



DevOps education program

Other cloud technologies

Lecture 2.4

Module 2. Virtualization and Cloud Basic

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Agenda

- GCP
- Azure
- Virtual resources
- OpenStack
- Containers
- Microservice
- Kubernetes
- AWS
- Orchestrator
- Migration
- Q&A

GCP

GCP briefly

- Start from 2011
- Low cost
- Best per second billing
- Non-standard sizes
- VPC covers all regions
- Spanner is a globally distributed database
- Free Tier <https://cloud.google.com/free>



Google Cloud

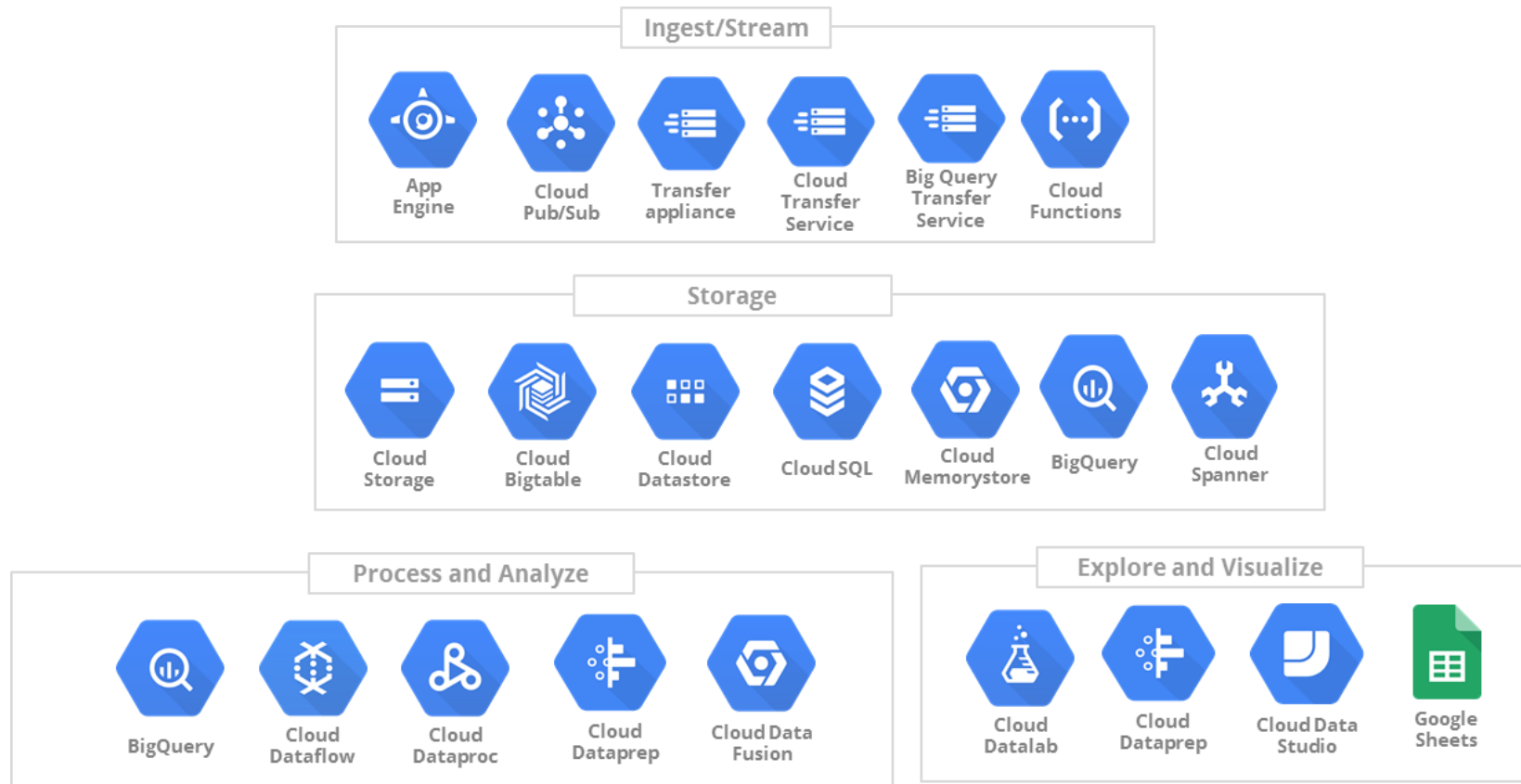
GSP global

2020Q1:
22 regions
61 zone

- Current region with 3 zones
- Future region with 3 zones



GCP services



AZURE

Azure briefly

- Start from 2008
- per minute billing
- Integration with Microsoft services
- Free Tier <https://azure.microsoft.com/en-us/free/>



Azure regions



54 regions
worldwide

140 available in
140 countries

* Two Azure Government Secret region locations undisclosed

Azure services

Platform Services

Security and Management

- Portal
- Active Directory
- Multi-Factor Authentication
- Automation
- Key Vault
- Store/Marketplace
- VM Image Gallery and VM Depot

Compute

- Cloud Services
- Service Fabric
- Batch
- Remote App

Web and mobile

- Web Apps
- API Apps
- API Management
- Mobile Apps
- Logic Apps
- Notification Hubs

Developer services

- Visual Studio
- Azure SDK
- Team Project
- Application Insights

Hybrid Operations

- Azure AD Connect Health
- AD Privileged Identity Management
- Backup
- Operational Insights
- Import/Export
- Site Recovery
- StorSimple

Integration

- Storage Queues
- BizTalk Services
- Hybrid Connections
- Service Bus

Analytics and IoT

- HDInsight
- Machine Learning
- Data Factory
- Event Hubs
- Stream Analytics
- Mobile Engagement

Data

- SQL Database
- SQL Data Warehouse
- Redis Cache
- Search
- Cosmos DB
- Tables

Media and CDN

- Media Services
- Content Delivery Network (CDN)

Infrastructure Services

Compute

- Virtual Machine
- Containers

Storage

- BLOB Storage
- Azure Files
- Premium Storage

Networking

- Virtual Network
- Load Balancer
- DNS
- Express Route
- Traffic Manager
- VPN Gateway
- Application Gateway

VIRTUAL RESOURCES

The main types of virtual resources

Storage, virtual disks

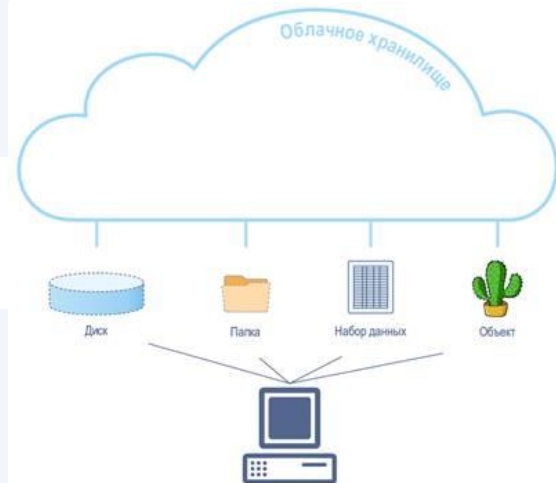
Virtual computing resources (processor, memory).

Productivity and bandwidth resources.

