SOSCON

삼성 오픈소스 컨퍼런스
SAMSUNG OPEN SOURCE CONFERENCE

OPEN YOUR UNIVERSE WITH SOSCON

Open Source based Private Cloud for a Samsung Mobile Service

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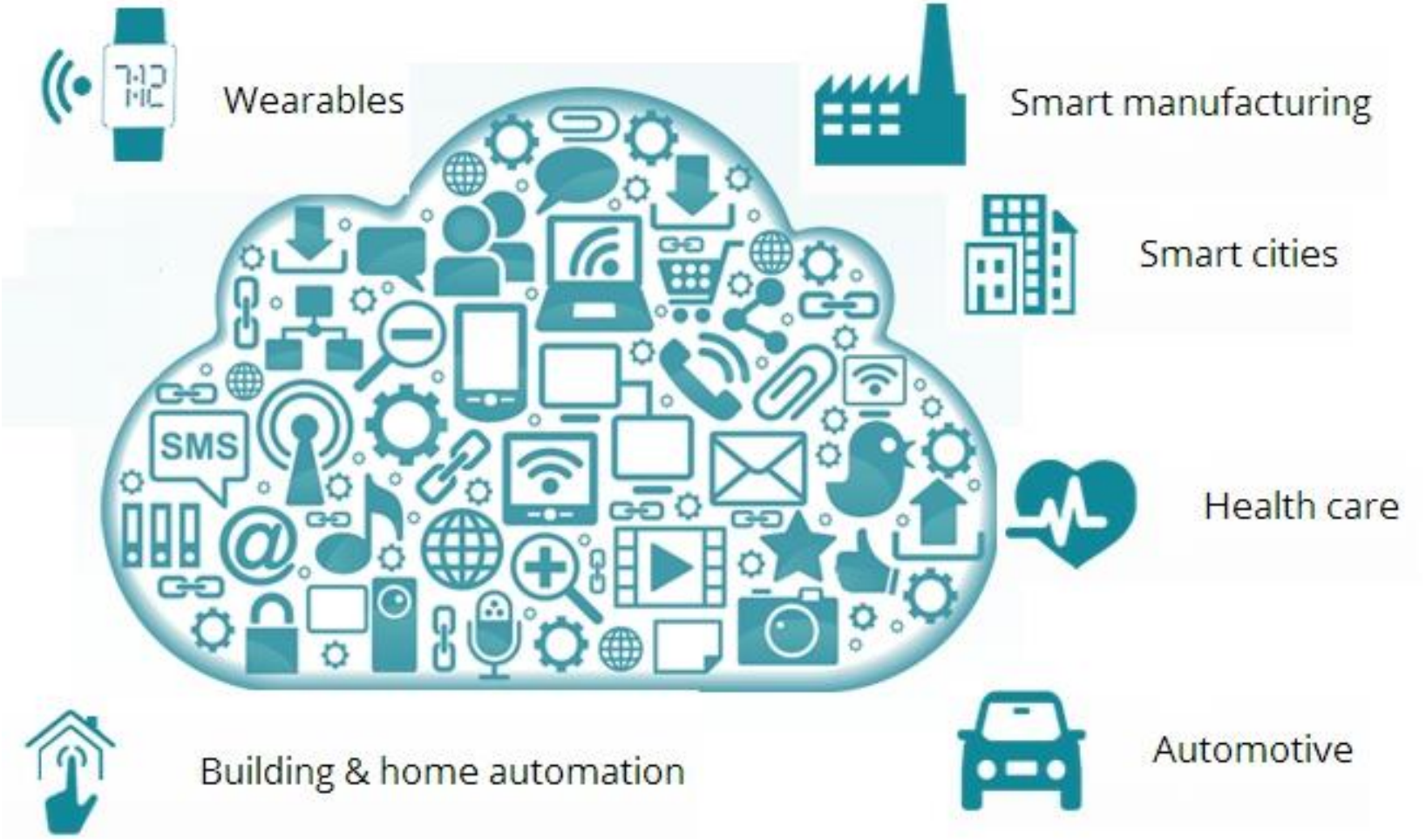
한영주

