Tungsten Operator Master Class

Basics: An Introduction to Tungsten Operator

Presented by Chris Parker

VP of Customer Success, EMEA & APAC

Topics

In this short course, we will

- Understand what Tungsten Operator is
- Explore the Core Capabilities
- Summarise Operations
- Review the Technology

What is Tungsten Operator

What It Is
A Kubernetes-native automation system that manages MySQL clusters with Continuent Tungsten technology.

For Non-technical Users
Acts like a "robot database admin" — keeps data synchronized, ensures copies in multiple places, and provides instant failover by utilizing Tungsten Clustering.

For Technical Users
A Go-based Kubernetes Operator using controller-runtime to manage MySQL clusters with replication, failover, backups, and workflows.

Why It Matters
Simplifies complex database operations, increases reliability, and reduces manual effort.

Core Capabilities

High Availability Database Clusters

- Automatic failover within seconds
- Multiple deployment topologies (Clustered, CAP, CAA)
- Zero-downtime operations for maintenance/updates

Intelligent Connection Management

- Smart Connector routes queries to the right instance
- Port 3306 → primary / Port 3307 → replicas
- Load balancing + connection pooling

Enterprise-Grade Backup System

- Hot & incremental backups (XtraBackup)
- Multi-cloud support with 40+ providers (rclone)
- Scheduled, encrypted, and optimized backups

Core Capabilities

Operational Automation

- Self-healing operations & automatic recovery
- Node and replication resets
- Dynamic configuration management
- Secure secret handling

Production-Ready Features

- Resource & storage management
- Pod placement and disruption budgets
- Monitoring via Prometheus + Grafana
- Alerts, logging, and observability
- Security: TLS, RBAC, policies, encryption

Operations

- Cluster Management
- Backup Operations
- Operational Tasks
  - Reset a node
  - Reset Replication
- Monitoring & Diagnostics

Key Technologies & Integration

Built With

- **Go 1.23.3**: Modern, efficient programming language
- **Kubernetes controller-runtime v0.20.2**: Industry-standard operator framework
- **Server-Side Apply**: Conflict-free resource management
- **Tungsten Clustering v8+**: Enterprise MySQL clustering technology

Integrates With

- **cert-manager**: Automatic TLS certificate management
- **Prometheus/Grafana**: Monitoring and alerting
- **Helm**: Package management and deployment
- **CSI Storage**: Dynamic volume provisioning
- **Multi-Cloud Storage**: AWS S3, Google Cloud Storage, Azure Blob, MinIO

Deployment Scenarios

Development & Testing

- **Kind/Minikube**: Local Kubernetes testing
- **Single Node**: Development environments
- **MinIO Integration**: Local object storage for backup testing

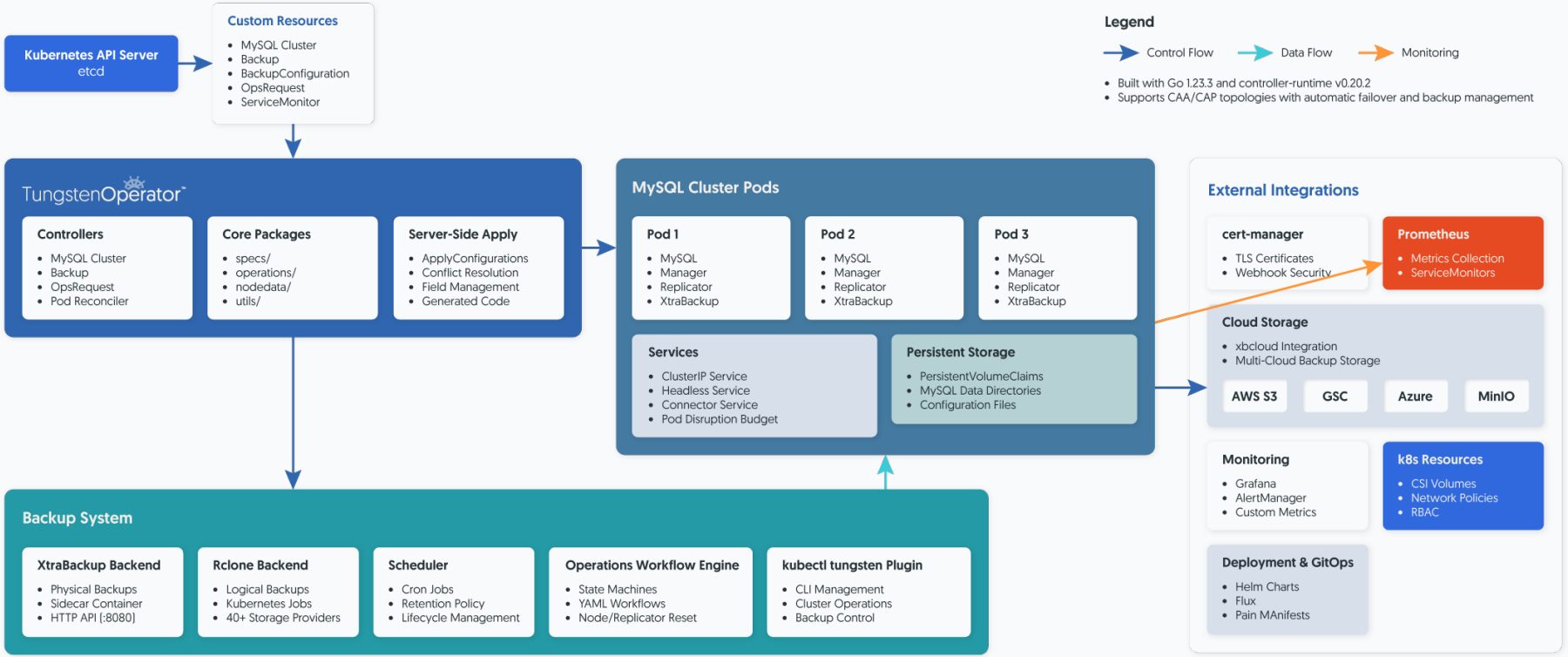
Production Environments

- **Multi-Zone Clusters**: Geographic distribution for disaster recovery
- **External Load Balancers**: Production-grade traffic management
- **Enterprise Storage**: High-performance SSD storage classes
- **Monitoring Stack**: Full observability with alerting

Cloud Platforms

- **Amazon EKS**: Native AWS integration with S3 backups
- **Google GKE**: GCS storage and regional persistent disks
- **Azure AKS**: Azure Blob storage integration
- **On-Premises**: VMware, OpenStack, bare metal Kubernetes

Architecture Diagram



Thank you for listening

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