Serverless solutions (Lambda)

Cloud storage

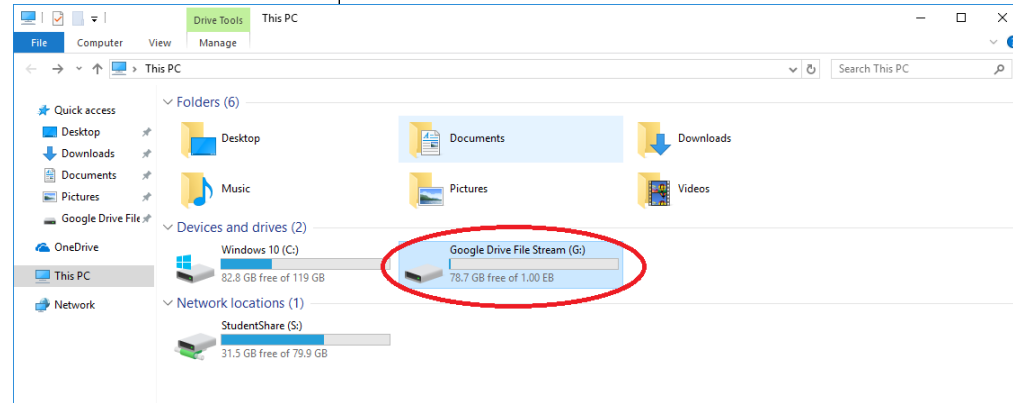
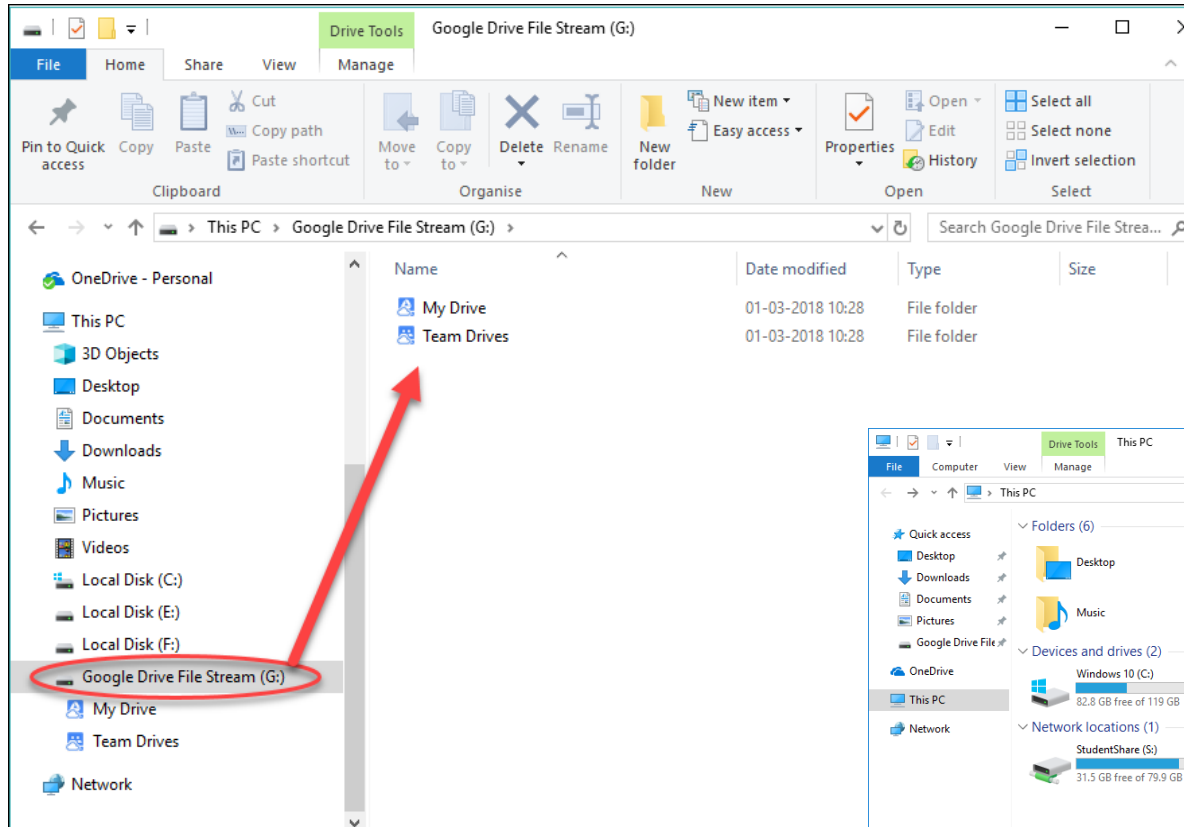
Cloud resource type	Data type	Note
Disc	Files, folders	You can manage the disk file system, partition it into logical disks, etc .; available disk space is limited by the size of the disk provided
Folder	Files, folders	You cannot manage the file system and the logical structure of the disk space; storage size is limited by tariff, not disk size
Data set	Numbers, strings and other atomic data	The application must "know" the logical connections between these data in order to use them correctly
Object	A set of related data	As a rule, this set corresponds to something from the real world: user, document, organization, product, etc..



Google drive



drive file stream




OPENSTACK

Home » OpenStack Oper x

Надежный | https://www.openstack.org

openstack

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Advance the future of edge computing at OpenDev

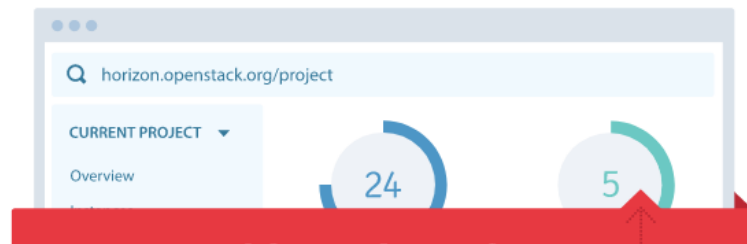
A new collaborative event for technical experts and operators with real world edge use cases.

Learn More >

September 7-8 | San Francisco, CA

Open source software for creating private and public clouds.

OpenStack software controls large pools of compute, storage, and networking resources throughout a datacenter, managed through a dashboard or via the OpenStack API. OpenStack works with popular





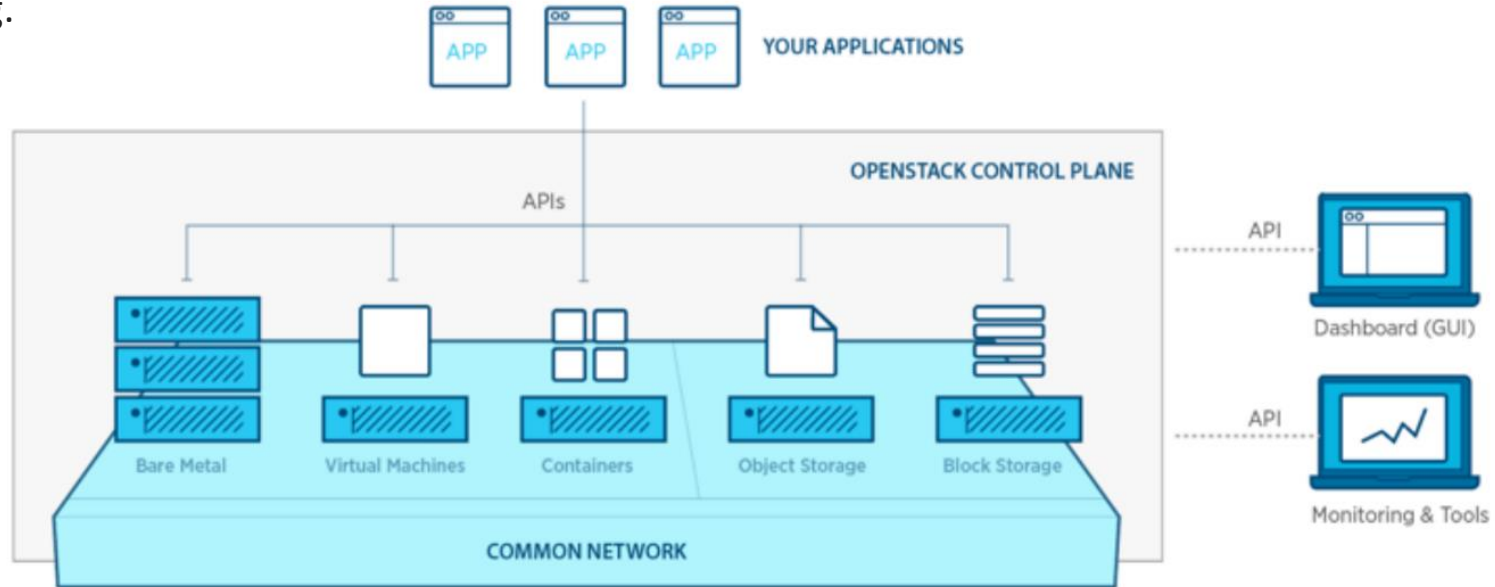
- OpenStack is a collection of open source services for building public and private clouds. Work on OpenStack began in 2010, when the code for two platforms was merged: Nebula (the so-called platform created specifically for NASA) and RackSpace CloudFiles (developed by RackSpace). Soon, developers of various Linux distributions began to show interest in the new project: already in 2011, OpenStack became the main cloud platform for Ubuntu Server and Ubuntu Enterprise Cloud. In the same year, OpenStack was used in the Debian OC.
- In mid-August 2012, Red Hat released a preview version of its OpenStack-based distribution. The commercial version appeared in July 2013 with the release of "Grizzly"
- The OpenStack Summit 2016 was attended by 7,500 participants !!.