2015. 10. 28

Overview

- Cloud Trend & Components
  - Public Cloud vs Private Cloud
  - Cloud Services
  - IaaS Key Components
- Experience and Lessons
  - From the scratch
  - Automation (No Human errors)
  - Cross Layer Optimization
  - DevOps
  - Reducing Virtualization Overhead
  - High Availability
  - Hybrid Cloud

Cloud


Wearables
Smart manufacturing
Smart cities
SMS
Health care
Building & home automation
Automotive

Cloud Trend (1/3)

Cloud Trend (2/3)

VS

Publically Shared
Virtualised Resources

Supports multiple
customers

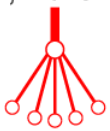
Supports connectivity
over the internet

Suited for less
confidential information

Privately Shared
Virtualised Resources

Cluster of dedicated
customers

Connectivity over
internet, fibre and private network

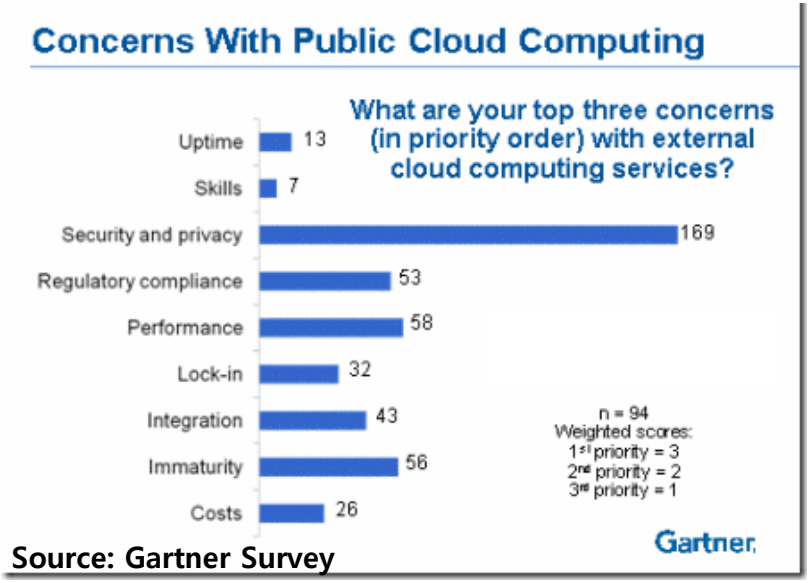


Suited for secured
confidential information
& core systems

Cost **Performance**

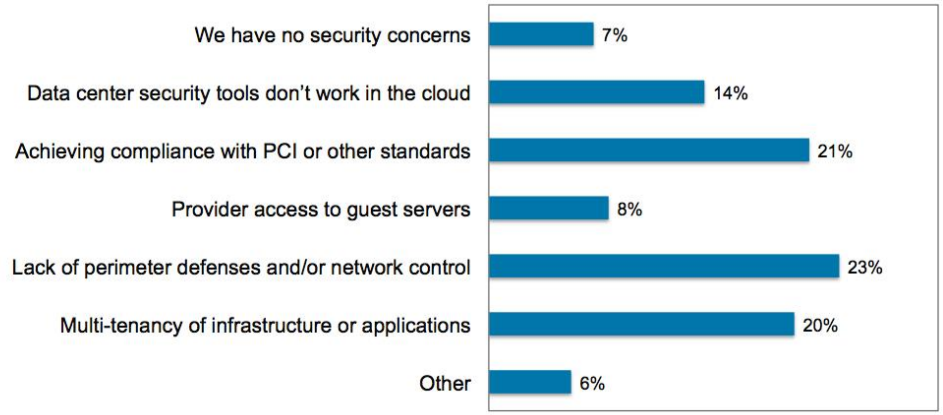
Concerns with Public Cloud

- Loss of Control of Data
- Security
- Lock-in
- General vs Customized
- Performance
- Costs
- etc

