



# Continuent™ Tungsten Enterprise Solutions

Robust Solutions for  
Continuous Data Availability and  
Database Performance Scaling

Tungsten Overview White Paper

June 18, 2009

# Enterprise Continuous Data Availability

Continuous data availability means having your data available when and where you need with consistently fast response times. This is the key requirement for databases operating in today's 24/7 environments.

Swift changes in database technology and data processing as a whole have made ensuring continuous data availability quite challenging. Large data volumes, high number of users, and nonstop operation raise the bar for application developers as well as database administrators. The emergence of disruptive but highly economical open source technologies is both an opportunity as well as another potential headache. There is a universal need to cut costs and process data more efficiently.

Continuent Tungsten harnesses the power of advanced open source and commercial technologies to deliver economical and efficient continuous data availability for enterprises. Tungsten solutions are based on the Tungsten Suite, a unique collection of solutions for database scale-out. All solutions include support delivered by database experts.

Tungsten Enterprise solutions and services are available from Continuent, a Continuous Data Availability Company.

Our website is [www.continuent.com](http://www.continuent.com), and you may download an evaluation version of Tungsten Enterprise at [www.continuent.com/software](http://www.continuent.com/software).

Tungsten Open Source components are available at the Continuent Community web site [www.continuent.com/community](http://www.continuent.com/community).

## Overview

Tungsten solves enterprise data availability and performance scalability problems

Tungsten solutions integrate scale-out technologies with open source and low cost commercial databases to provide drop-in answers for the big data availability problems that keep IT departments awake at night.

- **Avoid Data Loss.** Tungsten integrates advanced replication and backups to ensure complete protection from the DBA's worst nightmare: losing data. Tungsten makes it easy to set up live copies that protect from failures as well as administrative data deletion. Built-in consistency checks ensure data integrity so users can be confident that replicas are ready for use and correct.
- **Ensure Constant Availability.** Tungsten provides simple, automated failover procedures to allow applications to switch to replicas quickly, seamlessly, and without risk of data loss. This helps address not just failures but also maintenance, which is the main source of downtime in modern IT environments.
- **Performance Scaling.** Tungsten allows users to set up replica databases easily. Tungsten offers sophisticated SQL routing that directs application requests transparently to replicas based on availability and latency. Tungsten SQL routing greatly reduces the changes applications require to take advantage of read-only database copies.

- **Open source/commercial data integration.** Tungsten enables the use of open source database technology in enterprise IT environments by providing efficient data replication between commercial and open source databases. Tungsten thus removes one of the main obstacles to adopting open source technologies while maintaining existing applications based on Oracle and other commercial databases.

Tungsten solutions help users solve these problems with easy and intuitive management so that complex operations like failover are reduced to a single command. Our solutions minimize or entirely eliminate application changes and are simple to deploy.

## What is Tungsten Enterprise

Continuent Tungsten Enterprise is a fully supported, enterprise ready solution for Data Availability and Database Performance Scalability.

Continuent Tungsten Enterprise addresses some of the key pain points of Oracle, MySQL and PostgreSQL users:

### PERFORMANCE

- **Easy provisioning and management.** Tungsten allows users to set up new slaves easily and remove them when no longer needed. We also provide integrated management for the entire cluster.
- **Intelligent load balancing** (Tungsten exclusive). Tungsten SQL Router allows Java applications to load balance and route SQL requests efficiently with no performance overhead across multiple data replicas in master/slave clusters. The load balancing is based on an innovative algorithm that allows users to trade availability versus data consistency requirements to increase performance.
- **Fast proxying** (Tungsten exclusive). Tungsten proxies are very fast, as they use efficient thread scheduling across multi-core hosts. Your proxies will use all the horsepower available to avoid becoming an application bottleneck.
- **Automatic slave detection** (Tungsten exclusive). Tungsten automatically detects new slaves added to the cluster and adds them to the load-balancing pool. Inactive or off-line slaves are automatically removed. No management action is necessary to make this work.
- **Automatic latency management** (Tungsten exclusive). Tungsten allows users to specify acceptable latency levels on slaves and then monitors them automatically. Connections are only load-balanced to up-to-date slaves.

### DATA AVAILABILITY

- **Automated failover** (Tungsten exclusive). Tungsten failover is a one-step procedure that automatically switches masters and reconfigures the

rest of the cluster including directing other slaves to the new master and updating load-balancing.

- **Seamless slave promotion** (Tungsten exclusive). Tungsten can promote any slave to be master without data loss or requiring other slaves to be stopped or reprovisioned.
- **Integrated, transferable backups** (Tungsten exclusive). Backup and restore procedures are built into the Tungsten Replicator, making it easy to take data snapshots required for provisioning.
- **Seamless Failovers without proxies for Java-based Applications** (Tungsten exclusive). Java applications can use the Tungsten SQL Router for seamless failover without an intermediate proxy. Tungsten gives the benefits of middleware without the performance hit.
- **Upgrade across versions and database types** (Tungsten exclusive). Tungsten can replicate data between database versions and even database types, thereby allowing applications to minimize or even eliminate downtime for server upgrades.

