Lessons learned from deploying SUSE OpenStack Cloud and Enterprise Storage in the Public Cloud

TUT1224
Thursday, April 04, 03:15 PM - 04:15 PM | Belmont 1
Friday, April 05, 10:15 AM - 11:15 AM | Belmont 2

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Agenda

- The application that requires SOC and SES
- Introduction to the public cloud provider
- Lessons learned
  - Planning the deployment
  - Deploying SOC and SES
  - Validation of environment for application installation
SAP Cloud Platform

Enterprise platform-as-a-service (PaaS) by SAP that provides comprehensive application development capabilities to help you extend, integrate and build innovative applications in less time – without the effort of maintaining the infrastructure.¹

- A multi-cloud hosted offering
- Shared infrastructure of compute, storage and network environments

SCP, Private Edition

- Ideal for customer who want their own dedicated platform instance
- Meet data privacy and regulatory requirements
- Can be deployed on-prem by customers or as a hosted/managed service

¹ https://www.sap.com/products/cloud-platform.html
SAP Cloud Platform General Architecture

Customer 1

Customer 2

Customer 3 .. n

SAP Cloud Platform

managed

CLOUD FOUNDRY

managed

OpenStack

Amazon Web Services

Microsoft Azure

Google Cloud Platform
BOSH

- Provisioning – Configuration – Orchestration for Cloud Foundry
- Provisions, configures and orchestrates virtual machines
- Communicates with virtualization layer via Cloud Provider Interface

Stemcell
  create_stemcell(image, cloud_properties)
  delete_stemcell(stemcell_id)

VM
  create_vm(agent_id, stemcell_id, resource_pool,
            networks, disk_locality, env)
  delete_vm(vm_id)
  reboot_vm(vm_id)
  configure_networks(vm_id, networks)

Disk
  create_disk(size, vm_locality)
  delete_disk(disk_id)
  attach_disk(vm_id, disk_id)
  detach_disk(vm_id, disk_id)
OpenStack Integration

BOSH CPI

- Can use S3 interfaces for blobstore (Swift/Ceph)
- Uses Glance API to upload stemcells
- Interfaces directly with Nova (Cinder and Neutron are called via Nova)
- Credentials obtained via Keystone
Coming back to SAP Cloud Platform

- **SAP Cloud Platform, Private Edition Infrastructure Guide**
  - Specifies SUSE OpenStack Cloud 7 and SUSE Enterprise Storage 5 as the IaaS technologies

- **The Infrastructure Guide outlines and recommends**
  - Server requirements
  - Network link requirements
  - Availability zones
  - High availability
  - Control layer
  - Compute layer
  - Storage layer
  - Barclamp settings
The goal

A joint effort between IBM Cloud, SUSE and SAP

Create a customer ready proof-of-concept environment
  • SAP customers interested in SCP, Private Edition
  • Support up to ten (10) POC customers
  • Environment should not host customer confidential data

Design the environment to closely mimic a productive deployment
  • Highly available
  • Security
  • Meet SCP, PE performance requirements

Use the environment for learning and as a test bed for future deployments
Information about IBM Cloud
Bare Metal Servers

Flexible configuration options

- Popular
  - Number of cores, speed, RAM, and number of drives) are preset
  - Provisioned in 30 – 40 minutes
- Custom
  - Greater variety of cores, speeds, RAM, and drives
  - Provisioned in 2 – 4 hours
- SAP-certified
  - From small to large sizes — certified for production SAP HANA or SAP NetWeaver

Can be ordered with or without and operating system

- SLES for SAP is an option for SAP-certified bare metal systems
- On going discussions about adding SLES as an available OS option
Network configuration

Three distinct types

- **Public**
  - Direct access to the internet
  - Each host has a redundant pair of 10 Gbps Ethernet connections

- **Private**
  - Enables connectivity to IBM Cloud Service in worldwide datacenters
  - Each host has a redundant pair of 10 Gbps Ethernet connections
  - Jumbo Frames (MTU 9000) are supported

- **Management**
  - Out-of-band management for administration of servers using BMC and IPMI
  - VPN access
Lessons learned –
Planning the deployment
A considerable amount of time was spent on networking

- Public network was switched to another private network
- Vyatta firewall restricting inbound and outbound traffic
- Bond 0 and Bond 1 separated into VLANs for SOC and SES network traffic
- Defined IBM Cloud Portable IP address ranges for each VLAN
More about IBM Cloud Portable IP addresses

Portable IP addresses are customer maintained IP assignments
• Contiguous range of IP addresses assigned to each VLAN

Portions of IP ranges used in SOC network.json (examples below)