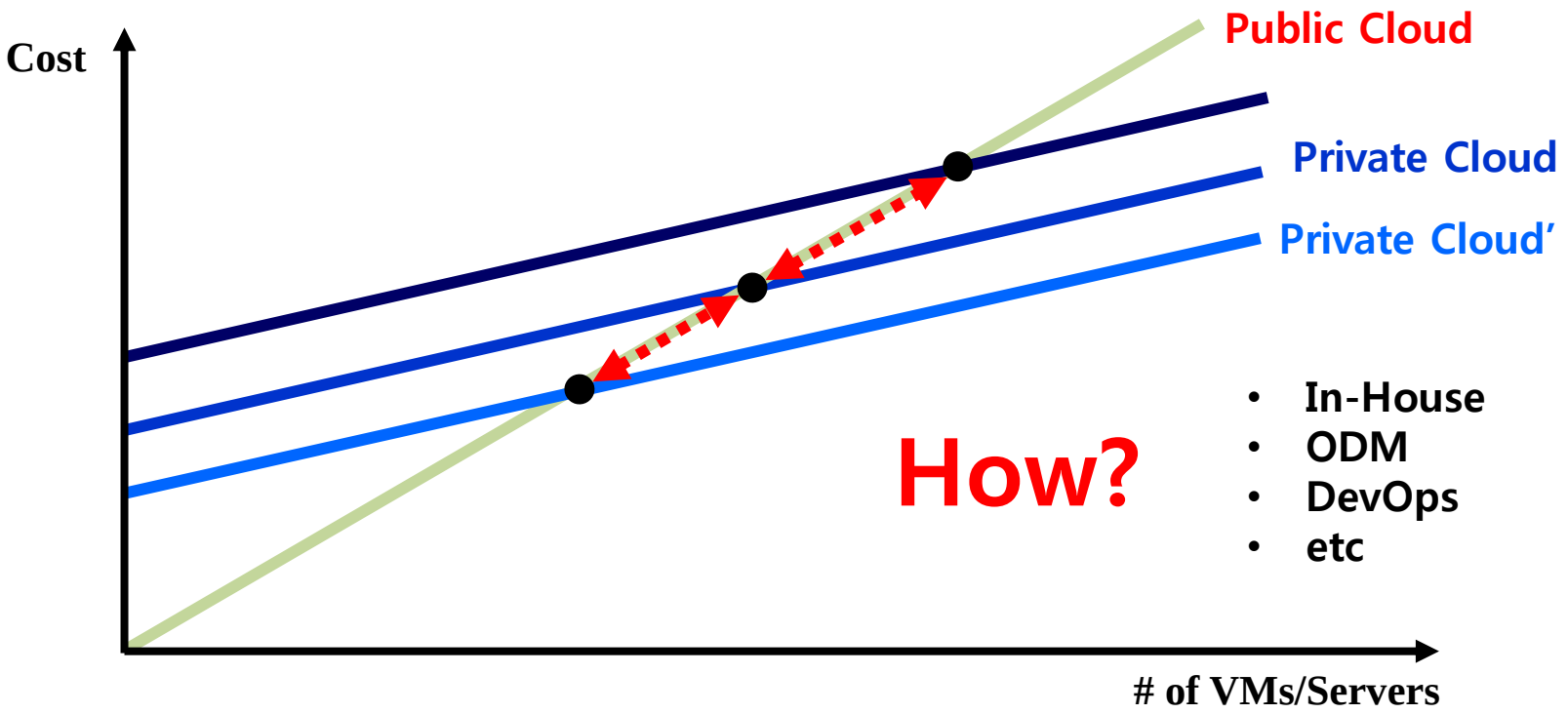


Source: Gartner Survey

Graph : Concerns about Public Cloud Computing



Cost Efficiency



> *Because it was cheaper, or because they were able to gather more information than they could in the public cloud. …*
>
> *Zynga is able to use only one server to every three servers it would have used in the public cloud.*
>
> ***Zynga CTO***