Advantages of OpenStack

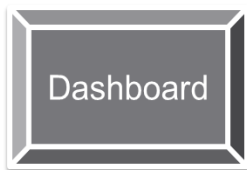
- OpenStack offers a systems approach to managing complex cloud computing services, which include: security, storage, interoperability, virtual machine management, tracking of processes occurring within the project, using the information panel, etc.
- OpenStack allows companies to fully control their assets. Now, if expansion is needed, companies will not have to rely entirely on their own cloud computing solutions. For example, if you want to add any detail to your cloud computing solution, you just need to hire an OpenStack developer and everything he needs he will do for you.
- Another huge advantage of using OpenStack is the ability to avoid vendor binding, as well as a wide choice of core technology, the ability to fully control the system, high performance and cost savings.

OpenStack

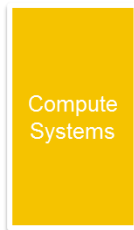
OpenStack is a set of components that work together to provide infrastructure as a service. Due to the open nature of the components, the user can use such components depending on their own needs. Thus, it is the user who has more control over the ecosystem than the software. The only way to achieve such an open structure is to combine unique solutions for different parts of cloud data processing.



OpenStack main components



=Horizon



=Nova



=Keystone



=Quantum
/ Neutron



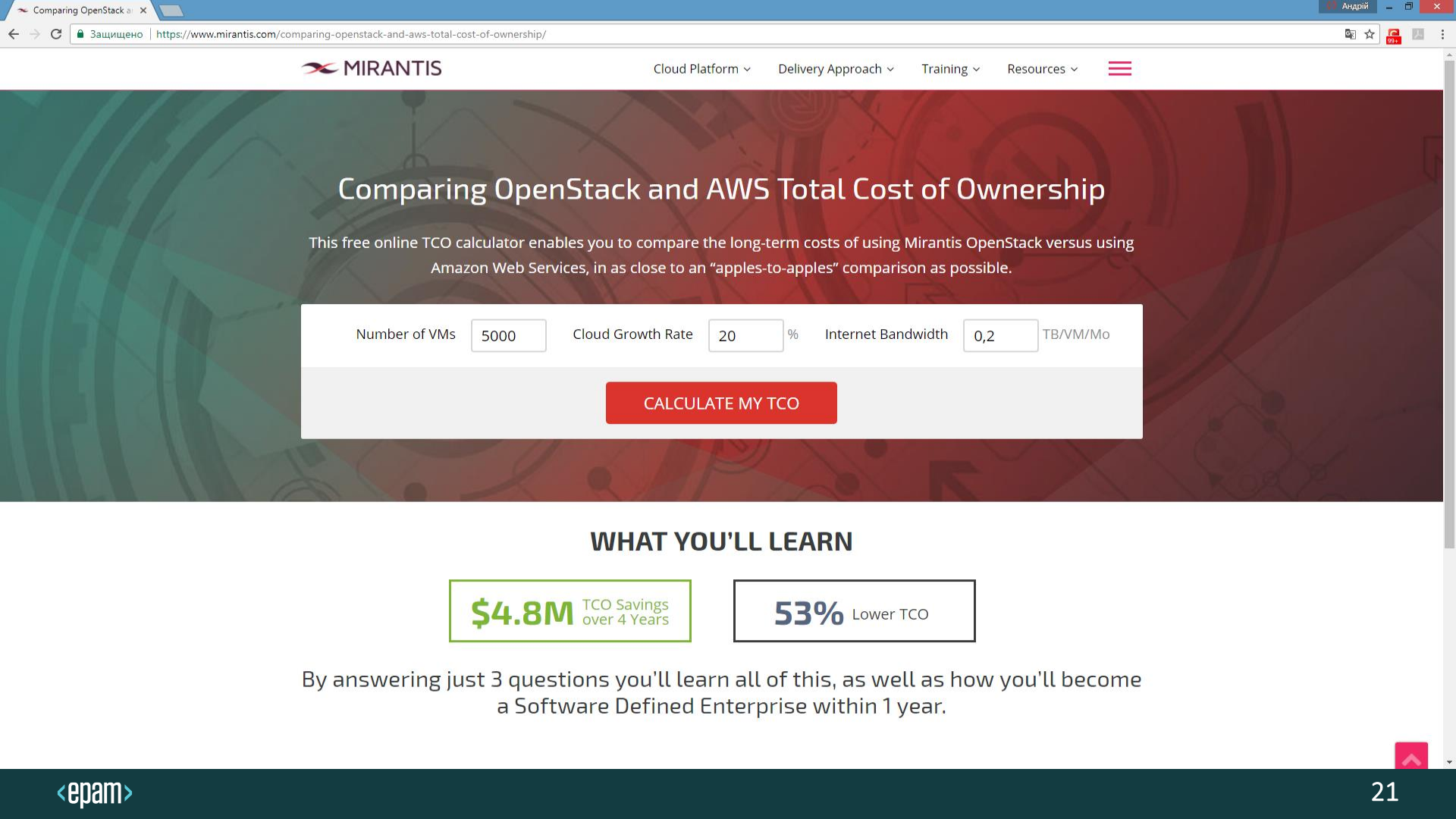
=Glance



=Swift



=Cinder



Comparing OpenStack and AWS Total Cost of Ownership

This free online TCO calculator enables you to compare the long-term costs of using Mirantis OpenStack versus using Amazon Web Services, in as close to an “apples-to-apples” comparison as possible.

Number of VMs

5000

Cloud Growth Rate

20

%

Internet Bandwidth

0,2

TB/VM/Mo

CALCULATE MY TCO

WHAT YOU'LL LEARN

\$4.8M

TCO Savings over 4 Years

53%

Lower TCO

By answering just 3 questions you'll learn all of this, as well as how you'll become a Software Defined Enterprise within 1 year.

OpenStack in Mirantis Cloud Platform

On-premises IaaS and NFV with comprehensive lifecycle management and operations support systems.