<table>
<thead>
<tr>
<th>Admin network</th>
<th>Public API network</th>
<th>Public API network</th>
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<tbody>
<tr>
<td>Portable Subnet Details</td>
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<td>Portable Subnet Details</td>
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<tr>
<td>10.187.190.0/26</td>
<td>10.187.190.0/26</td>
<td>10.187.190.0/26</td>
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<tr>
<td>VLAN 2278</td>
<td>VLAN 3506</td>
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<tr>
<td>Gateway 10.187.190.1</td>
<td>Gateway 10.187.190.1</td>
<td>Gateway 10.187.190.1</td>
</tr>
<tr>
<td>Broadcast 10.187.190.63</td>
<td>Broadcast 10.187.190.63</td>
<td>Broadcast 10.187.190.63</td>
</tr>
<tr>
<td>Mask 255.255.255.192</td>
<td>Mask 255.255.255.192</td>
<td>Mask 255.255.255.192</td>
</tr>
<tr>
<td>admin: .2 - .3</td>
<td>host: .34 - .53</td>
<td>nova_floating: .194 - .254</td>
</tr>
<tr>
<td>dhcp: .4 - .11</td>
<td>Manual assigned: .54 - .62</td>
<td></td>
</tr>
<tr>
<td>host: .12 - .42</td>
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<td></td>
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<tr>
<td>switch: .43 - .44</td>
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<td></td>
</tr>
<tr>
<td>Manual assigned: .45 - .62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Example server recommendations from SCP, PE Infrastructure Guide

### Compute and Control Plane Nodes

- **Ceph Monitoring and KVM Nodes**
  - 2 x Xeon-G 6138 (20 cores 2.00/3.70 GHz)
  - 512 GB RAM
  - 12.8 GB/Core ratio
  - 8TB local storage for ephemeral disks images (SSD or SAS disk with SSC cache) in hardware RAID5 configuration
  - 2 x >200GB boot SSDs on separate controller in RAID1 configuration
  - 2 x dual port 25 GBit/s ethernet cards with VXLAN offloading support

### Ceph OSD Nodes

- 2 x Xeon-G 6138 (20 cores 2.00/3.70 GHz)
- 512 GB RAM
- 12.8 GB/Core ratio
- 24 x 2TB 7200 rpm SAS disks on SAS HBA (no RAID controller)
- 2 x 800GB PCIe SSDs for write intensive use
- 2 x >200GB boot SSDs on separate controller in RAID1 configuration
- 2 x dual port 25 GBit/s ethernet cards with VXLAN offloading support
The deployed server configurations

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Node</th>
<th>CPU #</th>
<th>Memory</th>
<th>Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>#Procs</td>
<td>Core</td>
<td>Speed</td>
</tr>
<tr>
<td>1</td>
<td>SLES KVM host</td>
<td>2</td>
<td>16</td>
<td>2.1 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32GB</td>
</tr>
<tr>
<td>1</td>
<td>Network Gateway (Vyatta)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Openstack Control</td>
<td>2</td>
<td>16</td>
<td>2.1 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32GB</td>
</tr>
<tr>
<td>6 (minimum)</td>
<td>Openstack Compute (CF apps)</td>
<td>2</td>
<td>36</td>
<td>2.3 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>768GB</td>
</tr>
<tr>
<td>2 (minimum)</td>
<td>Openstack Compute (pet)</td>
<td>2</td>
<td>36</td>
<td>2.3 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>768GB</td>
</tr>
<tr>
<td>3</td>
<td>Ceph Monitor</td>
<td>2</td>
<td>16</td>
<td>2.1 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>96GB</td>
</tr>
<tr>
<td>1</td>
<td>Object Gateway</td>
<td>2</td>
<td>16</td>
<td>2.1 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32GB</td>
</tr>
<tr>
<td>4 (minimum)</td>
<td>Ceph OSD nodes</td>
<td>2</td>
<td>16</td>
<td>2.1 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lessons learned summary

Planning the deployment

• The planning was critical

• SAP understood SCP PE (the application requirements) and was still developing the documentation so the weekly scrum calls helped with knowledge sharing

• Understanding the application requirements helped in sizing for the POC

• Deciding what features were important for a customer POC helped with security, availability and monitoring

• The large amount of planning time was spent in translating IBM Cloud network capabilities into the network design for SOC and SES

• Tried to fit server requirements into popular server configurations in IBM Cloud helped with some cost savings
Lessons learned – Deploying SOC and SES
SUSE Implementation Feedback
Hardware and Networking