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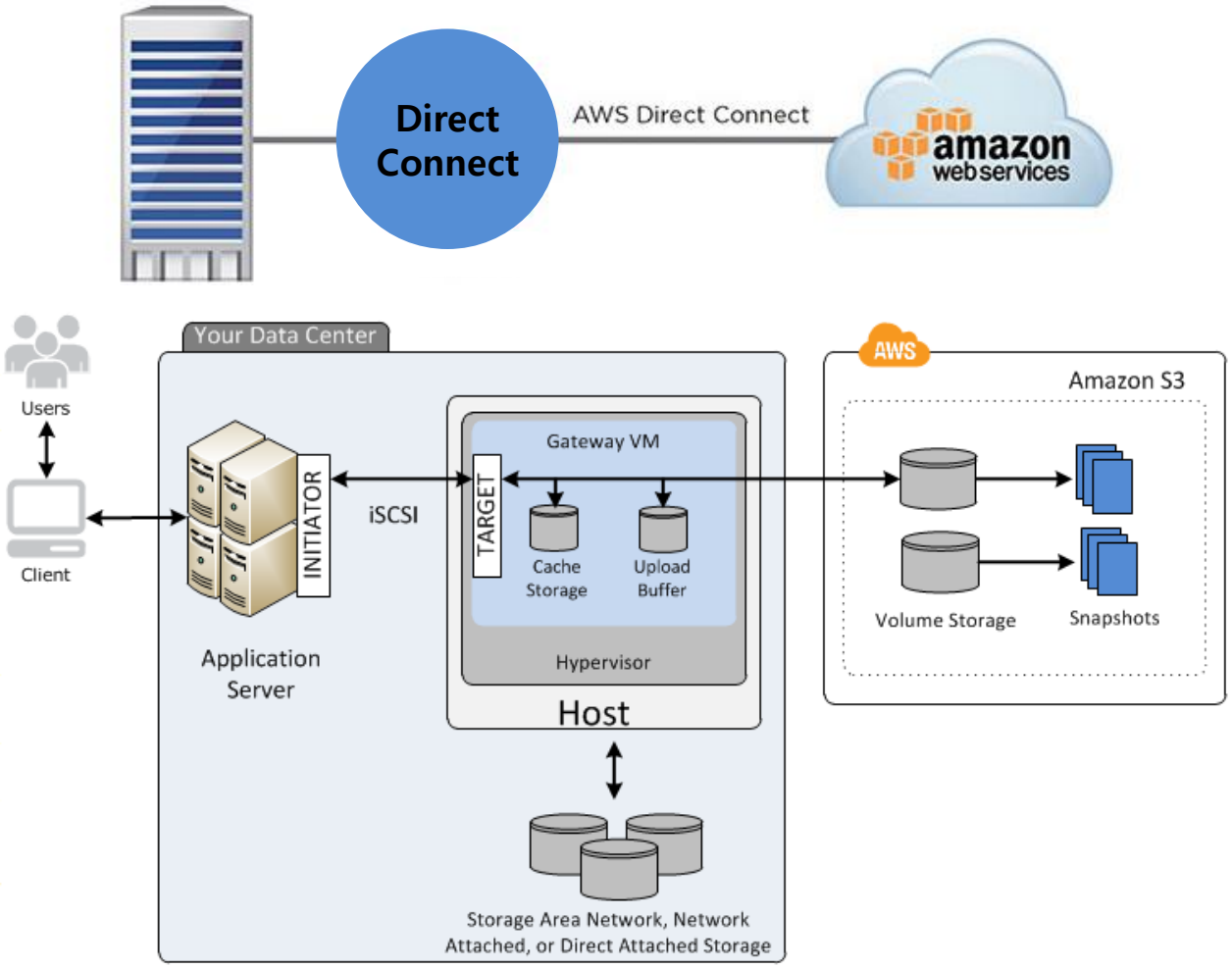
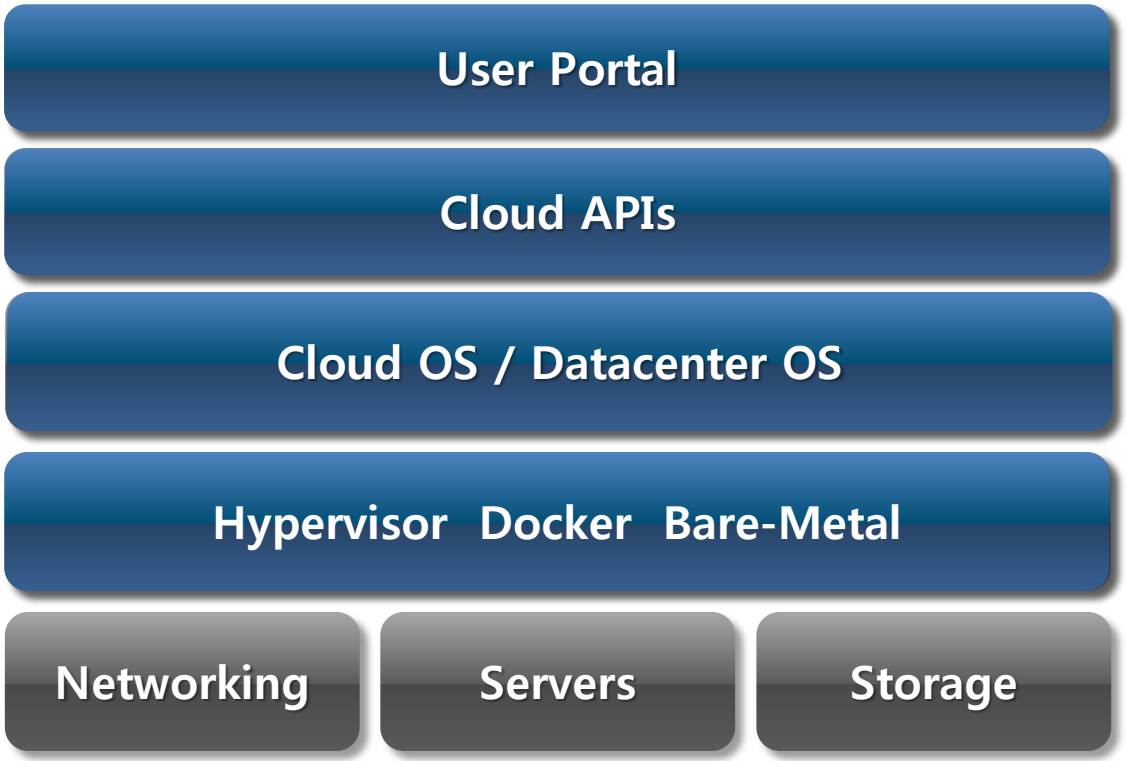
Cloud Trend (3/3)