[VIEW MCP DEPLOYMENT GUIDE](#)

[DOWNLOAD LEGACY OPENSTACK](#)

MCP Components

Lifecycle MGMT



DriveTrain

Operations Support



StackLight

Containers



Kubernetes

VMs



OpenStack

Storage



Ceph

SDN

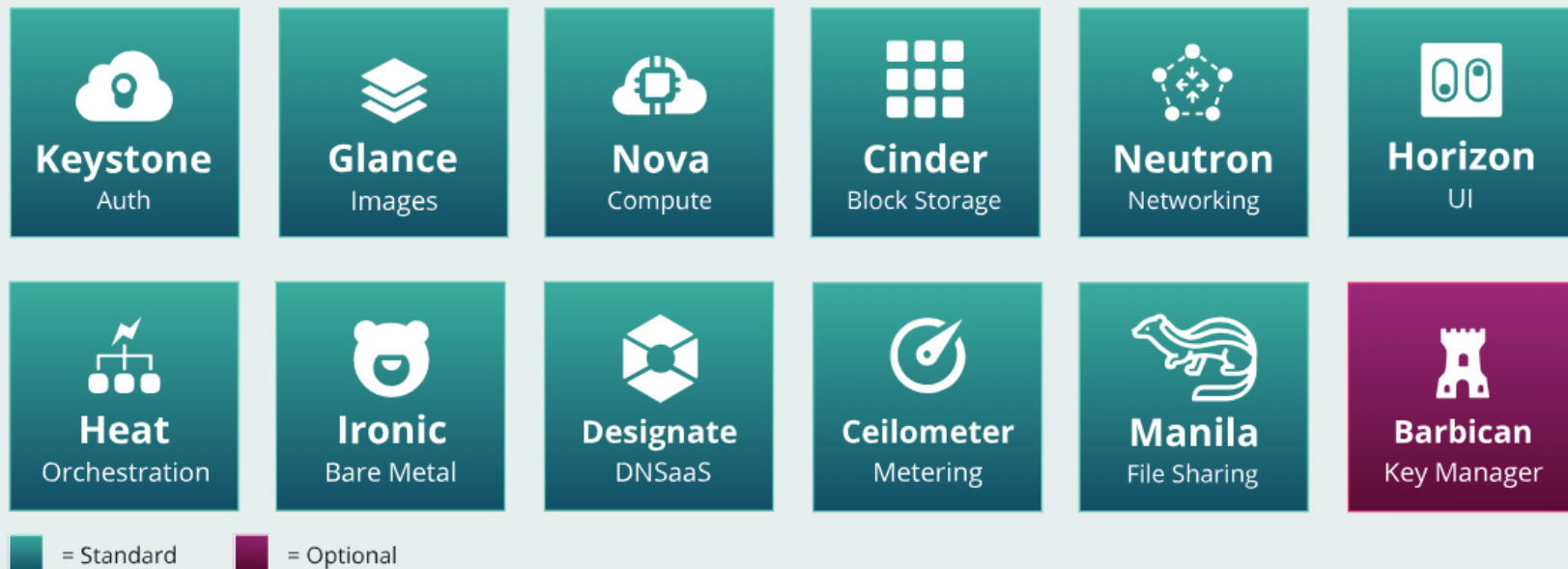


Tungsten Fabric

Management

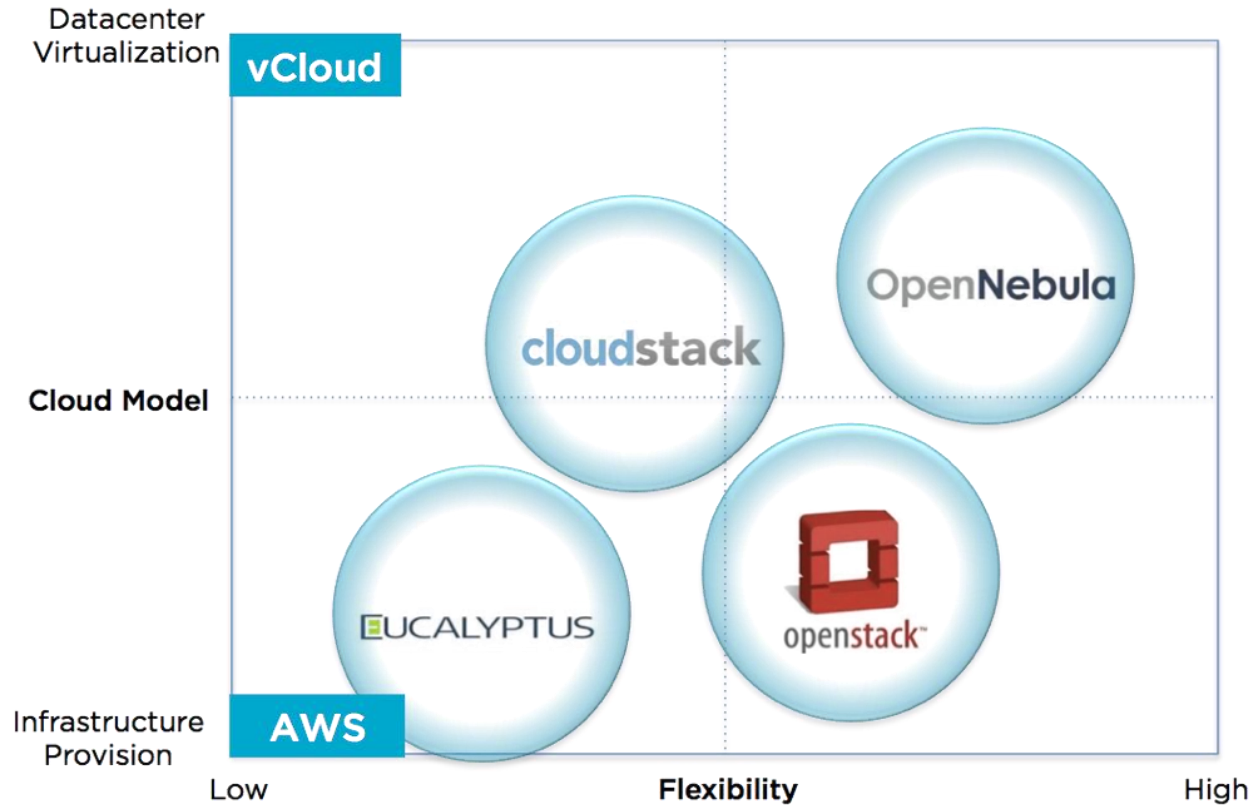
Infrastructure

What OpenStack Components are included in MCP?



MCP includes individual VM artifacts for core services, continuously delivered to your on-prem cloud environments via the DriveTrain toolchain.

