OpenStack in Production

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Agenda

- SAP Figures
- Situation 2014
- OpenStack and SAP Converged Cloud as the „Holy Grail“
- Challenges & Opportunities through OpenStack
- Solution approach
SAP Figures
Situation 2014
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Some High Level Figures of SAP

- 80k+ employees
- 70+ data centers
- 7+ PB RAM capacity
- 100+ PB Storage capacity
- 90+ PB backup capacity
- Multiple multi billion USD acquisitions during the last years (successfactors, Ariba, Concur…)


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2014: SAP’s Cloud Infrastructure Challenge
Software Provider and Cloud Service Provider have very different cost structures, differ in their core competencies.

How to increase margin? Sell more licenses!

How to increase margin? Run a competitive IT!

*Source: IDC, 2013*
SAP Figures
Situation 2014
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Solution approach
OpenStack End Users

OpenStack Object Store
- swift-proxy
  - account
  - container
  - object

OpenStack Image Service
- glance-api
  - glance-registry
    - glance database

OpenStack Identity API

OpenStack Compute
- nova-api (OS, EC2, Admin)
  - nova-compute
    - nova-network
    - nova-volume
    - nova-scheduler
  - nova-console
  - nova-compute
    - nova-network
    - nova-volume
    - nova-scheduler

OpenStack Block Storage API
- cinder-api
  - cinder-volume
  - cinder-backend
    - AMQP
    - cinder-service

OpenStack Network API
- quantum-server
  - quantum-plugin
  - quantum-agents
  - quantum-service

OpenStack Object API
- OpenStack Identity API
- OpenStack Image API
- OpenStack Compute API
- OpenStack Block Storage API
- OpenStack Network API
What means convergence in SAP‘s Converged Cloud?

➔ We converge „northbound“ around OpenStack API‘s

➔ We converge around the OpenStack software eco-system:
  integration of HW & Software components through OpenStack drivers and OpenStack modules

➔ We converge „southbound“ around standardized hardware pods
SAP Converged Cloud “Markitecture” Picture

Innovation & Adoption Roadmap

Current 23x Infrastructure Platforms

SAP Converged Cloud (IaaS*)

SaaS*

Cloud App

Cloud App

Cloud App

Application

Application

Application

PaaS*

Application Platform

(e.g. HCP@CF)

Open Stack API

Open Stack API

Open Stack API

Open Stack API

Core Services

CCloud OpenStack

Optional Services

VMware

KVM

bare metal

Data Center (SAP-owned & Co-Lo)

* SaaS = Software-as-a-Service, PaaS = Platform-as-a-Service

IaaS = Infrastructure-as-a-Service

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Challenges & Opportunities

Different payloads:
- SAP Enterprise Applications
- SAP Cloud native Applications (e.g. cloud foundry based)

Different maturity of OpenStack Projects

Multi hyper visor (KVM & VMware & bare metal) support in one L2 network
- Vendor neutral Software Defined Network solutions?

Organization and Operations readiness
- History of Operations teams with VMware preferences
- “Cylinders of Excellence” style setup of Operations Organization
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Recap: Challenges & Opportunities

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- Preference of Operations towards VMware
Solution Approach for: Different payloads (Cloud Native vs Enterprise Applications)

Why trunk and why a distro?

- **Distro approach enables cloud native & private cloud deployment support for HCP IE use cases:**
  Partner or even customer can use a defined distro to deploy and operate infrastructure for HCP IE in non SAP data center

- **Trunk approach supports flexibility required to support specifics for Enterprise payloads like S4H, HEC**
  - Bare metal, VMware, NFSaaS (Manila) etc. support missing in existing Distros
  - SAP needs to influence Community by active contributions and cooperation with partners to get SAP requirements introduced to OpenStack

HCP IE: HANA Cloud Platform Industry Edition
HEC: HANA Enterprise Cloud
S4H: SAP Suite for HANA
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Solution Approach for: Different maturity of OpenStack Projects

modifications of OpenStack required?

- Upstream vs downstream modifications
- Requires clear upstream/downstream strategy

Converged Cloud

release/trunk
consumes

merge

upstream contribution

upstream contribution
downstream development
**Upstream first**

- The paradigm means any change for an open source project should be aligned with the community.
- Feature implementation must follow the process and rely on the release cycle.
- Effects:
  - Solutions must be vendor independent.
  - Accepted changes are maintained by the community.
  - Code will be supported by distros later on.

