Intermediate: Performing Cluster Maintenance with Zero Downtime
Topics

In this short course we will:

• Review the Cluster Architecture
• Describe the Rolling Maintenance Process
• Explore what happens during a Master Switch
• Discuss Cluster States
• Demonstrate Rolling Maintenance
• Re-Cap Commands and resources used during the demo

Course Prerequisite Learning

– Basics: Introduction to Clustering
– Visit the Continuent website or Tungsten University on YouTube to watch these recordings
  • Continuent website https://www.continuent.com/videos/
  • Tungsten University on YouTube https://www.youtube.com/channel/UCZ9iU-7nT1RLNnJvTFCsWA or http://tinyurl.com/TungstenUni
Tungsten Cluster Architecture
Tungsten Cluster Architecture
Zero-Downtime Rolling Maintenance
Rolling maintenance proceeds node-by-node starting with the slaves and ending with the master

Slave upgrade
- Shun slave
- Upgrade MySQL
- Return node to cluster
- Discard and re-provision upon failure

Slave upgrade
- Repeat for remaining slave(s)

Switch
- Switch master to promote an upgraded slave

Master upgrade
- Upgrade old master
- Maintenance is now done!
Zero-Downtime Maintenance: The Switch

- The key to performing maintenance is the manual switch operation, where another node is selected to be the master.
- The switch command is invoked inside the cctrl command-line utility. In the below example, the Manager is allowed to select the new node:
  
  ```
  cctrl> switch
  ```
  
  - Instead of allowing the cluster to decide, you can switch to a specific node:
    ```
    cctrl> switch to db3
    ```
  - Make sure replication is 100% caught up before you switch because the cluster will let you switch to a new master that is missing transactions!
The process of switching the Master...

1. Halt in-coming connections

2. Master is shunned, wait for in flight queries to complete

[LOGICAL] /nyc > switch
The process of switching the Master...

1. Select and promote the most up-to-date slave
2. Bring replicator online as Master
3. Resume query flow using new Master

[LOGICAL] /nyc > switch
The process of switching the Master...

6. Convert old Master to a Slave

7. Reconfigure Slave replicators to use the new Master

8. Replication Recovered, Switch Complete

[LOGICAL] /nyc > switch
Rolling maintenance steps - Recap

• set policy maintenance
• On Slave Node:
  – datasource <node> shun
  – replicator <node> offline
    • Perform Maintenance
  – datasource <node> recover
• Repeat on all Slave Nodes
• Promote a Slave to Master
  – switch
• Repeat steps on old Master after switch complete
Cluster States

- **AUTOMATIC**
  - “set policy automatic”
  - When the cluster is in Automatic Mode,
    - Automatic Recovery of services is attempted
    - Automatic Failover will happen if the Master node fails
  - Cluster should ALWAYS be in this state under normal operation

- **MAINTENANCE**
  - “set policy maintenance”
  - Automatic Recovery of services will NOT happen
  - Failover will not occur if Master node fails
  - Cluster should NEVER be left in this state in Normal Operation
  - This state should only be used for Maintenance Operations
Cluster Datasource states

- **ONLINE**
  - “datasource <node> online”
  - The node is Online and available to Failover (if a slave) and data operations

- **OFFLINE**
  - “datasource <node> offline”
  - Not available for data operations.
  - Will not accept connections through the connector
  - Still receives and processes replication data
  - If cluster in AUTOMATIC Mode, cluster will attempt automatic recovery to ONLINE state

- **SHUNNED**
  - “datasource <node> shun”
  - As per OFFLINE but automatic recovery will NOT be attempted
Rolling Maintenance Demo

- Tungsten Clustering 5.2
- Connectors in Port-Based Routing mode
- Amazon AWS EC2
- MySQL Community 5.7
- Java 1.8
- Ruby 2.0
- Maintenance: Change location of MySQL Error Log
Command Line Tools
&
Resources
Tools : cctrl

- “cctrl” can be run from any node within a cluster to control the local cluster and gather information
- Type “help” to get a full list of all commands available
- “ls” provides a summary overview of the entire cluster
- “datasource <node> shun”  
  - Isolates node in cluster
- “replicator <node> offline”  
  - Stop node receiving replication data
- “datasource <node> recover”  
  - Re-Introduce node to cluster
- “switch” or “switch to <node>”
Tools: trepctl

