

# Tungsten Cluster Master Class

## Basics: Tungsten Cluster – Under the Hood

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# Topics

In this short course, we will

- Review the key benefits offered by Continuent Tungsten Cluster
- Examine the cluster architecture
  - The Manager
  - The Connector
  - The Replicator
- Compare Topologies
- How does failover work?
- Rolling Maintenance

# Benefits of Tungsten Cluster

# Tungsten Key Benefits



## Continuous MySQL Operations

- MySQL High Availability and Disaster Recovery solution, which provides redundancy within and across data centers
- Immediate failover for maximum availability and data protection of business-critical MySQL applications
- Reduce MySQL recovery time from hours or days to mere seconds
- Dashboard provides graphical view and management of all globally distributed MySQL clusters



## Zero Downtime MySQL

- Site-level and cross-site failover ensures application availability
- Upgrade hardware, software and data without taking applications offline
- MySQL compatibility means seamless migration of your data and applications

# Tungsten Key Benefits



## Geo-Scale MySQL

- Load-balance MySQL read operations across multiple slaves, locally and globally
- Geo-distributed MySQL clusters bring data close to your application users for faster response times
- Easily add more MySQL clusters as needed for unlimited scaling, both locally or across the globe



## Hybrid-Cloud and Multi-Cloud MySQL

- Deploy in the cloud, VM and bare metal environments
- Mix-and-match on-premises, private and public clouds (incl. Amazon AWS, Google Cloud and Microsoft Azure)
- Easy, seamless migration from cloud to cloud to avoid vendor lock-in in any specific cloud provider
- Withstand node, data center, zone or region failures or outages

# Tungsten Key Benefits



## Intelligent MySQL Proxy

- Provides intelligent traffic routing to a valid MySQL Primary, locally and globally
- Scale read queries via query inspection and other methods
- Application and active users do not disconnect during MySQL Primary failover events



## Full MySQL Support, No Application Changes

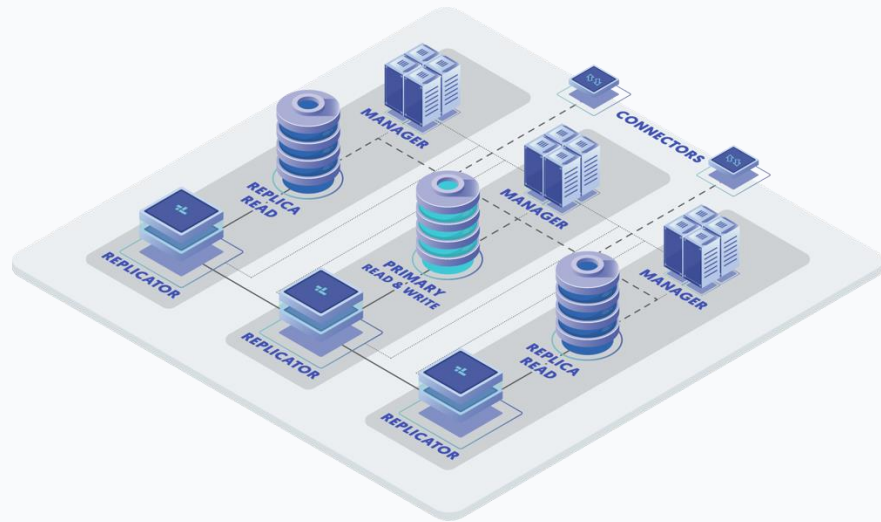
- Deploy and Configure MySQL clusters in minutes
- Not “MySQL-compatible” solution. Use any of your off-the-shelf MySQL, MariaDB and Percona Server versions
- Support for all modern MySQL (5.x through 8.x) and MariaDB (5.x and 10.x) versions and features
- SSL support for all in-flight traffic
- Native MySQL support means easy and complete migration of your data and applications

# Architecture

# Tungsten Cluster

## Core Components

- Connector
- Manager
- Replicator



# Tungsten Cluster

## Core Components

- Connector
- Manager
- Replicator
- Intelligent Proxy
- Read/Write Load Balancing
- Routing Modes
  - Bridge Mode (Default)
  - Proxy Mode
- Routing Methods
  - Port Based
  - Host Based
  - SQL Based
  - Direct Read
  - SmartScale
- Cluster-Aware
- Highly-configurable to suit multiple user requirements

<https://www.continuent.com/blog/mastering-tungsten-clustering-experience-the-power-of-the-tungsten-connector-intelligent-mysql-proxy/>  
<https://www.continuent.com/blog/how-can-i-tell-which-tungsten-connector-mode-i-am-using-bridge-proxy-direct-or-proxy-smartscale/>  
<https://www.continuent.com/blog/configuring-the-tungsten-connector-for-pci-compliance/>

