2015 Spark 技术峰会

SuperVessel: Enabling Spark as a Service with OpenStack and Docker

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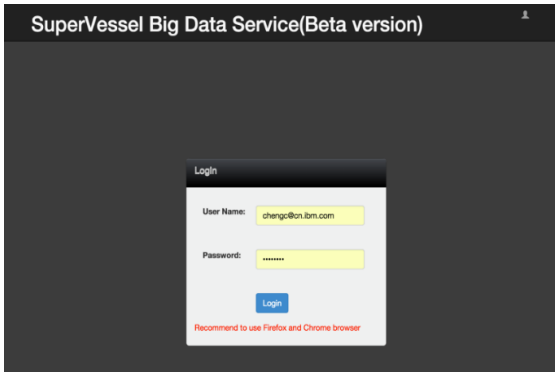
SuperVessel Cloud

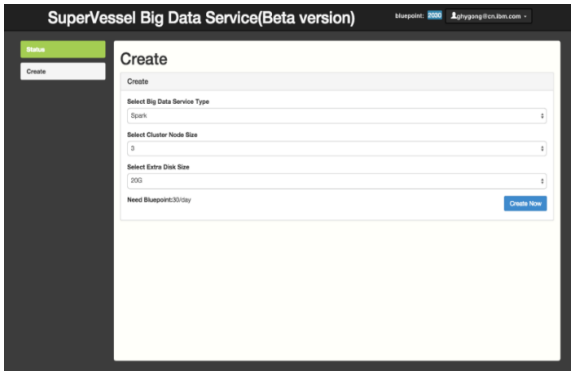
- Public cloud built on the POWER7/POWER8 servers with OpenStack
- It provides **free** access for students, researchers, developers across the world, and helps grow OpenPOWER ecosystem (used in 30+ universities now)
- It provides advanced technology services such as **Spark as a Service**, Docker Services, Cognitive Computing Service, IoT Service, Accelerator as a Service (FPGA and GPU)

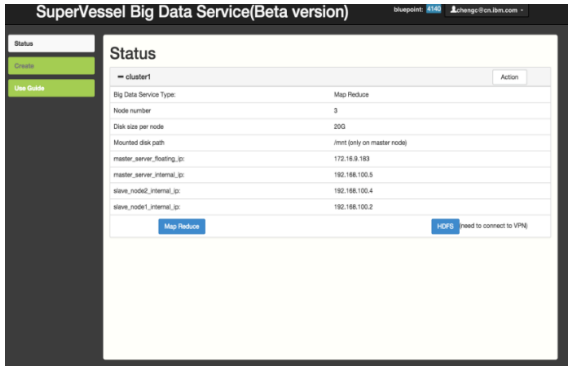
Spark as a Service

Try it at: www.ptopenlab.com

3 steps to launch a Spark cluster, easy!







Step 1: Login → **Step 2: Create** → **Step 3: Ready!**

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Why OpenStack?