**Deliver in time**

- Our stakeholders have tough timelines and therefore demanding our infrastructure features are delivered in time.
- Some components are missing functionality.
- Upstreaming takes time.
- Does not mean downstream only (upstreaming can be decoupled but can be risky).
Downstream only → cumulates technical debt

Fraken-Cloud

Business Requirements
downstream development

OpenStack Trunk

Liberty Mitaka

Technical Debt Can Make OpenStack Fail

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Upstream Development Impact

upstream development:
→ pay down tech debt + innovate upstream OpenStack

carefully evaluate customer demands & requests and analyze impact
Upstream first vs Downstream first depends on Impact levels

A change can have the following impact levels:

1. **Impact level: high**
   - API change (= the API version will be increased)
   - DB schema changes (= DB migration need to be done)
   - RPC changes
   - core changes

   Should be always upstream first

2. **Impact level: medium**
   - vendor driver change (not in core repository)
   - plugin change (an external hosted plugin)

   Upstream first preferred
   Downstream possible

3. **Impact level: low**
   - An external module that uses OpenStack APIs only
   - A monitoring script
   - 3rd party integration that is SAP specific (like AD integration)

   Typically done downstream

The higher the impact level the higher the risk to be incompatible to vanilla OpenStack in case of downstream solution.
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Solution Approach for:
Multi hyper visor (KVM & Vmware & bare metal) support in one L2 network

Objective:
→ avoid vendor lock in by vendor specific/proprietary Software Defined Storage solution

Approach: Hierarchical Port Binding


Additional advantages:
→ Eases the operations model transition
  → from network, storage & compute silos to interdisciplinary cloud admins
  → end devices do still speak vLAN while 4k vLAN deadlock/limitation in network fabric is eliminated
  → Allows separation of data and control plane
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Approach to address Operations Challenges (1/3)

Pre-manufactured Pods
- Well defined BOM and procedure for pre-manufactured hardware commissioning (Pods)
- Addresses: time to delivery and quality in build-up

Clearly separate control and data planes
- Independent SLOs & Scalability
- Existing model to operate vendor gear and hypervisors (data path)

Run openstack as pure control plane
- Automatic, self healing, self supervising, immutable system (control)
- Target: Very limited extra operations
Approach to address Operations Challenges (2/3): Containerized OpenStack on Kubernetes

- Everything containerized on Kubernetes
- Constant releases with low touch operations.
  - OS patching via CoreOS auto-update.
- No downtime in data path due upgrades on OpenStack.
- Automatic, Self-healing, Consistent and Immutable.
- Scales non linearly across multiple regions – do once, repeat
Approach to address Operations Challenges (3/3):
Embedded Analytics

- Self contained monitoring and analytics per region for control plane
- Automatic: traditional ops “key action” is replacing/patching/adding hardware and vendor gear, the rest is automatic. (not yet, but step by step)
  → Kubernetes /healthz for OpenStack
  → Prometheus middleware for OpenStack
  → Sentry middleware for OpenStack
  → Monasca, alerting and logging for OpenStack and Prometheus.
  → SAP Hana for pay per use & long term analytics.
Embedded Analytics
Metric everything, Error reporting, Alerting

API Availability & uptime

Error reporting

Alert Management as a Service
Recommended reads

Running and building an IaaS is not only a technical challenge

It is also a cultural and conceptual one

Learning the patterns people out there use… is a important
Vision & Cultural Change – “we are all developers”

New on boards to Team → Read the book
- Automate everything, especially testing & deployment
- Version control everything

Get it in action
- Provide trust
- Provide cover
Vision & Cultural Change – “we are all operators”

New on boards to Team → Read the book

“Google’s SREs have done our industry an enormous service by writing up the principles and patterns – architectural and cultural – that enable their teams to combine continuous delivery with world-class reliability at ludicrous scale. You owe it to yourself and your organization to read this book and try out these ideas for yourself”

- Jez Humble, author of “Continuous Delivery”
Key Takeaways
Key Takeaways

➔ Vendor Neutrality through OpenStack
➔ Trunk and Distro approach are valid approaches, depending on the use case
➔ No way around collaboration with and contribution to the community
➔ Clear up- & downstream strategy required
➔ From Silo Admins/Operators to Cloud Admins/Operators
➔ From internal development to community development
Thank you for your time and attention…
Thank You!