# Tungsten Cluster

## Core Components

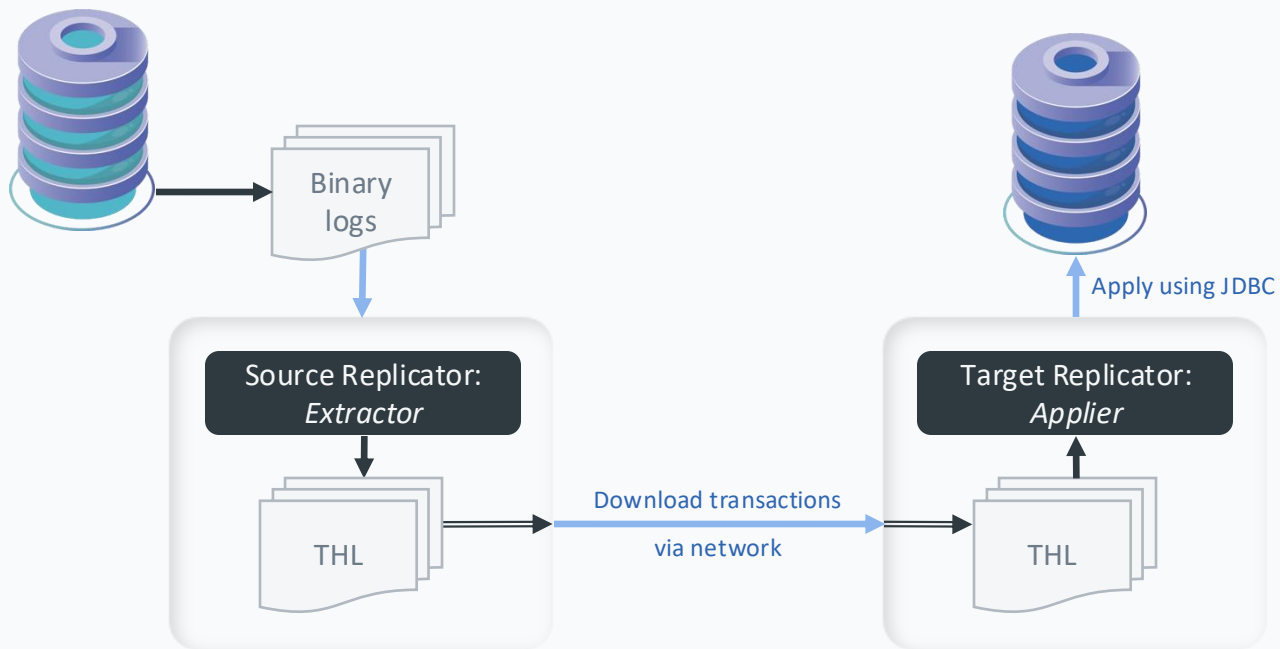
- Connector
  - Manager
  - Replicator
- The “brains” of the cluster
  - Communicates with all components
  - Rule based decision making
  - Monitors
    - Database Instance State
    - Replicator State
  - Provides status information to the Connectors
  - Votes with other managers during Failover and Switchover for Primary selection

# Tungsten Cluster

## Core Components

- Connector
  - Manager
  - Replicator
- Asynchronous Replication
  - Extracts entire events from MySQL binary log
  - Converts to/from THL (Transaction History Log)
  - Multiple stages for best performance
  - Advanced filtering at any stage
  - Extract once, use many means efficiency and lower overhead as a whole