Cloud Management Platforms

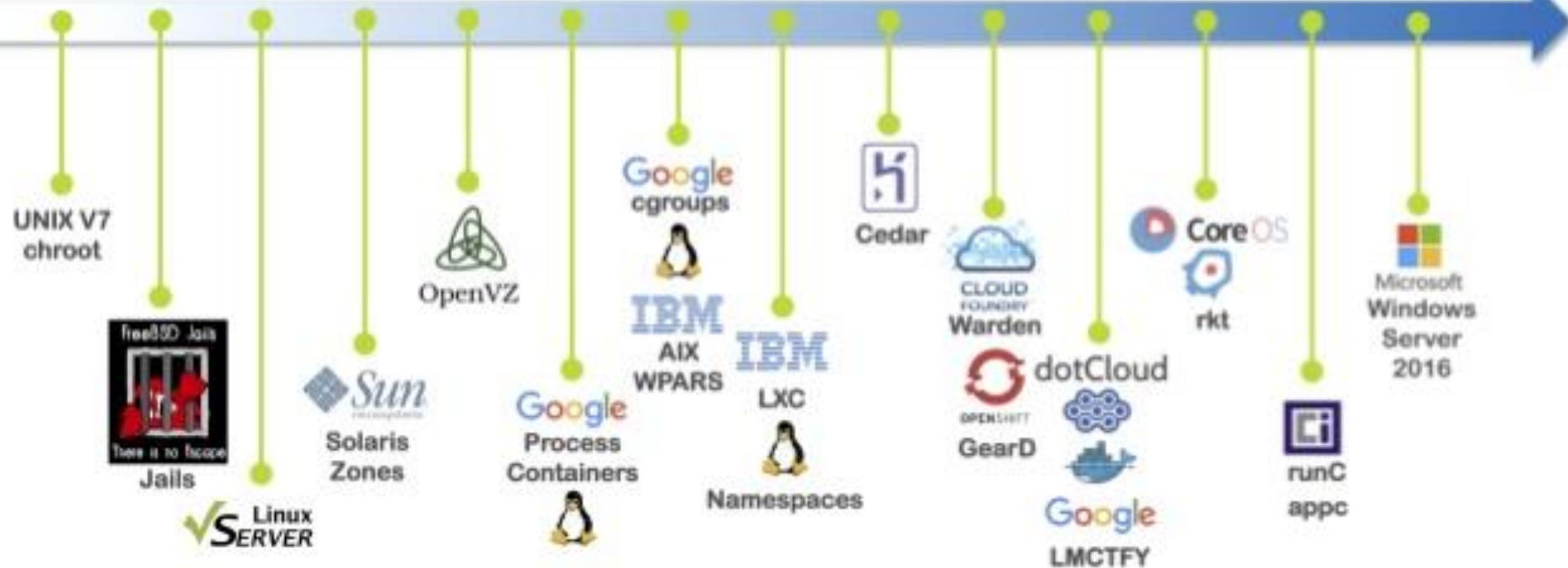


CONTAINERS

Container History Lesson



1982 2000 2001 2004 2005 2006 2007 2008 2010 2011 2013 2014 2015 2016



History and evolution of computing

development process

Waterfall



Agile Methodology



DevOps



application architecture

Monolithic



N-Tier

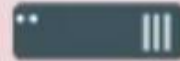


Microservices



deployment

Physical Server



Virtual Servers



Containers



application infrastructure

Datacenter



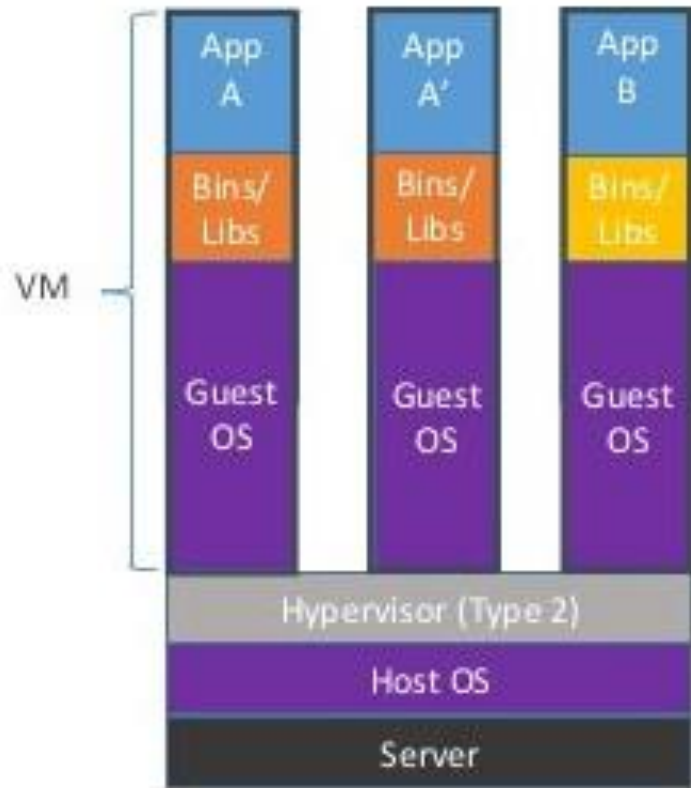
Hosted



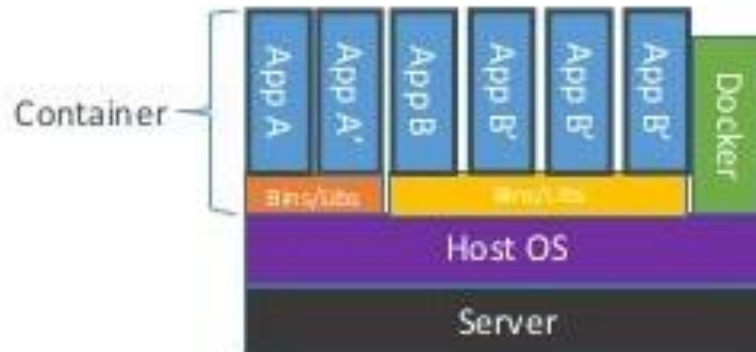
Cloud



Hypervisor+VMs vs. Containers



Containers are isolated, but share OS and, where appropriate, bins/libraries





- LXC is an operating system-level virtualization system for running multiple isolated Linux instances on a single computer. LXC does not use virtual machines, but creates a virtual environment with its own process space and network stack. All LXC instances use one instance of the OS kernel. LXC is based on a Linux kernel technology called cgroups (added in kernel 2.6.29) using a namespaces isolation mechanism. Container virtualization technology is often viewed as an improved implementation of the chroot sandboxing mechanism.

Docker

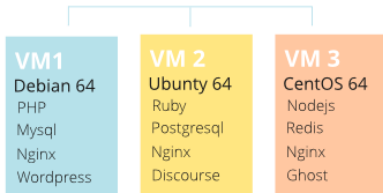
- Docker is a tool that provides a user-friendly interface for working with LXC. With Docker, you can run processes in an isolated environment. The process running under Docker seems to be running in a minimal environment, where besides it there are only its children. Although the process runs in the same operating system as the rest of the normal processes, it simply does not see them, just as it does not see files and everything else outside of its "sandbox".



Key differences between LxC and Docker

LXC

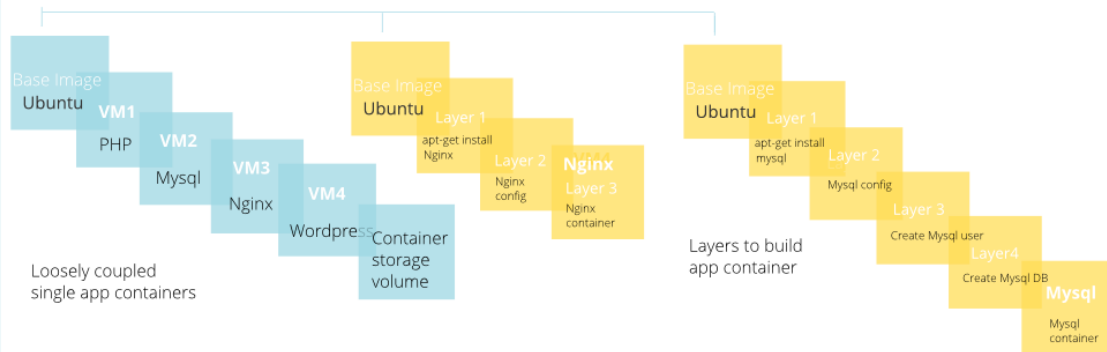
Host



- Filesystem neutral
- Containers are like VMs with a fully functional OS
- Data can be saved in a container or outside
- Build loosely coupled or composite stacks

