in the `tpm cert` command

*Issues:* CT-2222

- A new command has been added, `tpm check ini`, that will validate all options present in a `tungsten.ini` file. This command can be run prior to installation.

*Issues:* CT-2240

- `tpasswd` utility gets a new switch `-C` or `--compare.to` allowing password store file comparison for `tpm update` purpose.

*Issues:* CT-2278

- Added new `tpm check ports` command which will check port connectivity for standard Tungsten ports to a specified host

*Issues:* CT-2292

### Bug Fixes

### Command-line Tools

- The `tpm cert` and `tpm copy` commands now work from the staging directory before Tungsten is installed.

*Issues:* CT-2181

- All `tpm` commands now use the `--force` and `-f` arguments consistently.

*Issues:* CT-2224

- Fixes a regression in `tpm cert` that prevented `BASE_DIR` in `tungsten.env` from being used properly.

*Issues:* CT-2237

- The `tpm cert` command now works correctly with the `share/tungsten.env` configuration file prior to installation.

*Issues:* CT-2255

### Vertica Applier

- Fixed an issue with Vertica batch applier failing to correctly handle blob data containing the `\` (backslash) character

*Issues:* CT-2316

## 5.5. Tungsten Replicator 7.1.2 GA [3 Apr 2024]

Version End of Life. Not Yet Set

Release 7.1.2 contains a number of key bug fixes and improvements.

### Note

v7.1.2 was re-released as build 81 on 13 May 2024 to fix a critical bug that exists in the original build 42 release [CT-2284].

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- The `systemd` startup script will now have a dependency on the `time-sync` service (if available) being started before `tungsten` components.

*Issues:* CT-2257

### Improvements, new features and functionality

#### Installation and Deployment

- A new INI option has been added `rest-api-admin-password` which acts as an alias for the existing `rest-api-admin-pass` option.

*Issues:* CT-2246

#### Command-line Tools

- A new command, `tungsten_mysql_ssl_setup`, has been introduced to create all needed security files for the MySQL database server. `tungsten_mysql_ssl_setup` will act as a direct replacement for the `mysql_ssl_rsa_setup` command which is not included with either Percona Server or MariaDB. This command will now be called by `tpm cert gen mysqlcerts` instead of `mysql_ssl_rsa_setup`.

*Issues:* CT-2188

- The `tpm diag` command now captures the output of `sestatus` and `getenforce`.

*Issues:* CT-2243

#### Filters

- A new filter, `binarystringconversion`, was added to provide a way to convert `varchar` data from one charset into another.

*Issues:* CT-981

## Bug Fixes

## Heterogeneous Replication

- Fixes a bug in heterogeneous deployments that prevented CHAR and BINARY data types replicating correctly.

*Issues:* CT-2258

- Fixed an issue when using the ConvertStringFromMySQLFilter in heterogeneous deployments, that could show an error while processing an INSERT event after the PrimaryKeyFilter added key specifications to it.

*Issues:* CT-2260

## Core Replicator

- Fixed an issue where the shard name of an event could be badly identified, which could potentially lead to deadlocks when parallel applier was enabled.

*Issues:* CT-2266

- Event extraction can sometimes generate an empty fragment (for a multi fragment transaction). This in turn can lead to bad shard detection. While empty fragment is expected, shard detection will now use the last non-empty fragment.

## Note

This bug was detected in v7.1.2 build 42, and fixed in v7.1.2 build 81

*Issues:* CT-2284

## 5.6. Tungsten Replicator 7.1.1 GA [15 Dec 2023]

Version End of Life. Not Yet Set

Release 7.1.1 contains a number of key bug fixes and improvements.

## Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

## Command-line Tools

- The `tpm diag` command now collects `ps -aux` output in addition to `ps -efl` when possible.

*Issues:* CT-2119

## Bug Fixes

## Installation and Deployment

- Installations will now succeed on hosts running Ruby 3.x

*Issues:* CT-2196

## Command-line Tools

- The `tpm report` command now correctly displays security info tpm options as blank when none exists.

*Issues:* CT-2176

- The `tpm update` command no longer fails to display foreign-owned dot-files and directories.

*Issues:* CT-2190

- The `tpm mysql` command now properly accepts the `-e` argument as a shortcut for the `--execute mysql cli` client argument.

*Issues:* CT-2217

## 5.7. Tungsten Replicator 7.1.0 GA [16 Aug 2023]

Version End of Life. Not Yet Set

Release 7.1.0 is the next major v7 release containing a number of important bug fixes and key new features.

#### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- The `tpm copy-keys` command has been renamed to `tpm copy` and a new command has been created `tpm cert copy` with the same functionality.

*Issues:* CT-2186

#### Improvements, new features and functionality

##### Behavior Changes

- Additional logging will now be added to the replicator logs during switchover/failover operations to enable better debugging in the event of issues.

*Issues:* CT-1448

#### Installation and Deployment

- Running `tpm uninstall` will now save all of the Tungsten database tracking schemas for later use. There is also a new `tpm keep` command, which allows the tracking schemas to be saved to disk at any time in multiple formats (.json, .dmp and .cmd)

*Issues:* CT-2131

- Added `tpm` flag `deploy-systemd` as a more meaningful alias to `install`

*Issues:* CT-2152

#### Command-line Tools

- Added a new option `--preserve-schema` to the `tpm uninstall` command in order to leave the tracking schema in the database.

*Issues:* CT-561

- A new command `tpm cert` has been added to aid in the creation, rotation and management of certificates for all areas of Tungsten.

Known limitations: Percona 5.6, and all versions of MariaDB do not provide the `mysql_ssl_rsa_setup` command required by `tpm cert gen mysqlcerts`.

*Issues:* CT-2085

- The `tpm diag` command now supports the `--skipsudo` and `--nosudo` arguments to prevent operations from using the `sudo` command. Using this option may result in `tpm diag` skipping/failing various gathers due to a lack of access.

*Issues:* CT-2146

#### PostgreSQL Applier

- It is now possible to configure the PostgreSQL applier in Batch mode.

*Issues:* CT-2031

- Added a new `ddlscan` template, `ddl-mysql-postgres-staging.vm`, to allow generation of staging table DDL for the PostgreSQL batch applier.

*Issues:* CT-2136

#### S3 CSV Applier

- A new applier is now available that replicates to csv files on S3 storage.

For more information, see [S3 Applier Docuemntation](#)

*Issues:* CT-606

#### Core Replicator

- Upgraded JGroups library to 4.2.22

*Issues:* CT-2011

#### Filters

- A new `shardbyrules` filter has been added that will allow rule based sharding of replication based on user configurable rules that would allow sharding at table level, whereas previously sharding would only be handled at schema level.

For more information, see [shardbyrules Filter Docuemntation](#)

*Issues:* CT-2164

#### Monitoring

- Prometheus exporters now provide the ssl cert expiration date as an epoch value in addition to the label.

*Issues:* CT-2099

- Prometheus libraries have been upgraded from version 0.8.1 to 0.16.0

*Issues:* CT-2166

#### Bug Fixes

##### Installation and Deployment

- Fixed RPM package script to run `rpm install` instead of `rpm update` when installing the rpm

*Issues:* CT-2130

##### Command-line Tools

- `rpm uninstall` would sometimes print `"ERROR >> db1 >> undefined method '+' for nil:NilClass"`

*Issues:* CT-2104

- The `rpm` command now searches more places to locate shell commands that are called, especially useful when `$CONTINUENT_ROOT/share/env.sh` is not sourced.

*Issues:* CT-2182

##### Backup and Restore

- `rpm provision` will now print an error message and exit if the MySQL `datadir` does not exist.

*Issues:* CT-1901

##### PostgreSQL Applier

- Fixes an issue with the `ddl-mysql-postgres.vm` `ddlscan` template that caused `varchar` datatype lengths to be parsed incorrectly.

*Issues:* CT-2019

- Fixed a `NullPointerException` error occurring at startup when applying to PostgreSQL

*Issues:* CT-2021

##### Core Replicator

- Improved a query that is run by Tungsten when fetching tables metadata (column names, datatypes, etc). While it is not generally needed, the unoptimized query can run badly (especially) against old mysql versions with a lot of databases / tables. For now, the new optimized query is not used by default, but this could change in some future version.

This can be enabled by using the following property :

```
property=replicator.datasource.global.connectionSpec.usingOptimizedMetadataQuery=true
```

*Issues:* CT-2077

- Fixed an issue while processing geometry data with SRID 4326 that would swap longitude and latitude. This applies only to MySQL 8, as prior MySQL versions do not allow specifying the order when applying a WKB (Well-known binary) to MySQL

*Issues:* CT-2172

## 5.8. Tungsten Replicator 7.0.3 GA [4 Apr 2023]

Version End of Life. 28 Apr 2026

Release 7.0.3 contains a number of key bug fixes and improvements.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- `enable-sudo-access` is now enabled by default in Replicator only installations.

*Issues:* CT-1780

### Command-line Tools

- The `tps.pl` backup tool now shows the available command-line arguments when the TAB key is pressed.

*Issues:* CT-1246

- The `tungsten_skip_all` command (along with alias `tungsten_skip_seqno`) now shows the full `pendingExceptionMessage` instead of just `pendingError`, and the `more` choice shows the `pendingErrorEventId` and the `pendingError`.

*Issues:* CT-2030

- The `tpm` command now prints a warning when running as the root OS user during operations that make changes.

*Issues:* CT-2064

### Improvements, new features and functionality

#### Command-line Tools

- A new `thl tail` command has been added, allowing you to view the live THL changes as they are generated.

*Issues:* CT-405

- The `tungsten_get_ports` command now supports the `/opt/continuent/tungsten/tungsten-connector/conf/interfaces.json` file, if found.

*Issues:* CT-2003

- The `tungsten_get_ports` command now use values based on values obtained from `tpm query values` when possible for the greatest output accuracy.

*Issues:* CT-2008

- Shell command tab completion for Tungsten-specific commands has been updated to support recent additions and changes.

*Issues:* CT-2057

#### Redshift Applier

- Updated the Redshift JDBC driver to version 2.1.0.12

*Issues:* CT-1806

#### Core Replicator

- THL transfer protocol can now be changed dynamically. This can be done using the `trepctl` command tool

```
shell> trepctl setdynamic -property replicator.thl.protocol.client.serialization -value DEFLATE
Property replicator.thl.protocol.client.serialization successfully set to DEFLATE
```

This can also be done through API v2

```
curl --user tungsten:secret --insecure --request POST 'https://127.0.0.1:8097/api/v2/replicator/service/alpha/thl/inflight-protocol' -d '{
  "payloadType": "StringPayload",
  "payloadVersion": "1",
  "payload": {
    {
```

```

"value": "Legacy"
}
}'
{
  "payloadType": "StringPayload",
  "payloadVersion": "1",
  "payload": {
    {
      "value": "THL inflight protocol is now set to legacy"
    }
  }
}
}

```

*Issues:* CT-1862

## Bug Fixes

### Command-line Tools

- The `dsctl` command now works correctly against MongoDB targets.

*Issues:* CT-580

- Fixed rsync availability check in TPM to error out early when the executable is not found in the path

*Issues:* CT-1028

- The `trepctl reset` command now works correctly against MongoDB targets.

*Issues:* CT-1233

- The `tpm ask keys` command now lists all available keys properly.

*Issues:* CT-2041

- The `tpm update` command no longer aborts with a `Dataservice was NOT removed` error when service names with a hyphen are defined in the configuration. We strongly discourage the use of hyphens [-] in service names and recommend underscores [\_] instead.

*Issues:* CT-2052

- The `tpm validate-update` command now performs the delete-service checks properly.

*Issues:* CT-2054

- The `tungsten_find_events` command no longer fails with error `Undefined subroutine &main::info`

*Issues:* CT-2058

- The `tpm diag` command will now locate and kill any remaining `tpm diag` child processes on the calling host.

*Issues:* CT-2068

- Suppressed wrong tpm errors with autodetect hosts.

*Issues:* CT-2072

### PostgreSQL Applier

- Improved some data type mappings for MySQL to PostgreSQL replication.

*Issues:* CT-2069

### Core Replicator

- Fixed an issue that was occurring when an `ALTER USER` is applied on a mysql instance that uses lower case identifiers.

*Issues:* CT-2024

- Fixed an issue where an extracted JSON field could be invalid, with doubled commas in JSON arrays.

*Issues:* CT-2049

- Fixed an issue where status would fail if issued while a service was reconfiguring (in the middle of a `setrole` command for example).

*Issues:* CT-2081

## 5.9. Tungsten Replicator 7.0.2 GA [19 Dec 2022]

Version End of Life. 28 Apr 2026

Release 7.0.2 contains a number of key bug fixes and improvements.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Command-line Tools

- The various user-xxxx.log files are no longer generated

*Issues:* CT-1914

- The `check_tungsten.sh` was deprecated in release 6.1.18 and has now been removed from this release.

*Issues:* CT-1939

- Both the `tungsten_get_ports` and `tpm report` commands have been updated to use the `ss` OS command when the `netstat` OS command is unavailable or deprecated.

*Issues:* CT-2007

### Core Replicator

- `repl_svc_extractor_multi_frag_service_detection` is now turned ON by default. Event shards are determined at extraction time. With fragmented events, the shard cannot be determined by only reading the first fragment, but needs to check the last fragment as well. With this setting turned OFF, there is no issue with pipelines that don't need it, i.e. no parallel apply downstream replicas. However, as this is done at extract time, THL contains this information, and adding or changing a replica using parallel apply could introduce issues.

### Note

It can be disabled if you see a performance overhead but this should be done with caution. For Aurora<->Aurora Active/Active deployments it is essential that this property be left ON.

*Issues:* CT-1959

### Improvements, new features and functionality

#### Command-line Tools

- A new `-c` option is now available with some `trepctl` commands that can be used in conjunction with the `-r` option to indicate the number of times to refresh before automatically terminating. For example, the following command:

```
shell> trepctl perf -r 3 -c 10
```

Will refresh the output every 3 seconds, 10 times.

*Issues:* CT-679

- The `trepctl status` will now show the last known applied seqno and latency.

This information is stored on disk at regular intervals [10s minimum] so as not to overload the replicator, therefore the value can be shown as slightly old dependant on when the status command was issued.

By default, this feature is disabled. It can be enabled by setting the following parameter in the configuration :

```
svc-applier-last-applied-write-interval=20
```

This will write current position to disk every 20 seconds. This information is also exported by the Prometheus exporter.

If the service is online, it will display the current value (the same as `appliedLastSeqno` and `appliedLatency`)

```
shell> trepctl status
Processing status command...
NAME VALUE
----
appliedLastEventId : mysql-bin.000017:0000000151329854;70
appliedLastSeqno : 999
appliedLatency : 347707.0
```

```
...
lastKnownAppliedLatency: 347707.0
lastKnownAppliedSeqno : 999
...
```

Issues: CT-1823

- The `tungsten_merge_logs` command now supports the `--before TIMESTAMP` and `--after TIMESTAMP` filters

Issues: CT-1869

- The `tmonitor` command now accepts cli args to specify the ports and will auto-configure the ports if they have been changed via the Tungsten configuration.

Issues: CT-1919

- The `tpm` command calls to `glob` have been improved to be more strict and compliant.

Issues: CT-1940

- The `tpm ask stages` and `tpm ask allstages` commands have been added to display the Replicator stages for the current node (stages) and the stages for each role (allstages).

Issues: CT-1943

- The `tpm ask` command has five new variables available: `dsrole` & `dsstate` for the current datasource, and `trrole` & `trstate` for the current replicator, and `nodeinfo` which displays all 4 of the new variables.

Issues: CT-1944

- The `tpm report` command now prints the hostname and listener ports where available when using the `--extra|-x` option or the new `--ports` option.

Issues: CT-1969

- A new `dsctl` option has been added to the `thl` command, and a new `-event` option added to `thl list`

Full details and examples of these new options can be found [here](#)

Issues: CT-2012

#### Core Replicator

- Added a new feature that enables pausing a replicator stage for some amount of time.

This will pause the given stage for 100 seconds.:

```
treptcl pause -stage thl-to-q -time 100
```

This will pause the stage indefinitely (or until restart, etc) Add `-y` to avoid the prompt message whether you are sure.

```
treptcl pause -stage thl-to-q
```

For the previous 2 commands, running a pause command again will override the previous command.

This will resume the suspended stage (Note that if the stage is not paused, this will have no effect):

```
treptcl resume -stage thl-to-q
```

#### Note

Please note this pause does not survive a replicator restart or a service offline/online.

Issues: CT-1912

- Per-service tuning of the replicator thl directory is now possible for multi-service replicator-only installs as well as for clustering. The given value should be the base directory, to which tungsten will add the service name. For example, the following entry in the tungsten.ini:

```
[alpha]
...
...
thl-directory=/drv1/thl
...
```

Would result in the THL being placed in `/drv1/thl/alpha`

## Note

Update of thl directory is only available when tpm is called from the staging installation directory, NOT from the running directory.

*Issues:* CT-1927

- A new replicator role [thl-applier] has been added to allow a replicator service to apply its locally available THL, without pulling from a remote host

*Issues:* CT-1936

- Added a way to configure the maximum number of rows that can be grouped together when applying row based events for multiple insert or delete statements.

For these properties to be in effect, you must ensure that `optimize-row-events=true` is either explicitly set in your configuration, or not present (since it will be enabled by default)

For example, the following settings will limit the number of inserted or deleted rows applied at once to 10:

```
optimize-row-events-limit-insert-rows=10
optimize-row-events-limit-delete-rows=10
```

The default values if not specified will be 50 for inserts and 100 for deletes. Note that for deletes to be optimized, the affected table MUST have a single column PK.

*Issues:* CT-1980

## API

- A new log file has been added for the REST API, it is as follows:
  - `service_logs/replicator-api.log`

*Issues:* CT-1983

## Bug Fixes

### Installation and Deployment

- `ddlscan`, `dsctl` and `tungsten_send_diag` are now added to the `aliases.sh` script.

*Issues:* CT-813

- Fixes issues where fixed properties and filters passed to tpm in service stanzas were not being configured correctly

*Issues:* CT-1463

- No longer using Tanuki wrapper functionality to print jvm version, which was creating defunct java processes at startup, now using internal code.

*Issues:* CT-1876

### Command-line Tools

- Running `tpm update` on a standalone Replicator deployment no longer prints an uninitialized value error.

*Issues:* CT-1807

- Fixes an issue that prevented `ddlscan` from connecting to MySQL if SSL was enabled.

*Issues:* CT-1808

- The `tungsten_skip_seqno` command no longer fails when `-i` is specified, and now properly filters using `--filter` when there is a long error message.

*Issues:* CT-1877

- The `tpm` command now allows any case for section entries [i.e. [alpha\_FROM\_beta]] in the INI files.

*Issues:* CT-1879

- The `tpm diag` command now passes when the nodename defined in the `tungsten.ini` is the shortname, and DNS returns the FQDN.

Issues: CT-1908

- The `tpm diag` command now gathers the `mysql.log` file when SSL is enabled in the server.

Issues: CT-1920

- **Note**

This fix was released in Tungsten Clustering and Tungsten Replicator 7.0.2 Build 161.

The `tpm` command checks for the existence of the `mysql` command-line client when installing/upgrading. The process will no longer abort with an error on non-MySQL targets such as heterogeneous replicator appliers, or Active-Witness hosts.

Issues: CT-1924, CT-2018

- Fixes an issue that prevented `dsctl` from connecting to MySQL if SSL was enabled.

Issues: CT-1928

- The `tpm mysql` command will now gracefully handle being run on a non-database node.

Issues: CT-1946

- The `tpm mysql` command no longer aborts with an access denied error on CentOS 6.

Issues: CT-1977

- Both TungstenAPI and `tpasswd` now properly update `.passwords.store.orig` backup file so that proper manipulation of passwords won't trigger `tpm update` failure

Issues: CT-1981

#### Core Replicator

- Fixes an issue that would prevent a service from going offline at a specified time (`trepctl online -until-time`) when parallel apply is enabled. This is a rework of CT-1243.

Issues: CT-1684

- Fixed a possible issue when recovering an old primary as a replica after failover when parallel apply is enabled, that could lead the replica to be unable to come online and require a reprovisioning of this replica.

Issues: CT-1890

- Fixes an issue that prevented geometry datatypes with SRID from being replicated.

Issues: CT-1904

- Fixed an issue where filtered events would trigger a useless update to the service `trep_commit_seqno` table while it is overwritten anyway once the last statement of the applied event is done, just prior to committing the whole block.

Issues: CT-1931

- Fixed an issue where the replicator would hang after applying a `DROP TABLE` event, that originally failed on the primary, but got logged into the binlog.

Issues: CT-1973

- Fixed a parsing issue that would prevent the replicator from correctly detecting a `CREATE TABLE` statement with `START TRANSACTION`

Issues: CT-1987

- Fixed an issue in the applier to ensure it is not committing too often with a multi-service replicator (active/active for example, more specifically with AWS Aurora, or an unprivileged MySQL, backend).

Issues: CT-2004

#### Filters

- Fixed an issue where the `dropsqlmodes` filter would fail to remove invalid sql modes from a multi-statement event

Issues: CT-1993

## 5.10. Tungsten Replicator 7.0.1 GA [13 June 2022]

Version End of Life. 28 Apr 2026

Release 7.0.1 is the first minor release for the v7 release. This release contains a number of new features, minor bug fixes and a few key behavior changes, but importantly contains a critical bug fix for environments that use mixed-case table and database names, that could cause replication failures.

Customers already running v7.0.0 in production environments should upgrade to this release as soon as possible

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- A better error message is now provided when keystore password and enclosed private key password don't match.

*Issues:* CT-1853

### Command-line Tools

- The `tpm ask summary` command is now sorted by key when the Perl `Tie::IxHash` module is installed.

*Issues:* CT-1820

- The `tpm diag` command now gathers the output of the `tpm ask summary` command

*Issues:* CT-1827

- The `tmonitor` command now calls `sudo` internally as needed, removing the need for the `tmonitor` command to be run with `sudo` for the `install` and `remove` sub-commands.

*Issues:* CT-1846

### Core Replicator

- The default value for the `tpm` property `repl-svc-fail-on-zero-row-update` has been changed from `warn` to `stop`

### Warning

This is a significant change in behavior and could cause replicators, specifically cross-site replicators, in an Active/Active environment to stop and error more frequently.

To maintain original behavior you will need to add this property with the value of `warn` to your configuration, providing you fully understand the inherent risk of ignoring such warnings.

*Issues:* CT-1856

### Known Issues

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Replicator. They will be addressed in a subsequent patch release.

### Installation and Deployment

- After starting up Tungsten components, a `defunct` process for each running component can be found in the process listing.

Whilst this does not cause any issues, it could generate unnecessary alerts for customers monitoring.

The cause has been identified and affects version 7.0.0 and 7.0.1. This will be fixed in the next 7.0.2 release.

*Issues:* CT-1876

### Improvements, new features and functionality

#### Command-line Tools

- Added the ability to turn auto recovery on or off dynamically, removing the need to run `tpm update`.

This is done by running the following command:

```
shell> trepctl -service servicename setdynamic -property replicator.autoRecoveryMaxAttempts -value <number>
```

## Note

The service must be offline before changing the property

*Issues:* CT-1088

- A new `tpm report` sub-command has been added. By default, `tpm report` will generate a security report for all available communication channels on a per-node basis. The purpose of `tpm report` is to provide easy access to all of the settings that pertain to a specific topic. The default (and only) topic at this time is the security stance. More topics will be added over time.

*Issues:* CT-1793, CT-1857

- The `tapi` command now supports the creation and modification of multiple APIv2 admin users. Two new cli args have been added: `--create-user` and `--create-pass`.

*Issues:* CT-1801

- The `tapi` command now auto-detects the protocol, either http or https

*Issues:* CT-1803

- Added JMX encryption and authentication status to `trepctl -verbose` and connector command outputs

*Issues:* CT-1813

- The `tapi` command will now output service names with the new option `--includeServiceName`, or if there is more than one service name found..

*Issues:* CT-1860

## Core Replicator

- The `thl list` command now displays an approximative field size in bytes for row-based replication.

*Issues:* CT-1847

## Security

- Replaced official log4j library with a secured version in which all vulnerable classes have been removed. This prevents exposing the software following a [user] misconfiguration of the log4j properties

*Issues:* CT-1810

## API

- Added a way to retrieve service properties through the API, for example, to check a specific service parameter, run the following API call :

```
shell> curl https://127.0.0.1:8097/api/v2/replicator/service/alpha/properties?filter=replicator.global.db.sslEnabled
{
  "payloadType": "PropertiesListPayload",
  "payloadVersion": "1",
  "payload": {
    "replicator.global.db.sslEnabled": "false"
  }
}
```

*Issues:* CT-1802

- Added new top level REST API call to display RMI SSL status, run the following API call :

```
shell> curl https://127.0.0.1:8097/api/v2/rmiSecurity
```

*Issues:* CT-1812

## Bug Fixes

### Installation and Deployment

- The `tpm update` command now properly handles v7 -> v7 upgrades.

*Issues:* CT-1815

- `deployall` script now properly displays the executable prefix for restarting services, typically `mm_treplicator` in Multi-Site/Active-Active replicator-only installs, as well as the full path to component binaries

*Issues:* CT-1835

- `tpm` would fail on keystores containing special characters in alias names.

*Issues:* CT-1852

#### Command-line Tools

- Worked around a ruby issue where DNS name resolution was sometimes preferred to file-based resolution in TPM. The following logic now applies: first trying file-based host name resolution, upon failure try DNS, then through ping command

*Issues:* CT-1653

- Improves the `tpm diag` command so that it waits 2 seconds for replicator thread dump to complete.

*Issues:* CT-1792

- Fixed an Undefined subroutine `call error in `tapi --create`

*Issues:* CT-1798

- `tpm` now properly reports errors upon timeout executing commands. Typically, when a host is down, when upgrading or installing, `tpm` will now properly report that pinging this host failed.

*Issues:* CT-1819

- TPM would fail to validate data sources when using `ssl-capath [directory]` rather than `ssl-ca [file]` in `my.cnf`.

This fixes only the validation part, automated truststore creation by TPM will not be possible at this point, a full `tungsten-truststore.ts` will have to be passed through `--java-truststore-path`

*Issues:* CT-1826

- The `tapi` command now auto-switches protocol (http or https) properly.

*Issues:* CT-1829

- `replicator start offline` would not properly pass the offline argument to systemd scripts when installed through `deployall`.

*Issues:* CT-1836

- `undeployall` script would not properly uninstall `systemd` services on some distributions including amazon linux.

*Issues:* CT-1845

#### Redshift Applier

- If the optional `RedshiftCopyOptions` option was omitted from the `s3-config.json` file, the replicator would fail to start with an `undefined` error.

*Issues:* CT-1814

#### Core Replicator

- Due to a change in binlogging behavior from MySQL 5.7 onwards (Including Aurora) when using the standalone Tungsten Replicator to configure bi-directional replication with unprivileged access (ie unable to control binlogging behavior), certain DDL statements failed to be tagged correctly causing them to be re-applied to the originating source database, resulting in replicator errors.