• **Change boot order**
  - kvmhost required HD, USB(ISO), PXE
  - A few of the compute nodes had to be changed to PXE, HD
  - **FUTURE**: A deployment will use HD first with autoyast deployment

• **Trunking VLANs**
  - kvmhost (ses-admin VM) had to be trunked to storage-replication and storage-clients VLANs
  - ses-swift needed vlan3506 to be added
  - VLAN configuration was correct but not working so the config was re-pushed

• **IPMI**
  - soc-pet1 ipmi and remote console access stopped working; DC team had to fix
SUSE Implementation Feedback
SUSE OpenStack Cloud and SUSE Enterprise Storage Implementation

• **Using the SAP SCP PE Infrastructure Guide**
  • The guide was written for large deployment, several configuration settings did not apply
  • A version for smaller deployments and optional configuration options is needed

• **SOC**
  • Had to change soc-admin ip from .47 to .2 in handover document
  • Had to define bmc and bmc_vlan ranges for Admin vlan in handover document
  • Code changes to fix publicly signed certificates issues in barclamps, SOC7 updates have been released
  • Added A record for public.sapcp.cloud.ibm.com in DNS barclamp
  • Added public.sapcp.cloud.ibm.com in Pacemaker barclamp for wildcard certificate
SUSE Implementation Feedback
SUSE OpenStack Cloud and SUSE Enterprise Storage Implementation

• SOC (continued)
  • FUTURE: Use
    Converting Existing SUSE Linux Enterprise Server 12 SP2 Machines Into SUSE OpenStack Cloud Nodes
    with the --keep-existing-hostname option so that soc-* systems to keep their friendly hostnames versus the mac address generated hostname

• SES
  • ceph -s reported HEALTH_WARN after initial pools were automatically created for radosgw; had to update the default PG and PGP settings to 64 for *rgw* pools; suggest trying 32 and increase to 64 until HEALTH_WARN goes away
    • FUTURE: Use https://ceph.com/pgcalc/ as a guide. Best to start small and grow into more as needed with SES5
  • Filesystem inodes were completely used due to salt job logging; recommend keep_jobs: 1 and job_cache: False in /etc/salt/master before connecting salt minions
Lessons learned summary
Deploying SOC and SES

• Start with an “out-of-the-box” deployment of SOC and SES
  • Do not immediately customize the configuration based on application documentation

• Difficult dealing with the auto-generated hostnames based on MAC address for the SOC nodes

• IBM Cloud support resolved issues very quickly – IPMI access, boot order, failing NIC
Lessons learned – Validation of environment
Validation recommendations in SCP, PE Infrastructure Guide

• Is your OpenStack installation ready to run BOSH and install Cloud Foundry
  • Cloud Foundry OpenStack Validator

• Functional Network Tests
  • Rally
    boot-and-live-migrate       boot-and-delete
    boot-server-attach-created-volume-and-live-migrate create-and-delete-image
    create-and-delete-routers  create-and-delete-user

• High Availability Validation Tests
  • Rally or Shaker
    Control/API node outage       Database node outage (master)
    Rabbit node outage           Network node outage (verify SNAT/L3 HA)
    Shutdown full availability zone Network fabric upgrade
Validation recommendations for SCP, PE

- **Network Performance Tests**
  - Shaker
    - L2 east-west
    - L3 east-west
    - L3 north-south
    - Cross-AZ
    - External

- **Rados Gateway Tests**
  - `getput, gpmulti, gpsuite`
  - Throughput tests
    - Max 10 clients in parallel
    - Max 140 parallel threads per client
Lessons learned summary
Validation of environment for SCP, PE installation

- Finding and using the testing tools took a bit of effort
- Not all of the tests applied to the POC deployment
- Most of the tests ran successfully on the first run
- The tests that did not run successfully
  - IBM focused on pinpointing the reasons for the failures
  - SUSE was engaged if an adjustment to SOC or SES was needed
Wrapping up
## All Hypervisors