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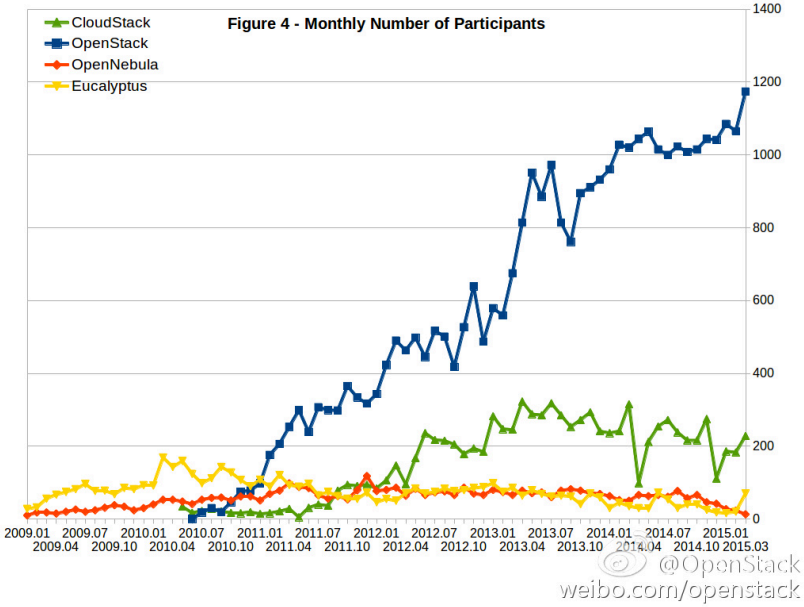
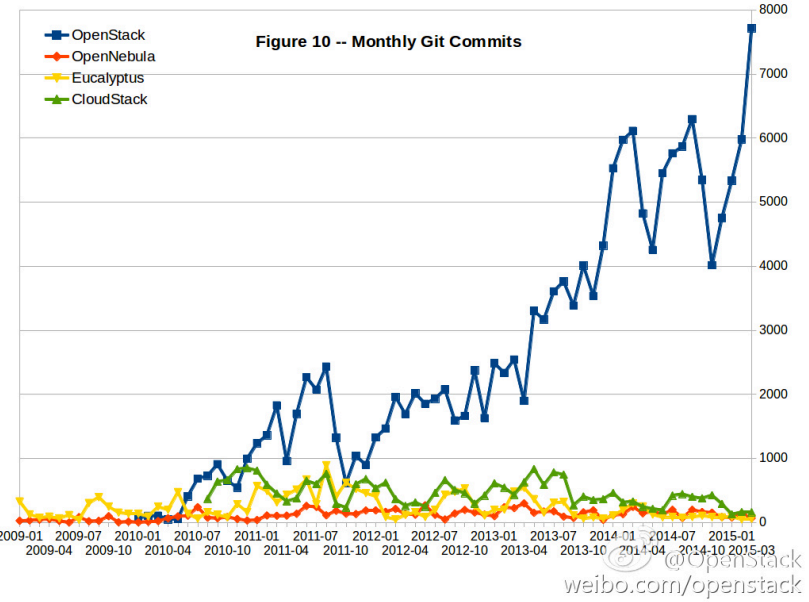
- Most popular IaaS software
- Supports Docker*
- Heat can orchestra docker containers easily – good for provision a Spark cluster

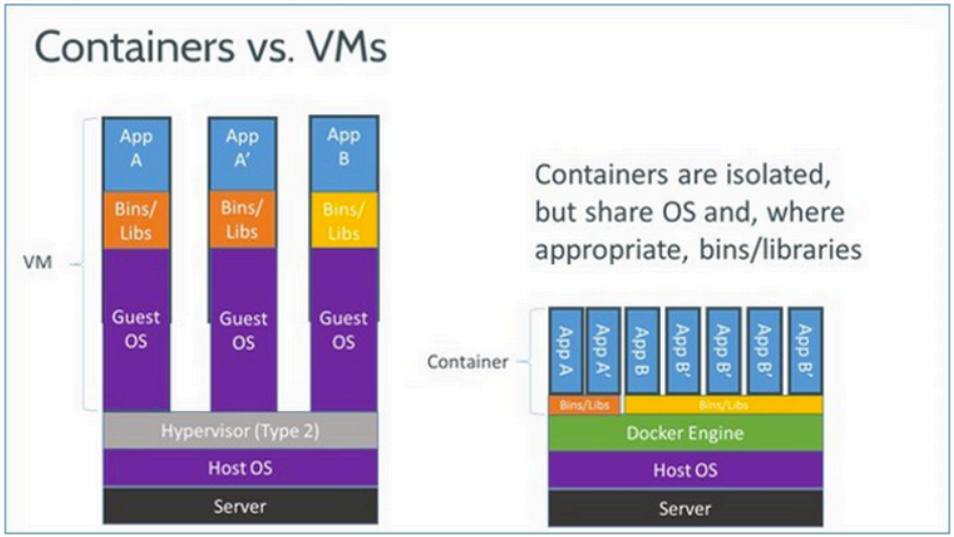




Picture source: http://www.qyjohn.net/?p=3801

Why Docker?