*Issues:* CT-1083

- Fixed the EnumToString and pkey filters to renew their database connections (every hour by default). This can be changed with the following properties:

```
property=replicator.filter.enumtostring.reconnectTimeout=3600
property=replicator.filter.pkey.reconnectTimeout=3600
```

*Issues:* CT-1786

- `tpm update` would fail with message "The host is configured to be '' but it is currently operating as a 'master'" when a dynamic replicator configuration file is found

*Issues:* CT-1848

- Fixes issues with PrimaryKeyFilter:
  - It could fail from correctly fetching primary key columns for tables with mixed upper and lower case letters in table names
  - Alter user statements could make it fail

*Issues:* CT-1861

- Fixed a `NullPointerException` that could happen if a replicator was put offline during startup. This had mostly no consequence except the exception being logged.

*Issues:* CT-1863

## 5.11. Tungsten Replicator 7.0.0 GA [29 Mar 2022]

Version End of Life. 28 Apr 2026

Release 7.0.0 is a major release introducing many new features including a fully documented API. There are a large number of bug fixes and improvements in all areas of the product, and a number of key behavior changes, most significantly being Security is now enabled by default.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Installation and Deployment

- An RPM update now issues `--replace-release`

*Issues:* CT-1708

### Command-line Tools

- The `tpm diag` command now uses `tar czf` instead of the `zip` command to compress the gathered files. The `zip` command is no longer a prerequisite for `tpm diag`.

*Issues:* CT-1253

- `tungsten_set_position` has been deprecated and no longer available in this release. `dsctl` should be used instead.

`tungsten_provision_slave` has now been renamed to `tprovision`

*Issues:* CT-1302

- The `tungsten_find_orphaned` script now creates a log file every time it runs which is stored in the configured temporary directory (`/tmp/` by default, `tpm query values temp_directory`). This is to allow for easier troubleshooting and visibility during automatic execution.

*Issues:* CT-1447

- `tpm` now accepts `chrony` as a valid time synchronization software

*Issues:* CT-1462

- The `tpm diag` command now uses the `ss` (socket status) command in place of `netstat` on SUSE and other operating systems that have deprecated `netstat`.

*Issues:* CT-1483

- The `tpm diag` command now gathers the `/etc/os-release` file when located. Also now using the `ip` command on systems where `ifconfig` and/or `route` is deprecated.

*Issues:* CT-1496

- Changed output of `thl purge` command when no lower and upper bounds are given from 'Deleting events where' to 'Deleting all events'.

*Issues:* CT-1738

### Backup and Restore

- `tungsten_provision_slave` has now been renamed to `tprovision`.

*Issues:* CT-1436

#### Core Replicator

- Replicator will now check after extracting a mysql `STOP_EVENT` whether a new binlog file was created, actually handling this event as a `ROTATE_EVENT`.

This decreases the time that would be needed after `STOP_EVENT` to extract a new event..

*Issues:* CT-1349

#### Other Issues

- Log files for each component now have the same date and time stamp format.

*Issues:* CT-1669

#### API

- API calls triggering configuration changes are protected by a flag, `i-am-sure=true`, in order to avoid unwanted, potentially dramatic, configuration changes. This applies to:
  - `configuration/module/servicesmap`
  - `reset`
  - `offline`
  - `online`
  - `onhold`
  - `addDataService`
  - `addDataSource`

*Issues:* CT-1317

#### Known Issues

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Replicator. They will be addressed in a subsequent patch release.

#### Installation and Deployment

- After starting up Tungsten components, a `defunct` process for each running component can be found in the process listing.

Whilst this does not cause any issues, it could generate unnecessary alerts for customers monitoring.

The cause has been identified and affects version 7.0.0 and 7.0.1. This will be fixed in the next 7.0.2 release.

*Issues:* CT-1876

#### Command-line Tools

- The `check_tungsten_online` command returns a Replicator offline error on active witness hosts.

*Issues:* CT-1783

### Improvements, new features and functionality

#### Installation and Deployment

- Two new `tpm` options have been included as part of the new API in this release.

The options are used for setting the API admin user credentials and are as follows:

- `rest-api-admin-user`
- `rest-api-admin-pass`

*Issues:* CT-1327

- Support now included for MariaDB 10.3+

*Issues:* CT-1276, CT-1433

- Support has been added for Java 17 LTS

*Issues:* CT-1706

#### Command-line Tools

- A new `tpm` option `delete-service` is now available to simplify the removal of replicator services.

*Issues:* CT-327

- Prometheus exporters `mysqld_exporter` and `node_exporter` are now included with the distribution packages.

A new command line tool `tmonitor` is now available for the management and testing of external Prometheus exporters (`node` and `mysqld`), and for the testing of internal exporters (Replicator).

*Issues:* CT-960

- A new `tpm` option `purge-thl` and a new script `tungsten_purge_thl` have been added to allow easier and more intelligent THL purging across all nodes in a topology.

This allow you to purge THL files based on the following rules:

- Gather the last applied `seqno` from all Replica nodes and take the lowest one
- Find the current THL file which contains that `seqno`, then locate the previous one
- Construct a `thl purge` command to remove `thl` thru the last `seqno` in the `prev` file

The default behavior is to display the needed commands for the admin to execute manually.

*Issues:* CT-1273

- `tpm diag` now collects routing table information via `route -n`, and has two new command-line arguments: `--include` and `--groups`.

`--include` specifies a comma-separated list of subroutines to include. Any gather subroutine not listed will be skipped.

`--groups` specifies a comma-separated list of subroutine groups to include. Any group not listed will be skipped.

*Issues:* CT-1322

- `tungsten_send_diag` now supports a new command-line argument, `--cleanup`, which will cause the removal of the diagnostic archive file generated using the `--diag` argument.

*Issues:* CT-1360

- With the release of APIv2, a new cli tool has been introduced to allow easier access called `tapi`.

In addition, the vast majority of Tungsten cli tools have been updated to optionally use the APIv2 interface when desired.

The Nagios and Zabbix checks are also available via APIv2 using the `tapi` tool.

*Issues:* CT-1454

- The `tungsten_purge_thl` command is now a wrapper for the `tpm purge-thl` command.

*Issues:* CT-1488

- The `tmonitor` command now has better help text and more options to ease usage, including `--filter` to allow easy viewing of the `tmonitor` test output.

*Issues:* CT-1585

- A new option to print the merged logs to `STDOUT` has been added to `tungsten_merge_logs` (`--stdout|-o`).

The `tpm` command suite now properly supports the `--profile` argument to specify a Tungsten json configuration file in place of the installed `tungsten.cfg`.

*Issues:* CT-1680

- A new command `[error]` has been added to `trepctl` to output a full stack trace of the last error, if any.

```
shell> trepctl -service <serviceName> error
```

```
Event application failed: seqno=10 fragno=0 message=Table hr.regions not found in database. Unable to generate a valid statement.
com.continuent.tungsten.replicator.applier.ApplierException: Table hr.regions not found in database. Unable to generate a valid statement.
at com.continuent.tungsten.replicator.applier.JdbcApplier.getTableMetadata(JdbcApplier.java:582)
at com.continuent.tungsten.replicator.applier.JdbcApplier.fillColumnNames(JdbcApplier.java:494)
at com.continuent.tungsten.replicator.applier.JdbcApplier.getColumnInformation(JdbcApplier.java:1236)
at com.continuent.tungsten.replicator.applier.MySQLApplier.applyOneRowChangePrepared(MySQLApplier.java:418)
at com.continuent.tungsten.replicator.applier.JdbcApplier.applyRowChangeData(JdbcApplier.java:1460)
at com.continuent.tungsten.replicator.applier.JdbcApplier.apply(JdbcApplier.java:1576)
at com.continuent.tungsten.replicator.applier.ApplierWrapper.apply(ApplierWrapper.java:100)
at com.continuent.tungsten.replicator.pipeline.SingleThreadStageTask.apply(SingleThreadStageTask.java:871)
at com.continuent.tungsten.replicator.pipeline.SingleThreadStageTask.runTask(SingleThreadStageTask.java:601)
at com.continuent.tungsten.replicator.pipeline.SingleThreadStageTask.run(SingleThreadStageTask.java:185)
at java.base/java.lang.Thread.run(Thread.java:834)
```

*Issues:* CT-1747

### Redshift Applier

- Adds a new option `redshiftCopyOptions` that can be supplied in the `s3.json` file to include valid options that can be included in the Redshift COPY command when loading csv data from S3 into Redshift staging tables. See example below.

```
{
  "awsS3Path" : "s3://your-bucket-for-redshift/redshift-test",
  "awsIAMRole" : "arn:iam-role",
  "redshiftCopyOptions" : "ACCEPTANYDATE ACCEPTINVCHARS TRUNCATECOLUMNS",
  "cleanUpS3Files" : "true"
}
```

*Issues:* CT-1298

### PostgreSQL Applier

- Templates have been included for `ddlscan` to enable MySQL to Postgres Schema translation.

*Issues:* CT-1736

### Core Replicator

- It is now possible to compress and/or encrypt THL on disk. For more information on using these features see <https://docs.continuent.com/tungsten-replicator-7.0/thl-compress-encrypt.html>

*Issues:* CT-630

- The replicator will now be able to handle new `SQL_MODES` available in later releases of MySQL and MariaDB, these are as follows:

- MySQL: `TIME_TRUNCATE_FRACTIONAL`
- MariaDB: `TIME_ROUND_FRACTIONAL`, `SIMULTANEOUS_ASSIGNMENT`

*Issues:* CT-1362

- In-Flight THL Compression is now available.

For full details on enabling this feature, refer to [this page](#)

*Issues:* CT-1420

- Added a new property to allow configuration of character set used during batch loading into MySQL targets.

Default is `ut8mb4`. Override using the following:

```
property=replicator.applier.dbs.loadCharset=utf8
```

*Issues:* CT-1647

### Security

- Tungsten can now install on default CentOS and RedHat 8 with tightened security settings thanks to support of TLSv1.3

*Issues:* CT-1359

- Tungsten software now undergoes a rigorous security scan during QA. We also check included open-source/3rd-party software.

*Issues:* CT-1579

## Monitoring

- A number of new metrics have been added to the Prometheus exporters.

*Issues:* CT-1266, CT-1615

## Platform Specific Deployments

- ARM 64 bit processor support added (linux aarch64)

### Note

Note that at time of release, there is currently no xtrabackup binary available for ARM.

*Issues:* CT-1619, CT-1620

## Other Issues

- General improvements in MySQL 8.0 support.

*Issues:* CT-1346

- IPv6 host addresses are now fully supported.

Can be enabled with the following configuration property:

```
prefer-ip-stack="6"
```

By default, IPv4 is enabled, which equates to the value of "4" in the above property.

*Issues:* CT-1537

## Bug Fixes

### Installation and Deployment

- Default systemd configuration files for Tungsten components no longer specifies the tungsten group to execute the command. This will prevent file access issues when tungsten user belongs to several groups.

*Issues:* CT-1550

- When services are deployed with systemd and MySQL could not start due to an error, `tpm` would not be able to later start MySQL

*Issues:* CT-1734

### Command-line Tools

- Issuing `dsctl set [--reset]` against Aurora source and targets would fail with Access Denied errors. This is due to the inability to disable Binary Logging for specific transactions which `dsctl` issues. The errors did not prevent `dsctl` from working, however they were misleading.

*Issues:* CT-1040

- In certain cases, `tprovision` would not be able to find the binary log position of the backup when taken from a primary. This has been fixed.

*Issues:* CT-1085

- Fixes a bug in `tprovision` when using xtrabackup version 8, due to changes in xtrabackup binaries.

*Issues:* CT-1248

- The `tpm connector` command now handles special characters in the password string.

*Issues:* CT-1258

- The `tpm update` command will now exit with an error if any files not owned by the configured Tungsten OS user are found in the Tungsten installation directory.

For example, if the OS user is `tungsten` and the installation directory is `/opt/continuent`, containing the file `/opt/continuent/thl/archived_thl.zip` owned by `root` would cause something like the following error to be produced, and `tpm update` would exit:

```
Foreign-owned files found!
Located files in the Tungsten installed directory /opt/continuent
that are not owned by the Tungsten OS user (tungsten):
```

```
/opt/continuent/thl/archived_thl.zip
```

Please change the ownership of these files to OS user "tungsten" using the `chown` command as root via `sudo`, then rerun the `'tpm update'` command.

For example:  
`shell> sudo chown -R tungsten:tungsten /opt/continuent`

*Issues:* CT-1260

- Fixes a security issue within the `tpm diag` command.

*Issues:* CT-1295

- `tungsten_send_diag` no longer prints an error about `Use of uninitialized value $diagArgs in concatenation`.

*Issues:* CT-1354

- The `tpm` command no longer prints an error when run with no other command-line arguments.

*Issues:* CT-1373

- The `tpm` command no longer aborts with a `Use of uninitialized value error` when a stray `tungsten.cfg` file exists under `$CONTINUED_ROOT`

*Issues:* CT-1394

- Fixes a monitoring bug with users using `caching_sha2_password`.

*Issues:* CT-1406

- The `tpm` command now checks the local host's shortname in addition to the FQDN returned by the `hostname` command upon initialization.

This fixes a bug that prevented `tpm mysql` from working on appliance hosts running MySQL.

*Issues:* CT-1414

- `tprovision` (formerly `tungsten_provision_slave`) may fail to provision if the MySQL data directory was not accessible to the `tungsten` user.

*Issues:* CT-1475

- The `tmonitor` command no longer fails on Debian 9 and Ubuntu.

*Issues:* CT-1485

- All `tpm` sub-commands now handle command-line arguments more intelligently.

*Issues:* CT-1487

- The `tpm purge-thl` command now handles command-line arguments more intelligently.

*Issues:* CT-1489

- The `tpm diag` command now properly collects the system information file on Debian systems.

*Issues:* CT-1492

- Database monitoring logs are now reporting the correct error number and SQL state when database errors occur.

*Issues:* CT-1497

- The `tpm update` command now handles updates/upgrades more gracefully when the previous version did not have the latest `tpm` framework.

*Issues:* CT-1506

- The `tpm ask` command no longer calls `Data::Dumper` when it is not available.

*Issues:* CT-1626

- `tpm` now parses the MySQL SSL related setting correctly.

*Issues:* CT-1662

- Fixes an issue where the `deployall` command would create a root owned `wrapper.log` in the `./tools` directory.  
*Issues:* CT-1664
- When MySQL services were badly installed, some distributions could show a “not-found” status within `systemctl`, confusing `tpm`  
*Issues:* CT-1677
- The `tpm` command now communicates properly when there is no INI configuration file or staging-method `deploy.cfg` configuration defined.  
*Issues:* CT-1712
- The `tpm diag` command now handles Multi-Site/Active-Active topologies better.  
*Issues:* CT-1718
- `tungsten_monitor.rb` script no longer uses `sudo` to send emails if the configuration doesn't allow it.  
*Issues:* CT-1737
- The `tpm diag` command now handles zero-length `mysqld.log` files gracefully.  
*Issues:* CT-1740

#### Backup and Restore

- Fixed an issue where an xtrabackup generated by the replicator would fail to be restored using `trepctl restore` command.  
*Issues:* CT-1575

#### Oracle Applier

- Fixes an issue causing an error when using the `ddl-mysql-oracle.vm` template with `ddlscan` to convert MySQL schema DDL into Oracle DDL  
*Issues:* CT-1326
- Fixes a bug in the MySQL to Oracle `ddlscan` templates that prevented them from executing.  
*Issues:* CT-1735, CT-1756

#### Heterogeneous Replication

- Fixes an issue where a heterogeneous (non-MySQL) applier would try to run MySQL syntax to set the timezone in use.  
*Issues:* CT-1324

#### Core Replicator

- The replicator metadata cache will now correctly handle table names when `lower_case_table_names=1` is set in the MySQL configuration.  
*Issues:* CT-651
- When using parallel apply, the replicator would error with a Foreign Key constraint error if statements were issued against two or more objects that shared the same name, but with different case sensitivity, for example:

```
mysql> create table testtable;
mysql> drop table testtable;
mysql> create table TestTable;
```

*Issues:* CT-1259

- A change in the way MySQL logs `CREATE TABLE AS SELECT` in the Binary Logs from v8.0.20 onwards, meant these transactions would previously fail.

#### Warning

Whilst these statements will now replicate, it must be noted that in the event of a failure during the data load, the initial `CREATE` statement won't be rolled back, and therefore care must be taken when using this type of DDL.

#### Note

This only affects customers using MySQL v8.0.20+ running with `ROW` based replication. An alternative workaround to ensure correct rollback on failure, would be to run the statement with `STATEMENT` based replication for the session. This will also provide better performance for larger tables.

*Issues:* CT-1301

- Fixes occurrences of `NullPointerException` that would occur when bringing the replicator online before MySQL was started.

*Issues:* CT-1348

- For row based events, SQL modes were not displayed in the THL output. This is now fixed.

*Issues:* CT-1440

- When connecting to a THL server, a client will now connect to the next available host in its THL uri, if the first does not have the sequence number that the client requires. The client will then fail only if none of the hosts from the uri can provide the needed sequence number.

*Issues:* CT-1558

- Fixed an issue when using Parallel apply that would show a `NullPointerException` in case an event could either not be found or be corrupted in THL. This will now display a correct message `Missing or corrupted event from storage`

*Issues:* CT-1722

- Fixed an issue with the batch loader where `DATETIME` and `TIME` datatypes with milliseconds would be replicated as `.000` instead of the real millisecond value.

*Issues:* CT-1739

- Fixed an issue where `trepctl` was leaving JMX connections opened.

*Issues:* CT-1752

- Added more debug information for detecting possible hanging connections while a THL client connects to the THL server. Also, added socket timeout for the connection initialization

*Issues:* CT-1760

Filters

- Includes previously missing template file to enable easy configuration of the `dbrename` filter.

*Issues:* CT-1350

- The `BidiRemoteSlaveFilter` could fail to correctly flag fragmented events in unprivileged environments (Aurora, for example) In such an environment (multi-active, unprivileged database access), a new setting was introduced to force extraction process to read ahead to the last fragment to detect the service name (false by default). Enabled with `repl_svc_extractor_multi_frag_service_detection=true`

*Issues:* CT-1351

Security

- log4j libraries updated to v2.17.1 specifically to mitigate risk of exposure to the 0-day vulnerability detected in log4j v2.14

*Issues:* CT-1703

## 6. Tungsten Clustering v6.x Release Notes

### 6.1. Tungsten Clustering 6.1.25 GA [7 July 2024]

Version End of Life. 15 Aug 2024

Release 6.1.25 contains a specific feature request in Tungsten Connector and fixes a small bug in Tungsten Replicator.

Improvements, new features and functionality

Tungsten Connector

- In proxy mode, kill queries are now intercepted by the connector in order to replace the given `thread_id` by the underlying database connection `thread_id`.

#### Note

While executing the kill command, you might get an error like "Could not execute query kill query <id>: Unknown thread id: <id>". This can be ignored, the connection will still be properly killed.

*Issues:* CT-2298

#### Bug Fixes

#### Core Replicator

- Fix for an issue in ColumnNameFilter, EnumToStringFilter and TableMetadataCache where an `ALTER USER` statement could trigger a `NullPointerException`.

*Issues:* CT-2321

## 6.2. Tungsten Clustering 6.1.24 GA [11 Dec 2023]

Version End of Life. 15 Aug 2024

Release 6.1.24 contains a critical bug fix to address an issue during failover.

#### Bug Fixes

#### Tungsten Manager

- Fixes an issue when the manager would wait longer than the timeout for replicator purge on a failover.

*Issues:* CT-1733

## 6.3. Tungsten Clustering 6.1.23 GA [31 Aug 2023]

Version End of Life. 15 Aug 2024

Release 6.1.23 contains a number of critical bug fixes.

#### Bug Fixes

#### Tungsten Connector

- Fixed an issue where a failover could hang in rare cases when security and Proxy mode are enabled. SSL connections to a failed data source could enter a deadlock and block failover for up to 15 minutes.

#### Note

This issue only affects users running Java 11, and is related to <https://bugs.openjdk.org/browse/JDK-8241239>

*Issues:* CT-2183, CT-2187

## 6.4. Tungsten Clustering 6.1.22 GA [6 July 2023]

Version End of Life. 15 Aug 2024

Release 6.1.22 contains a number of critical bug fixes and it is advised customers running 6.1.21 should upgrade to this release.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- `cctrl` now accepts services names with capital letters, dots and hyphens

*Issues:* CT-2163

#### Bug Fixes

#### Installation and Deployment

- Fixed RPM package script to run `tpm install` instead of `tpm update` when installing the rpm

*Issues:* CT-2130

#### Core Replicator

- A change in the way MySQL logs `CREATE TABLE AS SELECT` in the Binary Logs from v8.0.20 onwards, meant these transactions would previously fail.

### Warning

Whilst these statements will now replicate, it must be noted that in the event of a failure during the data load, the initial CREATE statement won't be rolled back, and therefore care must be taken when using this type of DDL.

### Note

This only affects customers using MySQL v8.0.20+ running with `ROW` based replication. An alternative workaround to ensure correct rollback on failure, would be to run the statement with `STATEMENT` based replication for the session. This will also provide better performance for larger tables.

Issues: CT-1301

- Fixed an issue where an extracted JSON field could be invalid, with doubled commas in JSON arrays.

Issues: CT-2049

- Improved a query that is run by Tungsten when fetching tables metadata (column names, datatypes, etc). While it is not generally needed, the unoptimized query can run badly (especially) against old mysql versions with a lot of databases / tables. For now, the new optimized query is not used by default, but this could change in some future version.

This can be enabled by using the following property :

```
property=replicator.datasource.global.connectionSpec.usingOptimizedMetadataQuery=true
```

Issues: CT-2077

### Tungsten Connector

- Note, this bug only affects v6.1.21

Removed extra logging for each `"SET xxx"` statement when in proxy mode. On top of polluting the logs, this extra logging can overwhelm the connector, making it slow to respond and have client threads pile up, up to the point where that could exhaust memory

Issues: CT-2165

## 6.5. Tungsten Clustering 6.1.21 GA [18 Apr 2023]

Version End of Life. 15 Aug 2024

Release 6.1.21 contains a number of critical bug fixes and improvements.

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Command-line Tools

- The `tungsten_skip_all` command (along with alias `tungsten_skip_seqno`) now shows the full `pendingExceptionMessage` instead of just `pendingError`, and the `More` choice shows the `pendingErrorEventId` and the `pendingError`.

Issues: CT-2030

- Enabling a custom backup script does not require it to be made the default option anymore, i.e. Setting `--repl-back-up-method` to the custom backup script is not required anymore.

Issues: CT-2039

- No longer using connector `graceful-stop` together with `systemd` for upgrades. The underlying change of binary confuses `systemd` scripts.

Issues: CT-2113

### Known Issue

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Cluster. They will be addressed in a subsequent patch release.

### Tungsten Connector

- Note, this bug only affects this release, v6.1.21

Each "SET xxx" statement issued when in proxy mode is being logged. On top of polluting the logs, this extra logging can overwhelm the connector, making it slow to respond and have client threads pile up, up to the point where that could exhaust memory

If using Proxy mode, it is advised to NOT install this release, and instead use either version 6.1.20 or 6.1.22

*Issues:* CT-2165[ki]

Improvements, new features and functionality

Command-line Tools

- tungsten show processlist could error with a disconnection message listing connections disconnected on the mysql server side.

*Issues:* CT-2112

- The `tpm diag` command now captures the output of `ctrl> cluster topology validate`

*Issues:* CT-2115

Tungsten Connector

- Improved smart scale handling of session and global changes so they're all played against connected replica or in case of reconnection. As an example, `SET SESSION TRANSACTION READ ONLY` will be sent to both primary and replica connections so that a subsequent `SELECT @@SESSION.transaction_isolation` will return the expected value, even if executed on a replica.

*Issues:* CT-1600

Platform Specific Deployments

- ARM 64 bit processor support added (linux aarch64)

#### Note

Note that at time of release, there is currently no xtrabackup binary available for ARM.

*Issues:* CT-1619, CT-1620

Bug Fixes

Command-line Tools

- The `tungsten_get_status` command now handles shunned nodes properly.

*Issues:* CT-2026

- The `tpm ask keys` command now lists all available keys properly.

*Issues:* CT-2041

## 6.6. Tungsten Clustering 6.1.20 GA [19 Dec 2022]

Version End of Life. 15 Aug 2024

Release 6.1.20 contains a number of critical bug fixes and improvements.

Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

Command-line Tools

- Both the `tungsten_get_ports` and `tpm report` commands have been updated to use the `ss` OS command when the `netstat` OS command is unavailable or deprecated.

*Issues:* CT-2007

Core Clustering

- Changed the behavior of the connector and manager upon local site failover:

No longer sending write traffic to the remote site unless the local site is fully offline. In case of local failover, the connector will now pause connections until a new primary is elected. This will avoid risks of out-of-order apply after local failover

*Issues:* CT-2009

Improvements, new features and functionality

Command-line Tools

- A new command has been added called `tungsten_get_ports`, which will display the running Tungsten processes and the associated TCP ports that those processes are listening on.

*Issues:* CT-1970

- The `tungsten_get_ports` command now supports the `/opt/continuent/tungsten/tungsten-connector/conf/interfaces.json` file, if found.

*Issues:* CT-2003

- The `tungsten_get_ports` command now use values based on values obtained from `tpm query values` when possible for the greatest output accuracy.

*Issues:* CT-2008

Bug Fixes

Command-line Tools

- Worked around a ruby issue where DNS name resolution was sometimes preferred to file-based resolution in TPM. The following logic now applies: first trying file-based host name resolution, upon failure try DNS, then through ping command

*Issues:* CT-1653

Backup and Restore

- When running the `cluster_backup` in a Active/Active environment, when setting `require_master_backup` to false, the script would still attempt to backup the Primary as it would scan the wrong sub-service and incorrectly identify the Relay node as a candidate.

*Issues:* CT-1280

Filters

- Fixed an issue where the `dropsqlmodes` filter would fail to remove invalid sql modes from a multi-statement event

*Issues:* CT-1993

Tungsten Manager

- The `cctrl` command `datasource <ds> slave` now sets the replicator role correctly. Previously, only the `datasource` role would change.

*Issues:* CT-1882

- A bug has been fixed that, in a few very rare cases, would allow replicas to continue to pull and apply THL from a failed primary whilst a failover was in the process of electing a new primary. This resulted in failovers being unable to complete fully. Whilst the new primary would be online and functioning, existing replicas in the cluster could experience errors due to THL discrepancies between the old and new primary nodes.

*Issues:* CT-1986

## 6.7. Tungsten Clustering 6.1.19 GA [17 Oct 2022]

Version End of Life. 15 Aug 2024

Release 6.1.19 contains a number of critical bug fixes and improvements, specifically for customers using Parallel Replication.

Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

Command-line Tools

- The `check_tungsten.sh` was deprecated in release 6.1.18 and has now been removed from this release.

*Issues:* CT-1939

#### Core Replicator

- `repl_svc_extractor_multi_frag_service_detection` is now turned ON by default. Event shards are determined at extraction time. With fragmented events, the shard cannot be determined by only reading the first fragment, but needs to check the last fragment as well. With this setting turned OFF, there is no issue with pipelines that don't need it, i.e. no parallel apply downstream replicas. However, as this is done at extract time, THL contains this information, and adding or changing a replica using parallel apply could introduce issues.

#### Note

It can be disabled if you see a performance overhead but this should be done with caution. For Aurora<->Aurora Active/Active deployments it is essential that this property be left ON.

*Issues:* CT-1959

#### Tungsten Connector

- Improved tungsten show processlist by running underlying commands in parallel.