## AVOID DATA LOSS

- **Zero-data loss for planned and unplanned failovers** (Tungsten exclusive). Tungsten has multiple options to eliminate loss of data when failing over from an old master to a promoted slave. These include flush events that clear transactions from the master and extended features like DRBD integration.
- **Fail-safe data application on slaves** (Tungsten exclusive). Slaves remain consistent even following crashes thanks to transactional data replication, which ensures that SQL updates are neither dropped nor repeated.
- **Time-delay replication** (Tungsten exclusive). Tungsten can delay replication to offer a “window of opportunity” to recover data lost through administrative mistakes on the master, such as deleting application tables.
- **Integrated backups** (Tungsten exclusive). Tungsten integrates backups using file system snapshots and also through database dumps.
- **Continuous consistency checks** (Tungsten exclusive). Tungsten allows users to perform incremental checks of consistency between master and slave databases, without stopping the cluster and without causing a performance hit on applications.
- **Upgrade on slaves.** Users can run upgrade and maintenance processes on slaves, then switch masters after the upgrade has finished successfully. This eliminates the risk of data loss due to upgrade mistakes.

## LOW COST DATA INTEGRATION

- **Low-Cost Oracle Replication to Open Source Databases.** Tungsten can replicate data from more expensive commercial databases (Oracle) to less expensive open source databases (MySQL and PostgreSQL). This is key to using open source solutions in an enterprise that already stores substantial amounts of data in Oracle.
- **SQL Filtering** (Tungsten exclusive). Tungsten integrated filtering technology can change SQL “on the fly” from the source dialect to the target. This enables a much wider range of SQL to be replicated across database platforms such as Oracle to MySQL.
- **Replication to and from applications, message queues, and files** (Tungsten exclusive). Tungsten is not just limited to databases. The Tungsten Replicator can be extended to generate XML, put database changes in message queues, and write to applications. This is not just better than MySQL replication; it is better than most replicators available on the market. Tungsten Replicator allows you to integrate databases with anything that produces or consumes data.

## MANAGEABILITY

- **One-step failover** (Tungsten exclusive). Failover is a complex operation in master/slave clusters that may involve applications, proxies, replication tools, and of course databases. Tungsten reduces failover to a single command that takes databases safely on- and offline (without losing data) and reconfigures the rest of the system accordingly.
- **Auto-configuration** (Tungsten exclusive). Tungsten group communication eliminates administration tasks by auto-configuring system components to adjust load balancing as servers become available, disappear, or exceed latency requirements of client applications. MySQL and other solutions are single components, not full solutions.
- **Centralized API** (Tungsten exclusive). This is on the way. We will provide a central API for cluster management. This allows users to tie in additional automation to offer still more flexibility in management.
- **Multiple technologies.** Tungsten allows management of multiple technologies, not just databases.

## How Does Tungsten Works?

In simple terms, Tungsten works by spreading live copies of data over multiple hosts connected by networks.

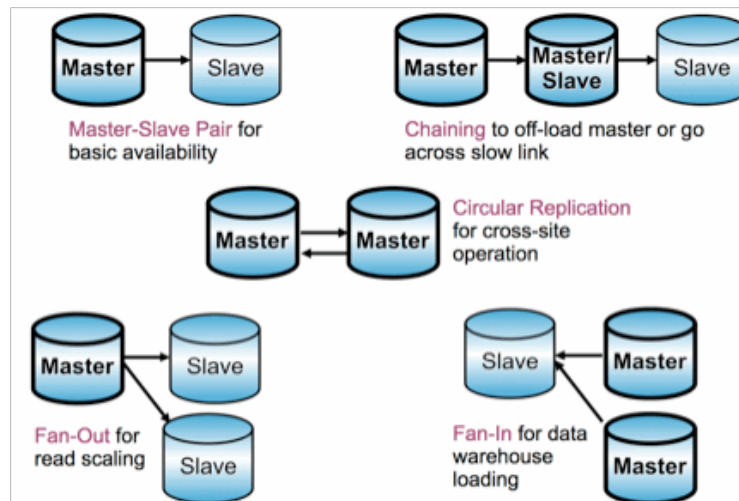
Tungsten is based on database technologies such as SQL routing, data replication and cluster management that copy data and manage the copies. These technologies maintain “live” copies of data in running databases and are a well-known way of scaling database availability or performance.

You can increase database performance incrementally by adding more data copies using commodity hardware and off-the-shelf databases.

You can also build various topologies depending on your needs - continuous availability, performance scaling, disaster recovery, data warehousing, etc.

Tungsten is very flexible and solves many important problems far beyond simple scaling.

Tungsten uses these basic technologies to solve problems that range from ensuring basic availability to copying between different database types to loading data warehouses in real time to eliminating downtime due to database and application upgrades.



## Tungsten for Oracle

**T**ungsten Enterprise offers simple, economical, and flexible data replication to all Oracle users regardless of the edition they are using.