- Less resource consumption than KVM
  - We can provision more Spark clusters!
- Boot faster than KVM
  - Users like fast provision!
- Incrementally build, revert and reuse your container
  - We love Git and AUFS!
- However, Docker is not officially supported in OpenStack yet
  - Nova Docker is an external component of OpenStack
- Port Docker to POWER Architecture (ppc64 and ppc64le)
  - Ubuntu 15.04 includes Docker for POWER8 ppc64le



Picture source: http://www.zdnet.com/article/what-is-docker-and-why-is-it-so-darn-popular/

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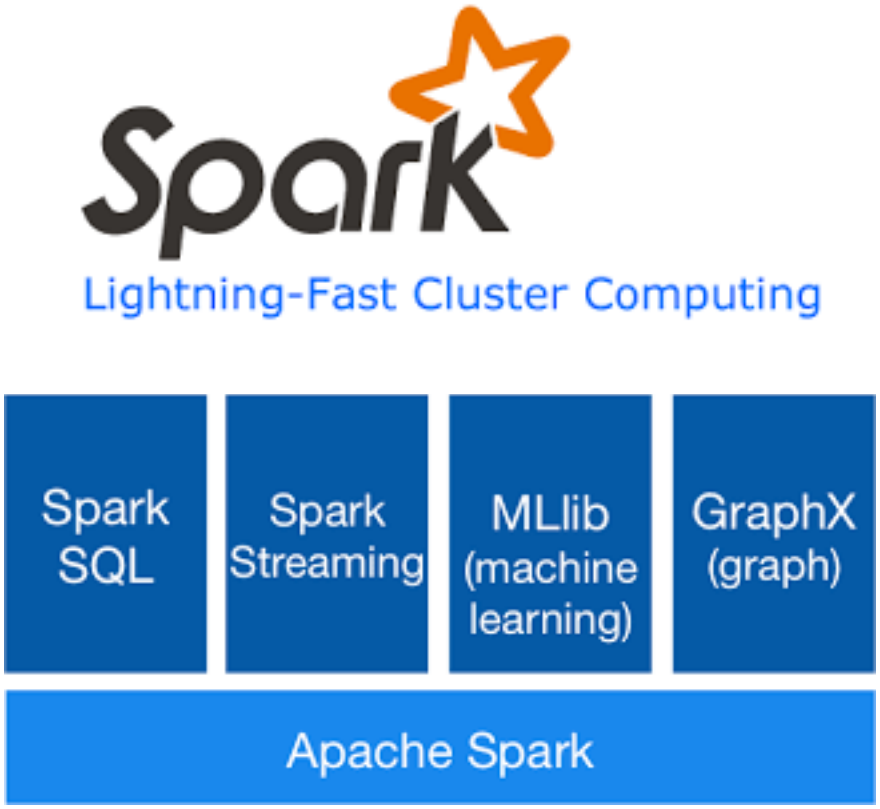
Why Spark?

- Fast
- Unified
- Ecosystem

Porting to POWER

- Bugfix submitted to the community
- Spark 1.3 works smoothly! ☺



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Why not Sahara?

Sahara is a component for Hadoop/Spark as a Service in OpenStack

- We started from OpenStack Icehouse …
- Dockerization
  - Better service deployment and isolation for Big Data dashboard server
- Customization
  - Waiting for Sahara's improvements is somehow *SLOW*
    - Docker, user analytics, Spark 1.4, Spark IDE, scheduling, data visualization etc.

