Oracle Fusion Middleware Running on Kubernetes

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WebLogic, Coherence and Cloud Native Trends

- Industry trends
  - Microservices, serverless
  - Private and public clouds
  - Containers, orchestration frameworks
- WebLogic, Coherence customer demand
  - Leverage cloud neutral infrastructure
  - Integrate with new tools and services
  - Evolve WebLogic, Coherence for these environments
Oracle Enterprise Java Strategy Evolve Products to Meet Customer Demand

- Migrate to Kubernetes on premise
  Tools for migration and management
  Support existing and new applications

- Migrate to Kubernetes on Oracle Cloud
  Leverage management tools on OCI
  Availability, security, scaling, low-cost

- Integrate with Microservices
  Flexibility for developers
  Evolve and manage applications
WebLogic Server on Kubernetes - Building Blocks

- Docker and CRI-O certification
  - Docker images, Dockerfiles, examples
- WebLogic Kubernetes certification
  - How-to, best practices
- Value add integration
  - Management: Operator
  - Monitoring: Exporter for Prometheus
  - Migration: Deploy tooling
  - Logging: Exporter for Elastic Stack
  - Image Creation: WebLogic Image Tool
The Fusion Middleware Infrastructure install images contains:

- WebLogic binaries
- Coherence binaries
- JRF binaries
- RCU binaries
Fusion Middleware ADF & JRF Support on Docker

Base Image
OracleFMWInfrastructure 12.2.1.3

Sample
12213-domain-in-volume
Fusion Middleware ADF & JRF Support on Docker

App A

Create RCU Schema

Retrieve RCU Schema

DB
WebLogic Domain in Kubernetes
Domain Custom Resource

- We create a Kubernetes Resource Object for the WebLogic domain.
  
  This is a data structure representation of the WebLogic domain in Kubernetes.

- Domain Custom Resource allows you to declare or specify the desired state of the resource.

- Allows the Kubernetes API server to begin serving the custom resource object.

- The WebLogic Kubernetes Operator is a controller that is always looking at the Domain Custom Resource and tries to match the actual state to this desired state.

Domain Custom Resource

**Meta Data:** Name of Resource, Namespace, Labels, ...

**Admin Server:** Node Ports to expose, Volumes, ...

**Cluster:** Number of Replicas (Managed Servers), ...

**Domain:** Image to base the Domain containers, Domain in PV or in Image, K8S secrets, Logs to pod

**Managed Servers:** non-clustered MS

**Server Pod:** Java Options, Start Policy (Lifecycle control)

**Events:**
Why build the WebLogic Kubernetes Operator?

- Contains built-in knowledge about how to perform lifecycle operations on a domain
- Uses Kubernetes APIs to automate lifecycle operations.
WebLogic Kubernetes Operator

1. Manages lifecycle operations (start, stop, scale, rolling restart, etc.) in Kubernetes

2. Automate configuration, e.g. clustering, channels/ports, configuration overrides

3. Supports standard k8s idioms like sidecars, init containers, custom resources

Open source and fully supported [https://github.com/oracle/weblogic-kubernetes-operator](https://github.com/oracle/weblogic-kubernetes-operator)
Fusion Middleware ADF & JRF Support on Kubernetes

- FMW Infra Domain Image
- WebLogic binaries
- Domain
- Applications
Fusion Middleware ADF & JRF Support on Kubernetes

- FMW Infrastructure Image
  - FMW Infrastructure binaries
- PV
  - Domain
  - Applications
Tooling
WebLogic Monitoring Exporter

- Monitoring Exporter enables Prometheus monitoring of WebLogic
- Standard monitoring tools can be used for monitoring WebLogic
- Grafana Dashboards used for visualization
- Prometheus **auto-scaling** of WebLogic cluster
Out of the Box Grafana Dashboards
WebLogic Deploy Tooling

- Introspect domains
  - WebLogic 10.3.6, 12.1.3, 12.2.1.X
  - Create a model (yaml) of the domain
  - Migrate existing domains and applications
  - Upgrade (if required) to 12.2.1.X
  - Supports ADF domain introspection

- Customize and Validate configuration to meet Kubernetes requirements.
- Create domains in Docker image
- Deploy Applications
- Modify/remove objects from the Domain configuration
WebLogic Logging Exporter

- Logging Exporter enables exporting WebLogic server logs to the Elastic Stack
- Store logs in the Elastic Stack
- Search and analyze logs in Elasticsearch
- Display logs in dashboards in Kibana
Kibana Dashboards
WebLogic Image Tool