*Issues:* CT-1569

#### Improvements, new features and functionality

##### Command-line Tools

- The `tpm` command calls to `glob` have been improved to be more strict and compliant.

*Issues:* CT-1940

- The `tpm ask stages` and `tpm ask allstages` commands have been added to display the Replicator stages for the current node (`stages`) and the stages for each role (`allstages`).

*Issues:* CT-1943

- The `tpm ask` command has five new variables available: `dsrole` & `dsstate` for the current datasource, and `trrole` & `trstate` for the current replicator, and `nodeinfo` which displays all 4 of the new variables.

*Issues:* CT-1944

- A new standalone status script has been added called `tungsten_get_status` that shows the datasources and replicators for all nodes in all services along with seqno and latency.

*Issues:* CT-1962

##### Tungsten Connector

- Added a connector mode command to print which mode the connector is running in, either "bridge" or "proxy"

*Issues:* CT-1799

- The connector graceful-stop command now supports systemd service manager properly. The `connector stop` command now takes an optional argument that will make it a graceful stop. If `connector stop` is run without the parameter, it will stop the connector immediately. If a positive number of seconds is passed, it will wait, at most, this timeout for connections to disconnect (refusing new connections), after which it will force close all connections and shutdown the connector. connector graceful-stop behavior is unchanged: without the parameter, the connector will wait "forever" for connections to disconnect. A positive timeout in seconds can be passed to sever connections after the given delay

*Issues:* CT-1921

##### Bug Fixes

##### Installation and Deployment

- The `tpm install` and `tpm update` commands now properly support the `--thl-ports` option for cross-site subservices.

*Issues:* CT-1953

##### Command-line Tools

- Fixes an issue where the pause state would be badly displayed under no load, when the pause reaches the defined time. Note this is only a display issue : once an event is received, the pause state and displayed remaining time will be reseted correctly.

*Issues:* CT-1942

- The `tpm mysql` command will now gracefully handle being run on a non-database node.

*Issues:* CT-1946

#### Core Replicator

- Fixes an issue that would leave a transaction uncommitted longer than necessary.

*Issues:* CT-1958

- Fixed an issue where the `shard_id` stored in the `trep_commit_seqno` table would show an incorrect shard after processing a skipped event (an event from another channel)

*Issues:* CT-1967

- Fixed an issue where the replicator would hang after applying a `DROP TABLE` event, that originally failed on the primary, but got logged into the binlog.

*Issues:* CT-1973

#### Filters

- The `BidiRemoteSlaveFilter` could fail to correctly flag fragmented events in unprivileged environments (Aurora, for example) In such an environment (multi-active, unprivileged database access), a new setting was introduced to force extraction process to read ahead to the last fragment to detect the service name (false by default). Enabled with `repl_svc_extractor_multi_frag_service_detection=true`

*Issues:* CT-1351

#### Tungsten Connector

- Connector now auto detects default authentication plugin by retrieving MySQL data source variable `default_authentication_plugin` rather than just using MySQL server version

*Issues:* CT-1926

## 6.8. Tungsten Clustering 6.1.18 GA [7 Sept 2022]

Version End of Life. 15 Aug 2024

Release 6.1.18 contains a number of minor bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- The `check_tungsten.sh` script has been deprecated and no longer maintained. It will be removed in the next patch release and users should use the newer `tmonitor` commands.

*Issues:* CT-1038

- The `tungsten_find_orphaned` command now places the log file in `$(CONTINUENT_ROOT)/service_logs/`, not `/tmp/`

*Issues:* CT-1866

#### Backup and Restore

- From v8 of xtrabackup, the `--stream=tar` option was removed, meaning that backups could fail if using the newer release of the Percona tools

In this release, the backups will now create the backup and then manually compress it

#### Warning

This change will increase the required disk space for backups to allow the post-backup compression to complete.

*Issues:* CT-1346

#### Tungsten Manager

- A failsafe shunned cluster (Caused by a network split) will be auto recovered after the network connection is re-established.

*Issues:* CT-241

#### Improvements, new features and functionality

##### Command-line Tools

- The `tungsten_merge_logs` command now supports the `--before` `TIMESTAMP` and `--after` `TIMESTAMP` filters

*Issues:* CT-1869

- The `tungsten_generate_haproxy_for_api` and `tpm generate-haproxy-for-api` commands now support using connector hosts in the backend definitions via `-c`, and extra backend flags to the backend hosts lines using `-f`.

*Issues:* CT-1909

- The `tungsten_generate_haproxy_for_api` and `tpm generate-haproxy-for-api` commands no longer call the `Perl Data::Dumper` module.

*Issues:* CT-1915

- The `tpm ask isBridge` and `tpm ask isCoordinator` commands have been back-ported to v6.

*Issues:* CT-1916

- The `tungsten_reset_manager` command now supports the ability to simply print out the path or paths to be cleared, one per line via the `-l` or `--list` arguments.

*Issues:* CT-1917

##### Core Replicator

- The `thl list` command now displays an approximative field size in bytes for row-based replication.

*Issues:* CT-1847

- Added a new feature that enables pausing a replicator stage for some amount of time.

This will pause the given stage for 100 seconds.:

```
trepctl pause -stage thl-to-q -time 100
```

This will pause the stage indefinitely (or until restart, etc) Add `-y` to avoid the prompt message whether you are sure.

```
trepctl pause -stage thl-to-q
```

For the previous 2 commands, running a pause command again will override the previous command.

This will resume the suspended stage (Note that if the stage is not paused, this will have no effect):

```
trepctl resume -stage thl-to-q
```

#### Note

Please note this pause does not survive a replicator restart or a service offline/online.

*Issues:* CT-1912

#### Tungsten Manager

- Added a new option to TPM `manager-replicator-offline-timeout=<timeout_in_sec>` that configures the timeout for the manager to wait until the replicator goes offline. When parallel applier is in use the default timeout was too low, so it's now user configurable so that it can be adjusted to suit different topologies. If not supplied, the default is 180 (3 minutes). This value should be sufficient in most use cases.

*Issues:* CT-1892

#### Bug Fixes

#### Installation and Deployment

- Fixes issues where fixed properties and filters passed to tpm in service stanzas were not being configured correctly

*Issues:* CT-1463

#### Command-line Tools

- `replicator start offline` would not properly pass the offline argument to systemd scripts when installed through `deployall`.

*Issues:* CT-1836

- `undeployall` script would not properly uninstall `systemd` services on some distributions including amazon linux.

*Issues:* CT-1845

- The `tpm diag` command now passes when the nodename defined in the `tungsten.ini` is the shortname, and DNS returns the FQDN.

*Issues:* CT-1908

- The `tpm diag` command now gathers the `mysql.log` file when SSL is enabled in the server

*Issues:* CT-1933

- The `tpm diag` command now behaves properly when the MySQL server is logging to STDERR.

*Issues:* CT-1935

#### Backup and Restore

- Fixed an issue where an xtrabackup generated by the replicator would fail to be restored using `trepctl restore` command.

*Issues:* CT-1575

- During the backup/restore process the MySQL certificates are kept intact.

*Issues:* CT-1841

- Restore will now succeed even if only one incremental backup has been created.

*Issues:* CT-1842

- Incremental backups can now be restored more than once.

*Issues:* CT-1850

#### Core Replicator

- Fixes an issue that would prevent a service from going offline at a specified time (`trepctl online -until-time`) when parallel apply is enabled. This is a rework of CT-1243.

*Issues:* CT-1684

- Fixed a possible issue when recovering an old primary as a replica after failover when parallel apply is enabled, that could lead the replica to be unable to come online and require a reprovisioning of this replica.

*Issues:* CT-1890

- Fixes an issue that prevented geometry datatypes with SRID from being replicated.

*Issues:* CT-1904

- Fixed an issue where filtered events would trigger a useless update to the service `trep_commit_seqno` table while it is overwritten anyway once the last statement of the applied event is done, just prior to committing the whole block.

*Issues:* CT-1931

## 6.9. Tungsten Clustering 6.1.17 GA [16 May 2022]

Version End of Life. 15 Aug 2024

Release 6.1.17 contains a number of minor bug fixes and improvements.

## Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Command-line Tools

- Changed output of `thl purge` command when no lower and upper bounds are given from 'Deleting events where' to 'Deleting all events'.

*Issues:* CT-1738

- The following commands which call `cctrl` now support the pass-through `-t seconds` timeout argument which specifies how long `cctrl` will wait for a connection to the Manager process before aborting:

- `check_tungsten_latency`
- `check_tungsten_online`
- `check_tungsten_policy`
- `check_tungsten_services`
- `tungsten_show_processlist`
- `zabbix_tungsten_latency`
- `zabbix_tungsten_online`
- `zabbix_tungsten_progress`
- `zabbix_tungsten_services`

*Issues:* CT-1822

- The `tpm diag` command now gathers the output of the `tpm ask summary` command

*Issues:* CT-1827

### Backup and Restore

- Additional messaging has been added to the output displayed when running `tprovision`.

*Issues:* CT-1689

## Improvements, new features and functionality

### Command-line Tools

- Added the ability to turn auto recovery on or off dynamically, removing the need to run `tpm update`.

This is done by running the following command:

```
shell> trepctl -service servicename setdynamic -property replicator.autoRecoveryMaxAttempts -value <number>
```

### Note

The service must be offline before changing the property

*Issues:* CT-1088

- The `cctrl.log` file is now accessible from the `$(CONTINUED_ROOT)/service_logs` directory

*Issues:* CT-1727

### Tungsten Connector

- `connector-reset-when-affinity-back` is now available with proxy mode.

*Issues:* CT-1763

### Security

- Replaced official log4j library with a secured version in which all vulnerable classes have been removed. This prevents exposing the software following a [user] misconfiguration of the log4j properties

*Issues:* CT-1810

#### Other Issues

- IPv6 host addresses are now fully supported.

Can be enabled with the following configuration property:

```
prefer-ip-stack="6"
```

By default, IPv4 is enabled, which equates to the value of "4" in the above property.

*Issues:* CT-1537

#### Bug Fixes

##### Installation and Deployment

- When services are deployed with systemd and MySQL could not start due to an error, `tpm` would not be able to later start MySQL

*Issues:* CT-1734

- `deployall` script now properly displays the executable prefix for restarting services, typically `mm_treplicator` in Multi-Site/Active-Active replicator-only installs, as well as the full path to component binaries

*Issues:* CT-1835

##### Command-line Tools

- When MySQL services were badly installed, some distribution could show a "not-found" status within `systemctl`, confusing `tpm`

*Issues:* CT-1677

- The `tpm` command now communicates properly when there is no INI configuration file or staging-method `deploy.cfg` configuration defined.

*Issues:* CT-1712

- The `tpm diag` command now handles Multi-Site/Active-Active topologies better.

*Issues:* CT-1718

- `tungsten_monitor.rb` script no longer uses `sudo` to send emails if the configuration doesn't allow it.

*Issues:* CT-1737

- The `tpm update` command no longer aborts during a staging deployment when the actual hostname does not match what is configured for the node names in `tpm`

*Issues:* CT-1791

- Improves the `tpm diag` command so that it waits 2 seconds for replicator thread dump to complete.

*Issues:* CT-1792

- The `tpm connector` command now properly passes the `-e` arguments to the `mysql` command.

*Issues:* CT-1816

- `tpm` now properly reports errors upon timeout executing commands. Typically, when a host is down, when upgrading or installing, `tpm` will now properly report that pinging this host failed.

*Issues:* CT-1819

##### Backup and Restore

- Fixed an issue with latest `xtrabackup 8.0.28`

*Issues:* CT-1838

##### Core Replicator

- When connecting to a THL server, a client will now connect to the next available host in its THL uri, if the first does not have the sequence number that the client requires. The client will then fail only if none of the hosts from the uri can provide the needed sequence number.

*Issues:* CT-1558

- Fixed an issue when using Parallel apply that would show a `NullPointerException` in case an event could either not be found or be corrupted in THL. This will now display a correct message `Missing or corrupted event from storage`

*Issues:* CT-1722

- Fixed an issue where `trepctl` was leaving JMX connections opened.

*Issues:* CT-1752

- Added more debug information for detecting possible hanging connections while a THL client connects to the THL server. Also, added socket timeout for the connection initialization

*Issues:* CT-1760

- Fixed the EnumToString and pkey filters to renew their database connections (every hour by default). This can be changed with the following properties:

```
property=replicator.filter.enumtostring.reconnectTimeout=3600
property=replicator.filter.pkey.reconnectTimeout=3600
```

*Issues:* CT-1786

#### Tungsten Connector

- By default, the connector will no longer transparently reconnect underlying connections to database servers when the data service changes.

This will prevent the following case: in Composite Active/Active topologies, a given connection starts to write data to a site. The site fails, connection gets reconnected the other site and resumes writing. However the data written to the 1st site has not reached the 2nd site, thus data will not be consistent.

Default is to reject reconnections that follow a write operation (`RW_STRICT` connection or SmartScale after a write) and to allow reconnection after a read operation (`RO_RELAXED` or SmartScale after a read) which translates to `--connector-allow-cross-site-reconnects-for-writes=false` and `--connector-allow-cross-site-reconnects-for-reads=true`

It is still possible to get the previous behavior (reconnecting transparently connections cross-site) by specifying both `--connector-allow-cross-site-reconnects-for-writes=true` and `--connector-allow-cross-site-reconnects-for-reads=true`, at your own risk

*Issues:* CT-1265

- Connector now mirrors the MySQL default `connect_timeout` by retrieving it from the primary when starting up. This timeout will apply to all connections made from the connector to MySQL servers.

This setting can be over-ridden by using the following tpm property

```
property=connectTimeout=VALUE
```

If `VALUE` set to autodetect, this value will mirror the MySQL `connect_timeout` system variable. Set to 0 for infinite timeout.

*Issues:* CT-1726

## 6.10. Tungsten Clustering 6.1.16 GA [20 Dec 2021]

Version End of Life. 15 Aug 2024

Release 6.1.16 contains a number of minor bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- The Perl-based command-line tools now include the latest version of `JSON::PP`

*Issues:* CT-1679

- The `tungsten_show_processlist` command has been re-located to the cluster-home/bin from tools/.

*Issues:* CT-1695

#### Documentation

- Updated the `open_source_licenses.txt` file to include most up-to-date information for the included Perl modules.

*Issues:* CT-1675

#### Improvements, new features and functionality

##### Command-line Tools

- A new command, `tungsten_merge_logs` has been added which will gather Manager, Replicator and Connector logs into one file sorted by timestamp for easier troubleshooting.

*Issues:* CT-1667

- A new command `tungsten_get_mysql_datadir` has been added which will gather and display the actual running value for the mysql data directory [datadir] with any sym-links to the physical destination resolved.

*Issues:* CT-1690

##### Bug Fixes

##### Command-line Tools

- Now properly adds executable-prefix (when specified) to systemd boot scripts for the replicator.

*Issues:* CT-1663

- The cluster-specific `check_tungsten_online` tool now properly checks the Replicator and validates the service name if provided.

*Issues:* CT-1674

- The `tpm ask` tool now works properly on all supported Linux distros.

*Issues:* CT-1682

- The `tpm diag` command now uses sudo to read the `mysqld.log` file.

*Issues:* CT-1685

- The `tpm --help` text now includes the `--ini` argument.

*Issues:* CT-1693

##### Core Replicator

- Fixes an issue where the replicator would loop forever if a wrong startup option was provided, e.g replicator start wrong

Now, the replicator will stop with a fatal error message logged `Unrecognized option: wrong - Shutting down`

*Issues:* CT-1672

- Fixes a replication issue with some JSON fields that would contain a single quote within the JSON text

*Issues:* CT-1691

##### Tungsten Connector

- `connector reconfigure`, which allows seamless reconfiguration of the Tungsten Connector during `tpm update`, now properly reloads load balancers.

*Issues:* CT-1655

##### Documentation

- The documentation for the `tpm` command now describes the use of the `--ini` argument fully.

*Issues:* CT-1692

## 6.11. Tungsten Clustering 6.1.15 GA [19 Oct 2021]

Version End of Life. 15 Aug 2024

Release 6.1.15 contains a number of minor bug fixes and improvements.

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Backup and Restore

- Cluster backup now uses `--source-data` as mysqldump parameter from MySQL 8.0.26+

*Issues:* CT-1635

### Bug Fixes

#### Command-line Tools

- The `tpm update` command now handles the `--replace-release` argument properly when `--ini` is also specified.

*Issues:* CT-1623

- Added missing connector capability flag `CLIENT_PS_MULTI_RESULTS` allowing multiple result sets to be retrieved when executing multiple select prepared statements.

*Issues:* CT-1624

- Improved Perl-based command-line tools to use routines with no external dependencies in place of `Data::Dumper`

*Issues:* CT-1630

#### Backup and Restore

- `tungsten_provision_slave` would fail using mysqldump with MySQL version 8.0.26+ due to warning of using `--master-data=2`

*Issues:* CT-1612

#### Core Replicator

- Improved error reporting when the replicator is not able to open a file. This was causing a `NullPointerException` to be raised.

*Issues:* CT-1618

#### Filters

- Fixed an issue with the `ColumnNameFilter` that was not resetting its internal connection to the database.

This would then fail if the database connection would time out (e.g. MySQL `wait_timeout` reached). The connection is now renewed every 1 hour by default.

This can be reconfigured to a different value by adding the following `tpm` property:

```
property=replicator.filter.colnames.reconnectTimeout=<time in seconds>
```

*Issues:* CT-1646

#### Tungsten Connector

- The show slave status hook could use the wrong tracking schema in Composite Active/Passive clusters.

*Issues:* CT-1625

## 6.12. Tungsten Clustering 6.1.14 GA [17 Aug 2021]

Version End of Life. 15 Aug 2024

Release 6.1.14 contains a number of bug fixes and improvements in the Connectors, and improved handling of systemd integration, additionally XA transaction support is now available.

Improvements, new features and functionality

#### Command-line Tools

- Tungsten Connector upgrades are now performed with minimal downtime thanks to graceful-shutdown which is now also used when systemd services are installed.

`systemd` definition file has been updated to prevent unwanted systemd-driven control of Tungsten components. 2 new settings have been added to definition files:

- `RemainAfterExit=yes` so that systemd won't interfere when the binary is restarted after upgrade
- `GuessMainPID=no` so that the PID can change without confusion inside systemd status

Note that Tungsten has its own service manager (Tanuki service wrapper), systemd is only used for system startup launch of Tungsten components.

#### Note

After upgrade, the systemd status output might show "Active: active (exited)". This is expected since systemd doesn't know the new process to monitor after upgrade

Issues: CT-1538

- Added `tpm` support for tuning `maxDelayInterval`, used to tune parallel apply. Usage example:

```
property=replicator.store.parallel-queue.maxDelayInterval=120
```

This sets the max delay interval to 2 minutes

Issues: CT-1541

- A new command-line tool `tungsten_show_processlist` has been added. This is a read-only script which will show the output from tungsten show processlist; on all available Connectors.

Issues: CT-1542

- 3 new tpm flags have been added:
  - `svc-systemd-config-connector`
  - `svc-systemd-config-replicator`
  - `svc-systemd-config-manager`

These flags can be used to provide a custom systemd configuration that will be used in place of the default, generated one.

This is typically useful when ExecStartPre or ExecStartPost commands are needed

Issues: CT-1555

- Improved the `tpm` command's internal logic and introduced a new sub-command, `tpm ask`.

Issues: CT-1573

- Improved the `check_tungsten_online` command:
  - determine the cluster name by default if none is provided via `-s`
  - always check ls resources even if a dataservice name is provided
  - add an option to be node-specific, ignoring any status from other nodes

Issues: CT-1578

- New `ddlscan` template [`ddl-mysql-staging.vm`] available to generate ddl required for staging tables when deploying the batch applier on a MySQL target.

Issues: CT-1587

#### Backup and Restore

- A new `tpm` option has been added `--backup-options`

This property can be used to pass options directly to the backup binary (Xtrabackup, mariabackup etc). This can be especially useful when the xtrabackup and MySQL versions differ. Generally, MySQL is always ahead of xtrabackup and in some situations xtrabackup will fail if the underlying MySQL patch release does not match the xtrabackup patch release. In this scenario, you could utilise the new option to force xtrabackup to not check the versions, for example:

```
backup-options=-no-server-version-check
```

Multiple options can be passed as a space separated list, for example.

```
backup-options=-option1 -option2 -option3
```

### Note

Options passed are specific to the underlying binary and are not validated by Tungsten, therefore you must ensure you only use options that are valid, and check syntax accurately.

*Issues:* CT-1595

#### Core Replicator

- Support for XA transactions has been added.

*Issues:* CT-925

#### Tungsten Manager

- A new `tpm` option has been added `replica-tx-commit-level`

Valid values of either 1 (default) or 2. Setting this value to 2 will change the underlying database property `innodb_flush_log_at_trx_commit` when the node becomes a replica, resetting it back to 1 if the node is promoted to a primary.

This can improve performance on the apply rates for replicas.

*Issues:* CT-1241

#### Bug Fixes

##### Command-line Tools

- `tpm` was failing to check application password when single quoted.

*Issues:* CT-1257

- The `--host` argument to `tpm connector` now works properly. Support for the legacy `--hosts` is also included.

Only one hostname may be specified to `tpm connector`.

*Issues:* CT-1543

- The `tpm update` command now properly parses the `--ini` argument.

*Issues:* CT-1551

- The `tungsten_generate_haproxy_for_api` and `tpm generate-haproxy-for-api` command now properly skips sub-services in Composite Active/Active clusters.

*Issues:* CT-1552

- The `tpm connector --samples` command no longer displays the password in any example.

*Issues:* CT-1593

- The `tpm connector` command now works when the application user's password contains double quotes.

*Issues:* CT-1596

- The `check_tungsten_services -r` command no longer takes an extended time to complete when the manager is not running.

*Issues:* CT-1599

#### Tungsten Connector

- With smartscale enabled, when no writes have been issued to the connection, the user session will remain uninitialized. In that situation, we now send reads to replicas.

*Issues:* CT-1560

- When an `RO_RELAXED` connection is requested and no replica is available to serve the request, we will now properly reuse the current connection to the primary for executing the request.

*Issues:* CT-1564

## 6.13. Tungsten Clustering 6.1.13 GA [27 May 2021]

Version End of Life. 15 Aug 2024

Release 6.1.13 contains a number of bug fixes, and contains a new Connector feature: Support for Proxy Protocol v1 (if supported by your underlying MySQL release)

### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Command-line Tools

- The `tpm diag` command now gathers `tungsten-manager/log/console.log*` files.

*Issues:* CT-1500

- The `tpm diag` command now gathers the `tungsten-manager/log/cctrl.log` file.

*Issues:* CT-1510

- Ensure that all tools are available in the appropriate software packages.

*Issues:* CT-1518

### Tungsten Connector

- In a Composite Active/Active topology, connectors within both sites have read and write affinity set to the local site by default.

*Issues:* CT-1502, CT-1505

### Improvements, new features and functionality

#### Command-line Tools

- A new `tpm` option `delete-service` is now available to simplify the removal of clusters and/or replicator services.

*Issues:* CT-210, CT-327, CT-1275

- A new utility, `tungsten_skip_seqno` has been added which allows events to be skipped based on filters, allowing the Tungsten Replicator to come back online with less manual intervention.

*Issues:* CT-42, CT-1087, CT-1453, CT-1511

#### Tungsten Connector

- Full support for proxy-protocol v1 has been added to Tungsten Connector.

Proxy protocol specifications can found here: <http://www.haproxy.org/download/1.8/doc/proxy-protocol.txt>

#### Enabling proxy-protocol:

- You first need a compatible server, like MariaDB 10.3+ or Percona-5.6.25-73.0+, with the proxy protocol functionality enabled, for example in `my.cnf`: `proxy-protocol-networks=*`
- Then install or update Tungsten with `--connector-enable-proxy-protocol=true`

You should now see the origin IP of the connecting application in place of the connector IP in `show processlist` and `tungsten show processlist` commands.

Further reading:

- [Percona](#)
- [MariaDB](#)

*Issues:* CT-1533

Bug Fixes

Command-line Tools

- This release includes a wide range of improvements and bug fixes for [tpm](#) and other command-line tools.

*Issues:* CT-1509

- Fixes an issue where the [undeployall](#) command would create a root owned `wrapper.log` in the `./tools` directory.

*Issues:* CT-1516

- Fixed a [tpm](#) call to `systemd` services listing which was making [tpm](#) wrongly fall back to `init.d`. This issue was found when testing MariaDB 10.0.

*Issues:* CT-1524

- [tpm](#) now supports new MariaDB `my_print_defaults` flag `--defaults-file`

*Issues:* CT-1528

Core Replicator

- Fixes an issue where `null` values in JSON structures were incorrectly quoted once replicated.

For example :

```
[{"example":null}]
```

would be replicated as

```
[{"example":"null"}]
```

*Issues:* CT-1523

Tungsten Connector

- Now properly supporting negative write affinity in Composite Active/Active clusters. For example you can now specify `affinity=localSite,-remoteSite:localSite` This allows access only to local sites for writes but still allows reads from remote sites if the local one goes down.

*Issues:* CT-1507

Tungsten Manager

- Fixes an issue in Composite Active/Active environments that would occasionally cause the primary node to be set to read only.

*Issues:* CT-1424

## 6.14. Tungsten Clustering 6.1.12 GA [8 Mar 2021]

Version End of Life. 15 Aug 2024

Release 6.1.12 is a minor bug fix release.

Improvements, new features and functionality

Command-line Tools

- A new `--no-routers` cli option has been added to the `cctrl` command.

Using `cctrl --no-routers` will suppress the collection and display of connectors when issuing the `ls` command. This is especially useful when there are a lot of connectors installed and gathering the information from them could take a lot of time, causing unexpected timeouts.

*Issues:* CT-1437

#### Tungsten Connector

- A new affinity feature has been added in this release that will allow you to define a dedicated datasource for writes within a Composite Active/Active deployment.

This feature can be particularly useful to direct all writes for a specific user/application to a dedicated Write endpoint, where you need to remove any chance of writes in multiple clusters conflicting.

This feature can be enabled in a number of ways :- Via edits to the `user.map` file for Proxy configurations, via calls during connection, or via the `--connector-affinity` tpm option if using Bridge mode.

For more details on configuring this, and examples, consult the connector specific documentation here:

- <https://docs.continuent.com/tungsten-clustering-6.1/connector-routing-write-affinity.html>
- <https://docs.continuent.com/tungsten-replicator-6.1/cmdline-tools-tpm-configoptions-c.html#cmdline-tools-tpm-configoptions-connector-affinity>

*Issues:* CT-1369, CT-1457

#### Tungsten Manager

- Minor improvements to rule handling in the managers.

*Issues:* CT-1464

#### Monitoring

- Support has now been added to allow monitoring via the New Relic Insights API, using a new script `tungsten_newrelic_event`

*Issues:* CT-892

#### Bug Fixes

##### Command-line Tools

- If using `mysqldump` as your preferred choice of backup method, Stored Procedures and Functions would not be included in the generated dump file when using `tungsten_provision_slave`.

*Issues:* CT-1339

- In a Composite Active/Active environment, the `tungsten_post_process` command now intelligently handles cross-site filter properties in the INI so that any defined filters are appended to the default values for any option that resolves to property `replicator.stage.q-to-dbms.filters`

*Issues:* CT-1372, CT-1449

- Replaced md5 hashing to sha256 within `tpm` to fix issues where `tpm install` would fail on FIPS enabled environments.