# Tungsten Replicator Operation Within a Tungsten Cluster



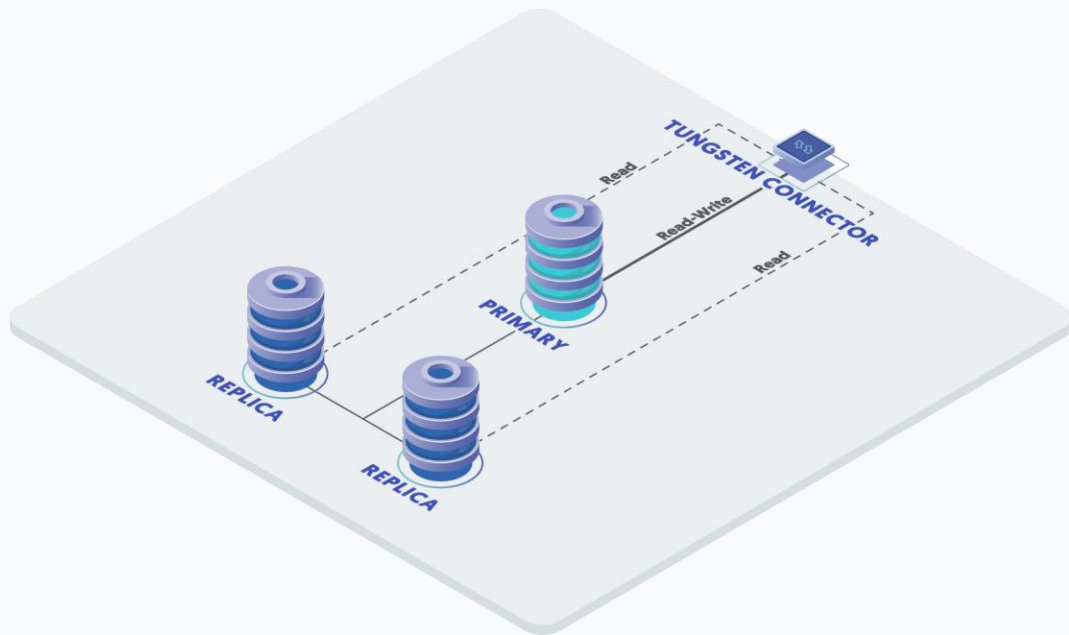
THL = Events + Metadata

# Tungsten Cluster Topologies

# Tungsten Cluster

STA Standalone High Availability Cluster

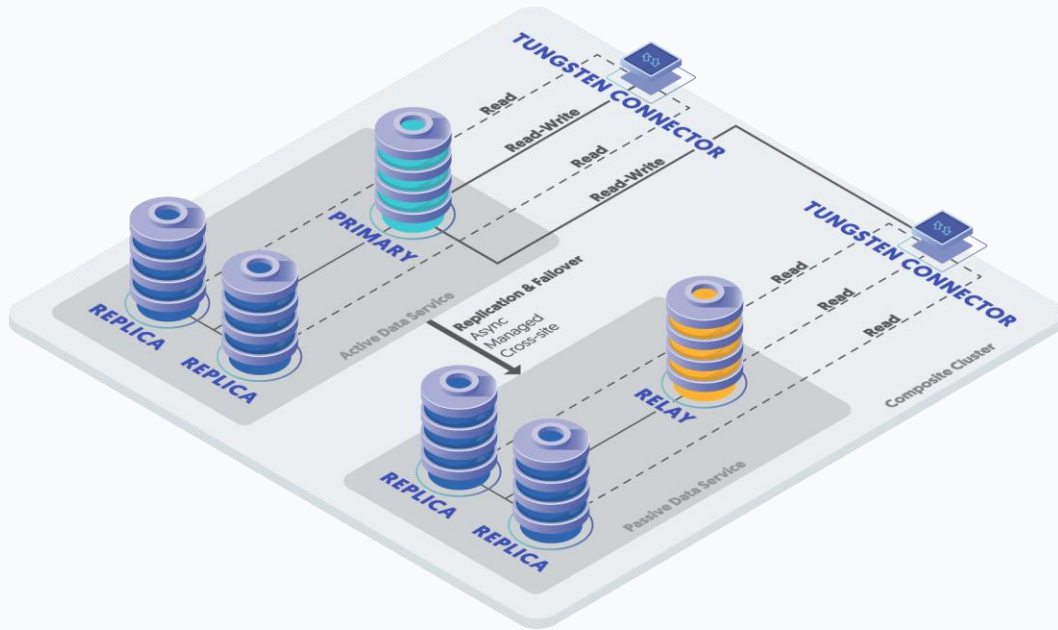
- Minimum 3 nodes
  - 1 Primary
  - 2 Replicas
- Odd number of nodes
- Single datacenter/region



# Tungsten Cluster

**CAP** Composite Active-Passive Topology

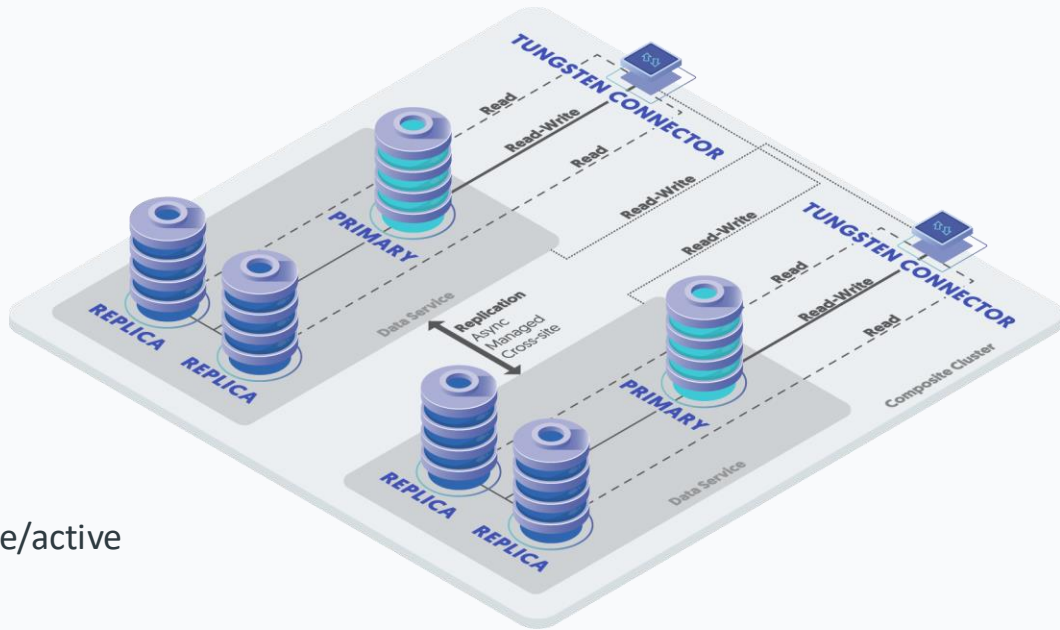
- Minimum 2 clusters
  - Min 3 nodes per cluster
- 1 Cluster for read/write (Active)
- All other clusters read-only (Passive)
- Can be Cross-Region
- Simple to use and implement
- Single, write-able Primary
- Managed cross-site replication
- Often used for Disaster Recovery