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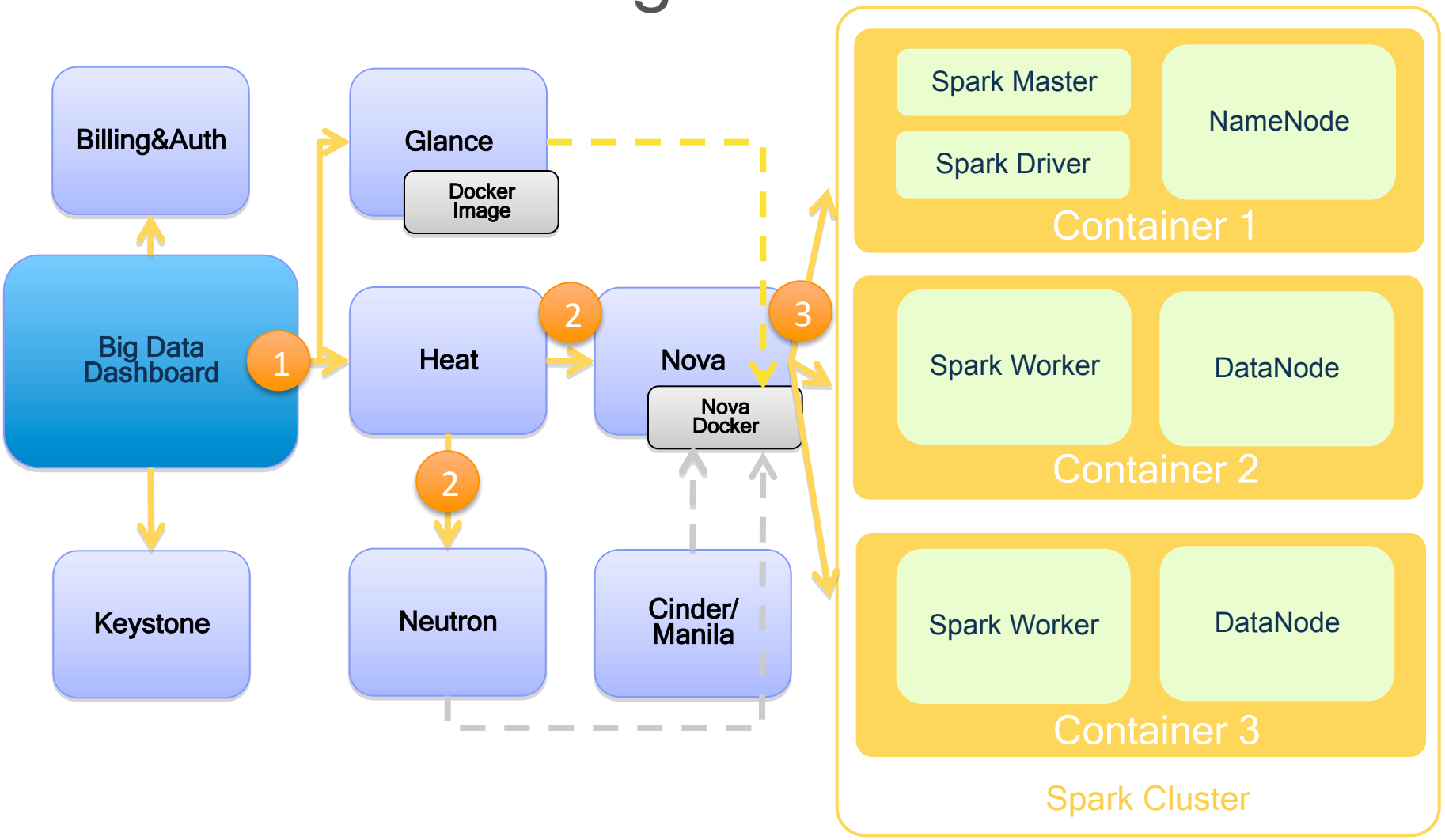
Architecture Design



Dockerize everything!

- We use containers to
  - run **applications**
  - run **other containers**
  - run **OpenStack python daemons**
  - run **OpenStack services inside OpenStack** (with a special trunk link in neutron/OVS)
  - run **OpenStack inside OpenStack**
- Good for multi-site expansion

Heat template design

Heat is a component for orchestration in OpenStack

- Parameters
  - Cinder/Malina/Neutron uuid
  - Size of Cinder/Malina resources
- Resources
  - Master/slave node
  - Neutron
  - Cinder/Manila
    - Need to modify nova-docker to mount the cinder/ manila resources when booting the docker container