*Issues:* CT-1451

- When provisioning from a Primary node, in a Composite Active/Active environment, using `tungsten_provision_slave`, the replicator would fail to reset due to the incorrect service name being used.

*Issues:* CT-1458

- Fixed an issue where, in Composite Active/Active environments, tpm would ignore the affinity passed with the tpm flag `--connector-affinity`.

*Issues:* CT-1465

- If using `tungsten_provision_slave` to restore a previously failed Primary node, the provision could fail to recover the node.

*Issues:* CT-1468

#### Core Replicator

- A new `mapcharset` filter is included, which fixes collation incompatibilities when replicating from MySQL 8 to an older release (5.7 or 5.6)

This new filter should be enabled within any MySQL applier where the source is generated from a MySQL 8 database and the target is MySQL 5.7 or lower.

*Issues:* CT-1404

- If SSL is enabled between replicators for THL Transfer, and a source node fails and becomes unresponsive, or is slow/overloaded, the replicator on the replica can fail to go offline due to a timeout, remaining in a GOING-ONLINE:SYNCHRONIZING state.

In a clustering environment, this can prevent failovers occurring due to the manager waiting for the replicator which is stuck in a timeout loop.

*Issues:* CT-1459

## 6.15. Tungsten Clustering 6.1.11 GA [21 Jan 2021]

Version End of Life. 15 Aug 2024

Release 6.1.11 is a critical bug fix addressing an issue found in the Managers.

Bug Fixes

Tungsten Manager

- Fixed a bug in the Hedera library that prevented Managers to pass through the init state.

*Issues:* CT-1415

## 6.16. Tungsten Clustering 6.1.10 GA [15 Dec 2020]

Version End of Life. 15 Aug 2024

Release 6.1.10 is a critical bug fix addressing an issue with Parallel Apply within a clustered environment.

Improvements, new features and functionality

Command-line Tools

- `tpm diag` now collects routing table information via `route -n`, and has two new command-line arguments: `--include` and `--groups`.  
`--include` specifies a comma-separated list of subroutines to include. Any gather subroutine not listed will be skipped.  
`--groups` specifies a comma-separated list of subroutine groups to include. Any group not listed will be skipped.

*Issues:* CT-1399

Filters

- A number of `sql_modes` have been removed in MySQL 8.0, meaning that when replicating from an earlier version (e.g. 5.7) the applier could error when applying session variables.

A new `dropsqlmode` filter is now available that should be configured against appliers where the source is version 5.7 or earlier and the target is version 8.0 or later.

*Issues:* CT-1361

Bug Fixes

Tungsten Manager

- If parallel apply has been enabled, automatic failovers could hang indefinitely if one of more channels are inactive.

### Important

All customer using parallel apply are urged to apply this release to avoid production outages due to this known issue.

*Issues:* CT-1407

## 6.17. Tungsten Clustering 6.1.9 GA [23 Nov 2020]

Version End of Life. 15 Aug 2024

Release 6.1.9 is a minor bug fix release containing a fix for a critical bug within the Replicator related to the handling of Timezone.

Improvements, new features and functionality

#### Command-line Tools

- A new script is available, `tungsten_generate_haproxy_for_api`. This script will read all available INI files and dump out corresponding `haproxy.cfg` entries with properly incrementing ports; the composite parent will come first, followed by the composite children in alphabetical order.

This script will be embedded as a `tpm` command in a future release.

*Issues:* CT-1385

#### Bug Fixes

#### Command-line Tools

- `tpm update` no longer fails when using the staging method to upgrade to a new version.

*Issues:* CT-1381

- `tungsten_find_orphaned` no longer hangs when the password keyword exists by itself under `[client]` in `my.cnf`, which caused `mysqlbinlog` to issue a password prompt.

*Issues:* CT-1387

#### Core Replicator

- In some edge case scenarios, the replicator was not setting the session `time_zone` correctly when proceeding sessions had a different `time_zone` applied, this could lead to situations where `TIMESTAMP` values could be applied into replica nodes with an incorrect `time_zone` offset applied.

*Issues:* CT-1390

## 6.18. Tungsten Clustering 6.1.8 GA [2 Nov 2020]

Version End of Life. 15 Aug 2024

Release 6.1.8 is a minor bug fix release.

#### Bug Fixes

#### Command-line Tools

- `tungsten_post_process` now handles whitespace properly on `property=` lines in INI files.

*Issues:* CT-1364

#### Core Replicator

- Fixes an issue that would prevent a service from going offline at a specified time (`trepctl online -until-time`) or at a specific seqno (`trepctl online -until-seqno`) when parallel apply is enabled.

*Issues:* CT-1243

- In MySQL releases using old row events format (MySQL 5.6 or earlier), `Delete_rows_v1` were badly handled, leading to an extraction error when handling such an event type.

*Issues:* CT-1358

#### Tungsten Manager

- Managers now accept both unencrypted and TLS connections from connectors. This allows migrations when security is enabled from earlier versions to 6.1.2+, as well as seamless switch to encrypted connector-manager communications.

### Important

When upgrading to this release from an earlier release, and SSL is either already enabled, or being enabled as part of the upgrade, it is important that managers are upgraded before the connectors.

Note that non-secured connectors connections will trigger a warning in the manager logs:

```
WARN [RouterGatewayServer] - Un-encrypted connection request from <connector address> while this manager »
```

is configured to use SSL. This is expected ONLY when migrating manager<->connector communication to SSL. » Otherwise it might be a misconfiguration of this connector.

*Issues:* CT-1320

- A network partition between primary and relay sites with port 11999 still functioning was leading to full connectivity outage. Managers now send data services configuration with every node update (one per node every 3s) so that connectors remain up-to-date even in that corner case.

*Issues:* CT-1356

- Fixes a memory leak when non recognized connections to manager port 11999 were made.

*Issues:* CT-1357

## 6.19. Tungsten Clustering 6.1.7 GA [5 Oct 2020]

Version End of Life. 15 Aug 2024

Release 6.1.7 was a minor bug fix release containing a fix for SSL Communications specific to clustering deployments.

Bug Fixes

Tungsten Connector

- Disables the naggle algorithm (TcpNoDelay=true) on SSL Sockets which causes performance degradation on SSL communications within the connector.

*Issues:* CT-1331

- Allows configuration of the protocols and cipher suites to use within the drizzle driver for SSL communications to the database server.

New TPM parameters can be used to control this. New parameters are as follows:

```
connector-server-ssl-protocols=protocol1[,protocol2,...]
connector-server-ssl-ciphers=cipher1[,cipher2,...]
```

For example:

```
connector-server-ssl-protocols=TLSv1.2
connector-server-ssl-ciphers=TLS_RSA_WITH_AES_256_CBC_SHA256,TLS_RSA_WITH_AES_256_CBC_SHA512
```

Default values for `connector-server-ssl-protocols` will be `TLSv1,TLSv1.1,TLSv1.2`. Default values for `connector-server-ssl-ciphers` will be to allow all cipher suites supported by the running JVM.

*Issues:* CT-1335

- When the Primary node is not available (for example during switch/failover), the connector would pause incoming `RO_RELAXED` connection requests even if a Replica is available for reads.

### Note

This only applies to connectors configured in Bridge Mode.

*Issues:* CT-1337

- c3p0 libraries upgraded to version 0.9.5.5 and adjusted recommended pool configuration.

*Issues:* CT-1343

## 6.20. Tungsten Clustering 6.1.6 GA [20 Aug 2020]

Version End of Life. 15 Aug 2024

Release 6.1.6 is a minor bug fix containing a fix for Composite Active/Active environments.

Bug Fixes

Command-line Tools

- `tpm install` and `tpm update` will now call `tungsten_post_process` automatically to ensure cross-site specific configurations are applied at the right time during the install and update process within Composite Active/Active installations.

*Issues:* CT-761

#### Core Replicator

- Allows multiple service names to be supplied to `property=local.service.name` when configuring bi-directional replication between a Composite Active/Passive cluster topology and a MySQL target to prevent loopback of transactions.

*Issues:* CT-1308

## 6.21. Tungsten Clustering 6.1.5 GA [5 Aug 2020]

Version End of Life. 15 Aug 2024

Release 6.1.5 is a small interim bug fix with a number of issues resolved within the Core Replicator, and a specific issue within Tungsten Connector in Multi-Cluster Environments.

#### Known Issue

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Cluster. They will be addressed in a subsequent patch release.

#### Core Replicator

- In MySQL release 8.0.21 the behavior of `CREATE TABLE ... AS SELECT ...` has changed, resulting in the transactions being logged differently in the binary log. This change in behavior will cause the replicators to fail.

Until a fix is implemented within the replicator, the workaround for this will be to split the action into separate `CREATE TABLE ...` followed by `INSERT INTO ... SELECT FROM...` statements.

If this is not possible, then you will need to manually create the table on all nodes, and then skip the resulting error in the replicator, allowing the subsequent loading of the data to continue.

*Issues:* CT-1301

#### Bug Fixes

#### Core Replicator

- When replicating data that included timestamps, the replicator would update the timestamp value to the time within the commit from the incoming THL. When using statement based replication times would be correctly replicated, but if using a mixture of statement and row based replication, the timestamp value would not be set back to the default time when switching between statement and row based events. This would not cause problems in the applied host, except when `log_slave_updates` was enabled. In this case, all row-based events after a statement based event would have the same timestamp value applied.

This was most commonly seen when using the standalone replicator to replicate into a Cluster, either from a standalone source, or a cluster source.

*Issues:* CT-1255

- If filtering is in use, and a space appeared either side of the delimiter in a "schema.table" definition in your SQL, the replicator would fail to parse the statement correctly.

For example, all of the examples below are valid SQL but would cause a failure in the replicator:

```
sql> CREATE TABLE myschema .mytable (...
sql> CREATE TABLE myschema .mytable (...
sql> CREATE TABLE myschema . mytable (...
```

*Issues:* CT-1278

- Fixes a bug in the Drizzle Driver whereby a failing prepared statement that exceeds 1000 characters would report a `String index out of range: 999` error rather than the actual error.

*Issues:* CT-1303

#### Tungsten Connector

- Connector would fail to properly find appropriate data service for its auto-configuration. Now using the service provided in the user map when present.

## Note

This fix is also available in build 51 of the 6.1.4 release.

Issues: CT-1277

## 6.22. Tungsten Clustering 6.1.4 GA [4 June 2020]

Version End of Life. 15 Aug 2024

Release 6.1.4 contains a number of improvements and bug fixes, specifically for the `tpm` command line tool and stability improvements for Composite Active/Active topologies. In addition this release now fully supports the latest binlog compression feature of MySQL 8.0.20.

Improvements, new features and functionality

Command-line Tools

- Improves `tpm` performance by using more efficient routines to calculate paths.

Issues: CT-1168

- Added the ability for `tpm diag` to skip both individual gather subroutines along with entire groups of gather subroutines.

Also added ability to list all gather groups and subroutines using `--list` for use with the `--skip` and `--skipgroups` cli arguments.

Issues: CT-1176

- `tungsten_provision_slave` has been rewritten fixing a number of issues in the previous release. This version was previously released as the Beta script `prov-sl.sh`.

Issues: CT-1208

- A number of performance improvements and fixes have been incorporated into the Drizzle Driver used for communication between components and MySQL, these include:

- Better handling of large queries close to max network packet size.
- Batch Support. Instead of sending statements one by one, the driver will be able to send multiple statements at once, avoiding round trips between the driver and MySQL server.
- Fixes issues with interpreting `useSSL` on connect string URLs.

Issues: CT-1215, CT-1216, CT-1217, CT-1228

- The `tungsten_send_diag` command now accepts arguments for the `tpm diag` command using `--args` or `-a` for short.

You must enclose the arguments in quotes, for example:

```
shell> tungsten_send_diag -c 9999 -d --args '--all -v'
```

Issues: CT-1220

Core Replicator

- A new replicator role `thl-client` has been added. This new role allows the replicator to download THL from a Primary, but not apply to the target database.

Issues: CT-1123

- A new `delayInMs` filter has been added which allows the applying of THL to a Replica to be delayed. The filter allows millisecond precision. This filter works in the same way as the `TimeDelayFilter`, however that filter only allow second precision.

Issues: CT-1191

- A new `droprow` JavaScript filter has been added.

The filter works at ROW level and allows the filtering out of rows based on one or more column/value matches

Issues: CT-1213

- Tungsten Replicator can now correctly extract and parse Binary Log entries when the MySQL option `binlog-transaction-compression` has been enabled.

`binlog-transaction-compression` is a new parameter introduced from MySQL 8.0.20.

*Issues:* CT-1223

#### Tungsten Manager

- When a Primary is `OFFLINE` or `SHUNNED`, we no longer mark the whole data service as `OFFLINE`.

#### Note

This will allow reading from Replicas to continue even if the Primary is offline.

*Issues:* CT-1152

- In a Composite Active/Active topology, the relay hosts, by default, will pull THL from the remote Primaries. This can be changed to pull from remote Replica(s) by use of the following setting `policy-relay-from-slave=true`

#### Note

This is a change in behaviour. From version 6.0.4 up to and including 6.1.3, the default behaviour was configured to pull from the remote Replica(s).

*Issues:* CT-1211

#### Bug Fixes

##### Command-line Tools

- In certain edge cases, `tungsten_provision_slave` would fail to detect if `mysql` was shutdown.

*Issues:* CT-1096

- The `tpm diag` command now captures `cctrl` ls output from the Composite dataservice when appropriate.

*Issues:* CT-1139

- Fixes an issue where affinity specified in the configuration (`connector-affinity`) was ignored since it was not written to `user.map` (this affects proxy configurations only).

*Issues:* CT-1146

- `tpm diag` now collects directories specified with `!includedir` in the `/etc/my.cnf` file.

*Issues:* CT-1153

- Fixes the `tpm update` command, which would exit with the error:

```
Argument " (error code 1)" isn't numeric
```

*Issues:* CT-1165

- Fixed a bug where `tpm diag` would fail to gather some MySQL information on a Composite Active/Active node.

*Issues:* CT-1167

- `tpm diag` now collects any files specified by `!include` directives in the `/etc/my.cnf` and `/etc/mysql/my.cnf` files.

`tpm diag` also looks in `/etc/mysql/my.cnf` for `!includedir` directives

*Issues:* CT-1169

- Fixes a bug which prevented `tungsten_send_diag` from uploading a self-generated diagnostic zip file.

*Issues:* CT-1170

- `tpm diag` now properly derives the correct target path to the releases directory if the home directory in the configuration points to a symlink.

*Issues:* CT-1172

- Removed `tpm diag` call to `sudo` for gathering `ifconfig` and `lsb_release` commands.

*Issues:* CT-1175

- `tpm update` would fail and report errors if `deployall` had been executed.

*Issues:* CT-1179

- `tpm diag` no longer requires the `mysql` command-line client when running on non-MySQL Applier nodes, and no longer attempts to gather any MySQL diagnostic information.

*Issues:* CT-1188

- Removes the requirement to execute component start/stop commands with `sudo` when called through `systemd`.

This is specific to start/stop actions following the use of the `deployall` scripts.

*Issues:* CT-1193

- Fixed a bug in `tungsten_post_process` where the `/etc/tungsten/tungsten.ini` file would not be read properly. Also adds two warnings for skipped entries and corrects a typo in the property definitions.

*Issues:* CT-1198

- Fixes cases where `tpm` fails when the OS `hostname` command returns a different string than what is used in the configuration (i.e. `hostname` returns a FQDN, yet the configuration contains shortnames like `db1`, `db2`, etc.).

*Issues:* CT-1206

- In certain cases, after a reprovision, `tungsten_provision_slave` didn't always run the steps to reset the local replicator service. This made the replicator go into an error state after provision had completed.

*Issues:* CT-1210

- The `tpm diag` command now handles the cluster-slave topology more gracefully, and properly handles cluster nodes without the Connector installed.

Improved output text clarity by converting multiple verbose-level outputs to debug, and warnings to notice-level.

*Issues:* CT-1222

- `tpm diag` now gathers sym-linked files correctly.

*Issues:* CT-1232

- Fixes a situation where `tpm update` exits with a `Data::Dumper` error.

*Issues:* CT-1249

#### Core Replicator

- Tungsten Replicator could wrongly think it is already in `DEGRADED` mode when trying to put it into `DEGRADED` state.

*Issues:* CT-1131

- When host server time (and thus MySQL time) is not configured as UTC, issuing cluster heartbeat or `trepctl heartbeat` in the first hours around daylight savings time would create an invalid time in MySQL.

For more information on timezones when issuing heartbeats, see [trepctl heartbeat Time Zone Handling](#)

*Issues:* CT-1174

- Due to a change in the Binary log structure introduced in MySQL 8.0.16, the replicator would fail to extract transactions for Partitioned tables.

*Issues:* CT-1201

- The replicator would fail to correctly parse statements with leading comment blocks in excess of 200 characters.

*Issues:* CT-1236

#### Tungsten Connector

- Fixed an issue where `connector client-list` and the Proxy-mode command, `tungsten show processlist`, would report `NullPointerException` errors when listing disconnected client applications.

*Issues:* CT-1177

- When in proxy mode and fetching data source configuration at startup, the Connector will now properly parse, and use, affinity (and other URL options if any) to establish the connection.

*Issues:* CT-1212

- Fixes an issue where connections with multiple affinity would not keep the current channel and reconnect to the database server while the connection could be reused.

*Issues:* CT-1250

#### Tungsten Manager

- In certain edge case situations, the manager could choose a manually shunned node as a viable node during failover.

*Issues:* CT-1115

- Issuing `cluster topology validate` within `cctrl` would fail if the cluster contained an Active Witness host.

*Issues:* CT-1180

- Piping multiple commands to `cctrl` that would affect components in a remote cluster would fail, for example:

```
shell> echo "use east; replicator db5 offline" | cctrl
```

*Issues:* CT-1209

- Resolves an edge case in a Composite Active/Passive topology, with 2 or more Composite Passive dataservices, where a switch of a relay node in a single Replica service would incorrectly reconfigure all relays in the other Replica services.

*Issues:* CT-1214

## 6.23. Tungsten Clustering 6.1.3 GA [17 February 2020]

Version End of Life. 15 Aug 2024

Release 6.1.3 contains a small number of critical bug fixes that can affect customers operating geo-distributed clusters across high latency network links, along with a small number of improvements and fixes to common command line tools.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- `tpm diag` has been updated to provide additional feedback detailing the hosts that were gathered during the execution, and also provides examples of how to handle failures

When running on a single host configured via the ini method:

```
shell> tpm diag
Collecting localhost diagnostics.
Note: to gather for all hosts please use the "-a" switch and ensure that you have passwordless »
ssh access set between the hosts.
Collecting diag information on db1.....
Diagnostic information written to /home/tungsten/tungsten-diag-2020-02-06-19-34-25.zip
```

When running on a staging host, or with the `-a` flag:

```
shell> tpm diag [-a|--allhosts]
Collecting full cluster diagnostics
Note: if ssh access to any of the cluster hosts is denied, use "--local" or "--hosts=<host1,host2,...>"
Collecting diag information on db1.....
Collecting diag information on db2.....
Collecting diag information on db3.....
Diagnostic information written to /home/tungsten/tungsten-diag-2020-02-06-19-34-25.zip
```

*Issues:* CT-1137

- Improved the `tungsten_find_position` script to add the ability to specify the low and high sequence numbers which limits the amount of THL the script needs to parse. This allows for better performance and lower system overhead. Also allows the use of the `--file` option.

```
[-f|--file] Pass specified file to the thl command as -file {file}
```

```
[--low|--from] Pass specified seqno to the thl command as -low {seqno}
[--high|--to] Pass specified seqno to the thl command as -high {seqno}
```

*Issues:* CT-1143

- **tpm diag** : make the output from remote host diagnostic gathering visible in addition to alerting when a host is not reachable.

*Issues:* CT-1158

Known Issue

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Cluster. They will be addressed in a subsequent patch release.

Backup and Restore

- The backup process, when configured to use Xtrabackup, uses the `--stream=tar` option as one of the options passed to the backup process.

This option is no longer available in Xtrabackup 8.0

If you use Xtrabackup 8.0 in combination with MySQL 8, generating backups using the procedures available in Tungsten Clustering will fail. Until a fix is available and to allow backups to continue you will need to make the following edit to the configuration

After installation, open the `static-servicename.properties` file located in `INSTALL_PATH/tungsten/tungsten_replicator/conf`

Locate the following entry `replicator.backup.agent.xtrabackup.options` and within the string value, change the value of `tar=true` to `tar=false`

If the replicator is already running, then you will need to issue `replicator restart` for the change to take effect

### Warning

Changing the properties file directly will cause future `tpm update` commands to fail, therefore you should run this with the `--force` option, and then redit the file as per the above instructions to reset the tar option

*Issues:* CT-1157

Bug Fixes

Command-line Tools

- `tpm` would fail to run on some Operating Systems due to missing `realpath`

`tpm` has been changed to use `readlink` which is commonly installed by default on most operating systems, however if it is not available, you may be required to install GNU coreutils to satisfy this dependency

*Issues:* CT-1124

- Removed dependency on perl module `Time::HiRes` from `tpm`

*Issues:* CT-1126

- Added support for handling missing dependency (`Data::Dumper`) within various `tpm` subcommands

*Issues:* CT-1130

- `tpm diag` would fail to collect diagnostics for relay nodes within a Composite Active/Passive Topology

*Issues:* CT-1140

- `tpm` will now work on MacOS/X systems, provided `greadlink` is installed.

*Issues:* CT-1147

- `tpm install` will no longer report that the linux distribution cannot be determined on SUSE platforms.

*Issues:* CT-1148

- Fixes a condition where `tpm diag` would fail to set the working path correctly, especially on Debian 8 hosts.

*Issues:* CT-1150

- Fixes an edge case whereby `tpm mysql` would fail on a node within a Composite Active/Active topology.

*Issues:* CT-1151

- `tpm diag` now gathers all hosts in a staging deployment when run from a non-staging node.

*Issues:* CT-1155

- `tpm diag` : fix ensures collection of diagnostics from standalone connector hosts.

*Issues:* CT-1159

- `tpm diag` now checks for OS commands in additional paths [/bin, /sbin, /usr/bin and /usr/sbin]

*Issues:* CT-1160

- Fixes an issue introduced in v6.1.2 where the use of the `undeployall` script would stop services as it removed them from systemctl control

*Issues:* CT-1166

#### Core Replicator

- The replicator would fail with `Unknown column '' in 'where clause'` when replicating between MySQL 8 hosts where the client application would write data into the source database host using a different collation to that of the default on the target database.

The replicator would fail due to a mismatch in these collations when querying the `information_schema.columns` view to gather metadata ahead of applying to the target

*Issues:* CT-1145

#### Tungsten Manager

- During a local Primary switch within a Composite Active/Active Topology, where there is a high latency link between clusters, the switch could intermittently fail due to an incorrect rule triggering as the remote cluster sees an incorrect state in the opposing cluster

*Issues:* CT-1141

## 6.24. Tungsten Clustering 6.1.2 GA [20 January 2020]

Version End of Life. 15 Aug 2024

Release 6.1.2 contains significant improvements as well as some needed bugfixes.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

##### Behavior Changes

- The Passive Witness functionality is now officially DEPRECATED and will be REMOVED in version 6.2

*Issues:* CT-653

- Certified the Tungsten product suite with Java 11.

A small set of minor issues have been found and fixed [CT-1091, CT-1076] along with this certification.

The code is now compiled with Java compiler v11 while keeping Java 8 compatibility.

Java 9 and 10 have been tested and validated but certification and support will only cover Long Term releases.

#### Note

■ Known Issue

With Java 11, command line tools are slower. There is no impact on the overall clustering or replication performance but this can affect manual operations using CLI tools such as [cctrl](#) and [trepctl](#)

*Issues:* CT-1052

#### Installation and Deployment

- In cluster deployments with witness nodes, if the MySQL servers had been configured to listen on any port other than the standard 3306, the [tpm](#) command would default to the wrong port number.

When witness hosts are in use, the [tpm](#) command will no longer "guess" the data source port automatically by running `my_print_defaults`.

It is now mandatory to specify the MySQL data server port explicitly using `--datasource-port={mysql_listen_port}` or one of its aliases

*Issues:* CT-1071

#### Improvements, new features and functionality

##### Command-line Tools

- The [tpm](#) command was originally written in Ruby. This improvement converts [tpm](#) to Perl over time, starting with the [tpm](#) shell wrapper and refactoring each sub-command one-by-one.

For this release, we have redone the [diag](#), [mysql](#) and [connector](#) sub-commands.

This also wraps the [update](#) sub-command to provide the CT-1093 clustering fix.

*Issues:* CT-1048

- This version includes an update to the new BETA tool to provision Replicas, and Primaries in a Composite Active/Active topology. This release fully supports provisioning of nodes in a Composite Active/Active Topology.

It can be invoked by running `prov-sl.sh` or `tps.pl`.

This tool will replace [tungsten\\_provision\\_slave](#) in a future release.

*Issues:* CT-1070

- Added the [tpm policy](#) subcommand to allow easy get and set cluster policy operations instead of using `cctrl`.

For more information, please see ...

*Issues:* CT-1106

- The new changes made to the [tpm](#) command, require that the [zip](#) package be installed on all DB hosts

*Issues:* CT-1111

##### Core Replicator

- A new Replicator role, [thl-server](#), has been added.

This new feature allows your Replica replicators to still pull generated THL from a Primary even when the Primary replicator has stopped extracting from the binlogs.

If used in Tungsten Clustering, this feature must only be enabled when the cluster is in [MAINTENANCE](#) mode.

*Issues:* CT-58

For more information, see [Understanding Replicator Roles](#).

- A new JavaScript filter [dropddl.js](#) has been added to allow selective removal of specific object DDL from THL.

*Issues:* CT-1092

##### Tungsten Manager

- The new default datasources sort order is alphabetically when using the `cctrl ls` command. Additionally, the sort order of the datasources list is now configurable.

The behavior is controlled by the tpm configuration property `cctrl.sort.datasources.alphabetically` which has a default value of `true` (meaning alpha sort).

If set to `false`, the sort is ordered by datasource role, so the Primary or relay will appear first, followed by the Replicas. For example, use the following in the INI file for role-based sorting:

```
property=cctrl.sort.datasources.alphabetically=false
```

*Issues:* CT-1018

## Bug Fixes

### Behavior Changes

- Corrected resource leak when loading Java keystores

*Issues:* CT-1091

## Installation and Deployment

- Ensure that all Connector-Manager communications are SSL-encrypted when `--disable-security-controls=false`

*Issues:* CT-1060

## Command-line Tools

- When performing an update of a cluster with `tpm`, the cluster would be switched to `MAINTENANCE` but would remain in this policy after the update. The original policy is now retained during the update.

*Issues:* CT-595, CT-1093

- The `deployall` script was only able to install init.d system startup scripts.

In this release, the script will now detect the initialization system in use (systemd or initd) and prefer systemd when both are available.

For systemd configurations only:

For continuity of service reasons, the `deployall` script does NOT restart individual components when called, it will only install systemd scripts. This implies that, right after a call to `deployall` and before host restart, the system will stay in a mixed mode where systemd scripts are in place but components were started without systemd, so won't be controllable by it.