# Tungsten Cluster

## CAA Composite Active-Active Topology

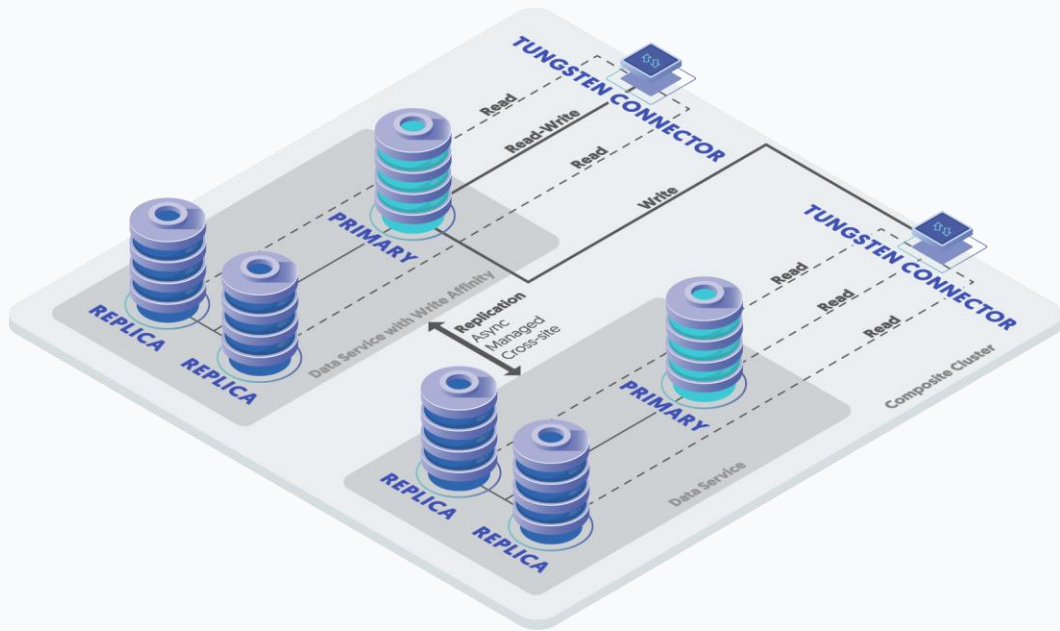
- Minimum 2 Clusters
  - Min 3 nodes per cluster
- All clusters are read/write
- Cross-Region
- Multiple write-able primaries
- Managed cross-site replication – the managers now are aware of and control the cross-site Replication services
- Complex topology, applications must be active/active aware to avoid data conflicts



# Tungsten Cluster

## DAA Dynamic Active-Active Topology

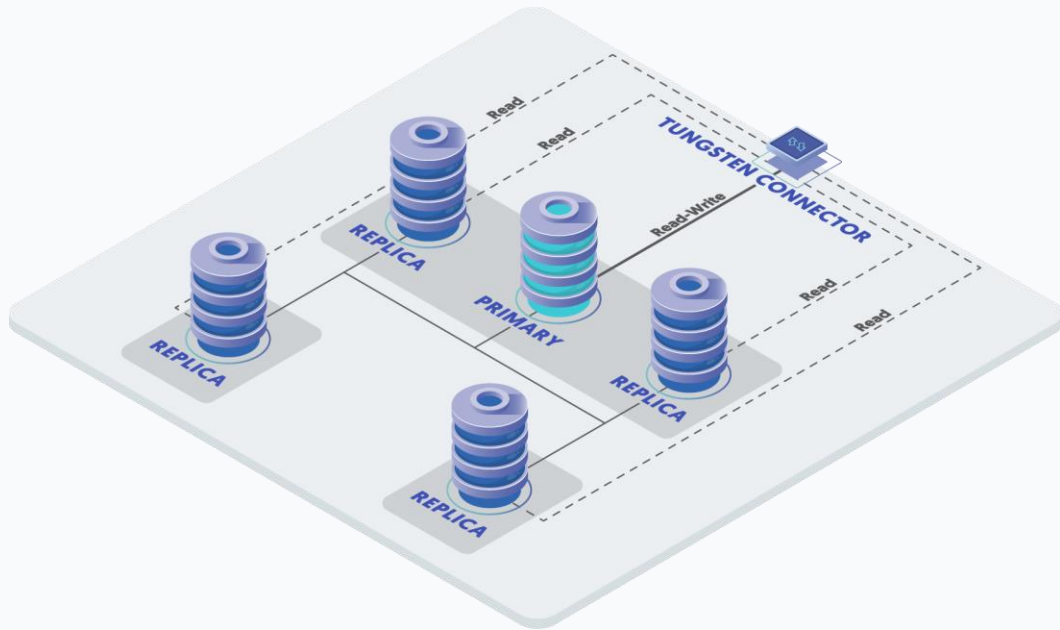
- Introduced in v7.0.0
- Minimum 2 Clusters
  - Min 3 nodes per cluster
- Configured the same as Composite Active/Active
- Behaves like Composite Active-Passive
- Connectors handle routing with all write traffic to designated write cluster using affinity.
- Connectors handle failover of traffic.
- Results in all writes to a single cluster without the need for a manual switch between clusters