Docker

Host



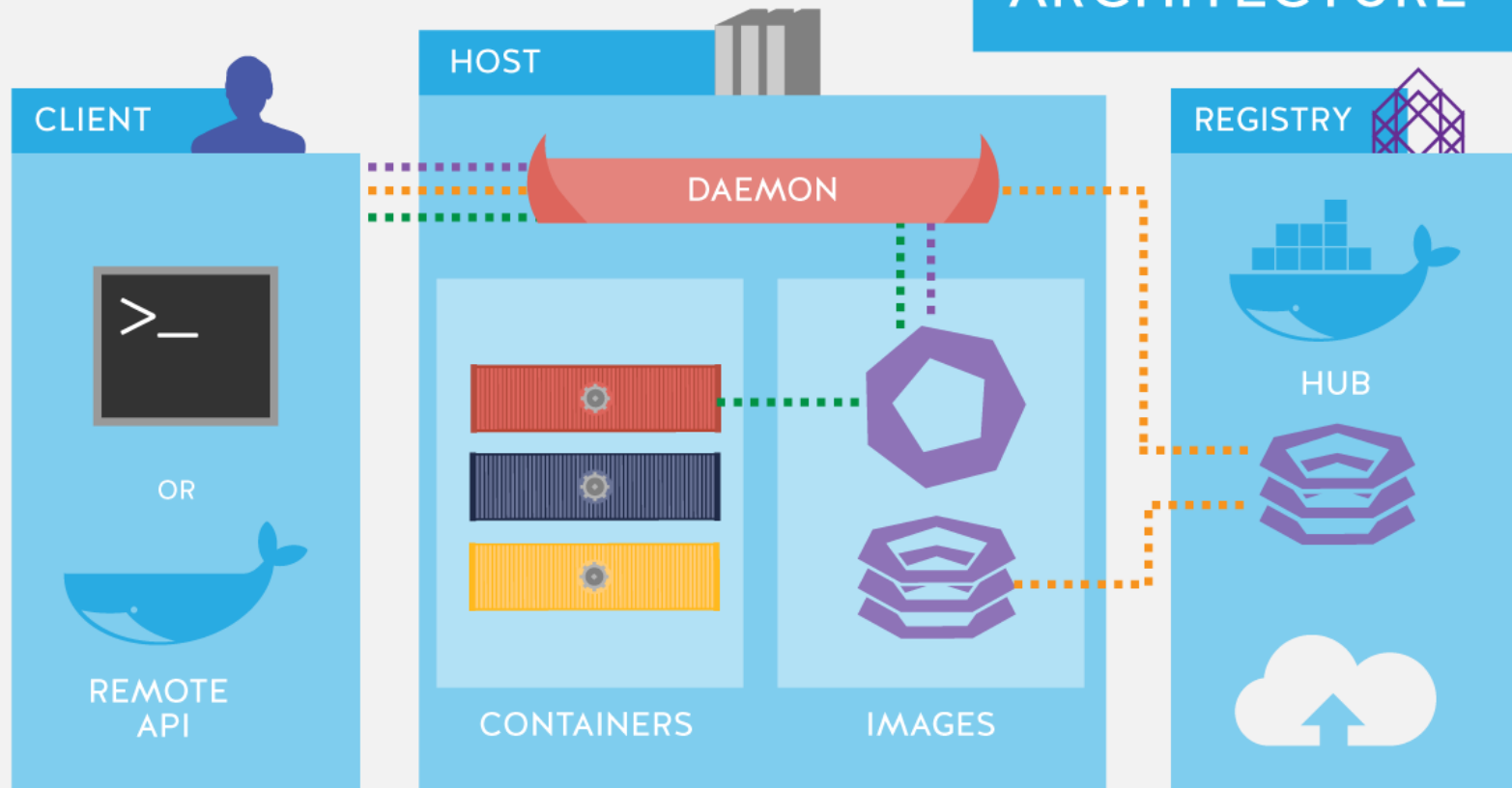
- Containers are made up of read only layers via AUFS/Devicemapper
- Containers are designed to support a single application.
- Instances are ephemeral, persistent data is stored in bind mounts to host or data volume containers

BUILD

PULL

RUN

DOCKER ARCHITECTURE



NORDICAPIS.COM

Docker core components

- **Docker Client** - Command Line Interface (CLI) for interacting with Docker.
- **Dockerfile** - A text file of Docker instructions used to build a Docker image.
- **Image** - The file hierarchies generated from the Dockerfile are used as input to the build command.
- **Container** - Launch an instance of an image using a docker run environment.
- **Registry** - image repository

Docker image

Docker images can be built from base images, the description steps for creating these images are called instructions. Each instruction creates a new image or level. The instructions will be as follows:

- running command
- adding a file or directory
- creating an environment variable
- specifying what to run when the container of this image is launched

These instructions are stored in the Dockerfile. Docker reads this Dockerfile when it needs to build an image, follows these instructions, and returns the final image.