In order to align the configuration, you will need to run

```
shell> component stop sysd
shell> sudo systemctl start tcomponent
```

For example:

```
shell> connector stop sysd
shell> sudo systemctl start tconnector
```

*Issues:* CT-853

- When issuing `tpm connector --samples`, the output displayed clear text passwords. In this release the passwords are obfuscated.

*Issues:* CT-1021

- Continuent Tungsten Clustering now uses the `xtrabackup` command instead of the deprecated `innobackupex` to create and restore backups. A new check was added to TPM for validating different xtrabackup versions along with MySQL version compatibility. The oldest supported version of `xtrabackup` is v2.3

*Issues:* CT-1074

- Fixed error message to indicate the need to specify a service on Composite Active/Active clusters for the `tungsten_find_position` and `tungsten_find_seqno` commands.

*Issues:* CT-1098

- The `tpm` command no longer reports warnings about existing system triggers with MySQL 8+

*Issues:* CT-1099

## Core Replicator

- When configuring SSL for the Connector only, the Replicator would fail to start due to the Replicator also looking for the SSL configuration.

*Issues:* CT-956

- If a JSON field contained a single quote, the replicator would break during the apply stage whilst running the generated SQL into MySQL.

Single quotes will now be properly escaped to solve this issue

*Issues:* CT-983

- Under rare circumstances (network packet loss or MySQL Server hang), the replicator would also hang until restarted.

This issue has been fixed by using specific network timeouts in both the replicator and in the Drizzle jdbc driver connection logic

*Issues:* CT-1034

- The following warnings would appear in the replicator log due to GTID events not being handled.

```
WARN extractor.mysql.LogEvent Skipping unrecognized binlog event type 33, 34 or 35)
```

The WARN message will no longer appear, however GTID Events are still not handled in this release, but will be fully extracted in a future release.

*Issues:* CT-1114

#### Tungsten Connector

- Fixed an issue where some applications might fail to connect to the Connector with MariaDB 10+

Previously, when using MariaDB 10+, the Connector would be confused by the 10 and will think it is a MySQL 8+ server. By default, the Connector will offer to connect with `cached_sha2_password`. If the application does not know how to switch authentication plugins, it would fail with a message similar to the following:

```
The server requested authentication method unknown to the client [cached_sha2_password]
```

The previous work-around was to specify the authentication plugin using the `tpm` command:

```
--property=defaultAuthPlugin=mysql_native_password
```

*Issues:* CT-1033

- Improved Tungsten Connector bridge mode performance when transferring small amounts of data.

*Issues:* CT-1081

#### Tungsten Manager

- When using the `cctrl` command interactively, the 'cluster topology' TAB completion was showing invalid options. Invalid options have been removed.

*Issues:* CT-979

- Fixed an issue where long-duration operations like failover and switch would create false positives about network partitioning after completion.

*Issues:* CT-1023

- Fixed the `cctrl` command so that the '[SSL]' indicator in the `ls` output is displayed. This is a Version 5 feature that was lost in v6.0.0, now restored.

*Issues:* CT-1061

- Fixed the `cctrl` command `datasource {hostname} restore` which was failing in Composite Active/Active cluster deployments with: ERROR: MORE THAN ONE PRIMARY DATA SOURCE FOUND.

*Issues:* CT-1062

- Continuent Tungsten Clustering now only checks for a running MySQL server when the backup method is 'mysqldump' in `cctrl`.

Background: Running `datasource {hostname} restore` inside `cctrl` would fail when the MySQL server was not running. Only the 'mysqldump' method requires a running MySQL server. The 'xtrabackup-full' and 'xtrabackup-incremental' methods will work even if MySQL is stopped.

*Issues:* CT-1077

- `tungsten_find_orphaned` was displaying an incorrect error message if a service name wasn't supplied correctly.

*Issues:* CT-1079

- `tungsten_find_orphaned` would error with 'Argument "" isn't numeric in addition'.

*Issues:* CT-1080

- Fixed an issue where Composite clusters with only a single site would come up as SHUNNED after install.

*Issues:* CT-1101

## 6.25. Tungsten Clustering 6.1.1 GA [28 October 2019]

Version End of Life. 15 Aug 2024

Release 6.1.1 contains both significant improvements as well as some needed bugfixes.

Improvements, new features and functionality

Tungsten Manager

- Improved how the Manager and Replicator behave when MySQL dies on the Primary node.

This improvement will induce a change of behavior in the product during failover by default, possibly causing a delay in failover as a way to protect data integrity.

The new default setting for 6.1.1 is:

```
replicator.store.thl.stopOnError=false
```

This means that the Manager will wait until the Replicator reads all remaining binlog events on the failing Primary node.

Failover will only continue once:

- all available events are completely read from the binary logs on the Primary node
- all events have reached the Replicas

WARNING:

The new default means that the failover time could take longer than it used to.

When `replicator.store.thl.stopOnError=true`, then the Replicator will stop extracting once it is unable to update the `trep_commit_seqno` table in MySQL, and the Manager will perform the failover without waiting, at the risk of possible data loss due to leaving binlog events behind. All such situations are logged.

For use cases where failover speed is more important than data accuracy, those NOT willing to wait for long failover can set `replicator.store.thl.stopOnError=true` and still use `tungsten_find_orphaned` to manually analyze and perform the data recovery. For more information, please see [The tungsten\\_find\\_orphaned Command](#).

*Issues:* CT-583

- A new feature called "Cluster State Savepoints" has been implemented.

This new functionality was created to support clean, consistent rollbacks during aborted switch and failover operations. This functionality works for both physical clusters as well as for composite clusters.

To support this new feature, a new `cluster` sub-command has been added to the `ctrl` command - `cluster topology validate`, which will check and validate a cluster topology and, in the process, will report any issues that it finds. The purpose of this command is to provide a fast way to see, immediately, if there are any issues with any components of a cluster.

Savepoints are created automatically with every switch and failover command. The savepoint is only used if there is an exception during switch or failover that is actually able to be rolled-back.

WARNING:

Not all exceptions during switch and failover will cause a rollback.

In particular, if an exception happens during switch or failover AFTER a new primary datasource has been put online (relay or Primary) then the switch or failover operation cannot be rolled back.

The Manager is configured, by default, to hold a maximum of 50 savepoints. When that limit is hit, the Manager resets the current-savepoint-id to 0 and starts to overwrite existing savepoints, starting at 0.

*Issues:* CT-951

For more information, see [The cctrl Command](#).

- Improved the ability of the manager to detect un-extracted, desirable binary log events when recovering the old Primary via `cctrl` after a failover.

The `cctrl recover` command will now fail if:

- any unextracted binlog events exist on the old Primary that we are trying to recover
- the old Primary THL contains more events than the Replicas

In this case, the `cctrl recover` command will display text similar to the following:

```
Recovery failed because the failed Primary has unextracted events in
the binlog. Please run the tungsten_find_orphaned script to inspect
this events. Provided you have a recent backup available, you can
try to restore the data source by issuing the following command:
    datasource {hostname} restore
Please consult the user manual at:
https://docs.continuent.com/tungsten-clustering-6.1/operations-restore.html
```

The `tungsten_find_orphaned` script is designed to locate orphaned MySQL binary logs that were not extracted into THL before a failover. For more information, please see [The tungsten\\_find\\_orphaned Command](#).

*Issues:* CT-996

- Improved the ability to configure the manager's behavior upon failover.

During a failover, the manager will now wait until the selected Replica has applied all stored THL events before promoting that node to Primary.

This wait time can be configured via the `manager.failover.thl.apply.wait.timeout=0` property.

The default value is 0, which means "wait indefinitely until all stored THL events are applied".

Any value other than zero invites data loss due to the fact that once the Replica is promoted to Primary, any unapplied stored events in the THL will be ignored, and therefore lost.

Whenever a failover occurs, the Replica with most events stored in the local THL is selected so that when the events are eventually applied, the data is as close to the original Primary as possible with the least number of events missed.

That is usually, but not always, the most up-to-date Replica, which is the one with the most events applied.

There should be a good balance between the value for `manager.failover.thl.apply.wait.timeout` and the value for `policy.slave.promotion.lateness.threshold=900`, which is the number of seconds to which a Replica must be current with the Primary in order to qualify as a candidate for failover. The default is 15 minutes [900 seconds].

*Issues:* CT-1022

## Bug Fixes

### Command-line Tools

- Installing with `disable-security-controls=false` or when updating using: `tools/tpm update --replace-jgroups-certificate --replace-tls-certificate` would generate self-signed security certs that have a 1-year expiration which will cause installs to break eventually.

This expiration time value is controlled by the `tpm` command option `--java-tls-key-lifetime`, which is now set to 10 years or 3,650 days by default.

*Issues:* CT-937

- Fixed an issue that would prevent reading remote binary logs when using SSL.

*Issues:* CT-958

- Fixed an issue where the command `trepctl -all-services status -name watches` fails.

*Issues:* CT-977

- Restored previously-removed log file symbolic links under `$CONTINUENT_ROOT/service_logs/`  
*Issues:* CT-1026
- Fixed a bug where `tpm diag` would generate an empty zip file if the hostnames contain hyphens [-] or periods [.]  
*Issues:* CT-1032
- Updated the `check_tungsten.sh` command to have the executable bit set.  
*Issues:* CT-1037
- Updated the `check_tungsten_services` and `zabbix_tungsten_services` commands to auto-detect active witnesses.  
*Issues:* CT-1043
- Improve ability to find needed binaries for commands: `tungsten_find_position`, `tungsten_find_seqno` and `tungsten_get_rtt`  
*Issues:* CT-1054

#### Tungsten Manager

- Fixed an issue where the `ls resources` command run inside of `cctrl` would fail to list the MANAGER entry on a Replica node.  
*Issues:* CT-599
- If the pipeline source replicator goes OFFLINE, the relay will reconnect to a different Replica.  
*Issues:* CT-871
- Fixed an issue where the Manager would show an exception when the MySQL check script did not get expected results.  
*Issues:* CT-912
- Fixed use case where xtrabackup would timeout during backup via `cctrl`  
*Issues:* CT-1045
- Improve ability to find needed binaries, both locally and over SSH, for commands: `tungsten_find_orphaned` and `tungsten_is_recoverable`  
*Issues:* CT-1053

## 6.26. Tungsten Clustering 6.1.0 GA [31 July 2019]

Version End of Life. 15 Aug 2024

Release 6.1.0 contains both significant improvements as well as some needed bugfixes. One of the main features of this release is MySQL 8 support.

The Tungsten Stack now supports the new MySQL 8.0 authentication plugins. Both `sha256_password` and `caching_sha2_password` (the new default) are supported by the Replicator, Manager and Connector.

More info on these authentication plugins can be found here: <https://dev.mysql.com/doc/refman/8.0/en/sha256-pluggable-authentication.html>

The Drizzle driver has been updated to support these new authentication methods, and the [MySQL Connector/J 8](#) is also supported.

#### Behavior Changes

The following changes have been made to Tungsten Cluster and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Tungsten Connector

- The Connector `passThroughMode` configuration option is now deprecated.

The following `passThroughMode` entry will be removed from `tungsten-connector/conf/connector.properties`. There is currently no `tpm` option for this, and it is undocumented. The default will be kept to `passThroughMode=true`.

```
# The Tungsten Connector offers an extra fast data transfer mode known as
# pass-through. When the following switch enabled (default), the Connector
# will directly transfer data packets between the client and the server.
```

```
# When disabled, every native MySQL command will be translated into a JDBC call.
passThroughMode=true
```

*Issues:* CT-897

#### Known Issue

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Cluster. They will be addressed in a subsequent patch release.

#### Tungsten Connector

- Some applications might fail to connect to the Connector with MariaDB 10+

When using MariaDB 10+, the Connector will be confused by the 10 and will think it is a MySQL 8+ server. By default, the Connector will offer to connect with `caching_sha2_password`. If the application does not know how to switch authentication plugins, it will fail with a message similar to the following:

```
The server requested authentication method unknown to the client [caching_sha2_password]
```

As a work-around, you may specify the authentication plugin using the following `tpm` command option:

```
--property=defaultAuthPlugin=mysql_native_password
```

*Issues:* CT-1033

### Improvements, new features and functionality

#### Command-line Tools

- A new utility script has been added to the release, `tungsten_post_process`, which assists with the graceful maintenance of the static cross-site replicator configuration files on disk.

*Issues:* CT-761

For more information, see [The tungsten\\_post\\_process Command](#).

- Two new utility scripts have been added to the release to help with setting the Replicator position:

- `tungsten_find_position`, which assists with locating information in the THL based on the provided MySQL binary log event position and outputs a `dsctl set` command as output.

- `tungsten_find_seqno`, which assists with locating information in the THL based on the provided sequence number and outputs a `dsctl set` command as output.

*Issues:* CT-934

#### Core Replicator

- A new, beta-quality command has been included called `prov-sl.sh` which is intended to eventually replace the current `tungsten_provision_slave` script.

Currently, `prov-sl.sh` supports provisioning Replicas using `mysqldump` and `xtrabackup` tools, and is MySQL 8-compatible.

The `prov-sl.sh` command is written in Bash, has less dependencies compared to the current version and is meant to fix a number of issues with the current version.

Backups are streamed from source to target so that an intermediate write to disk is not performed, resulting in faster provisioning times.

Logs are written to `$CONTINUED_ROOT/service_logs/prov-sl.log` (i.e. `/opt/continuent/service_logs/prov-sl.log`).

For example, provision a Replica from [source db] using `mysqldump` (default):

```
shell> prov-sl.sh -s {source db}
```

As another example, use `xtrabackup` for the backup method, with 10 parallel threads (default is 4), and `ssh` is listening on port 2222:

```
shell> prov-sl.sh -s {source db} -n xtrabackup -t 10 -p 2222
```

### Warning

At the moment, `prov-sl.sh` does not support Composite Active/Active topologies when used with Tungsten Clustering, however it will be included in a future release.

*Issues:* CT-614, CT-723, CT-809, CT-855, CT-963

- Upgraded the Drizzle driver to support MySQL 8 authentication protocols (SHA256, caching\_sha2).

*Issues:* CT-914, CT-931, CT-966

#### Tungsten Connector

- The Tungsten Stack now supports the new MySQL 8.0 authentication plugins. Both `sha256_password` and `caching_sha2_password` (the new default) are supported by the Replicator, Manager and Connector.

More info on these authentication plugins can be found here: <https://dev.mysql.com/doc/refman/8.0/en/sha256-pluggable-authentication.html>

The Drizzle driver has been updated to support these new authentication methods, and the [MySQL Connector/J 8](#) is also supported.

In order to be fully transparent with the new defaults, when connected to a MySQL 8+ data source, the Connector will advertise `caching_sha2_password` as the default plugin.

With earlier versions of MySQL (pre-8.0), the previous default `mysql_native_password` is used by default and advertised to the client applications.

In order to override the default behavior, a new Connector property option for `tpm`, `property=defaultAuthPlugin={autodetect|caching_sha2_password|mysql_native_password}`, and is set to `autodetect` by default.

Note that if `property=defaultAuthPlugin` is set to `caching_sha2_password`, the `sha256_password` authentication is automatically also supported.

#### Warning

Please note that the Connector does not support public key retrieval as of yet.

Also note that, for backwards compatibility, the Connector forces the “CLIENT\_DEPRECATED\_EOF” to false, disallowing the usage of client session tracking requests (<https://dev.mysql.com/doc/refman/5.7/en/session-state-tracking.html>)

*Issues:* CT-771

- When logging is set to `debug` or `trace`, the Connector will print individual queries. In the past, advanced logging limited the display size of requests to 256 characters to prevent overwhelming the logs in terms of both space and filesystem I/O.

Some customers need to display more than that, so it is now possible to adjust the size of the statements displayed in `debug` or `trace` logging modes. This is handled by a new Connector property option for `tpm`, `property=statement.display.size.in.kb=NNN`, which is defined as the maximum query length to display in Kbytes, and now defaults to 1KB.

#### Warning

Warning: setting this option to a high value while DEBUG or TRACE is enabled will quickly fill logs and disk, in addition to using up disk I/O's!

For example, if the raw query size is 4KB, then a setting of 1KB would simply display the first 1024 bytes of the query and truncate/discard the rest from a logging perspective.

For more information about configuring debug and trace logging, please visit [Generating Advanced Diagnostic Information](#).

*Issues:* CT-990

#### Bug Fixes

##### Command-line Tools

- When executing `mysqldump`, all Tungsten tools no longer use the `--add-drop-database` flag as it will prevent MySQL 8+ from restoring the dump.

*Issues:* CT-935

- Fixed a bug where `tpm diag` would generate an empty zip file if the hostnames contain hyphens [-] or periods [.]

*Issues:* CT-1032

##### Core Replicator

- Added support for missing charset GB18030 to correct `WARN extractor.mysql.MySQLBinlog Unknown charset` errors.

*Issues:* CT-915, CT-932

- Now properly extracting the Geometry datatype.

*Issues:* CT-997

Tungsten Connector

- OLD BEHAVIOR: If the Primary data source was not accessible when the Connector started (i.e. connection refused, etc.), the connector would still fully initialize, leading to a running Connector without an accessible data source. This has the side effects of having default configuration values for both `wait_timeout` and `server_version` instead of properly auto-detected values based on the MySQL server settings.

NEW BEHAVIOR: The Connector will now wait indefinitely for a Primary to become available before finishing startup.

*Issues:* CT-930

- Introduced a new `tpm` flag allowing for tuning Connector thread stack size, which can be required in particular cases where large requests are sent as text to a connector configured for automated read/write splitting (smartscale and direct reads).

The setting is commented out by default, leaving the JVM use its own default, generally 1024.

Setting `tpm` option `connector-thread-stack-size={value in kb}` will override this value.

#### Note

Please note that since the new size will be allocated for each incoming connection, increasing the thread stack size will affect the total runtime memory used by the connector instance

*Issues:* CT-973

## 7. Tungsten Replicator v6.x Release Notes

### 7.1. Tungsten Replicator 6.1.25 GA [7 July 2024]

Version End of Life. 15 Aug 2024

Release 6.1.25 was released to address a small bug in Tungsten Replicator.

Bug Fixes

Core Replicator

- Fix for an issue in `ColumnNameFilter`, `EnumToStringFilter` and `TableMetadataCache` where an `ALTER USER` statement could trigger a `NullPointerException`.

*Issues:* CT-2321

### 7.2. Tungsten Replicator 6.1.24 GA [11 Dec 2023]

Version End of Life. 15 Aug 2024

Release 6.1.24 was released to address a bug in the Tungsten Clustering product and there are no specific changes in Tungsten Replicator.

### 7.3. Tungsten Replicator 6.1.23 GA [31 Aug 2023]

Version End of Life. 15 Aug 2024

Release 6.1.23 was released to address a minor bug in the Tungsten Clustering product and there are not specific changes in Tungsten Replicator.

### 7.4. Tungsten Replicator 6.1.22 GA [6 July 2023]

Version End of Life. 15 Aug 2024

Release 6.1.22 contains a number of minor bug fixes.

Bug Fixes

## Installation and Deployment

- Fixed RPM package script to run `tpm install` instead of `tpm update` when installing the rpm

*Issues:* CT-2130

## PostgreSQL Applier

- Fixed a `NullPointerException` error occurring at startup when applying to PostgreSQL

*Issues:* CT-2021

## Core Replicator

- A change in the way MySQL logs `CREATE TABLE AS SELECT` in the Binary Logs from v8.0.20 onwards, meant these transactions would previously fail.

**Warning**

Whilst these statements will now replicate, it must be noted that in the event of a failure during the data load, the initial `CREATE` statement won't be rolled back, and therefore care must be taken when using this type of DDL.

**Note**

This only affects customers using MySQL v8.0.20+ running with `ROW` based replication. An alternative workaround to ensure correct rollback on failure, would be to run the statement with `STATEMENT` based replication for the session. This will also provide better performance for larger tables.

*Issues:* CT-1301

- Fixed an issue where an extracted JSON field could be invalid, with doubled commas in JSON arrays.

*Issues:* CT-2049

- Improved a query that is run by Tungsten when fetching tables metadata (column names, datatypes, etc). While it is not generally needed, the unoptimized query can run badly (especially) against old mysql versions with a lot of databases / tables. For now, the new optimized query is not used by default, but this could change in some future version.

This can be enabled by using the following property :

```
property=replicator.datasource.global.connectionSpec.usingOptimizedMetadataQuery=true
```

*Issues:* CT-2077

## 7.5. Tungsten Replicator 6.1.21 GA [18 Apr 2023]

Version End of Life. 15 Aug 2024

Release 6.1.21 contains a number of critical bug fixes and improvements.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Command-line Tools

- The `tungsten_skip_all` command (along with alias `tungsten_skip_seqno`) now shows the full `pendingExceptionMessage` instead of just `pendingError`, and the `More` choice shows the `pendingErrorEventId` and the `pendingError`.

*Issues:* CT-2030

Improvements, new features and functionality

### Platform Specific Deployments

- ARM 64 bit processor support added (linux aarch64)

**Note**

Note that at time of release, there is currently no xtrabackup binary available for ARM.

*Issues:* CT-1619, CT-1620

## Bug Fixes

## Command-line Tools

- The `tpm ask keys` command now lists all available keys properly.

*Issues:* CT-2041

## 7.6. Tungsten Replicator 6.1.20 GA [19 Dec 2022]

Version End of Life. 15 Aug 2024

Release 6.1.20 contains a number of critical bug fixes and improvements.

## Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

## Command-line Tools

- Both the `tungsten_get_ports` and `tpm report` commands have been updated to use the `ss` OS command when the `netstat` OS command is unavailable or deprecated.

*Issues:* CT-2007

Improvements, new features and functionality

## Command-line Tools

- A new command has been added called `tungsten_get_ports`, which will display the running Tungsten processes and the associated TCP ports that those processes are listening on.

*Issues:* CT-1970

- The `tungsten_get_ports` command now supports the `/opt/continuent/tungsten/tungsten-connector/conf/interfaces.json` file, if found.

*Issues:* CT-2003

- The `tungsten_get_ports` command now use values based on values obtained from `tpm query values` when possible for the greatest output accuracy.

*Issues:* CT-2008

## Bug Fixes

## Command-line Tools

- Worked around a ruby issue where DNS name resolution was sometimes preferred to file-based resolution in TPM. The following logic now applies: first trying file-based host name resolution, upon failure try DNS, then through ping command

*Issues:* CT-1653

## Core Replicator

- Fixed an issue in the applier to ensure it is not committing too often with a multi-service replicator (active/active for example, more specifically with AWS Aurora, or an unprivileged MySQL, backend).

*Issues:* CT-2004

## Filters

- Fixed an issue where the `dropsqlmodes` filter would fail to remove invalid sql modes from a multi-statement event

*Issues:* CT-1993

## 7.7. Tungsten Replicator 6.1.19 GA [17 Oct 2022]

Version End of Life. 15 Aug 2024

Release 6.1.19 contains a number of critical bug fixes and improvements, specifically for customers using Parallel Replication.

## Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Command-line Tools

- The `check_tungsten.sh` was deprecated in release 6.1.18 and has now been removed from this release.

*Issues:* CT-1939

### Core Replicator

- `repl_svc_extractor_multi_frag_service_detection` is now turned ON by default. Event shards are determined at extraction time. With fragmented events, the shard cannot be determined by only reading the first fragment, but needs to check the last fragment as well. With this setting turned OFF, there is no issue with pipelines that don't need it, i.e. no parallel apply downstream replicas. However, as this is done at extract time, THL contains this information, and adding or changing a replica using parallel apply could introduce issues.

### Note

It can be disabled if you see a performance overhead but this should be done with caution. For Aurora<->Aurora Active/Active deployments it is essential that this property be left ON.

*Issues:* CT-1959

## Improvements, new features and functionality

### Command-line Tools

- The `tpm` command calls to `glob` have been improved to be more strict and compliant.

*Issues:* CT-1940

- The `tpm ask stages` and `tpm ask allstages` commands have been added to display the Replicator stages for the current node (`stages`) and the stages for each role (`allstages`).

*Issues:* CT-1943

- The `tpm ask` command has five new variables available: `dsrole` & `dsstate` for the current datasource, and `trrole` & `trstate` for the current replicator, and `nodeinfo` which displays all 4 of the new variables.

*Issues:* CT-1944

### Bug Fixes

#### Command-line Tools

- Fixes an issue where the pause state would be badly displayed under no load, when the pause reaches the defined time. Note this is only a display issue : once an event is received, the pause state and displayed remaining time will be reseted correctly.

*Issues:* CT-1942

- The `tpm mysql` command will now gracefully handle being run on a non-database node.

*Issues:* CT-1946

#### Core Replicator

- Fixes an issue that would leave a transaction uncommitted longer than necessary.

*Issues:* CT-1958

- Fixed an issue where the `shard_id` stored in the `trep_commit_seqno` table would show an incorrect shard after processing a skipped event (an event from another channel)

*Issues:* CT-1967

- Fixed an issue where the replicator would hang after applying a `DROP TABLE` event, that originally failed on the primary, but got logged into the binlog.

*Issues:* CT-1973

## Filters

- The `BidiRemoteSlaveFilter` could fail to correctly flag fragmented events in unprivileged environments (Aurora, for example) In such an environment (multi-active, unprivileged database access), a new setting was introduced to force extraction process to read ahead to the last fragment to detect the service name (false by default). Enabled with `repl_svc_extractor_multi_frag_service_detection=true`

Issues: CT-1351

## 7.8. Tungsten Replicator 6.1.18 GA [7 Sept 2022]

Version End of Life. 15 Aug 2024

Release 6.1.18 contains a number of minor bug fixes and improvements.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

### Command-line Tools

- The `check_tungsten.sh` script has been deprecated and no longer maintained. It will be removed in the next patch release and users should use the newer `tmonitor` commands.

Issues: CT-1038

Improvements, new features and functionality

### Command-line Tools

- The `tungsten_merge_logs` command now supports the `--before TIMESTAMP` and `--after TIMESTAMP` filters

Issues: CT-1869

### Core Replicator

- The `thl list` command now displays an approximative field size in bytes for row-based replication.

Issues: CT-1847

- Added a new feature that enables pausing a replicator stage for some amount of time.

This will pause the given stage for 100 seconds.:

```
trepctl pause -stage thl-to-q -time 100
```

This will pause the stage indefinitely (or until restart, etc) Add `-y` to avoid the prompt message whether you are sure.

```
trepctl pause -stage thl-to-q
```

For the previous 2 commands, running a pause command again will override the previous command.

This will resume the suspended stage (Note that if the stage is not paused, this will have no effect):

```
trepctl resume -stage thl-to-q
```

### Note

Please note this pause does not survive a replicator restart or a service offline/online.

Issues: CT-1912

### Other Issues

- General improvements in MySQL 8.0 support.

Issues: CT-1346

### Bug Fixes

### Installation and Deployment

- Fixes issues where fixed properties and filters passed to `tpm` in service stanzas were not being configured correctly

*Issues:* CT-1463

#### Command-line Tools

- `replicator start offline` would not properly pass the offline argument to systemd scripts when installed through `deployall`.

*Issues:* CT-1836

- `undeployall` script would not properly uninstall `systemd` services on some distributions including amazon linux.

*Issues:* CT-1845

- The `tpm diag` command now passes when the nodename defined in the `tungsten.ini` is the shortname, and DNS returns the FQDN.

*Issues:* CT-1908

- The `tpm diag` command now gathers the `mysql.log` file when SSL is enabled in the server

*Issues:* CT-1933

- The `tpm diag` command now behaves properly when the MySQL server is logging to STDERR.