- “trepctl status” can be run from any node within a cluster to view the status of the local replicator
- “trepctl status –r 3” will show status output refreshed every 3 second until CTRL+C
- “trepctl qs” provides a quick summary overview of the local replicator
- “trepctl perf” provides deeper diagnostics of the different stages in the replicators
- “trepctl offline|online”

```
$ trepctl qs
State: east Online for 21.069s, running for 45.654s
Latency: 0.837s from DB commit time on db1 into THL
21.839s since last database commit
Sequence: 1 last applied, 0 transactions behind (0-1 stored) estimate 0.00s before synchronization
```
Tools: tpm connector

- Simple and quick way to connect to MySQL CLI
- Tungsten Commands to query database and cluster stats
  - Connector-based Tungsten commands are NOT available in Bridge Mode
  - This is a good way to tell if you are in Bridge mode – if no commands are available, then you are in Bridge mode
  - "tungsten help" will show all commands available

```sql
mysql> tungsten help;
+-----------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+---------------------------------------------------------------+
| Message                                                                                           | display information about the connection used for the last request ran | gives the count of current connections to each one of the cluster datasources | prints detailed information about the cluster view this connector has | list all running queries handled by this connector instance | list connector configuration options in use. The <string> may contain '%' wildcards | reload user.map and refresh user credentials | display memory information about current JVM | calls garbage collector | display this help message |
| tungsten connection status:                                                                         |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
| tungsten connection count:                                                                           |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
| tungsten cluster status:                                                                            |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
| tungsten show [full] processlist:                                                                   |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
| tungsten show variables [like '<string>']:                                                           |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
| tungsten flush privileges:                                                                          |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
| tungsten mem info:                                                                                  |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
| tungsten gc:                                                                                        |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
| tungsten help:                                                                                       |                                                                            |                                                                              |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |                                                                            |
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9 rows in set (0.00 sec)
```
Log Files

- The `/opt/continuent/service_logs/` directory contains both text files and symbolic links for cluster log files.

- Links in the `service_logs` directory go to one of three [3] subdirectories:
  - `/opt/continuent/tungsten/tungsten-connector/log/`
  - `/opt/continuent/tungsten/tungsten-manager/log/`
  - `/opt/continuent/tungsten/tungsten-replicator/log/`

---

```
tungsten@db1:/opt/continuent/service_logs $ ls -l
total 116
lrwxrwxrwx 1 tungsten tungsten  61  Jun 22 09:52 connector.log -> /opt/continuent/tungsten/tungsten-connector/log/connector.log
lrwxrwxrwx 1 tungsten tungsten  62  Jun 22 09:52 mysqldump.log -> /opt/continuent/tungsten/tungsten-replicator/log/mysqldump.log
lrwxrwxrwx 1 tungsten tungsten  55  Jun 22 09:52 tmsvc.log -> /opt/continuent/tungsten/tungsten-manager/log/tmsvc.log
lrwxrwxrwx 1 tungsten tungsten  60  Jun 22 09:52 trepsvc.log -> /opt/continuent/tungsten/tungsten-replicator/log/trepsvc.log
lrwxrwxrwx 1 tungsten tungsten  63  Jun 22 09:52 xtrabackup.log -> /opt/continuent/tungsten/tungsten-replicator/log/xtrabackup.log
```
Tools: tpm diag

- Provides support engineers with an entire overview of the cluster state, by:
  - Gathering point-in-time status of all components in a cluster
  - Gathering log files of all components in a cluster, including database logs to provide historical information
  - Bundles everything into one easy zip file that can be attached to a support case
  - ALWAYS create a diag package when you contact support for assistance

- tungsten_send_diag
  -Executes “tpm diag” to generate the diagnostic package
  -Automatically uploads the package to support
  -https://docs.continuent.com/tungsten-clustering-5.2/cmdline-tools-tungsten_send_diag.html

```
tungsten@db1:/opt/continuent/service_logs $ tungsten_send_diag -d -c 1234
```
Next Steps

• If you are interested in knowing more about the clustering software and would like to try it out for yourself, please contact our sales team who will be able to take you through the details and setup a POC – sales@continuent.com

• Read the documentation at http://docs.continuent.com/tungsten-clustering-5.2/index.html

• Subscribe to our Tungsten University YouTube channel! http://tinyurl.com/TungstenUni

• Visit the events calendar on our website for upcoming Webinars and Training Sessions https://www.continuent.com/events/

• Tues 3rd October : Advanced: Performing Schema Changes in a Multi-Site/Multi-Master Cluster https://attendee.gotowebinar.com/register/8332481030891376387

• Percona Live: Europe : 26th – 28th September : https://www.percona.com/live/e17/
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