MICROSERVICE

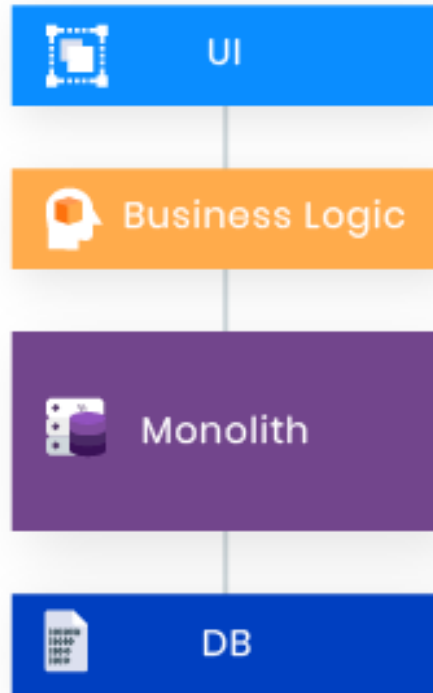
Monolith vs



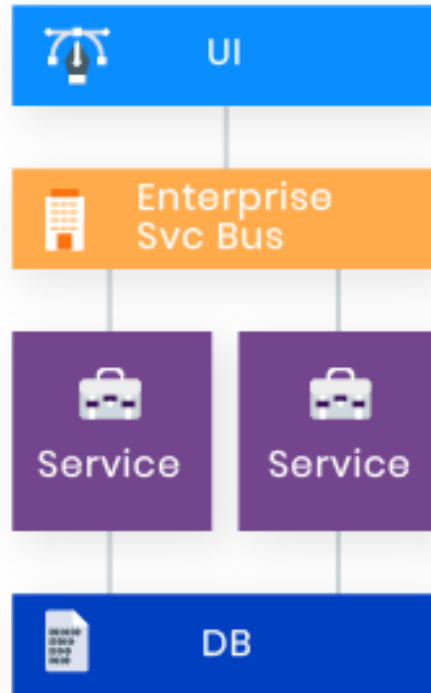
Microservices



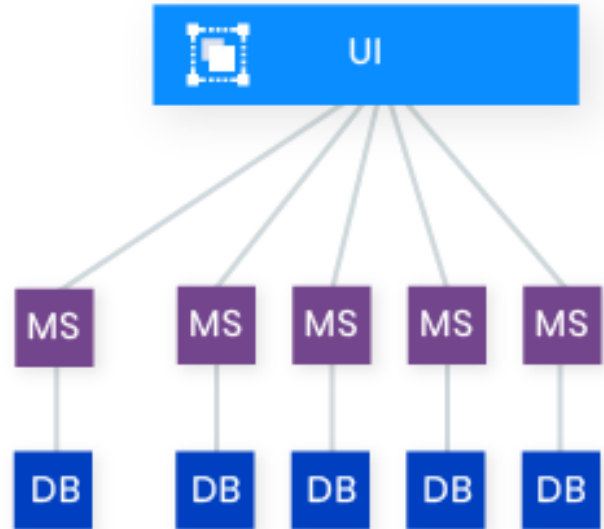
Monolithic, SOA, Microservices



Monolithic



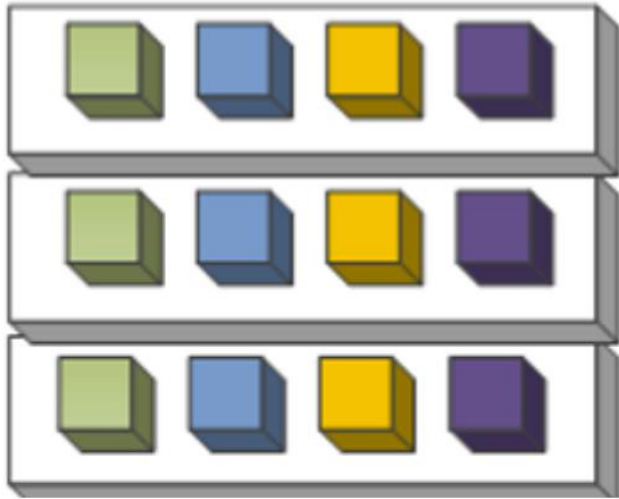
Service - Oriented



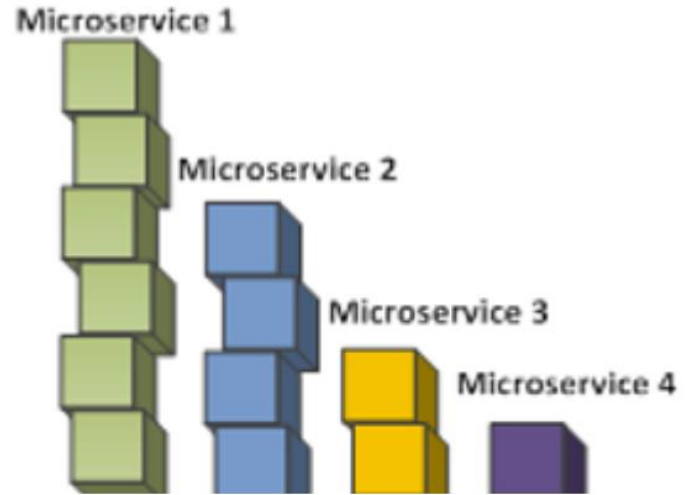
Microservices

Advantages - flexibility, scalability, low cost

All Parts of Monolith must scale together

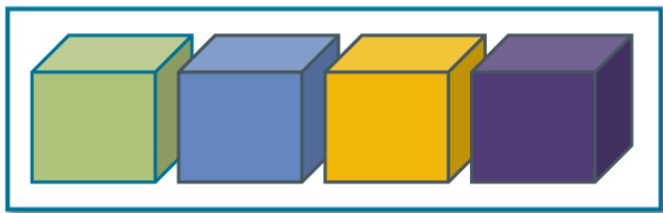


Microservices scale at their individual pace

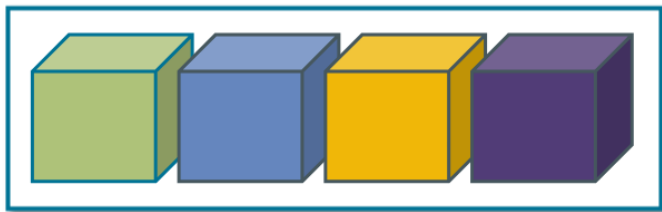


Advantages - independent versions

All Parts of Monolith must release together



V 3.1



V 3.2

Microservices release at their individual pace



KUBERNETES

What is Kubernetes (K8s)?

- Kubernetes is a portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation. It has a large, rapidly growing ecosystem. Kubernetes services, support, and tools are widely available.
- The name Kubernetes originates from Greek, meaning helmsman or pilot. Google open-sourced the Kubernetes project in 2014. Kubernetes combines over 15 years of Google's experience running production workloads at scale with best-of-breed ideas and practices from the community.

Kubernetes provides you with

- Service discovery and load balancing
- Storage orchestration
- Automated rollouts and rollbacks
- Automatic bin packing
- Self-healing
- Secret and configuration management

AWS

Container Services

Find out more: <https://aws.amazon.com/containers/>

AWSSOME DAY
ONLINE CONFERENCE



ECR

- Secure Container Registry
- Integrated with IAM



ECS

- AWS Container platform
- Fully Managed Control Plane
- Tight integration with AWS services



EKS

- Managed Kubernetes Service
- Native Kubernetes experience
- Open source



Fargate

- No servers to manage
- ECS compatible
- Pay for resources not instances

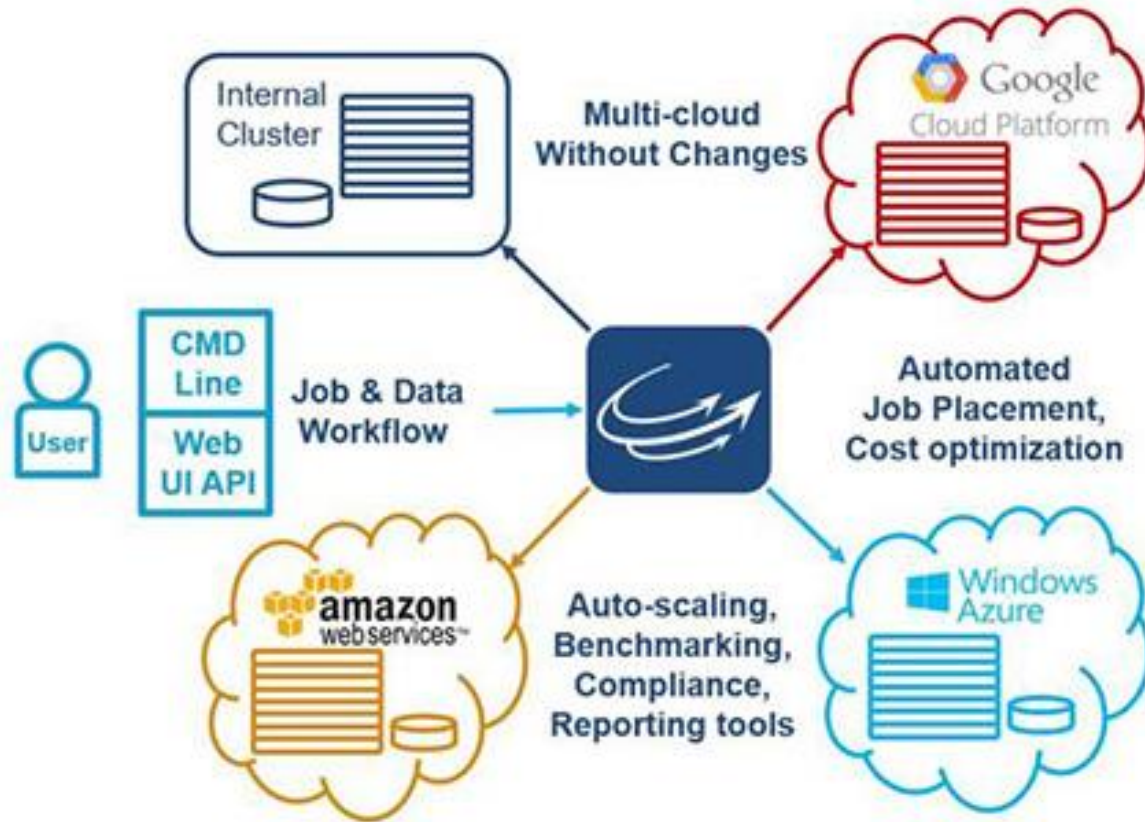
ORCHESTRATOR

Cloud orchestrator

- Cloud orchestration is the use of programming technology to manage the relationships and interactions between workloads on public and private cloud infrastructure. It combines automated tasks into a unified workflow to achieve the goal, with compliance with permissions and policy enforcement.
- Cloud management is typically used to secure, deploy, and run servers; reservation and assignment of memory volumes; network management; creating virtual machines; and accessing certain software for cloud services. This is achieved through three main, closely related attributes of cloud orchestration:
 - service,
 - load,
 - orchestration of resources.
 - The orchestration platform can integrate security and compliance checks.
- Cloud orchestration technology must work with disparate systems that can potentially serve the global deployment of clouds in different geographic locations and different providers. Many users of cloud orchestrators launch public clouds and private deployments.