*Issues:* CT-1935

#### Backup and Restore

- Fixed an issue where an xtrabackup generated by the replicator would fail to be restored using `trepctl restore` command.

*Issues:* CT-1575

#### Core Replicator

- Fixes an issue that would prevent a service from going offline at a specified time (`trepctl online -until-time`) when parallel apply is enabled. This is a rework of CT-1243.

*Issues:* CT-1684

- Fixed a possible issue when recovering an old primary as a replica after failover when parallel apply is enabled, that could lead the replica to be unable to come online and require a reprovisioning of this replica.

*Issues:* CT-1890

- Fixes an issue that prevented geometry datatypes with SRID from being replicated.

*Issues:* CT-1904

- Fixed an issue where filtered events would trigger a useless update to the service `trep_commit_seqno` table while it is overwritten anyway once the last statement of the applied event is done, just prior to committing the whole block.

*Issues:* CT-1931

## 7.9. Tungsten Replicator 6.1.17 GA [16 May 2022]

Version End of Life. 15 Aug 2024

Release 6.1.17 contains a number of minor bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- Changed output of `thl purge` command when no lower and upper bounds are given from 'Deleting events where' to 'Deleting all events'.

*Issues:* CT-1738

- The `tpm diag` command now gathers the output of the `tpm ask summary` command

*Issues:* CT-1827

Improvements, new features and functionality

#### Command-line Tools

- Added the ability to turn auto recovery on or off dynamically, removing the need to run `tpm update`.

This is done by running the following command:

```
shell> trepctl -service servicename setdynamic -property replicator.autoRecoveryMaxAttempts -value <number>
```

#### Note

The service must be offline before changing the property

*Issues:* CT-1088

#### Core Replicator

- Added a new property to allow configuration of character set used during batch loading into MySQL targets.

Default is `ut8mb4`. Override using the following:

```
property=replicator.applier.dbms.loadCharset=utf8
```

*Issues:* CT-1647

#### Security

- Replaced official log4j library with a secured version in which all vulnerable classes have been removed. This prevents exposing the software following a [user] misconfiguration of the log4j properties

*Issues:* CT-1810

#### Other Issues

- IPv6 host addresses are now fully supported.

Can be enabled with the following configuration property:

```
prefer-ip-stack="6"
```

By default, IPv4 is enabled, which equates to the value of "4" in the above property.

*Issues:* CT-1537

#### Bug Fixes

##### Installation and Deployment

- When services are deployed with `systemd` and MySQL could not start due to an error, `tpm` would not be able to later start MySQL

*Issues:* CT-1734

- `deployall` script now properly displays the executable prefix for restarting services, typically `mm_treplicator` in Multi-Site/Active-Active replicator-only installs, as well as the full path to component binaries

*Issues:* CT-1835

##### Command-line Tools

- When MySQL services were badly installed, some distribution could show a "not-found" status within `systemctl`, confusing `tpm`

*Issues:* CT-1677

- The `tpm` command now communicates properly when there is no INI configuration file or staging-method `deploy.cfg` configuration defined.

*Issues:* CT-1712

- `tungsten_monitor.rb` script no longer uses `sudo` to send emails if the configuration doesn't allow it.

*Issues:* CT-1737

- Improves the `tpm diag` command so that it waits 2 seconds for replicator thread dump to complete.

*Issues:* CT-1792

- `tpm` now properly reports errors upon timeout executing commands. Typically, when a host is down, when upgrading or installing, `tpm` will now properly report that pinging this host failed.

*Issues:* CT-1819

#### Core Replicator

- Due to a change in binlogging behavior from MySQL 5.7 onwards (including Aurora) when using the standalone Tungsten Replicator to configure bi-directional replication with unprivileged access (ie unable to control binlogging behavior), certain DDL statements failed to be tagged correctly causing them to be re-applied to the originating source database, resulting in replicator errors.

*Issues:* CT-1083

- When connecting to a THL server, a client will now connect to the next available host in its THL uri, if the first does not have the sequence number that the client requires. The client will then fail only if none of the hosts from the uri can provide the needed sequence number.

*Issues:* CT-1558

- Fixed an issue when using Parallel apply that would show a `NullPointerException` in case an event could either not be found or be corrupted in THL. This will now display a correct message `Missing or corrupted event from storage`

*Issues:* CT-1722

- Fixed an issue with the batch loader where `DATETIME` and `TIME` datatypes with milliseconds would be replicated as `.000` instead of the real millisecond value.

*Issues:* CT-1739

- Fixed an issue where `trepctl` was leaving JMX connections opened.

*Issues:* CT-1752

- Added more debug information for detecting possible hanging connections while a THL client connects to the THL server. Also, added socket timeout for the connection initialization

*Issues:* CT-1760

- Fixed the EnumToString and pkey filters to renew their database connections (every hour by default). This can be changed with the following properties:

```
property=replicator.filter.enumtostring.reconnectTimeout=3600
property=replicator.filter.pkey.reconnectTimeout=3600
```

*Issues:* CT-1786

## 7.10. Tungsten Replicator 6.1.16 GA [20 Dec 2021]

Version End of Life. 15 Aug 2024

Release 6.1.16 contains a number of minor bug fixes and improvements.

#### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- The Perl-based command-line tools now include the latest version of `JSON::PP`

*Issues:* CT-1679

- The `tungsten_show_processlist` command has been re-located to the `cluster-home/bin` from `tools/`.

*Issues:* CT-1695

#### Documentation

- Updated the `open_source_licenses.txt` file to include most up-to-date information for the included Perl modules.

*Issues:* CT-1675

Improvements, new features and functionality

Command-line Tools

- A new command, `tungsten_merge_logs` has been added which will gather Replicator logs into one file sorted by timestamp for easier troubleshooting.

*Issues:* CT-1667

- A new command `tungsten_get_mysql_datadir` has been added which will gather and display the actual running value for the mysql data directory [datadir] with any sym-links to the physical destination resolved.

*Issues:* CT-1690

Bug Fixes

Command-line Tools

- Now properly adds executable-prefix (when specified) to systemd boot scripts for the replicator.

*Issues:* CT-1663

- The `tpm ask` tool now works properly on all supported Linux distros.

*Issues:* CT-1682

- The `tpm diag` command now uses sudo to read the `mysqld.log` file.

*Issues:* CT-1685

- The `tpm --help` text now includes the `--ini` argument.

*Issues:* CT-1693

Core Replicator

- Fixes an issue where the replicator would loop forever if a wrong startup option was provided, e.g replicator start wrong

Now, the replicator will stop with a fatal error message logged `Unrecognized option: wrong - Shutting down`

*Issues:* CT-1672

- Fixes a replication issue with some JSON fields that would contain a single quote within the JSON text

*Issues:* CT-1691

Documentation

- The documentation for the `tpm` command now describes the use of the `--ini` argument fully.

*Issues:* CT-1692

## 7.11. Tungsten Replicator 6.1.15 GA [19 Oct 2021]

Version End of Life. 15 Aug 2024

Release 6.1.15 contains a number of minor bug fixes and improvements.

Improvements, new features and functionality

Core Replicator

- Added ability to the Batch Applier, to apply to a remote MySQL instance using `LOAD DATA LOCAL INFILE`.

This is disabled by default, and can be enabled by the following property:

```
property=replicator.applier.dbms.useLoadDataLocalInfile=true
```

*Issues:* CT-1622

## Bug Fixes

## Command-line Tools

- The `tpm update` command now handles the `--replace-release` argument properly when `--ini` is also specified.

*Issues:* CT-1623

- Improved Perl-based command-line tools to use routines with no external dependencies in place of `Data::Dumper`

*Issues:* CT-1630

## Core Replicator

- Improved error reporting when the replicator is not able to open a file. This was causing a `NullPointerException` to be raised.

*Issues:* CT-1618

## Filters

- Fixed an issue with the `ColumnNameFilter` that was not resetting its internal connection to the database.

This would then fail if the database connection would time out (e.g. MySQL `wait_timeout` reached). The connection is now renewed every 1 hour by default.

This can be reconfigured to a different value by adding the following `tpm` property:

```
property=replicator.filter.colnames.reconnectTimeout=<time in seconds>
```

*Issues:* CT-1646

## 7.12. Tungsten Replicator 6.1.14 GA [17 Aug 2021]

Version End of Life. 15 Aug 2024

Release 6.1.14 contains a number of bugs fixes and improvements to the Batch loader for MySQL. In addition, support for XA transactions is now available.

### Improvements, new features and functionality

#### Command-line Tools

- Added `tpm` support for tuning `maxDelayInterval`, used to tune parallel apply. Usage example:

```
property=replicator.store.parallel-queue.maxDelayInterval=120
```

This sets the max delay interval to 2 minutes

*Issues:* CT-1541

- A new `tpm` flag has been added:

- `svc-systemd-config-replicator`

This flag can be used to provide a custom systemd configuration that will be used in place of the default, generated one.

This is typically useful when `ExecStartPre` or `ExecStartPost` commands are needed

*Issues:* CT-1555

- Improved the `tpm` command's internal logic and introduced a new sub-command, `tpm ask`.

*Issues:* CT-1573

- Improved the `check_tungsten_online` command:

- determine the cluster name by default if none is provided via `-s`
- always check `ls` resources even if a `dataservice` name is provided
- add an option to be node-specific, ignoring any status from other nodes

*Issues:* CT-1578

- New ddlscan template (`ddl-mysql-staging.vm`) available to generate ddl required for staging tables when deploying the batch applier on a MySQL target.

*Issues:* CT-1587

#### Backup and Restore

- A new `tpm` option has been added `--backup-options`

This property can be used to pass options directly to the backup binary (Xtrabackup, mariabackup etc). This can be especially useful when the xtrabackup and MySQL versions differ. Generally, MySQL is always ahead of xtrabackup and in some situations xtrabackup will fail if the underlying MySQL patch release does not match the xtrabackup patch release. In this scenario, you could utilise the new option to force xtrabackup to not check the versions, for example:

```
backup-options=--no-server-version-check
```

Multiple options can be passed as a space separated list, for example.

```
backup-options=--option1 --option2 --option3
```

#### Note

Options passed are specific to the underlying binary and are not validated by Tungsten, therefore you must ensure you only use options that are valid, and check syntax accurately.

*Issues:* CT-1595

#### Core Replicator

- Support for XA transactions has been added.

*Issues:* CT-925

- When using the MySQL Batch Applier, you can now choose to drop all deletes by specifying the following `tpm` property:

```
property=replicator.applier.dbms.skipDeletes=true
```

This is disabled (false) by default.

*Issues:* CT-1588

- When using the MySQL Batch Applier, you can now choose to log rows into an error table that would otherwise have either generated a duplicate key error.

This is disabled by default, but can be enabled and configured by using the following two new properties:

```
property=replicator.applier.dbms.errorTablePrefix=error_XXX_
property=replicator.applier.dbms.batchLogDuplicateRows=true
```

In addition, if your tables contain Foreign Keys, you can choose to disable them during the data loading process using the following property:

```
property=replicator.applier.dbms.disableForeignKeys=true
```

*Issues:* CT-1589

#### Bug Fixes

##### Command-line Tools

- `tpm` was failing to check application password when single quoted.

*Issues:* CT-1257

- The `tpm update` command now properly parses the `--ini` argument.

*Issues:* CT-1551

## 7.13. Tungsten Replicator 6.1.13 GA [27 May 2021]

Version End of Life. 15 Aug 2024

Release 6.1.13 contains a number of bug fixes, and contains updated drivers for replicating to newer releases of PostgreSQL.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- Ensure that all tools are available in the appropriate software packages.

*Issues:* CT-1518

### Improvements, new features and functionality

#### Command-line Tools

- A new `tpm` option `delete-service` is now available to simplify the removal of replicator services.

*Issues:* CT-327

- A new utility, `tungsten_skip_seqno` has been added which allows events to be skipped based on filters, allowing the Tungsten Replicator to come back online with less manual intervention.

*Issues:* CT-42, CT-1087, CT-1453, CT-1511

#### Heterogeneous Replication

- Upgraded PostgreSQL JDBC driver to the latest release to allow compatibility with PostgreSQL 12.

*Issues:* CT-1521

### Bug Fixes

#### Command-line Tools

- This release includes a wide range of improvements and bug fixes for `tpm` and other command-line tools.

*Issues:* CT-1509

- Fixes an issue where the `undeployall` command would create a root owned `wrapper.log` in the `./tools` directory.

*Issues:* CT-1516

- Fixed a `tpm` call to `systemd` services listing which was making `tpm` wrongly fall back to `init.d`. This issue was found when testing MariaDB 10.0.

*Issues:* CT-1524

- `tpm` now supports new MariaDB `my_print_defaults` flag `--defaults-file`

*Issues:* CT-1528

#### Core Replicator

- Fixes an issue where `null` values in JSON structures were incorrectly quoted once replicated.

For example :

```
[{"example":null}]
```

would be replicated as

```
[{"example":"null"}]
```

*Issues:* CT-1523

## 7.14. Tungsten Replicator 6.1.12 GA [8 Mar 2021]

Version End of Life. 15 Aug 2024

Release 6.1.12 is a minor bug fix release.

### Improvements, new features and functionality

## Monitoring

- Support has now been added to allow monitoring via the New Relic Insights API, using a new script [tungsten\\_newrelic\\_event](#)

*Issues:* CT-892

## Bug Fixes

## Command-line Tools

- [tpm install](#) would fail on FIPS enabled environments.

*Issues:* CT-1451

## Core Replicator

- A new [mapcharset](#) filter is included, which fixes collation incompatibilities when replicating from MySQL 8 to an older release (5.7 or 5.6)

This new filter should be enabled within any MySQL applier where the source is generated from a MySQL 8 database and the target is MySQL 5.7 or lower.

*Issues:* CT-1404

- If SSL is enabled between replicators for THL Transfer, and a source node fails and becomes unresponsive, or is slow/overloaded, the replicator on the replica can fail to go offline due to a timeout, remaining in a GOING-ONLINE:SYNCHRONIZING state.

*Issues:* CT-1459

## 7.15. Tungsten Replicator 6.1.11 GA [21 Jan 2021]

Version End of Life. 15 Aug 2024

Release 6.1.11 is a major bug fix release specifically for clustering deployments.

This Tungsten Replicator release contains no changes, but was released as part of Continuent's Standard release process to maintain consistency with version numbers.

## 7.16. Tungsten Replicator 6.1.10 GA [15 Dec 2020]

Version End of Life. 15 Aug 2024

Release 6.1.10 is a minor bug fix release.

Improvements, new features and functionality

## Command-line Tools

- [tpm diag](#) now collects routing table information via `route -n`, and has two new command-line arguments: `--include` and `--groups`.  
`--include` specifies a comma-separated list of subroutines to include. Any gather subroutine not listed will be skipped.  
`--groups` specifies a comma-separated list of subroutine groups to include. Any group not listed will be skipped.

*Issues:* CT-1399

## 7.17. Tungsten Replicator 6.1.9 GA [23 Nov 2020]

Version End of Life. 15 Aug 2024

Release 6.1.9 is a critical bug fix release containing a fix for a critical bug within the Replicator related to the handling of Timezone.

## Bug Fixes

## Command-line Tools

- [tpm update](#) no longer fails when using the staging method to upgrade to a new version.

*Issues:* CT-1381

## Core Replicator

- In some edge case scenarios, the replicator was not setting the session `time_zone` correctly when proceeding sessions had a different `time_zone` applied, this could lead to situations where `TIMESTAMP` values could be applied into replica nodes with an incorrect `time_zone` offset applied.

*Issues:* CT-1390

## 7.18. Tungsten Replicator 6.1.8 GA [2 Nov 2020]

Version End of Life. 15 Aug 2024

Release 6.1.8 is a minor bug fix release.

Bug Fixes

Core Replicator

- Fixes an issue that would prevent a service from going offline at a specified time (`trepctl online -until-time`) or at a specific seqno (`trepctl online -until-seqno`) when parallel apply is enabled.

*Issues:* CT-1243

- In MySQL releases using old row events format (MySQL 5.6 or earlier), `Delete_rows_v1` were badly handled, leading to an extraction error when handling such an event type.

*Issues:* CT-1358

## 7.19. Tungsten Replicator 6.1.7 GA [5 Oct 2020]

Version End of Life. 15 Aug 2024

Release 6.1.7 was a minor bug fix release containing a fix for SSL Communications specific to clustering deployments.

This Tungsten Replicator release contains no new changes, but was released as part of Continents Standard release process to maintain consistency with version numbers.

## 7.20. Tungsten Replicator 6.1.6 GA [20 Aug 2020]

Version End of Life. 15 Aug 2024

Release 6.1.6 is a minor bug fix containing a fix for bi-directional standalone Replicator deployments.

Bug Fixes

Core Replicator

- Allows multiple service names to be supplied to `property=local.service.name` when configuring bi-directional replication between a Composite Active/Active cluster topology and a MySQL target to prevent loopback of transactions.

*Issues:* CT-1308

## 7.21. Tungsten Replicator 6.1.5 GA [5 Aug 2020]

Version End of Life. 15 Aug 2024

Release 6.1.5 is a small interim bug fix with a number of issues resolved within the Core Replicator, specifically for heterogeneous environments.

Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

Heterogeneous Replication

- When using the batch applier in Heterogeneous pipelines (Redshift, Vertica, Hadoop) the batch applier removes DDL statements.

There may be occasions when you intentionally want DDL to pass through, such as if you have a custom filter that injects custom DDL statements into the pipeline, however the batch applier would always remove them.

A new property is now available to control this behaviour. Set `property=replicator.applier.dbms.applyStatements=true` to allow the batch applier to retain DDL statements. The default value of `false` retains the original behaviour of removing DDL.

*Issues:* CT-1270

#### Known Issues

The following issues are known within this release but not considered critical, nor impact the operation of Tungsten Replicator. They will be addressed in a subsequent patch release.

#### Core Replicator

- In MySQL release 8.0.21 the behavior of `CREATE TABLE ... AS SELECT ...` has changed, resulting in the transactions being logged differently in the binary log. This change in behavior will cause the replicators to fail.

Until a fix is implemented within the replicator, the workaround for this will be to split the action into separate `CREATE TABLE ...` followed by `INSERT INTO ... SELECT FROM...` statements.

If this is not possible, then you will need to manually create the table on all nodes, and then skip the resulting error in the replicator, allowing the subsequent loading of the data to continue.

*Issues:* CT-1301

#### Bug Fixes

##### Core Replicator

- When replicating data that included timestamps, the replicator would update the timestamp value to the time within the commit from the incoming THL. When using statement based replication times would be correctly replicated, but if using a mixture of statement and row based replication, the timestamp value would not be set back to the default time when switching between statement and row based events. This would not cause problems in the applied host, except when `log_slave_updates` was enabled. In this case, all row-based events after a statement based event would have the same timestamp value applied.

This was most commonly seen when using the standalone replicator to replicate into a Cluster, either from a standalone source, or a cluster source.

*Issues:* CT-1255

- For offboard extraction, the replicator would appear to be `ONLINE` but not actually processing new events.

This is due to the relay client getting an incomplete packet from the remote database and going into a `WAITING` state.

To handle these situations, a new property has been included that will set a timeout and if the replicator does not process an event in the given timeout period, we assume we have lost the link to the remote database and will place the replicator into an `OFFLINE:ERROR` state.

Providing auto-recovery has been enabled using the `auto-recovery-max-attempts` parameter, the replicator will then restart and proceed successfully.

The new property to include is `property=replicator.extractor.dbms.relayLogIdleTimeout`

The default value [0] will disable the timeout. Values provided are in seconds, so 300 would be 5 minutes.

Setting the timeout too low in quieter systems may result in unnecessary replicator restarts. The value should be set according to the activity levels of your database. If the source is very active with constant updates, then a low value would be appropriate. On quieter systems that may have long periods of inactivity, should have a timeout value set no less than the longest, normal, period of inactivity within your system.

*Issues:* CT-1262

- If filtering is in use, and a space appeared either side of the delimiter in a "schema.table" definition in your SQL, the replicator would fail to parse the statement correctly.

For example, all of the examples below are valid SQL but would cause a failure in the replicator:

```
sql> CREATE TABLE myschema. mytable (...
sql> CREATE TABLE myschema .mytable (...
sql> CREATE TABLE myschema . mytable (...
```

*Issues:* CT-1278

- Fixes a bug in the Drizzle Driver whereby a failing prepared statement that exceeds 1000 characters would report a `String index out of range: 999` error rather than the actual error.

*Issues:* CT-1303

## 7.22. Tungsten Replicator 6.1.4 GA [4 June 2020]

Version End of Life. 15 Aug 2024

Release 6.1.4 contains a number of improvements and bug fixes, specifically for the `tpm` command line tool and improvements to the Redshift Applier. In addition this release now fully supports the latest binlog compression feature of MySQL 8.0.20.

Improvements, new features and functionality

Command-line Tools

- Improves `tpm` performance by using more efficient routines to calculate paths.

*Issues:* CT-1168

- Added the ability for `tpm diag` to skip both individual gather subroutines along with entire groups of gather subroutines.

Also added ability to list all gather groups and subroutines using `--list` for use with the `--skip` and `--skipgroups` cli arguments.

*Issues:* CT-1176

- `tungsten_provision_slave` has been rewritten fixing a number of issues in the previous release. This version was previously released as the Beta script `prov-sl.sh`.

*Issues:* CT-1208

- A number of performance improvements and fixes have been incorporated into the Drizzle Driver used for communication between components and MySQL, these include:

- Better handling of large queries close to max network packet size.
- Batch Support. Instead of sending statements one by one, the driver will be able to send multiple statements at once, avoiding round trips between the driver and MySQL server.
- Fixes issues with interpreting `useSSL` on connect string URLs.

*Issues:* CT-1215, CT-1216, CT-1217, CT-1228

- The `tungsten_send_diag` command now accepts arguments for the `tpm diag` command using `--args` or `-a` for short.

You must enclose the arguments in quotes, for example:

```
shell> tungsten_send_diag -c 9999 -d --args '--all -v'
```

*Issues:* CT-1220

Core Replicator

- `debug` has been disabled by default in the schemachange filter. Resulting in reduced noise in the replicator log file.

*Issues:* CT-1013

- A new replicator role `thl-client` has been added. This new role allows the replicator to download THL from a Primary, but not apply to the target database.

*Issues:* CT-1123

- A new `delayInMs` filter has been added which allows the applying of THL to a Replica to be delayed. The filter allows millisecond precision. This filter works in the same way as the `TimeDelayFilter`, however that filter only allow second precision.

*Issues:* CT-1191

- A new `droprow` JavaScript filter has been added.

The filter works at ROW level and allows the filtering out of rows based on one or more column/value matches

*Issues:* CT-1213

- When configuring the Redshift applier, you can now configure which tool the applier will use for posting CSV files to S3. Options are `s3cmd` (default), `s4cmd` or `aws`.

*Issues:* CT-1218

- A number of improvements have been made to the Redshift Applier to allow optional levels of table locking.

This is particularly useful when you have multiple Redshift Appliers in a Fan-In topology, and/or very high volumes of data to process.

The additional locking options reduce the risk of Redshift Serializable Isolation Violation errors occurring.

Full details of how to utilise the new options can be read at [Handling Concurrent Writes from Multiple Appliers](#)

*Issues:* CT-1221

- Tungsten Replicator can now correctly extract and parse Binary Log entries when the MySQL option `binlog-transaction-compression` has been enabled.

`binlog-transaction-compression` is a new parameter introduced from MySQL 8.0.20.

*Issues:* CT-1223

## Bug Fixes

### Command-line Tools

- In certain edge cases, `tungsten_provision_slave` would fail to detect if `mysql` was shutdown.

*Issues:* CT-1096

- `tpm diag` now collects directories specified with `!includedir` in the `/etc/my.cnf` file.

*Issues:* CT-1153

- Fixes the `tpm update` command, which would exit with the error:

```
Argument " (error code 1)" isn't numeric
```

*Issues:* CT-1165

- `tpm diag` now collects any files specified by `!include` directives in the `/etc/my.cnf` and `/etc/mysql/my.cnf` files.

`tpm diag` also looks in `/etc/mysql/my.cnf` for `!includedir` directives

*Issues:* CT-1169

- Fixes a bug which prevented `tungsten_send_diag` from uploading a self-generated diagnostic zip file.

*Issues:* CT-1170

- `tpm diag` now properly derives the correct target path to the releases directory if the home directory in the configuration points to a symlink.

*Issues:* CT-1172

- Removed `tpm diag` call to `sudo` for gathering `ifconfig` and `lsb_release` commands.

*Issues:* CT-1175

- `tpm update` would fail and report errors if `deployall` had been executed.

*Issues:* CT-1179

- `tpm diag` no longer requires the `mysql` command-line client when running on non-MySQL Applier nodes, and no longer attempts to gather any MySQL diagnostic information.

*Issues:* CT-1188

- Removes the requirement to execute component start/stop commands with `sudo` when called through `systemd`.

This is specific to start/stop actions following the use of the `deployall` scripts.

*Issues:* CT-1193

- Fixes cases where `tpm` fails when the OS `hostname` command returns a different string than what is used in the configuration (i.e. `hostname` returns a FQDN, yet the configuration contains shortnames like `db1`, `db2`, etc.).

*Issues:* CT-1206

- In certain cases, after a reprovision, `tungsten_provision_slave` didn't always run the steps to reset the local replicator service. This made the replicator go into an error state after provision had completed.

*Issues:* CT-1210

- The `tpm diag` command now handles the cluster-slave topology more gracefully, and properly handles cluster nodes without the Connector installed.

Improved output text clarity by converting multiple verbose-level outputs to debug, and warnings to notice-level.

*Issues:* CT-1222

- `tpm diag` now gathers sym-linked files correctly.

*Issues:* CT-1232

- `ddlscan` now sets the datatype for sequence number columns to BIGINT when generating staging table DDL for Redshift deployments.

*Issues:* CT-1235

- Fixes a situation where `tpm update` exits with a `Data::Dumper` error.

*Issues:* CT-1249

#### Core Replicator

- In heterogeneous replicator deployments, the `convertstringfrommysql` filter would fail to convert strings for alphanumeric key values.

*Issues:* CT-1128

- Tungsten Replicator could wrongly think it is already in `DEGRADED` mode when trying to put it into `DEGRADED` state.

*Issues:* CT-1131

- Tungsten Replicator now recognises Amazon AWS SSL Certificates to enable SSL communication with AWS Aurora.

*Issues:* CT-1173

- When host server time (and thus MySQL time) is not configured as UTC, issuing cluster heartbeat or `trepctl heartbeat` in the first hours around daylight savings time would create an invalid time in MySQL.

For more information on timezones when issuing heartbeats, see [trepctl heartbeat Time Zone Handling](#)

*Issues:* CT-1174

- The replicator would fail to apply into Vertica when configured as an offboard installation due to the applier incorrectly expecting the csv files to exist locally on the remote Vertica host.

*Issues:* CT-1194

- Due to a change in the Binary log structure introduced in MySQL 8.0.16, the replicator would fail to extract transactions for Partitioned tables.

*Issues:* CT-1201

- The replicator would fail to correctly parse statements with leading comment blocks in excess of 200 characters.