Spark Docker Image

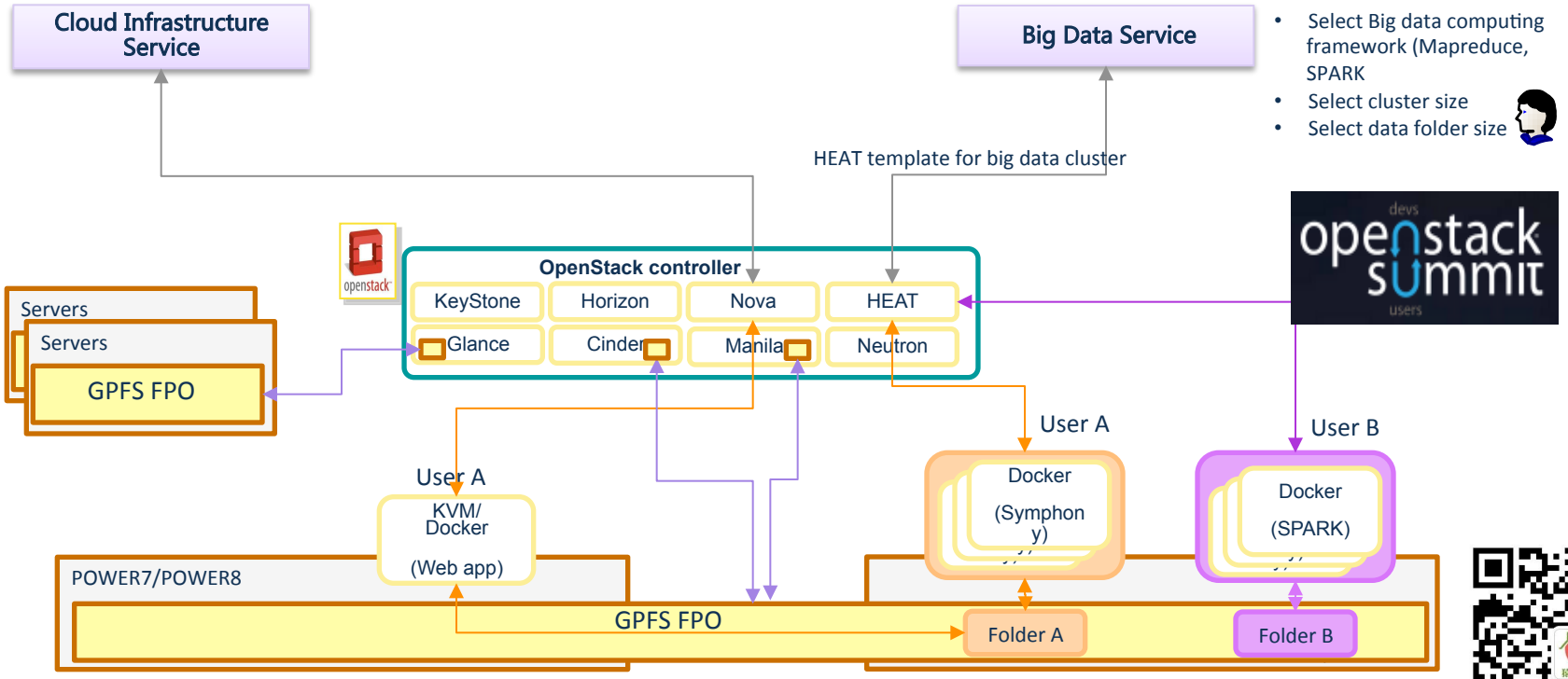
- Built from Ubuntu 14.04.1
- All Spark nodes use the same image, with different initialization scripts by using cloudinit
- Initialization scripts will
  - Sync /etc/hosts across all nodes
  - Set HDFS and Spark configurations accordingly
  - Format HDFS and launch HDFS
  - Launch Spark

Big Data Dashboard Development

- 2 Developers (frond end + backend)
  - Online in 2 months
  - Separates Heat related stuff and Dashboard
  - Restful API (for billing and authentication etc)
  - Dockerize the big data dashboard server
  - Separates development and production environment

Where should I put the data?