# Tungsten Cluster

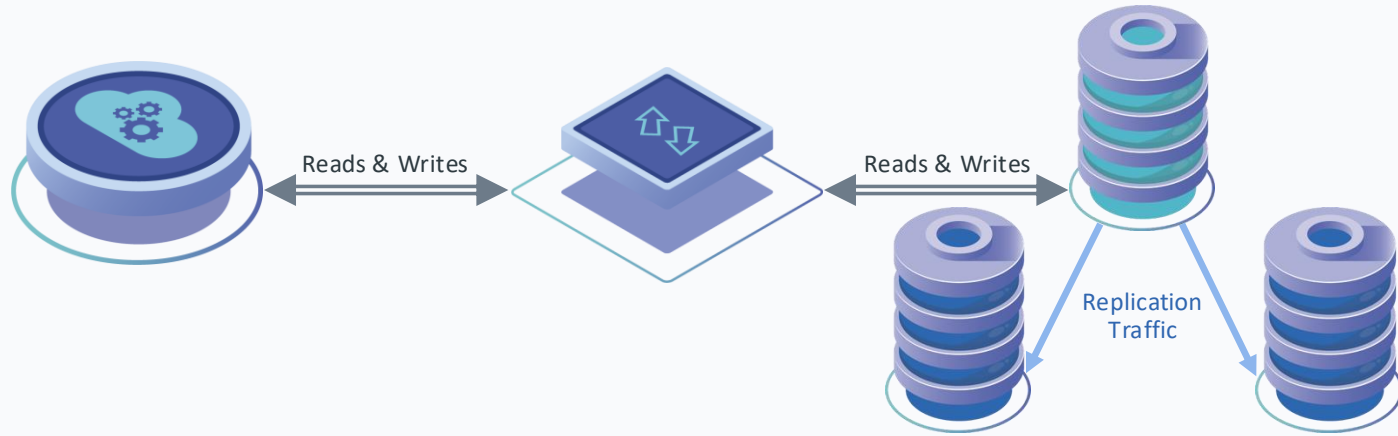
## DDG Dynamic Datasource Groups

- Introduced in v7.1.0
- A single, standalone, cluster with an odd number of nodes
  - 1 Primary
  - Multiple replicas
- Nodes can be distributed across regions
- Nodes are grouped together by a DDG-ID
- Nodes with the same DDG-ID will act as if they are part of a separate cluster, limiting failovers to nodes inside the group until there are no more failover candidates, at which time a node in a different DDG-ID will be selected