### Hypervisor Summary

<table>
<thead>
<tr>
<th>Hypervisor</th>
<th>Type</th>
<th>VCPUs (used)</th>
<th>VCPUs (total)</th>
<th>RAM (used)</th>
<th>RAM (total)</th>
<th>Local Storage (used)</th>
<th>Local Storage (total)</th>
<th>Instances</th>
</tr>
</thead>
<tbody>
<tr>
<td>d0c-c4-7a-f2-d4-6e.sapcp.cloud.ibm.com</td>
<td>QEMU</td>
<td>26</td>
<td>72</td>
<td>60.5GB</td>
<td>754.5GB</td>
<td>560GB</td>
<td>145.5TB</td>
<td>13</td>
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<td>dac-f6b-fc-7f-d6.sapcp.cloud.ibm.com</td>
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<td>56</td>
<td>72</td>
<td>146.5GB</td>
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<td>960GB</td>
<td>7TB</td>
<td>22</td>
</tr>
<tr>
<td>dac-f6b-fc-7f-e6.sapcp.cloud.ibm.com</td>
<td>QEMU</td>
<td>66</td>
<td>72</td>
<td>166.5GB</td>
<td>754.5GB</td>
<td>1.3TB</td>
<td>7TB</td>
<td>28</td>
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<tr>
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<td>QEMU</td>
<td>68</td>
<td>72</td>
<td>174.5GB</td>
<td>754.5GB</td>
<td>1.3TB</td>
<td>7TB</td>
<td>30</td>
</tr>
<tr>
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<td>67</td>
<td>72</td>
<td>153.5GB</td>
<td>754.5GB</td>
<td>1.2TB</td>
<td>7TB</td>
<td>32</td>
</tr>
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<td>QEMU</td>
<td>65</td>
<td>72</td>
<td>182.5GB</td>
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<td>1.1TB</td>
<td>7TB</td>
<td>22</td>
</tr>
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<td>754.5GB</td>
<td>1.4TB</td>
<td>7TB</td>
<td>36</td>
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</tbody>
</table>

Displaying 8 items
## Instances

<table>
<thead>
<tr>
<th>Project</th>
<th>Host</th>
<th>Name</th>
<th>Image Name</th>
<th>IP Address</th>
<th>Size</th>
<th>Status</th>
<th>Task</th>
<th>Power State</th>
<th>Time since created</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANDSCAPE_TRIAL dac-1f-6b-oc-79-de</td>
<td>alert/9e3d5f5-4d9e-4bf8-976c-1a6279f91251</td>
<td>bosh-openstack-kvm-ubuntu-trusty-go_agent/3586.57</td>
<td>10.1.4.21</td>
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<td>None</td>
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<td>2 weeks, 4 days</td>
<td>Edit Instance</td>
<td></td>
</tr>
<tr>
<td>LANDSCAPE_TRIAL dac-1f-6b-oc-78-9e</td>
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<td>Running</td>
<td>2 weeks, 4 days</td>
<td>Edit Instance</td>
<td></td>
</tr>
<tr>
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<td>Running</td>
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</tr>
<tr>
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<td>LANDSCAPETRIAL-jb2-ubuntu-16.04</td>
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<td>Running</td>
<td>3 weeks</td>
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<td>ubuntu-16.04</td>
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<td>Active</td>
<td>None</td>
<td>Running</td>
<td>3 weeks</td>
<td>Edit Instance</td>
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</tr>
<tr>
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<td>Running</td>
<td>3 weeks, 5 days</td>
<td>Edit Instance</td>
<td></td>
</tr>
<tr>
<td>LANDSCAPE_TRIAL dac-1f-6b-oc-79-be</td>
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<td>Running</td>
<td>3 weeks, 5 days</td>
<td>Edit Instance</td>
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<td>Edit Instance</td>
<td></td>
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<td>10.11.129.105</td>
<td>small_1_2</td>
<td>Active</td>
<td>None</td>
<td>Running</td>
<td>3 weeks, 5 days</td>
<td>Edit Instance</td>
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### Volumes

<table>
<thead>
<tr>
<th>Project</th>
<th>Host</th>
<th>Name</th>
<th>Size</th>
<th>Status</th>
<th>Type</th>
<th>Attached To</th>
<th>Bootable</th>
<th>Encrypted</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANDSCAPE_TRIAL</td>
<td>cluster-ha@backend-ceph:0 #ceph-0</td>
<td>volume-554fa967-62d7-4e6d-8dec-250c5d94150</td>
<td>1GiB</td>
<td>In-use</td>
<td>-</td>
<td>Attached to pgpool/74871898-8380-406d-b12c-d92eb4997c46 on /dev/vdb</td>
<td>No</td>
<td>No</td>
<td>Update Volume Status</td>
</tr>
<tr>
<td>LANDSCAPE_TRIAL</td>
<td>cluster-ha@backend-ceph:0 #ceph-0</td>
<td>volume-e7b25278-1671-40d9-978b-9d4f5b5265d1</td>
<td>1GiB</td>
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Status of the project

- IBM completed the SCP, PE deployment with SAP assistance

- POC customer onboarding testing and procedures were being developed

- SAP is reevaluating architecture and deployment options
  - The decision was made to cancel the project

- Even though the project has been canceled, a lot of knowledge and experience was gained
THANK YOU

Please remember to evaluate the session!!