Automatic datacenter and service deployments based on capacity planning artifacts

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About Me

• Xiaoxiang(XX) JIAN
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  – Apsara Infrastructure team in Alibaba
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• Middleware (2007~2011)
• Virtualization & Software-defined Data Center (2011~2014)
• Technical Infrastructure (2014~Now)
How to deploy a datacenter for cloud service?
Difficulties to deploy a datacenter

- Capacity planning
- Server placement
- Network cabling
- Network bootstrap
- OS bootstrap
- Service bootstrap
- .............
Our Goal

• Capacity planning by business requirement
• Automatic deployment
• Auto-healing for hardware failure
Our Solution

- Immutable bare-metal infrastructure
- Describe the datacenter with artifacts
IMMUTABLE BARE-METAL INFRASTRUCTURE
Traditional Deployment Method

• Build-in place approaches
  – Start from the foundation
  – Follow the delivery pipeline
Traditional Deployment Method

• Pros
  – Easy to learn for the beginners

• Cons
  – Impossible to rollback
  – Difficult to update
  – Difficult to lock down
Better solution: let’s lock it down

- Make the configuration before deployment
- Make the runtime state-driven
- A good example: Kubernetes
Immutable Infrastructure: Image based Deployment

Binary

Configuration

Image Deployment

Copy & Run
Image building process

Build Repository

Runtime Configuration

ImageBuilder

Image Caches

Runtime Servers
Normal immutable infrastructure

- Infrastructure is treated as a black box
- Changes are applied based on state description
Immutable infrastructure in a bare-metal environment
DESCRIBE THE DATACENTER WITH ARTIFACTS
Our approach to deploy a datacenter with cloud service

**Business planning phase**
- Categorize the services
- Capacity planning based on service measures
- Network planning

**Delivery planning phase**
- IDC planning
- Network configuration configuration
- OS/Service configuration generation
Concepts in the artifacts

• Product
  – The final deliverable for business.

• Service
  – Software concept deployed on a cluster.

• Application
  – The real thing runs as process on a server.
Product

- Products are composed by services.
- Product describes the deployment topology.
- Product describes the exposed features.
- Example: Alibaba Elastic Compute Service
Product – Services

• Id or name
• Version.
• Configuration templates.
Product – Deployment topology

• Cluster descriptions
  – Services
  – Capacity measures

• Service deployment topology
Product - Features

- Deployment requirement.
- Capacity measures.
Service

• Service is composed by serverroles.
• Service might have dependencies.
• ServerRoles might be in groups.
• Example: BlockStorage
Service - ServerRoles

• Types
• Server requirements.
• OS requirements.
• Applications.
Service - Dependencies

- Dependency on a node.
- Dependency on a cluster.
Service - ServerRoleGroups

• How to place the serverroles on a cluster?
Application

- Normal application.
- Docker application.
- ......
Data center described in artifacts

- IDC/Racks
- Network
- Server clusters
  - OS
  - Services
What do we have get now?

• An immutable bare-metal infrastructure
• Artifacts which describe the datacenter.
  – Generated in planning phase
• Datacenter bootstrap
  – From 2 months to 24 hours.
• Available Product
  – Apsara Stack from Alibaba Cloud
Summary

• Immutable bare-metal infrastructure
  – State-driven
  – Describe everything with state-based configuration files
  – Image based deployment

• Artifacts which describe the datacenter.
  – Model concepts for software services
  – Model concepts for the datacenter
Questions?

THANK YOU!