Tungsten for Oracle works with Oracle Xpress Edition, Oracle Standard Edition One, Oracle Standard Edition, and Oracle Enterprise Edition.

This enables solutions to a number of important business problems:

- Ensuring database high availability - Tungsten as an alternative for Oracle Streams
- Recovery from site failures - Tungsten as an alternative for Oracle Data Guard
- Replication to MySQL and PostgreSQL
- Replication to other JDBC databases
- Zero-downtime upgrades

Tungsten Enterprise capabilities permit users to run 24/7 businesses and also to gain maximum benefits from data stored in Oracle.

## Tungsten for MySQL

**C**ontinuent covers a wide variety of common problems for MySQL users by offering a wealth of solutions, including

- Simplifying the complexities of setting up replication
- Managing automatically large master/slave setups
- Providing high performance parallel replication to avoid MySQL slaves lagging (very) far behind
- Scaling application performance without changes in the application
- Automatic promotion of a MySQL slave upon master failure
- Protecting your data (100% protection)
- Consistency Checks and Flush Operations
- Automated back-up process
- Disaster Recovery over WAN
- Real-time replication from Oracle databases
- Multisite operations with bi-directional replication over WAN
- Simplifying database sharding
- Cloud or datacenter operation

Continuent's offerings represent the most complete coverage of MySQL Data Availability and Database Performance Scalability solutions you can find.

## Tungsten for PostgreSQL

PostgreSQL is the “other” open source database. For many people it is “the” open source database.

Continuent has a long history of support for PostgreSQL both by providing products to users as well as supporting the PostgreSQL community as a whole. Here are our key product offerings for PostgreSQL:

- Simplifying the complexities of setting up replication
- Managing automatically large master/slave setups
- Automated back-up process
- Disaster Recovery over WAN
- Replication from Oracle into PostgreSQL
- High availability with immediate failover on database loss
- Scaling of read-intensive applications with minimal or no application changes
- Cloud or datacenter operation

Continuent’s PostgreSQL offerings continue to grow. Please contact us to discuss your needs for PostgreSQL Continuous Data Availability and Database Performance Scaling.

## Commercial Support from Database Experts

Enterprise-level 24/7 support with direct access to key engineers

Technical support is a major concern for companies who value their data, need constant uptime, or have to react efficiently to different levels of loads on their systems. Continuent, Inc. offers commercial support and services that cover all Tungsten technologies. Our offerings preserve the openness and flexibility of the open source approach but add the security and convenience of knowing that experts are close at hand in case you run into difficulties.

Enterprise support includes not only phone and email contact but also options for regular meetings with Continuent engineering staff, guaranteed turnaround times for solutions, and custom consulting packages.

## Summary And More Information

Tungsten commercial solutions help users harness innovative open source technologies to provide continuous data availability that meets the needs of enterprises from small to large. Tungsten offers features that are critical to ensuring that databases operate efficiently and economically under a wide range of conditions.

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# Exhibit A: Tungsten Product Features

	Easy HA	Easy HA Plus	Easy Scale	Enterprise	Site License
Number of Servers	1+1	1+1	1+N	1+N	N*(1+N)
<b>High Availability</b>					
1+1 database replication	●	●	●	●	●
Seamless slave promotion and master failover	●	●	●	●	●
Zero data-loss with planned failover	●	●	●	●	●
Master recovery and fallback	●	●	●	●	●
Fail-safe data application on slave	●	●	●	●	●
Automated consistency checks	●	●	●	●	●
Integrated backup/restore	●	●	●	●	●
Simple management	●	●	●	●	●
Admin security	●	●	●	●	●
<b>Advanced High Availability</b>					
Zero data-loss with emergency failover		●		●	●
Recovery from admin data deletion		●		●	●
Automated failover		●		●	●
Zero downtime upgrade		●		●	●
<b>Database Performance Scaling</b>					
1+N database replication			●	●	●
Load balancing of reads			●	●	●
Automatic detection of new slaves			●	●	●
Automatic tracking of slave latency			●	●	●
<b>Enterprise Clustering and Replication</b>					
High performance parallel replication				●	●
Data partitioning/sharding support				●	●
Session consistency model load balancing				●	●
Scheduled backups				●	●
Bi-directional replication with conflict resolution				●	●
Secure transport and data encryption				●	●
<b>Cloud Operation</b>					
RightScale scripts and server templates	●	●	●	●	●
Amazon EC2 enabled	●	●	●	●	●
GoGrid enabled	●	●	●	●	●
Rackspace/Mosso enabled	●	●	●	●	●
<b>Data Integration</b>					
Extend to new data sources	●	●	●	●	●
Hooks for data transformation	●	●	●	●	●
Replication to/from applications				●	●
Replication to/from message bus software				●	●
Replication to any JDBC-enabled database				●	●
<b>Documentation, Deployment &amp; Support</b>					
Professional documentation	●	●	●	●	●
Quick installation and certified builds	●	●	●	●	●
8x5 email support	●	●	●	●	●
24x7 enterprise support		●		●	●
Custom bug fixes				●	●