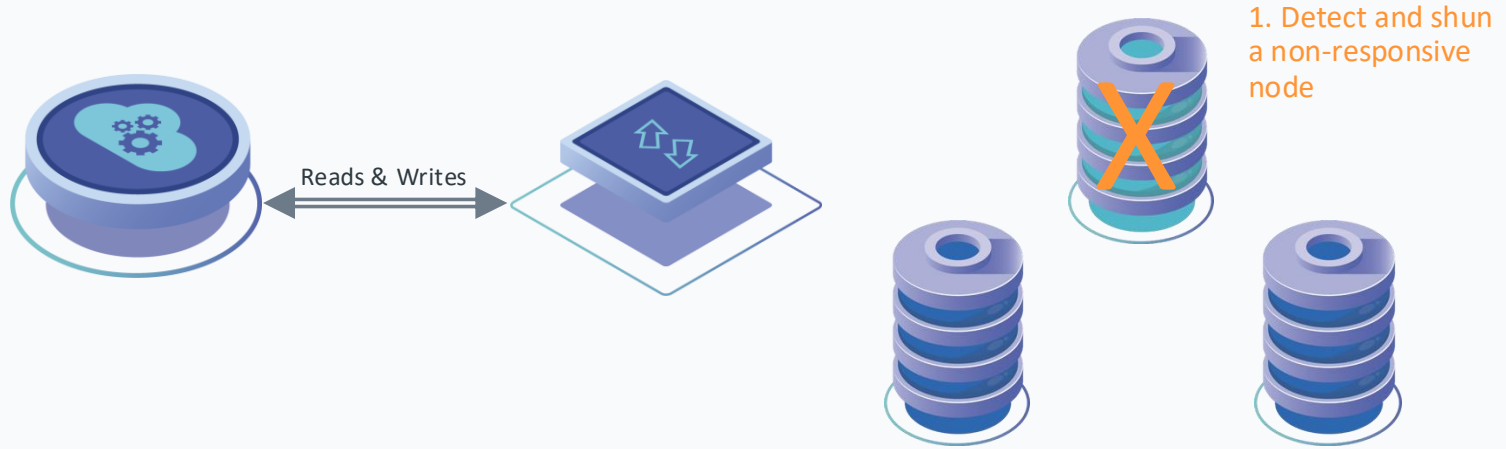


# Automatic Failover

# Automatic Failovers



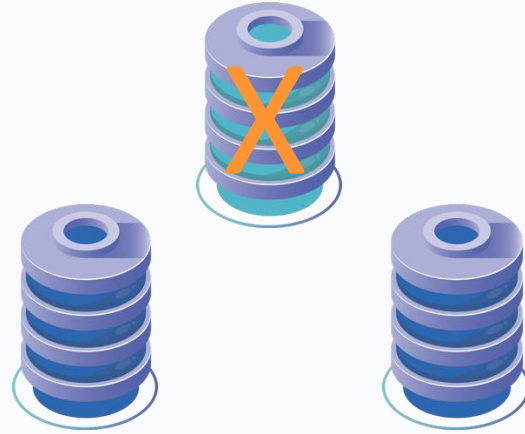
# Automatic Failovers



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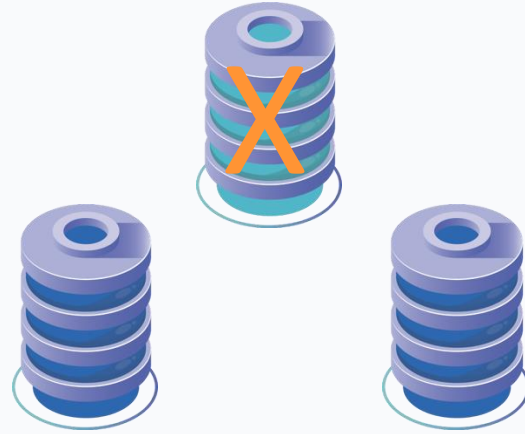
2. Halt  
in-coming  
connections



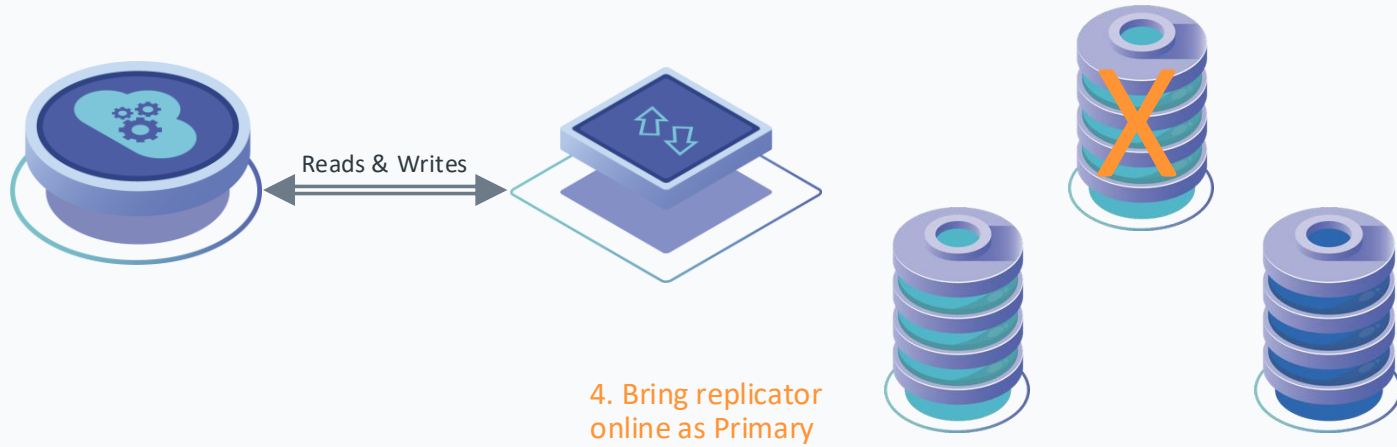
# Automatic Failovers



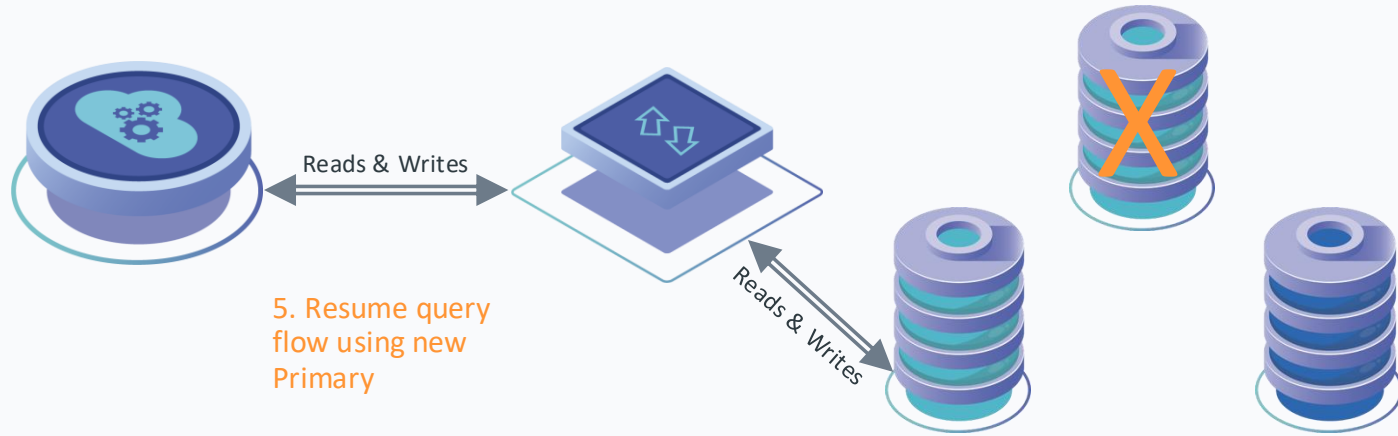
3. Find and promote  
the most up-to-date  
replica