Use Cases

Create new image image and Patch

Patches
WebLogic binaries
Server JRE
Oracle Linux

Download patches

MOS Credentials

My Oracle Support

Repository

Operator Image

WLS 12.2.1.3 patched Binary Image

Oracle Linux
WebLogic binaries
Server JRE
Oracle Linux
WebLogic Image Tool

Use Cases

- Update existing image and Patch

Repository

- WLS 12.2.1.3 patched Binary Image
- WLS 12.2.1.3 Binary Image

My Oracle Support

Download patches

Patches

- WebLogic 12.2.1.3 binary

WLS Image Tool

MOS Credentials

Operator Image
WebLogic Image Tool

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Repository

Use Cases

Create/Update Domain Image with WDT

Domain

MOS Credentials
WDT model

Patches

WebLogic 12.2.1.3 binary

WLS 12.2.1.3 Domain Image

WLS 12.2.1.3 Binary Image

WLS Image Tool

Operator Image

WDT model
WebLogic Image Tool

Use Cases

- Update Image and deploy Applications with WDT

- WDT model

My Oracle Support

Download patches

Applications

WebLogic 12.2.1.3 Domain

WLS Image Tool

Repository

Operator Image

WLS 12.2.1.3 Domain with Applications Image

WLS 12.2.1.3 Domain Image

Download patches
• Short introduction Intris
• Challenges
• From “On-premise” to OCI
• From OCI to OKE
• Next Steps
Introduction of Intris

- Founded in 1994
- Independent Software Vendor
- Located in Berchem, Antwerp
- 48 employees
- Standard Supply Chain Management Software “TRIS”
- >300 customers supporting > 5000 TRIS-users
- Since February 2018 member of the WiseTech Global Group
  - HQ Sydney Australia / > 1000 employees / > 6000 customers
Short Introduction

- 2014: Start transformation from 4GL application to Oracle/Java technology
  - Oracle Enterprise Database 12c
  - Oracle WebLogic Server 12c
  - Oracle ADF
  - Alta UI
- 2016: Start deploying the new application on premise off our customers
Challenges

• Embedded Software Licence
  • Separate install of the Oracle products and TRIS for each customer
  • Install must be scripted.
  • Customer is not allowed to access the Oracle products directly
• A lot of different environments to deploy on
  • No standard installation -> more work
  • Performance varies depending on infrastructure/environment
From on-premise to OCI

- Mid 2017: First experience “Oracle Compute Classic”
  - Lower monthly costs for our customers
  - Easier access to the environment
  - Better performance

- End 2017: Move to OCI
  - Improved performance
  - 1 customer = 1 tenant

- Start 2018: Single tenant
  - 1 customer = 1 compartment
  - Less administration
  - Easier to manage
From on-premise to OCI

• Result towards customers
  • Predictable performance
  • No more discussions on performance
  • Less time for upgrades of the software
  • Less time for support and maintenance
  • Standard deployment procedures
From OCI to OKE

• Problem
  • New release every 6 weeks to be installed at 50 customers in test and live
  • Average of 2 hours = 200 hours
  • Install of live environment not allowed during normal working hours

• Solution: Docker and Kubernetes
  • Deployment is automated and can be scheduled
  • Blue and Green scenario
    • Docker image (new application)
    • Database : Edition Based Redefinition
  • Benefits
    • Frees up 1 FTE
    • More (small) customers can run on the same Compute Instances
    • Scaling
TRIS WLS configuration

MASTER, SERVICE, ESB and BROKER have a Test and Live instance within the same domain (total 8 < 1 managed servers)
Oracle OKE setup

- OCI REGION
- Availability Domain
- VCN
- Compartment
- Intris Tenancy
- Object Storage
- Auditing
- File Storage

- Kubes cluster node - 2 OCPU
  - CDB for larger customer - 2 OCPU
  - Kubes cluster node - 2 OCPU
  - CDB for larger customer - 2 OCPU

- Subnet AD
  - Subnet LB

- Namespace Small customer A
  - Namespace Small customer B
  - Namespace Large customer A
  - Namespace Large customer B

- Pdb 1
  - Pdb 2
  - Pdb n
Steps taken

• Setup OKE on OCI
• WebLogic Deploy Tooling discover domain tool
• Edit generated YAML
• WebLogic Image Tool
• Edit Dockerfile
• Create Docker image
• Push image to OCI Registry
• Install Weblogic Operator
• Ingress-Nginx controller
• Create WebLogic Domain with WebLogic Kubernetes Operator
• ElasticSearch / Kibana
Next Steps

- Oracle Business Intelligence
- Blue and Green scenario: attach to our CI/CD
- Rollout OKE solution to customers
- Scaling
  - Dynamic Clusters
  - Monitor managed servers (Prometheus)
- Rethink and improve TRIS architecture
Safe Harbor

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Thank You

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