*Issues:* CT-1236

## 7.23. Tungsten Replicator 6.1.3 GA [17 February 2020]

Version End of Life. 15 Aug 2024

Release 6.1.3 contains a small number of improvements and fixes to common command line tools, and introduces compatibility with MongoDB Atlas.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Command-line Tools

- `tpm diag` has been updated to provide additional feedback detailing the hosts that were gathered during the execution, and also provides examples of how to handle failures

When running on a single host configured via the ini method:

```
shell> tpm diag
Collecting localhost diagnostics.
Note: to gather for all hosts please use the "-a" switch and ensure that you have passwordless »
ssh access set between the hosts.
Collecting diag information on db1.....
Diagnostic information written to /home/tungsten/tungsten-diag-2020-02-06-19-34-25.zip
```

When running on a staging host, or with the `-a` flag:

```
shell> tpm diag [-a|--allhosts]
Collecting full cluster diagnostics
Note: if ssh access to any of the cluster hosts is denied, use "--local" or "--hosts=<host1,host2,...>"
Collecting diag information on db1.....
Collecting diag information on db2.....
Collecting diag information on db3.....
Diagnostic information written to /home/tungsten/tungsten-diag-2020-02-06-19-34-25.zip
```

Issues: CT-1137

#### Bug Fixes

##### Command-line Tools

- `tpm` would fail to run on some Operating Systems due to missing `realpath`

`tpm` has been changed to use `readlink` which is commonly installed by default on most operating systems, however if it is not available, you may be required to install GNU coreutils to satisfy this dependency

Issues: CT-1124

- Removed dependency on perl module `Time::HiRes` from `tpm`

Issues: CT-1126

- Added support for handling missing dependency (`Data::Dumper`) within various `tpm` subcommands

Issues: CT-1130

- `tpm` will now work on MacOS/X systems, provided `greadlink` is installed.

Issues: CT-1147

- `tpm install` will no longer report that the linux distribution cannot be determined on SUSE platforms.

Issues: CT-1148

- Fixes a condition where `tpm diag` would fail to set the working path correctly, especially on Debian 8 hosts.

Issues: CT-1150

- `tpm diag` now checks for OS commands in additional paths (`/bin`, `/sbin`, `/usr/bin` and `/usr/sbin`)

Issues: CT-1160

- Fixes an issue introduced in v6.1.2 where the use of the `undeployall` script would stop services as it removed them from `systemctl` control

Issues: CT-1166

##### Core Replicator

- The MongoDB Applier has been updated to use the latest MongoDB JDBC Driver

Issues: CT-1134

- The MongoDB Applier now supports MongoDB Atlas as a target

Issues: CT-1142

- The replicator would fail with `Unknown column ' in 'where clause` when replicating between MySQL 8 hosts where the client application would write data into the source database host using a different collation to that of the default on the target database.

The replicator would fail due to a mismatch in these collations when querying the `information_schema.columns` view to gather metadata ahead of applying to the target

Issues: CT-1145

## 7.24. Tungsten Replicator 6.1.2 GA [20 January 2020]

Version End of Life. 15 Aug 2024

Release 6.1.2 contains both significant improvements as well as some needed bugfixes.

### Behavior Changes

The following changes have been made to Tungsten Replicator and may affect existing scripts and integration tools. Any scripts or environment which make use of these tools should check and update for the new configuration:

#### Behavior Changes

- Certified the Tungsten product suite with Java 11.

A small set of minor issues have been found and fixed [CT-1091, CT-1076] along with this certification.

The code is now compiled with Java compiler v11 while keeping Java 8 compatibility.

Java 9 and 10 have been tested and validated but certification and support will only cover Long Term releases.

#### Note

##### Known Issue

With Java 11, command line tools are slower. There is no impact on the overall clustering or replication performance but this can affect manual operations using CLI tools such as `cctrl` and `trepctl`

Issues: CT-1052

Improvements, new features and functionality

### Command-line Tools

- The `tpm` command was originally written in Ruby. This improvement converts `tpm` to Perl over time, starting with the `tpm` shell wrapper and refactoring each sub-command one-by-one.

For this release, we have redone the `diag` and `mysql` sub-commands.

Issues: CT-1048

### Core Replicator

- A new Replicator role, `thl-server`, has been added.

This new feature allows your Replica replicators to still pull generated THL from a Primary even when the Primary replicator has stopped extracting from the binlogs.

If used in Tungsten Clustering, this feature must only be enabled when the cluster is in `MAINTENANCE` mode.

Issues: CT-58

For more information, see [Understanding Replicator Roles](#).

- A new JavaScript filter `dropddl.js` has been added to allow selective removal of specific object DDL from THL.

Issues: CT-1092

## Bug Fixes

## Behavior Changes

- If you need to reposition the extractor, there are a number of ways to do this, including the use of the options `-from-event` Or `-base-seqno`

Both of these options are mutually exclusive, however in some situations, such as when positioning against an Aurora source, you may need to issue both of these options together. Previously this was not possible. In this release both options can now be supplied providing that you include the additional `-force` option, for example

```
shell> trepctl -service serviceName online -base-seqno 53 -from-event 000412:762897 -force
```

Issues: CT-1065

- When the Replicator inserts a heartbeat there is an associated timezone. Previously, the heartbeat would be inserted using the GMT timezone, which fails during the DST switch window. The new default uses the Replicator host's timezone instead.

This defaults change corrects an edge case where inserting a heartbeat will fail during the DST switch window when the MySQL server is running in a different timezone than the Replicator (which runs in GMT).

For example, on 31st March 2019, the time switch occurred @ 2AM in the Europe/Paris timezone. When inserting a heartbeat in the window between 4 and 5 AM (say at 4:15am), the corresponding GMT time would be 2:15am, which is invalid in the Europe/Paris timezone. Replicator would then fail if the MySQL timezone was set to Europe/Paris, as it would try to insert an invalid timestamp.

A new option, `-tz` has been added into the `trepctl heartbeat` command to force the use of a specific timezone.

For example, use GMT as the timezone when inserting a heartbeat:

```
shell> trepctl heartbeat -tz NONE
```

Use the Replicator host's timezone to insert the heartbeat:

```
shell> trepctl heartbeat -tz HOST
```

Use the given timezone to insert the heartbeat:

```
shell> trepctl heartbeat -tz {valid timezone id}
```

If the MySQL server timezone is different from the host timezone (which is strongly not recommended), then `-tz {valid timezone id}` should be used instead where `{valid timezone id}` should be the same as the MySQL server timezone.

Issues: CT-1066

- Corrected resource leak when loading Java keystores

Issues: CT-1091

## Command-line Tools

- Fixed error message to indicate the need to specify a service on Composite Active/Active clusters for the `tungsten_find_position` and `tungsten_find_seqno` commands.

Issues: CT-1098

- The `tpm` command no longer reports warnings about existing system triggers with MySQL 8+

Issues: CT-1099

## Core Replicator

- When configuring a Kafka Applier, the Kafka Port was set incorrectly

Issues: CT-693

- If a JSON field contained a single quote, the replicator would break during the apply stage whilst running the generated SQL into MySQL.

Single quotes will now be properly escaped to solve this issue

Issues: CT-983

- Under rare circumstances (network packet loss or MySQL Server hang), the replicator would also hang until restarted.

This issue has been fixed by using specific network timeouts in both the replicator and in the Drizzle jdbc driver connection logic

*Issues:* CT-1034

- When configuring Active/Active, standalone replicators, with the BidSlave filter enabled, the replicator was incorrectly parsing certain DDL Statements and marking them as unsafe, as a result they were being dropped by the applier and ignored

The full list of DDL commands fixed in this release are as follows:

- CREATE|DROP TRIGGER
- CREATE|DROP FUNCTION
- CREATE|DROP|ALTER|RENAME USER
- GRANT|REVOKE

*Issues:* CT-1084, CT-1117

- The following warnings would appear in the replicator log due to GTID events not being handled.

```
WARN extractor.mysql.LogEvent Skipping unrecognized binlog event type 33, 34 or 35)
```

The WARN message will no longer appear, however GTID Events are still not handled in this release, but will be fully extracted in a future release.

*Issues:* CT-1114

## 7.25. Tungsten Replicator 6.1.1 GA [28 October 2019]

Version End of Life. 15 Aug 2024

Release 6.1.1 contains both significant improvements as well as some needed bugfixes.

Improvements, new features and functionality

Core Replicator

- Added Clickhouse applier support.

*Issues:* CT-383

- If using the dropcolumn filter during extraction, in conjunction with the Batch Applier (eg Replicating to Redshift, Hadoop, Vertica) writes would fail with a CSV mismatch error due to gaps in the THL Index.

However, for JDBC appliers, the gaps are required to ensure the correct column mapping

To handle the two different requirements, a new property has been added to the filter to control whether or not to leave the THL index untouched (the default) or to re-order the Index ID's

If applying to Batch targets, then the following property should be added to your configuration. The property is not required for JDBC targets.

```
--property=replicator.filter.dropcolumn.fillGaps=true
```

*Issues:* CT-1025

Bug Fixes

Command-line Tools

- Fixed an issue that would prevent reading remote binary logs when using SSL.

*Issues:* CT-958

- Fixed an issue where the command `trepctl -all-services status -name watches` fails.

*Issues:* CT-977

- Restored previously-removed log file symbolic links under `$CONTINUENT_ROOT/service_logs/`

*Issues:* CT-1026

- Fixed a bug where `tpm diag` would generate an empty zip file if the hostnames contain hyphens (-) or periods (.)

*Issues:* CT-1032

- Improve ability to find needed binaries for commands: `tungsten_find_position`, `tungsten_find_seqno` and `tungsten_get_rtt`

*Issues:* CT-1054

## 7.26. Tungsten Replicator 6.1.0 GA [31 July 2019]

Version End of Life. 15 Aug 2024

Release 6.1.0 contains both significant improvements as well as some needed bugfixes. One of the main features of this release is MySQL 8 support.

Improvements, new features and functionality

Command-line Tools

- Two new utility scripts have been added to the release to help with setting the Replicator position:

- `tungsten_find_position`, which assists with locating information in the THL based on the provided MySQL binary log event position and outputs a `dsctl set` command as output.

- `tungsten_find_seqno`, which assists with locating information in the THL based on the provided sequence number and outputs a `dsctl set` command as output.

*Issues:* CT-934

Core Replicator

- A new, beta-quality command has been included called `prov-sl.sh` which is intended to eventually replace the current `tungsten_provision_slave` script.

Currently, `prov-sl.sh` supports provisioning Replicas using `mysqldump` and `xtrabackup` tools, and is MySQL 8-compatible.

The `prov-sl.sh` command is written in Bash, has less dependencies compared to the current version and is meant to fix a number of issues with the current version.

Backups are streamed from source to target so that an intermediate write to disk is not performed, resulting in faster provisioning times.

Logs are written to `$(CONTINUENT_ROOT)/service_logs/prov-sl.log` [i.e. `/opt/continuent/service_logs/prov-sl.log`].

For example, provision a Replica from [source db] using `mysqldump` (default):

```
shell> prov-sl.sh -s {source db}
```

As another example, use `xtrabackup` for the backup method, with 10 parallel threads (default is 4), and `ssh` is listening on port 2222:

```
shell> prov-sl.sh -s {source db} -n xtrabackup -t 10 -p 2222
```

### Warning

At the moment, `prov-sl.sh` does not support Composite Active/Active topologies when used with Tungsten Clustering, however it will be included in a future release.

*Issues:* CT-614, CT-723, CT-809, CT-855, CT-963

- Upgraded the Drizzle driver to support MySQL 8 authentication protocols (SHA256, `cached_sha2`).

*Issues:* CT-914, CT-931, CT-966

- The Redshift Applier now allows AWS authentication using IAM Roles. Previously authentication was possible via Access and Secret Key pairs only.

*Issues:* CT-980

For more information, see [Redshift Preparation for Amazon Redshift Deployments](#).

Bug Fixes

## Command-line Tools

- When executing `mysqldump`, all Tungsten tools no longer use the `--add-drop-database` flag as it will prevent MySQL 8+ from restoring the dump.

*Issues:* CT-935

- Fixed a bug where `tpm diag` would generate an empty zip file if the hostnames contain hyphens [-] or periods [.]

*Issues:* CT-1032

## Core Replicator

- Added support for missing charset GB18030 to correct `WARN extractor.mysql.MySQLBinLog Unknown charset errors`.

*Issues:* CT-915, CT-932

- Loading data into Redshift would fail with the following error if a row of data contained a specific control character (0x00 [NULL])

```
Missing newline: Unexpected character 0x30 found at location nnn
```

*Issues:* CT-984

- Now properly extracting the Geometry datatype.

*Issues:* CT-997

- The `ddl_map.json` file used by the `apply_schema_changes` filter was missing a rule to handle ALTER TABLE statements when replicating between MySQL and Redshift

*Issues:* CT-1002

- The `extract_schema_change` filter wasn't escaping " (double-quotes) and the generated JSON would then cause the applier to error with

```
pendingExceptionMessage: SyntaxError: missing } after property list »
(../../tungsten-replicator/support/filters-javascript/apply_schema_changes.js#236(eval)#1)
```

*Issues:* CT-1011

## 8. Tungsten Dashboard Release Notes

### 8.1. Tungsten Dashboard 8.0.4 GA [10 Mar 2026]

Version End of Life. Not Yet Set

Release 8.0.4 contains a number of bug fixes and improvements to usability.

Improvements, new features and functionality

General usability and Performance

- Removed several unnecessarily detailed questions in kubernetes installation and replaced them with automation.
- Kubernetes installation questions are now grouped by topic, and step counter has been added.
- Kubernetes installation now allows you to install ingress-nginx service to your cluster if you do not have it, allowing you to make the Dashboard accessible in your cluster without port forwarding. Both with SSL and no-ssl options are supported for the ingress.

*Issues:* TD2-270

- Diagnostic tool now collects `dynamic/clusters.edn` content in Docker dashboard diagnostics.

*Issues:* TD2-277

- Added `host:port` syntax support and smart port inference to `getcercert.pl`

*Issues:* TD2-279

- Added a compact layout mode that reduces cluster row height and spacing for a denser overview; toggle between compact and relaxed layout via the submenu toolbar.
- Replaced the fixed simple/advanced view toggle with a column selector dropdown in the table header, allowing users to show or hide individual columns (replicator state, latencies, sequence numbers, pipeline, etc.).

- Column visibility and layout preferences are persisted in local storage across sessions.

*Issues:* TD2-284

- Updated cluster status icons for topology warnings.
- The "Fetch Certs" action now displays a pending message while the operation is in progress.
- SSL status icon now shows a more specific tooltip indicating whether TCP, API, or both connections are unsecured.

*Issues:* TD2-287

#### Installation and Deployment

- The install script now lets you choose which namespace the dashboard is deployed into, defaulting to `tungsten-dashboard`, and detects conflicts when a dashboard already exists in a different namespace.

*Issues:* TD2-266

- Kubernetes installation now prompts user to add Tungsten clusters to the Dashboard. By providing namespace details and selecting the correct Kubernetes service a cluster can be added to the dashboard with the install script if the tungsten cluster was installed inside the same kubernetes cluster as the dashboard.

*Issues:* TD2-271

- Kubernetes installation script now allows user to enter certificate key and file to automatically create Kubernetes secret into dashboard namespace.
- Kubernetes installation no longer requires user to manually enter tls secret and domain details in to the helm values file. They will be automatically filled by the install script.

*Issues:* TD2-272

#### Bug Fixes

##### General usability and Performance

- Fixed a bug where a failed initial connection to a node with an unresolvable hostname could corrupt cluster state, causing subsequent commands to fail with a missing host target.

*Issues:* TD2-276

- Fixed a bug where a failed REST status poll could erase service connection options, causing subsequent commands to produce malformed URLs.

*Issues:* TD2-280

- Improved error handling around cluster actions. System now shows more clear errors if host data is missing or corrupted.

*Issues:* TD2-281

- REST URL construction now validates that a target host is present before making a call, providing a clear error message instead of a cryptic HTTP client failure.

*Issues:* TD2-283

##### Installation and Deployment

- Kubernetes installation no longer modifies `values.yaml` file after user has been prompted to validate it.

*Issues:* TD2-267

- Kubernetes & docker install no longer prints invalid https url at the end of the installation process when https was not enabled.

*Issues:* TD2-268

- Kubernetes installation's "wait for available" condition has had it's timeout increased from 30 to 60 seconds to reduce timeout errors at the last step of Kubernetes installations.

*Issues:* TD2-269

- Kubernetes install did not store repository and registry information correctly into helm `values.yaml` file. New system stores registry and repository into separate fields in the file.

*Issues:* TD2-273

- Feature for fetching certificates automatically now works for hybrid SSL setups.

Improved connections handling for clusters with hybrid SSL.

*Issues:* TD2-282

- Fixed Kubernetes installer to correctly report deployment failures instead of showing misleading "Installation completed!" messages.
- Added automatic StorageClass detection and configuration to prevent pods from getting stuck in Pending state on clusters without a default StorageClass.

*Issues:* TD2-288

## 8.2. Tungsten Dashboard 8.0.3 GA [13 Jan 2026]

Version End of Life. Not Yet Set

Release 8.0.3 contains a number of bug fixes and improvements to usability.

Improvements, new features and functionality

General usability and Performance

- Add/edit cluster form now has a "Reset" button on each section allowing you to clear all fields in the form section.

*Issues:* TD2-220

- Dashboard screen Clusters sorting now mirrors sorting settings from the Clusters screen

*Issues:* TD2-256

- Add/edit cluster form UX improvements

*Issues:* TD2-259

- UI elements position and styling fixes.

*Issues:* TD2-195, TD2-255, TD2-261

- Cluster connections popup improvements

*Issues:* TD2-262

- Three new ways to fetch certificates from the cluster have been introduced, specifically to assist when certificate rotation has happened within the cluster. These are as follows:

- via "Edit cluster" form with explicit "Fetch Certificates" button in "SSL" sub-form
- via cluster level menu item "Fetch Certificates"
- via warning icon in cluster row when connection error is detected

*Issues:* TD2-264

Bug Fixes

General usability and Performance

- Composite Active/Active clusters locking mechanism fixed.

*Issues:* TD2-263

- Fixed a bug with repeated installations failing when trying to generate new self-signed certificates.

*Issues:* TD2-265

## 8.3. Tungsten Dashboard 8.0.2 GA [6 Oct 2025]

Version End of Life. Not Yet Set

Release 8.0.2 contains a number of bug fixes and improvements to usability.

#### Behavior Changes

The following behavior changes have been made to Tungsten Dashboard which may impact the previous operational experience.

- Filtering clusters using search box is now case insensitive.

*Issues:* TD2-208

- Light/dark UI theme is now configurable in the Configuration screen.

*Issues:* TD2-216

- When adding a cluster, you can now progress through the form in steps using both "Next" button or Enter key.

*Issues:* TD2-231

- The install script now determines whether to use `docker-compose` command or the docker compose plugin automatically. `docker-compose` is not required anymore, when the docker compose plugin is installed.

*Issues:* TD2-236

#### Improvements, new features and functionality

##### General usability and Performance

- Improvements made to the performance of parallel connection initialization to clusters

*Issues:* TD2-180

- The Install script now has a new option `--reset`, which resets configuration files to their default state.

Please use this option if your configuration is broken and you want to start with clean [default] configuration files.

If updating an environment installed using docker compose from insecure to secure configuration, please use this new flag and start with specifying the configuration again.

*Issues:* TD2-223

- The `getcert` script can now output the certificate encoded in base64 by specifying the new `--base64` option

*Issues:* TD2-224

- The tool `collect-diag.pl` has been included in the installation directory and serves for collecting diagnostic information packages, useful for support cases.

*Issues:* TD2-240

##### Bug Fixes

##### General usability and Performance

- Search box now properly reflects URL query and filters section state

*Issues:* TD2-192

- Unreachable clusters do not block healthy clusters anymore, when initializing the application.

*Issues:* TD2-228

- Standalone cluster now shows current coordinator on a service level view.

*Issues:* TD2-230

- General design fixes and improvements

*Issues:* TD2-232

- Minor UI graphical changes and fixes

*Issues:* TD2-234

- Namespace label is now visible in the Dashboard main screen cluster widgets, and invalid clusters. Namespace label serves also as a fast filter/link to search all clusters within specific namespace.

*Issues:* TD2-235

- When adding a new cluster and pressing "Test connection" at the end of the form, all connection errors are shown above the button. Additionally, if testing the connection for a Tungsten Cluster running an older release [pre v8.0.0], the relevant error is also shown.

*Issues:* TD2-238

- Cluster coordinators aggregation and presentation fixes

*Issues:* TD2-241

- Connections per connector node and connection summaries now works properly with Tungsten Clusters version 8.0.1+

*Issues:* TD2-243

- Namespace label is now shown next to a cluster in Clusters sidebar menu

*Issues:* TD2-244

- The following issues are now fixed:

- Adjusted timeouts to cluster connections so that connections to unresponsive servers timeout faster.
- Discovering cluster topology no longer needs all clusters to respond or error out before updates show in browser.
- Cluster connection to existing clusters during first status check is now asynchronous. Unresponsive clusters no longer prevent other connections from forming.
- If a cluster is removed while http request is happening, the results of those requests are properly ignored. Preventing empty clusters from showing.

*Issues:* TD2-245

- Install script detects existing dashboard docker volume and offers user adequate solution to avoid corrupting existing data.

*Issues:* TD2-248

- Add cluster button is now visible in Dashboard widgets screen all the time.

*Issues:* TD2-260

#### Installation and Deployment

- Docker Compose installation method now offers to generate self-signed certificate for https connection. However this solution is only for development / testing and not recommended to use for production!

*Issues:* TD2-239

## 8.4. Tungsten Dashboard 8.0.1 GA [14 Jul 2025]

Version End of Life. Not Yet Set

Release 8.0.1.

Improvements, new features and functionality

#### Behavior Changes

- Tungsten Dashboard now supports virtual groups for clusters, to reflect Dynamic Datasource Groups.

*Issues:* TD2-40

- Fixed outdated packages in Dashboard frontend which might represent vulnerabilities.

*Issues:* TD2-79

- Show Cluster List in Dashboard sidebar, for Composite clusters, also shows services.

*Issues:* TD2-87

- All forms across the UI are improved for better and smoother usability.

Additionally, when adding a new cluster, certification details are automatically fetched upon selecting the SSL config tab.

*Issues:* TD2-117

- Dashboard frontend<->backend communication has been improved.

*Issues:* TD2-141

- Improved the logic on how the Dashboard displays labels and colours depending on clusters and hosts states and statuses.

*Issues:* TD2-194

- `values.yaml` file syntax has been unified. All keys are now camelCase, originally cluster definition was kebab-case.

*Issues:* TD2-200

- New fast action "Add cluster" button is available in the submenu of the Clusters screen.

*Issues:* TD2-211

#### Installation and Deployment

- The `install.pl` can now be used to upgrade the Tungsten Dashboard release, additionally, The environment configuration can also be updated using the same script.

*Issues:* TD2-214

- The `install.pl` now supports a wider range of CPU architectures.

The architecture is automatically detected from the output of the `uname`, however should this return a value that is unexpected, the user can manually provide the appropriate image.

*Issues:* TD2-221

#### Bug Fixes

##### General usability and Performance

- Improved websocket responsiveness, clusters are now loaded faster on startup.
- Bad cluster connection details no longer delays broadcasting of healthy cluster data.

*Issues:* TD2-221

## 8.5. Tungsten Dashboard 8.0.0 GA [28 Apr 2025]

Version End of Life. Not Yet Set

Release 8.0.0 marks a new major release of the Dashboard. Completely re-written and re-designed to be more performant and provide the ability to work alongside Tungsten Clustering solutions launched with Tungsten Operator within Kubernetes.

## 8.6. Tungsten Dashboard 1.0.15 GA [14 February 2024]

Version End of Life. 14 February 2025

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.15 is a feature and bugfix release.

- New Feature - Dashboard now checks to see if the pipelineSource on a replica is not pointing to the current primary and highlights the pipelineSource with bold red if mismatched.
- New Feature - now able to change the Auto-Configure host and port via Settings
- Improvement - Dashboard now has Connector polling disabled by default to reduce manager load. Enable via the Settings panel.

Technical Details - automatically adds the `?includeRouters=false` flag to the end of calls to `/api/v2/manager/cluster/status` and `/api/v2/manager/status/service/{service}`

- Improved Docker support.
- Improved support for Distributed Data Groups (DDG), including an added setting for enableDDGNodeColors.
- Improvement - updated various wording to differentiate between the Auto-Define and Auto-Configure features. updates all copyrights to 2024
- Improvement - Updates all copyrights to 2024.
- BugFix - Primary definition corrected to exclude shunned or failed masters.
- BugFix - Settings panel help broken when fancy tooltips were not enabled.
- BugFix - Auto-Define now gets the proper security defaults when none are specified in the form.

## 8.7. Tungsten Dashboard 1.0.14 GA [11 April 2023]

Version End of Life. 11 April 2024

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.14 mainly provides support for jQuery 3.6.4 along with a new "Client Request Tracking" feature.

- Upgraded to jQuery 3.6.4
- Added new feature "Client Request Tracking" to log one line per client request call.
- Improved formatting for the diagnostic upload result message.

## 8.8. Tungsten Dashboard 1.0.13 GA [31 January 2023]

Version End of Life. 31 January 2024

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.13 is a release for a single bugfix.

- Fixed an auto-configure regression for composite clusters.

## 8.9. Tungsten Dashboard 1.0.12 GA [14 December 2022]

Version End of Life. 14 December 2023

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.12 mainly provides support for the new datasource drain feature in Tungsten Clustering v7.0.2, along with a few improvements and bugfixes.

- The new datasource drain feature in Tungsten Clustering v7.0.2 is now supported in the Tungsten Dashboard node menus

There is a new, related setting called `drainTimeout` which controls the length of time to wait before closing the connection to a database node from a Connector

- Changed managerPort setting default value to 8201 from 8091
- Updated the auto-refresh browser-specific timestamp display to fit better on the navbar
- Corrected a page reload issue

## 8.10. Tungsten Dashboard 1.0.11 GA [8 November 2022]

Version End of Life. 8 November 2023

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.11 provides a number of new features, improvements and bugfixes.

Cluster Configuration File Changes

- The `config.php` file has been updated to include a `config.json` file in the same subdirectory. If the `config.json` exists, the contents will be used in place of any json configuration defined manually in the `config.php` file.

- The new best practice is to use only `config.json`, not `config.php` any longer.
- Since there is a new `config.php` file with this version, a new migration tool called `upgrade_config.php` has been included to easily install the new `config.php` file while still maintaining all of your existing settings.

The `upgrade_config.php` command will create a new file called `config.json` containing all of the settings that used to be inside the `config.php` file.

### Important

The `upgrade_config.php` tool should be NOT be RUN if the `config.json` file already exists!

The `upgrade_config.php` tool should be RUN ONLY ONCE!

COMPLETE ALL THE STANDARD UPGRADE STEPS FIRST!

```
shell> cd {DASHBOARD_WEBROOT}/
For example:
shell> cd /volumes/data/www/tungsten/html/

shell> ./upgrade_config.php `pwd`
```

### Important

The `upgrade_config.php` tool should be NOT be RUN if the `config.json` file already exists!

The `upgrade_config.php` tool should be RUN ONLY ONCE!

### New! Cluster Tagging and Filtering Feature

- You are now able to specify one or more tags per cluster in all cluster definition forms.
- You are now able to filter the cluster display by a tag from the top search bar.