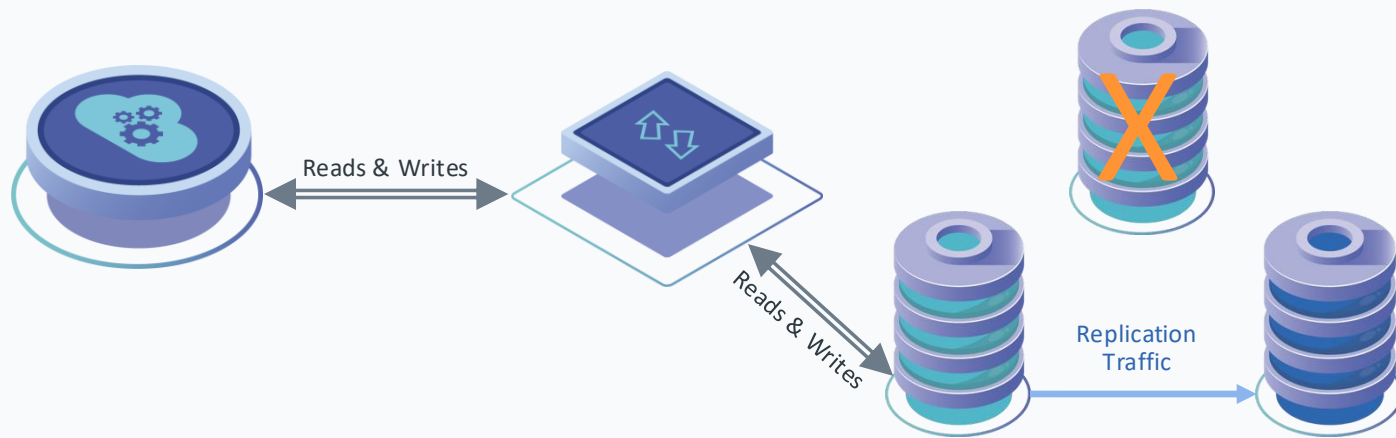
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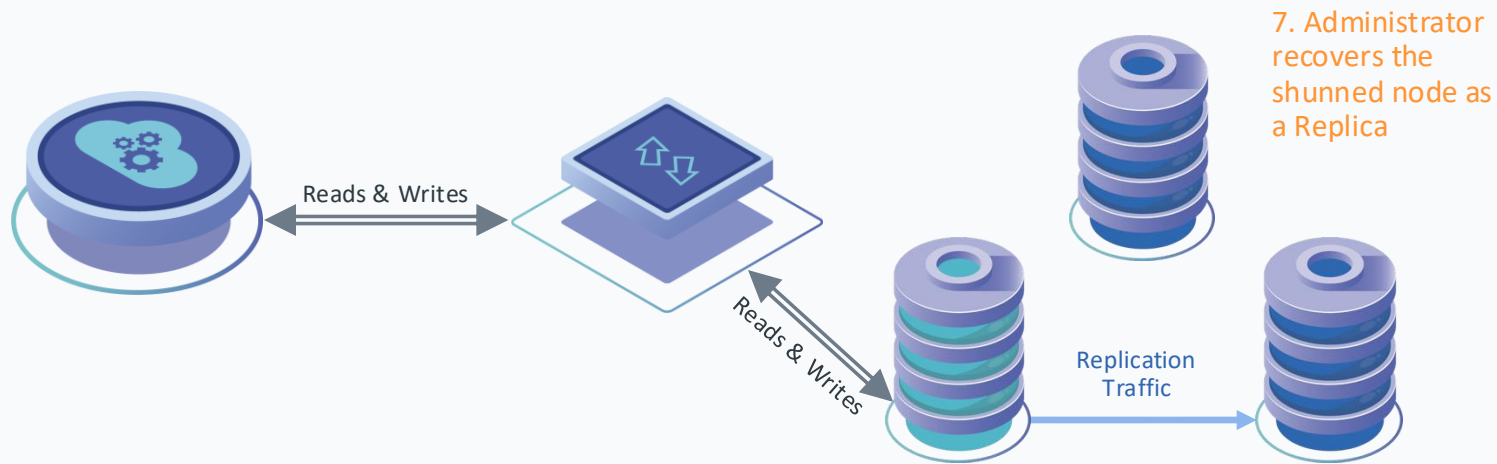