Shared File System for Cloud and Spark as a Service



- HEAT will orchestrate docker instances, subnet and data folder based on user's request
- Manila provides the NFS service using GPFS as backend, and the folder will be mounted via nova-docker (with -v support)
- Folder created by Manila could be accessed by the KVM/docker instances created for big data and other purpose

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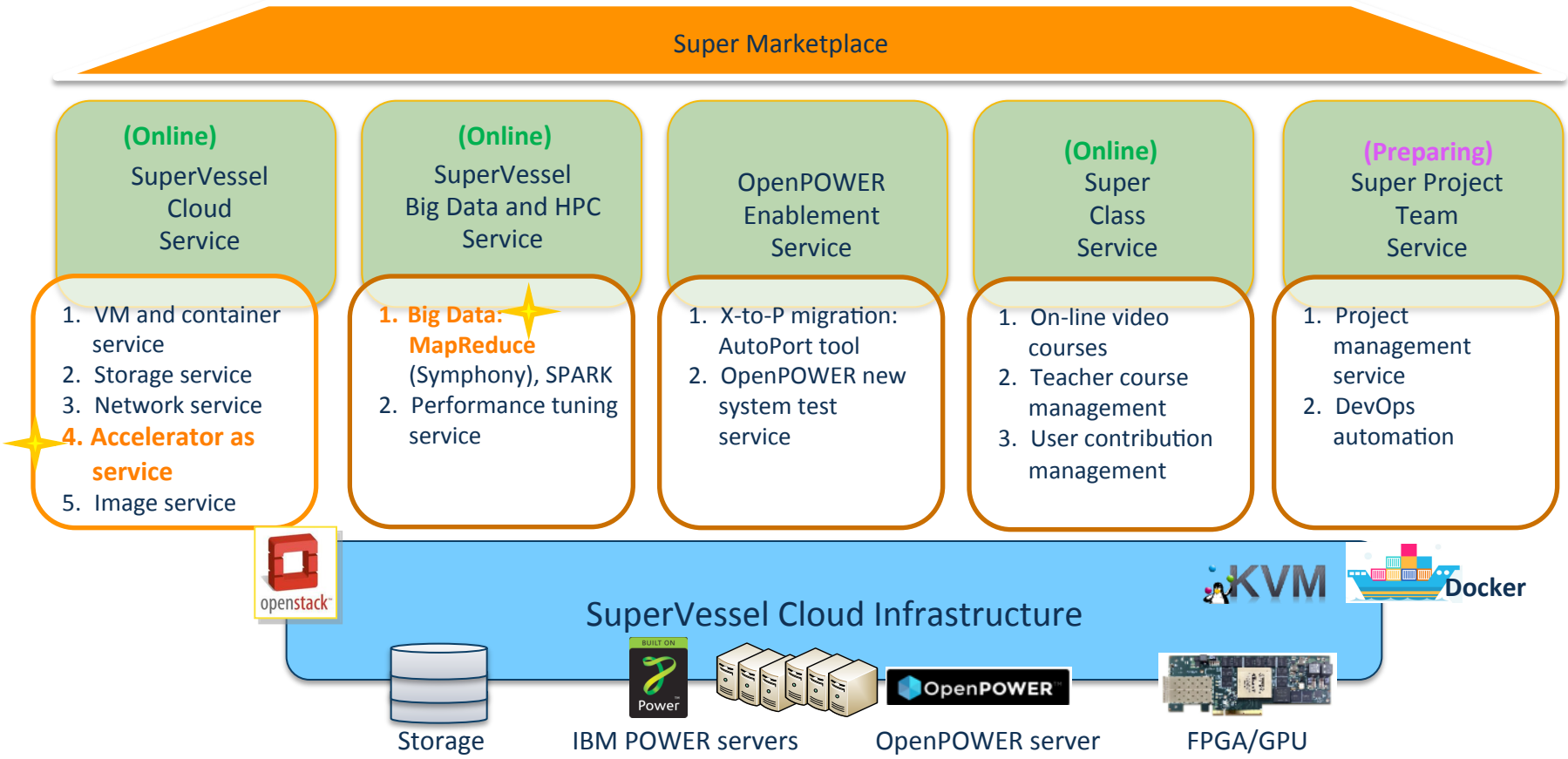
SuperVessel Services Roadmap



Summary

- Spark + OpenStack + Docker works very well on OpenPOWER servers
- Dockerized services made DevOps easier
- Docker issues
  - Zombie process
  - Can't dynamically attach volume
  - Commit, attach operations is not supported on Nova-docker
- Monitoring everything (API, resources etc)
  - key for operating a cloud
- TODO: Spark 1.4, Spark IDE, SWIFT, Data Visualization

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SuperVessel WeChat group

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