Edge Computing Operations:
Day-1 Deployment & Day-2 Management

Titanium Cloud
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Who we are

Brent Rowsell
- Principal Architect of Titanium Cloud,
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- Working with OpenStack since 2013,
- 25+ years of Telecom Experience.

Greg Waines
- Senior Architect of Titanium Cloud,
- Member of StarlingX Project,
- Contributing to OpenStack Vitrage and OpenStack Masakari,
- Working with OpenStack since 2013,
- 25+ years of Telecom Experience.
Our software has been deployed in over 2 billion devices; into environments, systems, and applications subject to the highest standards of safety, security and performance.
Wind River® Titanium Cloud Addresses Key Challenges

- Proven, integrated virtualization platform saves Time-To-Market
- Delivers latency, resiliency and performance for Edge use cases
- Streamlined installation, commissioning and maintenance
- End-to-End security and ultra-low latency for Edge applications
- Full support for multi-layer HW and SW decoupling
Introducing StarlingX

- StarlingX is a new project being hosted by the OpenStack Foundation
- Formed with seed code from the Wind River Titanium Cloud portfolio
- Project will provide a fully integrated openstack platform with differentiators for high availability, Quality of Service, performance and low latency needed for industrial and telco use cases
- Aligned with the OpenStack Foundation Edge Working Group and the Linux Foundation Akraino Edge Stack
Edge Computing

- Extending the cloud to the edge of the network, near the source of data,

- Reducing the latency between ‘cloud services’ and ‘end-user devices’,
  - Cloud Computing,
  - Cloud Storage,
  - Cloud Networking.

⇒ Enabling new genres of applications.
Titanium Cloud – *Distributed Cloud Project*
Part of StarlingX Project

Objectives:

- **Centralized Management** across all Edge Subcloud Deployments
- **Zero Touch Provisioning**
  - Day-1 Edge Subcloud Installation and Commissioning Simplicity
- **Single Pane of Glass**
  - Day-2 Centralized Management of System-Wide Configuration across all Edge Subclouds

- Scale to Large Number of Edge Subclouds,
- Scale Edge Subclouds both Small (i.e. Single Server) and Large (i.e. 100s of Servers),
- Maximize Edge Subcloud autonomy when communication to central control is lost.
Distributed Cloud - Solution Overview

- Based on OpenStack Regions,
- Central **SystemController Region:**
  - Hosting Shared Services and
  - System-wide Infrastructure Orchestration functions:
    - Deployment and Management of Subclouds,
    - Configuration portal for shared configuration across all Subclouds,
    - Fault aggregation,
    - Patching orchestration.
- Remote **Edge / Subcloud Regions:**
  - Geographically dispersed,
  - Connected via L3 network,
  - Running reduced Control Plane.
- Inter-Region Communications strictly REST APIs / L3.
Distributed Cloud - Manager

- CLI/REST API to add/delete/modify/query Subclouds
- Manages Subcloud configuration and status
  - Configuration: name, management subnet, etc.
  - Status: availability, sync status, etc.
- Provides administrative commands to manage/unmanage Subcloud
- Manages alarms for Subcloud availability
- Audits Subclouds to determine overall availability status
- REST API for system wide patch orchestration
Shared OpenStack Services

- **Keystone**
  - Centralized Project and User Management,
  - Future Blueprints:
    - Distributed across all Subclouds,
    - Centralized configuration portal and synchronization across all Subclouds.

- **Glance**
  - Centralized image management,
  - Partially distributed solution; images are cached in Subclouds, reducing latency impact.
  - Future Blueprints:
    - Distributed across all Subclouds,
    - Centralized configuration portal and synchronization across all Subclouds.

- **Horizon**
  - Single Central Horizon instance which can switch between Subcloud contexts.
Distributed Cloud – Orchestrator: Synch Shared Config

- SystemController exposes external endpoints to provision
  - synchronized **OpenStack** configuration for Nova, Neutron and Cinder,
  - Synchronized **Infrastructure** configuration.

- Configuration updates made on the SystemController are applied to all Edge / Subclouds,

- As part of Edge / Subcloud Installation, synchronized **OpenStack** configuration is automatically applied.

**Openstack Resources Synchronized:**
- Nova: flavors, flavor extra-specs, keypairs, quotas
- Neutron: security groups, security group rules
- Cinder: quotas

**Infrastructure Resources Synchronized:**
- DNS IP addresses
- NTP IP addresses
- OAM Firewall settings
- SNMP community and trapdest settings
- Remote logging settings
Distributed Cloud - Alarm Aggregation & Subcloud Status

User Name:
admin

Password:
********

Connect
Distributed Cloud - Software Patching Orchestration

- Patch == Software Update containing Bug Fixes and/or New Features.
- Orchestrate the application of software patches across entire distributed cloud.

- Applies Patch to SystemController Region first
  - Automatically iterating through all nodes of SystemController Region, ... and installs patch(es).

- Automatically recursively iterating
  - Through all Edge / Subcloud Regions,
    - And through all nodes in each Edge / Subcloud Region and installs patch(es).

- Automatically migrates VMs throughout procedure.

- A MUST for Edge Computing Systems
  - Improvement in usability of applying patches
  - Improvement in time to apply patches
Distributed Cloud - Software Patching Orchestration
Subcloud ZTP Installation

At remote site

1. Server(s) are physically installed
   - TOR cabling, config and verification
   - BMC cabling, config and verification

2. Power up first controller

3. Load is installed on the first controller
   - Installation options:
     - USB stick
     - Pxeboot server on customer network
     - Staged prior to delivery to remote site
     - Login and set initial wrsroot pw

Remotely

1. Via remote BMC console, run pre-bootstrap utility
   - Sets up basic network connectivity

2. Add & Configure Subcloud via GUI,

3. Generate ‘bootstrap configuration file’, Transfer to the Subcloud,

4. Run ‘config_subcloud’ bootstrap wizard,

5. Select ‘Manage Subcloud’ to synchronize shared data to Subcloud.

→ Subcloud is ready for workloads.
Subcloud ZTP Installation
Summary and Next Steps

**Summary:**
- Synchronization of OpenStack & Platform configuration & quotas across Subclouds,
- Fully Automated Orchestration of Patches across Subclouds,
- Aggregation of Alarms across all Subclouds,
- ZTP Installation of Subclouds.

**Future Blueprints:**
- Distributed Keystone for scalability and Subcloud autonomy,
- Securing Inter-Region Communications,
- Fully Distributed and Synchronized Glance,
- Synchronization of Configuration to ‘selected’ Subclouds,
- Inter-Subcloud VNF Lifecycle Management,
- Geo-Redundant SystemController,
- Upgrade Orchestration.