# Automatic Failovers

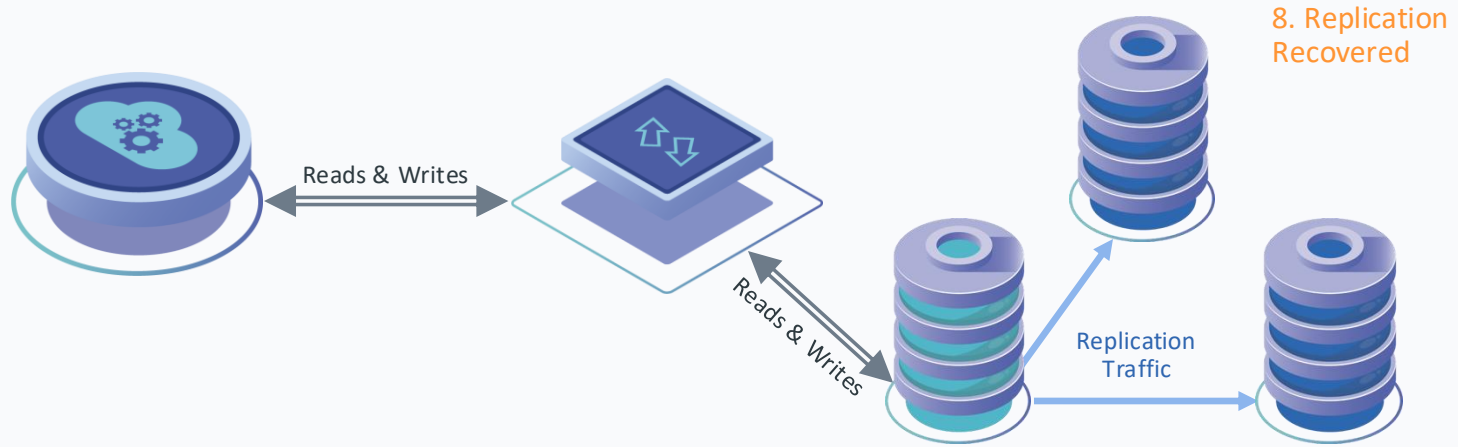


6. Reconfigure  
Replica replicator  
to use the new  
Primary

# Automatic Failovers



# Automatic Failovers

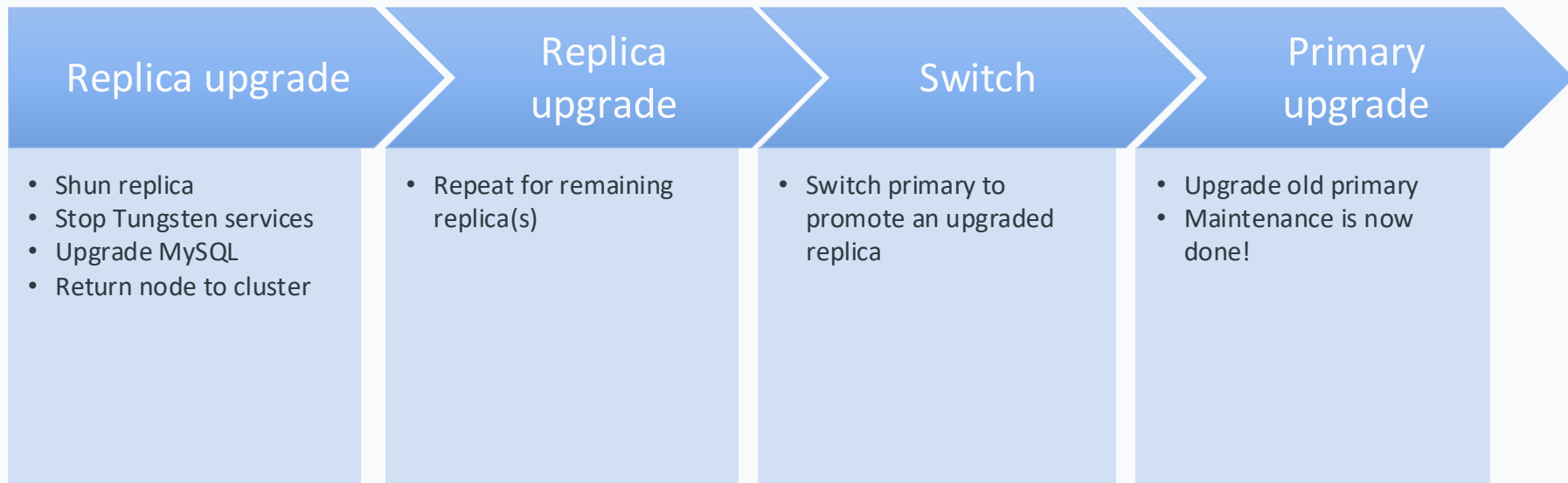


# Zero-Downtime Maintenance

(aka Rolling Maintenance)

# Rolling Maintenance

Rolling maintenance proceeds node-by-node starting with replicas and proceeding to the primary.



# Summary

What we have learnt today

- Reviewed the key benefits offered by Continuent Tungsten Cluster
- Examined the cluster architecture
- Compared Topologies
- Reviewed automatic failover
- Explored the concepts of a rolling maintenance procedure

# Thank you for listening

[continuent.com](https://continuent.com)

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