<https://searchitoperations.techtarget.com/definition/cloud-orchestrator>

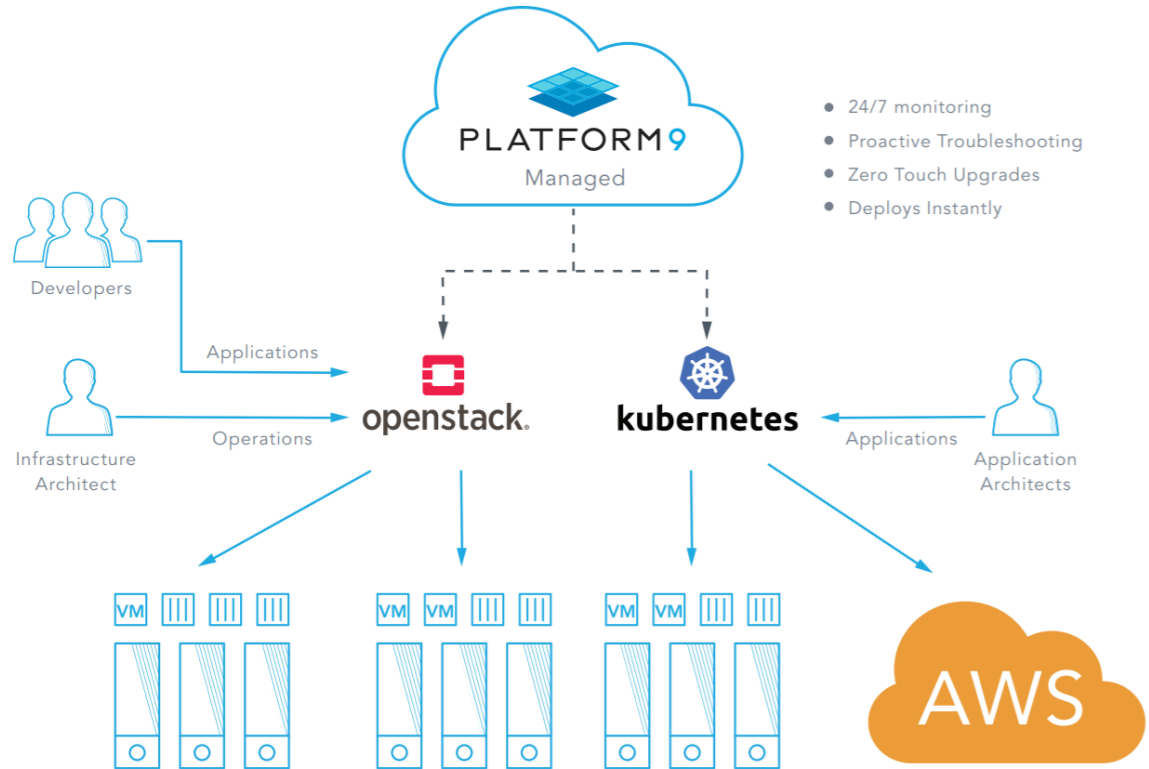
Cycle Computing



Platform9 - A Cost-Effective Hybrid Cloud Solution

Platform9. It is a hybrid cloud provider as a service based on OpenStack, Kubernetes, and Fission that enables organizations to create and manage hybrid clouds. However, the service is primarily intended for management, and all data and tasks remain on the site of the enterprise.

Platform9 supports KVM, VMware vSphere and Docker. Because Platform9 uses OpenStack and Kubernetes to manage, and essentially a hybrid cloud framework, users are relieved of the hassle of configuring and upgrading. The service is provided on an annual subscription basis



Platform9 Sandbox

Use it FREE!

See how easy it is to deploy, manage and scale your cloud-native infrastructure, on any environment.

<https://platform9.com/sandbox/>



Take Platform9 for a spin!

- Experience the power of our hybrid cloud solution as a **100% SaaS service – no hardware required**
- Be up and running in minutes
- Try the core features of our Managed Kubernetes and Managed OpenStack solutions for free
- Easily create and manage both VMs or Kubernetes clusters with a click of a button

Choose Your Sandbox Experience:



**Managed
Kubernetes**



**Managed
OpenStack**

MIGRATION

VM Migration types

- **Cold migration**

Shut down VM1 (on host 1), make an image, restart VM2 from the same image (on host 2)

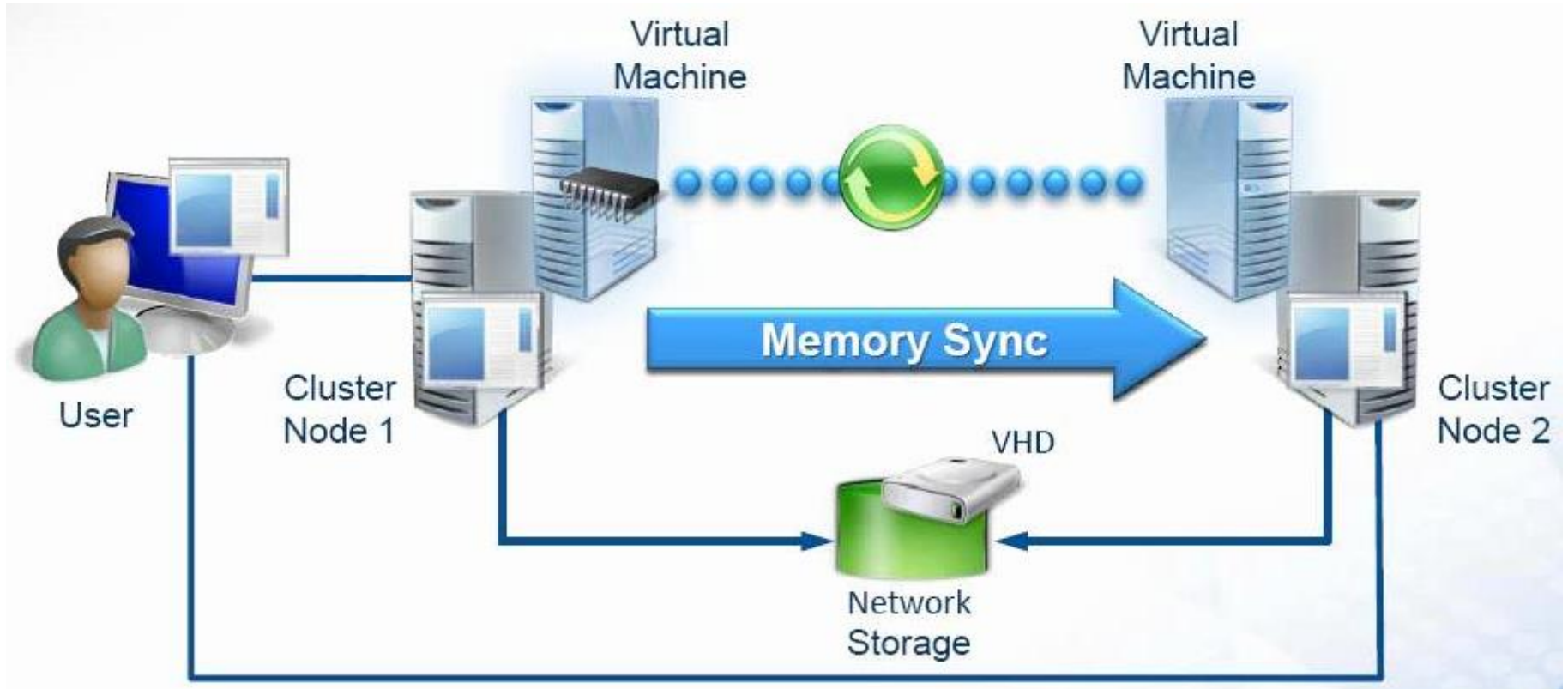
- **Warm migration**

Suspend VM1, copy across RAM and CPU registers, continue on host2

- **Live migration**

Copy across RAM while VM continues to run – mark “dirty” (changed) RAM pages and recopy

Hyper-V Live Migration



What is Snowball? Petabyte scale data transport

Ruggedized
case
"8.5G Impact"

50 TB
10GE network



E-ink shipping
label

Rain & dust
resistant

Tamper-resistant
case & electronics

All data encrypted
end-to-end

How fast is Snowball?

- Less than 1 day to transfer 250TB via 5x10G connections with 5 Snowballs, less than 1 week including shipping
- Number of days to transfer 250TB via the Internet at typical utilizations

	Internet Connection Speed			
Utilization	1Gbps	500Mbps	300Mbps	150Mbps
25%	95	190	316	632
50%	47	95	158	316
75%	32	63	105	211



Q&A



Thank you!