Support for both v6/APIv1 and v7/APIv2 clusters at the same time!

Support for per-cluster API User and Password!

- You are now able to specify the API settings on a per-cluster basis (`apiVersion`, `apiAuth`, `apiUser`, `apiPassword` and `apiSSL`), allowing for mixed APIv1 and APIv2 clusters in the same Dashboard session, and clusters with different admin user/password pairs.
- In previous versions of the Tungsten Dashboard, the API Version, API Authentication/User/Password and API Encryption settings were global only. This meant that a version 6 cluster running APIv1 and a version 7 cluster running APIv2 would not work at the same time in the same Dashboard session, nor would clusters with different API user/password pairs.
- The new configuration fields have been added to the display, add and edit cluster definition forms in all areas of the dashboard.
- The API settings for each cluster are now displayed upon hover over the cluster service name. Each option will also show if the value is derived from the global default, or from a cluster-specific setting.
- Expert mode now allows one-click toggling of global API authentication and SSL Encryption options in addition to the existing global API version toggle.

### New Display Options for the REACT Frontend GUI

- Two new settings have been added to the Tungsten Dashboard to support an improved GUI experience.
- Both of the new settings are available via the GUI (`config.php` options in parens):
  - Display Style (`displayStyle`)
    - Specify which horizontal display method to use in the new REACT frontend (Fill Space or Compressed)
  - Home Page (`homepage`)
    - Specify which page to display first in the new REACT frontend (Cluster, Dashboard or Metrics)

### New Cluster Rename Behavior

- When changing a composite cluster parent name, the children are now updated with the new parent name. Previously, this was a manual operation.
- when changing a composite cluster child name, the parent is now updated with the new child name. Previously, this was a manual operation.

#### New Tab Bar Behaviors for Improved Performance

- A new setting (`enableTabs`) has been added to the Tungsten Dashboard to control the Tab bar behavior.
- While getting the information to populate the Tab bar is a lightweight AJAX call, the actual data gathering in the backend is quite heavy, and requires an API call to every cluster. This backend processing can cause slowdowns in response time for the Dashboard and is why the new default is to have "dumb" Tabs and better performance.
- Now, by default, the Tab bar will operate in "dumb" mode, and will NOT display the quantity of nodes that are not in *AUTOMATIC* mode, nor the quantity of nodes that are in the not ready state. Also, the Tab refresh button will not appear either.
- Enabling Tabs in the Settings Panel restores the original behavior of displaying the counts and the refresh button.

#### Additional New Features of Note

- The Tungsten Dashboard now fully supports CAA clusters in v6!
- Added the ability to close windows using the Escape key, enabled by default. Disable in the Settings panel.
- Added a Copy To Clipboard button to all cluster configuration display windows.
- Added a refresh button to the missing cluster display box for convenience - no longer need to refresh the entire page
- In expert mode, there is a new heartbeat trigger button per cluster in old frontend
- Cleaned up `error_log` calls to make the log file as quiet as possible, and added new setting (`enableVerbose`) and the associated `verbose_log()` function.
- When RBAC is enabled, a logout link is now visible at the bottom center of the footer. Also improved footer messaging when RBAC is disabled and/or basic auth is disabled.
- For both auto and manual cluster definition, if you create a Dashboard Service ID (`service name`) with hyphens, they will be converted to underscores upon save due to the way Javascript handles id's with hyphens.
- When `useHAProxy` is enabled, the Manager Port will now be set to 8201 instead of 8091 to avoid port conflicts when installed directly on a cluster node.
- The browser-specific date and time display for auto-refresh has been shortened to better fit on the navbar.

## 8.11. Tungsten Dashboard 1.0.10 GA [7 March 2022]

Version End of Life. 6 March 2023

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.10 provides a number of new features, improvements and bugfixes.

#### Prometheus and Grafana Integration

- Two new settings have been added to the Tungsten Dashboard to support Prometheus and Grafana integration.
- Both of the new settings are available via the GUI (`config.php` options in parens):
  - Enable Prometheus Integration (`enablePrometheus`)  
Enable integration with Prometheus to display data in a new window.
  - Enable Grafana Integration (`enableGrafana`)  
Enable integration with Grafana to display graphs inside the Dashboard.

#### Configurable CURL Timeouts

- Two new settings have been added to the Tungsten Dashboard to help compensate for slow environments where API calls may take longer to complete.
- Both of the new settings are available via the GUI (`config.php` options in parens):
  - CURL GET Timeout (`curlTimeoutGET`)  
The timeout used when curl connects to the Manager for a GET-specific API call, in seconds.
  - CURL POST Timeout (`curlTimeoutPOST`)

The timeout used when curl connects to the Manager for a POST-specific API call, in seconds.

#### New Audit Trail Feature

- The ability to track all write API calls made has been added.
- There will be one audit file per day created in the auditDir (default: {WEBROOT}/audit.d).
- One line per write containing: timestamp, ipaddr, user, role and msg/action
- The new setting is partially available via the GUI (config.php options in parens):
  - Enable Audit Trail (enableAudit)

Capture all POST API calls to a file in the {WEBROOT}/audit.d subdir like audit-{YYMMDD}.log

  - Audit subdirectory name (auditDir) [NOT available via GUI]

The directory used to store the audit files (default: {WEBROOT}/audit.d)

#### New Notes-Per-Node Feature

- You can now store text on a per-node basis.
- There will be one note file per node created in the notesDir (default: {WEBROOT}/notes.d).
- The new setting is partially available via the GUI (config.php options in parens):
  - Enable Per-Node Notes (enableNotes)

Turn on the notes per node feature to capture text to a file in the {WEBROOT}/notes.d subdir, named like {SERVICE}-{FQDN}.txt

  - Note Icon (noteGlyphicon) [NOT available via GUI]

Use noteGlyphicon to specify the note-per-node Glyphicon (default: comment).

  - Notes subdirectory name (notesDir) [NOT available via GUI]

The directory used to store the note files (default: {WEBROOT}/notes.d)

#### New API URL Display Feature

- You can now enable the display of the back-end API call URLs for transparency and learning.
- The new setting is available via the GUI (config.php options in parens):
  - Enable API URL Display (enableURLDisplay)

Display the API call URL for each command run.

#### New Flag-On-Lag Feature

- You can now automatically highlight node rows where the Replicator is lagging by a specified number of seconds.
- The new setting is available via the GUI (config.php options in parens):
  - Flag-On-Lag Delay (flagOnLagDelay) (in seconds)

Set this option to a non-zero value to enable node row highlighting when the Replica is more than the specified number of seconds behind the Primary.

  - Flag-On-Lag Color (flagOnLagColor)

The background color to use when marking a node row as too far behind. One of Info (blue), Warning (yellow) or Danger (red).

## 8.12. Tungsten Dashboard 1.0.9 GA [12 August 2020]

Version End of Life. 11 August 2021

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.9 provides a number of new features, improvements and bugfixes.

## Dashboard Configuration

- Now able to configure Dashboard settings via the browser

You can disable the editing of settings in the browser by changing the value of `disableSettingsEdit` to `1` in the `config.php` file, in the `"settings": { }` stanza:

```
"disableSettingsEdit": 1
```

- All settings configured via the browser page are stored in the `{webroot}/settings.d/` directory as individual JSON text files named for the setting. Please ensure it exists and is writable by the web server user.
- You may edit or delete any of the files in the `{webroot}/settings.d/` directory. The setting will revert to the default if deleted. you may also choose to configure settings in this way as opposed to using the `config.php` file. Your choice.
- Refactored all options and created centralized defaults

## Software Update

- Now able to self-update the Dashboard software via the browser

There are four related settings, `enableUpdates`, `tmpDir`, `downloadAccessKey` and `downloadSecretKey`.

All four must be located in the `config.php` file, in the `"settings": { }` stanza. They are not accessible from the browser settings page.

You can disable the Dashboard self-update feature by changing the value of `enableUpdates` to `0` in `config.php` (default: `1`):

```
"enableUpdates": 1
```

The `tmpDir` value is used to determine where downloaded software packages are saved to:

```
"tmpDir": "/tmp"
```

The other two (`downloadAccessKey` and `downloadSecretKey`) need to be obtained from Continuent support and typically ship with the Dashboard installation package.

## Cluster Definitions

- Now able to manually create and save cluster definitions in the `conf.d` subdirectory. Originally, a cluster could only be defined in the `"clusters": { }` stanza.
- Now able to create and save cluster definitions to the `conf.d` subdirectory via a browser workflow
- Added Display, Edit and Remove Cluster Definition menu choices for each cluster
- Now able to automatically define cluster definitions in `conf.d` just by providing a hostname and port number in a browser workflow
- Now able to automatically define cluster definitions in `conf.d` at Dashboard startup

There are three related settings, `enableAutoConfiguration`, `managerPort` and `useHAProxy`.

You can enable the Dashboard auto-configuration feature by changing the "Enable Auto-Configuration?" setting via the Dashboard settings page in the browser, or changing the value of `enableAutoConfiguration` to `1` in `config.php` (default: `0`) or via the Dashboard settings page in the browser:

```
"enableAutoConfiguration": 1
```

The `managerPort` value is used to determine what port to communicate with the manager upon when performing auto-configuration and auto-define, as well as populating form fields in other places. Only change this if you have change the API listener port for the Manager as well.

```
"managerPort": 8090
```

The `useHAProxy` value is used to determine how to calculate ports when performing auto-configuration and auto-define.

Set the value to `1` to determine the manager port number automatically during various operations based on calculations using the base `managerPort`.

Set the value to `0` (default) to use the base `managerPort` with no attempt to auto-define the port.

You can enable the manager port auto-configuration feature by changing the "Using HA Proxy?" setting via the Dashboard settings page in the browser, or changing the value in the `config.php` file.

```
"useHAProxy": 1
```

## UI/UX

- Role name cleaning (Master is now Primary, and Slave is now Replica for nodes; Master is now Active, and Slave is now Passive for clusters)
- Improve error handling for JSON responses to AJAX calls
- Bug fixes in service alias support
- Many footer improvements, including a link to check for an available Dashboard software update
- Stop providing tabInfo during initial page load, instead do it as AJAX call after load to save initial page load time

## Dashboard Diagnostics

- Now able to upload a Dashboard Diagnostic containing the JSON configuration to Continuent Support's protected AWS bucket. No other customer has access to this location, it is upload-only.

There are three related settings, `customerName`, `uploadAccessKey` and `uploadSecretKey`.

The `customerName` value is used to pre-populate the diagnostic upload form.

```
"customerName": "your customer name here"
```

The other two (`uploadAccessKey` and `uploadSecretKey`) need to be located in `config.php`

```
"uploadAccessKey": "AKIAIWDZPQE5YL4SBDQ", ]
"uploadSecretKey": "FQ0iVktTtH9biIZT2+IpwXwhqXvVwqMUqsZ4++N4K" ]
```

## Misc Admin

- New Expert mode disables both confirmation prompts when Deleting All Definitions

The default is 0 (disabled). Set `enableExpertMode` to 1 (one) to enable.

```
"enableExpertMode": 1
```

- Use the `enableDebug` setting to get additional logging information and use the debug software versions when checking for an available update.

```
"enableDebug": 1
```

## 8.13. Tungsten Dashboard 1.0.8 GA [4 June 2020]

Version End of Life. 3 June 2021

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.8 provides a number of new features, improvements and bugfixes.

- Added basic Role-Based Access Control (RBAC). There are two roles, Administrator with full access and Operator with Read-Only access. This feature requires Basic Auth to be properly configured on the Web server.

When enabled, the user's current role will be displayed in the footer. Refresh the page to activate any changes to `config.php`.

The default is 0 (disabled). Set `enableRBAC` to 1 (one) to enable.

```
"enableRBAC":1
```

Use the `administrators` setting to list the users with admin privs:

```
"administrators": [ "adminUser1", "adminUser2" ]
```

- Improved page load performance via caching of API calls. This is especially helpful with Composite clusters that have multiple sites over a wide area.
- Added the ability to modify the browser window title using the new configuration option `windowTitle`
- Added the ability to change the cluster service sort order from the alpha default to as-written configuration order using the new configuration option `sortByConfigOrderNotAlpha`
- Site favicons along with the navigation bar logo and colors have been updated to promote a cleaner look. Additional icon replacements and color tweaks have been made throughout the tool.
- Added hover-based tooltips for all fields and buttons where possible. Set `disableTooltips` to 1 to prevent the tooltips from appearing.

- Significantly improved the Connector popover formatting, sorting and operation.
- Message handling is improved so that multiple actions and responses are tracked and messaged properly.
- Added the ability to view the json configuration in the browser via a menu link.
- Added the ability to check for Dashboard software updates.
- Added the ability to check for Clustering software updates on a per-node basis.

Tungsten Dashboard is compatible with both the Tungsten Clustering 5.3.x series and 6.x series.

## 8.14. Tungsten Dashboard 1.0.7 GA [26 November 2019]

Version End of Life. 26 November 2020

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.7 provides a number of new features, improvements and bugfixes.

- Added the feature to allow for cluster service name aliases. You may now add the sub-key `actualName` pointing to the "real" name of the service, and change the top-level cluster service name to some alias that you understand.

Previously, it was impossible to configure two or more clusters with the same service name. This could be required if clusters were installed into different environments like production, staging or development. While the best practice is to name the cluster services to match the environment (i.e. `east_prod` and `east_staging`), in some situations this may not be possible.

- Added a new feature to automatically fade out messages after a delay. The default is 60 seconds. Set `msgFadeOutTimer` to 0 (zero) to disable or to a positive integer to specify the delay in seconds.

```
"msgFadeOutTimer":60
```

- Improved the look & feel of the overall layout, including display widths, the location of the timestamp marker and spacing.
- Fixed a bug where the controls to open and close a cluster were STILL not working.
- Fixed a bug where the datasource status details hover was not displaying properly

Tungsten Dashboard is compatible with both the Tungsten Clustering 5.3.x series and 6.x series.

## 8.15. Tungsten Dashboard 1.0.6 GA [3 September 2019]

Version End of Life. 3 September 2020

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.6 is a bugfix and minor feature release.

- Fixed a bug where the controls to open and close a cluster were not working.
- When Auto-refresh is turned on, any issuance of a command will stop the auto-refresh. Simply re-select your desired refresh rate to turn it back on.

Tungsten Dashboard is compatible with both the Tungsten Clustering 5.3.x series and 6.x series.

## 8.16. Tungsten Dashboard 1.0.5 GA [28 June 2019]

Version End of Life. 28 June 2020

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.5 is a bugfix release.

- Fixed CMM cluster bug where clusters other than the first do not show subservices.
- Tweaked cell alignment

Tungsten Dashboard is compatible with both the Tungsten Clustering 5.3.x series and 6.x series.

## 8.17. Tungsten Dashboard 1.0.4 GA [11 April 2019]

Version End of Life. 11 April 2020

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.4 is a bugfix release.

- Fixed cluster-level open/close regression.
- Tweaked error text and reduced noise in the logs.

Tungsten Dashboard is compatible with both the Tungsten Clustering 5.3.x series and 6.x series.

## 8.18. Tungsten Dashboard 1.0.3 GA [22 March 2019]

Version End of Life. 22 March 2020

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.3 is a feature release for better global controls and customization.

The default for `navButtonFormat` is `icon` if not specified.

- Added modal "Stop Auto-Refresh" button which will turn off the Auto-refresh feature. This button is only visible if auto-refresh is enabled.
- Added ability to set global buttons to icon, text or some combination. Use the setting `navButtonFormat` and specify one or more of `icon` or `text` as a comma-separated string, no spaces. Order counts.

```
$jsonConfig = <<<E0J
{
  "settings": {
    "navButtonFormat": "icon",
    ...
  }
}
E0J;
```

Currently there are four [4] possible entries:

```
"navButtonFormat": "icon",
"navButtonFormat": "text",
"navButtonFormat": "icon,text",
"navButtonFormat": "text,icon",
```

Tungsten Dashboard is compatible with both the Tungsten Clustering 5.3.x series and 6.x series.

## 8.19. Tungsten Dashboard 1.0.2 GA [20 September 2018]

Version End of Life. 20 September 2019

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.2 is a bug fix release for better API error handling.

- Refactored API calls for better error handling.
- Better error reporting on the front-end.

Tungsten Dashboard is compatible with both the Tungsten Clustering 5.3.x series and 6.x series.

## 8.20. Tungsten Dashboard 1.0.1 GA [17 September 2018]

Version End of Life. 17 September 2019

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

Tungsten Dashboard v1.0.1 is a bug fix release that also contains a few improvements.

- Support for Composite Active/Active topology offered in Continuent Clustering v6.x [requires Continuent Clustering version 6.0.3]
- Improvements to the menu system layout and clarity
- Composite-level cluster commands have been relocated to a new menu to the right of the State field

- Composite clusters now display the actual composite state instead of the Ready/Warning/Error status indicators, and status indicator lights have been moved to the left of the State label
- Improvements to the locking system:
  - Auto-Lock and Auto-Unlock are now both configurable via config.php
  - Auto-Lock and Auto-Unlock setting are now both visible at the bottom of the cluster-level locking menu
  - Auto-Lock may be configured to attempt a lock for all actions, heartbeats only, or not at all
  - Auto-Unlock may be configured to attempt an unlock for all actions, heartbeats only, or not at all
- Additional formatting tweaks, including the reduction in height of the rows

Tungsten Dashboard is compatible with both the Tungsten Clustering 5.3.x series and 6.x series.

## 8.21. Tungsten Dashboard 1.0.0 GA [10 May 2018]

Version End of Life. 10 May 2019

Tungsten Dashboard provides a web-based UI for monitoring and managing Tungsten Clustering deployments.

It supports the following features:

- Full monitoring information on the status and progress of replication and the status of the cluster
- Monitor multiple clusters through a single page
- Perform switches and failovers
- Shun hosts
- Recover failed hosts

Tungsten Dashboard is compatible with the Tungsten Clustering 5.3.x series.

## 9. Tungsten MI [TMI] Release Notes

### 9.1. Tungsten MI [TMI] 8.0.3.2 GA [13 Mar 2026]

Version End of Life. Not Yet Set

These images launch with version 8.0.3 build 39 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 8.0.3 Release Notes](#) and [Tungsten Replicator 8.0.3 Release Notes](#)

Bug Fixes

Installation and Deployment

- Resolves a "Missing Library" error when launching appliers.

*Issues:* TMI-16

### 9.2. Tungsten MI [TMI] 8.0.3.1 GA [23 Feb 2026]

Version End of Life. Not Yet Set

These images launch with version 8.0.3 build 38 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 8.0.3 Release Notes](#) and [Tungsten Replicator 8.0.3 Release Notes](#)

### 9.3. Tungsten MI [TMI] 8.0.2.1 GA [13 Jan 2026]

Version End of Life. Not Yet Set

This release includes a number of minor fixes to the launch Wizard and is shipped with the newest Tungsten product release.

These images launch with version 8.0.2 build 87 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 8.0.2 Release Notes](#) and [Tungsten Replicator 8.0.2 Release Notes](#)

#### Behavior Changes

The following changes have been made to Tungsten MI that changes the behavior of the MI, this could include a change in default values or in methods required to configure the host.

#### Installation and Deployment

- The images now launch with Java 21

*Issues:* TMI-12

- The default MySQL root password has been changed for MySQL installations as part of the Clustering builds. The password will be presented at the end of the Wizard setup and should subsequently be changed manually by the user after installation.

*Issues:* TMI-13

- The `binlog_format` is now set to ROW by default for all Cluster topology installations.

*Issues:* TMI-14

#### Bug Fixes

##### TMI Configuration Wizard

- When configuring a MySQL Applier to apply to a Tungsten Cluster, a number of ini properties were not correctly applied to the generated `tungsten.ini` file. This has now been corrected.

*Issues:* TMI-10

- The README files have now been updated to include the correct URL directing to the Prerequisite doc pages

*Issues:* TMI-11

- When choosing a new hostname or servicename during the Wizard process, the script will ensure the entered text does not contain any invalid characters

*Issues:* TMI-15

## 9.4. Tungsten MI (TMI) 8.0.1.1 GA [9 Oct 2025]

Version End of Life. Not Yet Set

These images launch with version 8.0.1 build 185 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 8.0.1 Release Notes](#) and [Tungsten Replicator 8.0.1 Release Notes](#)

No changes were made to the TMI Launch wizard in this release.

## 9.5. Tungsten MI (TMI) 8.0.0.1 GA [28 Apr 20225]

Version End of Life. Not Yet Set

This release includes a number of minor fixes to the launch Wizard and is shipped with the newest Tungsten product release.

These images launch with version 8.0.0 build 305 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 8.0.0 Release Notes](#) and [Tungsten Replicator 8.0.0 Release Notes](#)

#### Behavior Changes

The following changes have been made to Tungsten MI that changes the behavior of the MI, this could include a change in default values or in methods required to configure the host.

##### Behavior Changes

- Install wizard now includes the new `cloud-install=true` when configuring against a cloud source or target.

*Issues:* TMI-7, CT-2317

- Fixed an issue which prevented the launch wizard creating a valid configuration for MongoDB Atlas appliers.

*Issues:* TMI-8

## 9.6. Tungsten MI [TMI] 7.1.4.3 GA [27 Mar 2025]

Version End of Life. Not Yet Set

This release includes a number of minor fixes to the host operating systems configurations and included packages.

These images launch with version 7.1.4-11 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 7.1.4 Release Notes](#) and [Tungsten Replicator 7.1.4 Release Notes](#)

### Behavior Changes

The following changes have been made to Tungsten MI that changes the behavior of the MI, this could include a change in default values or in methods required to configure the host.

#### Behavior Changes

- Images no longer include the gstreamer package. This isn't required for Tungsten products and therefore removing from the built VM's bypasses issues with known vulnerabilities in gstreamer.

*Issues:* TMI-9

## 9.7. Tungsten MI [TMI] 7.1.4.2 GA [9 Jan 2025]

Version End of Life. Not Yet Set

This release includes a number of minor fixes to the host operating systems configurations and included packages.

These images launch with version 7.1.4-11 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 7.1.4 Release Notes](#) and [Tungsten Replicator 7.1.4 Release Notes](#)

### Behavior Changes

The following changes have been made to Tungsten MI that changes the behavior of the MI, this could include a change in default values or in methods required to configure the host.

#### Behavior Changes

- Install wizard now includes `install=true` by default ensuring that Tungsten components are correctly registered with systemctl and will start automatically when the host boots.

*Issues:* TMI-2

### Bug Fixes

#### Installation and Deployment

- The selinux contexts are now set correctly to ensure software will start correctly via systemctl.

*Issues:* TMI-4

- The host now includes the `perl-sigtrap` module required by a number of Tungsten scripts

*Issues:* TMI-5

- The host now includes the `ed25519` and `bcrypt-pbkdf` ruby gems required by a number of Tungsten scripts

*Issues:* TMI-6

## 9.8. Tungsten MI [TMI] 7.1.4.1 GA [12 December 2024]

Version End of Life. Not Yet Set

This release marks a change in name from Tungsten AMI which was specific to Amazon AWS, to Tungsten MI [TMI] which coincides with the launch of the images to the Google GCP Marketplace.

To ensure consistency across cloud providers, the AWS images now launch on Rocky Linux 9.5, previously Amazon Linux 2. GCP images also launch with the same.

These images launch with version 7.1.4-11 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 7.1.4 Release Notes](#) and [Tungsten Replicator 7.1.4 Release Notes](#)

### Important

The "Tungsten Clustering for MySQL 5.7" images on AWS are no longer available

## 9.9. Tungsten MI [TMI] 7.1.2 GA [9 April 2024]

Version End of Life. Not Yet Set

This AMI release fixes a few issues with the launch wizard, which now allows easy configuration with IPv6 hosts.

It was launched with version 7.1.2-42 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 7.1.2 Release Notes](#) and [Tungsten Replicator 7.1.2 Release Notes](#)

## 9.10. Tungsten MI [TMI] 7.0.1 GA [20 June 2022]

Version End of Life. Not Yet Set

For this release, the version number of the AMI was adjusted to be in line with the version of the Tungsten Products that are shipped with the images.

This AMI release was launched with version 7.0.1-96 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 7.0.1 Release Notes](#) and [Tungsten Replicator 7.0.1 Release Notes](#)

## 9.11. Tungsten MI [TMI] 5.0.0 GA [10 May 2020]

Version End of Life. Not Yet Set

This AMI release resolves Amazon Linux OS vulnerabilities identified by AWS and a number of small improvements in the deployment Wizard for manual configurations.

It was launched with version 6.1.12-53 of the Tungsten suite of products. The product specific release notes for this release can be found at [Tungsten Clustering 6.1.12 Release Notes](#) and [Tungsten Replicator 6.1.12 Release Notes](#)

### Bug Fixes

#### Operating System/3rd Party Packages

- Addresses OS security vulnerability identified by AWS (More info at <https://alas.aws.amazon.com/AL2/ALAS-2019-1367.html>)
- Deployment Wizard now correctly configures the `tungsten.ini` for the MongoDB Atlas applier.

*Issues:* CT-1161

- When configuring a cluster-extractor to apply into AWS Redshift, the `s3.json` configuration file would be named incorrectly.

*Issues:* CT-1219

## 9.12. Tungsten MI [TMI] 4.0.0 GA [17 December 2020]

Version End of Life. Not Yet Set

This AMI release brings the Tungsten Replicator and Tungsten Clustering AMI's in line with the latest release of the core products, in addition new Cloudformation Templates were released to allow easier deployment of Tungsten Clustering.

### Improvements, new features and functionality

#### Installation and Deployment

- The MongoDB applier now supports replication into MongoDB Atlas.

### Bug Fixes

#### Operating System/3rd Party Packages

- Addresses OS security vulnerability identified by AWS (More info at <https://alas.aws.amazon.com/AL2/ALAS-2019-1367.html>)

## 9.13. Tungsten MI (TMI) 3.0.0 GA [20 July 2020]

Version End of Life. 17 December 2020

The v3.0 AMI release introduces two new AMI's for Tungsten Clustering.

Known Issues

Installation and Deployment

- Cloudformation support for Composite Active/Active and Composite Active/Passive clusters will only allow all clusters to be deployed within the same AWS region. This will be addressed in a future release.

## 9.14. Tungsten MI (TMI) 2.0.0 GA [11 November 2019]

Version End of Life. 17 December 2020

The v2.0 AMI release includes additional Targets and a more simplified deployment wizard.

Improvements, new features and functionality

Behavior Changes

- Additional support added for the following Targets:
  - Oracle
  - Cassandra
  - Clickhouse
  - Elasticsearch
  - Hadoop
  - MongoDB
- Support added to allow easy configuration of extraction from, or replication into, an existing Tungsten Cluster.
- Installation Wizard now makes it easier to enable additional properties, such as SSL and basic filtering
- Ships with the latest v6.1.1 release of Tungsten Replicator

## 9.15. Tungsten MI (TMI) 1.0.0 GA [6 June 2019]

Version End of Life. 11 November 2019

The first release of the Tungsten AMI on the Amazon Marketplace is available and supports replication out of MySQL (Community Edition, Enterprise Edition, Percona, MariaDB, Amazon RDS/Aurora) into the following targets:

- MySQL (Community Edition, Enterprise Edition, Percona, MariaDB, Amazon RDS/Aurora)
- AWS Redshift
- Vertica
- PostgreSQL
- Kafka

Known Issues

Installation and Deployment

- Additional Targets will be supported in a future release.