Building Private Cloud for their own services

Hybrid Cloud = Public Cloud + Private Cloud



S/W Stack to build Private Cloud



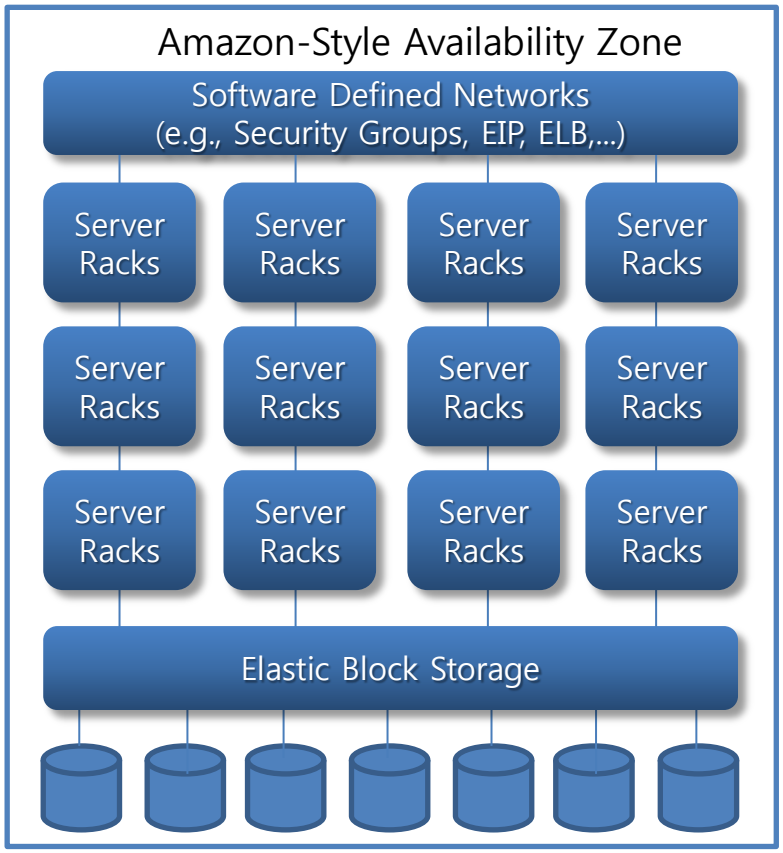
Key Components

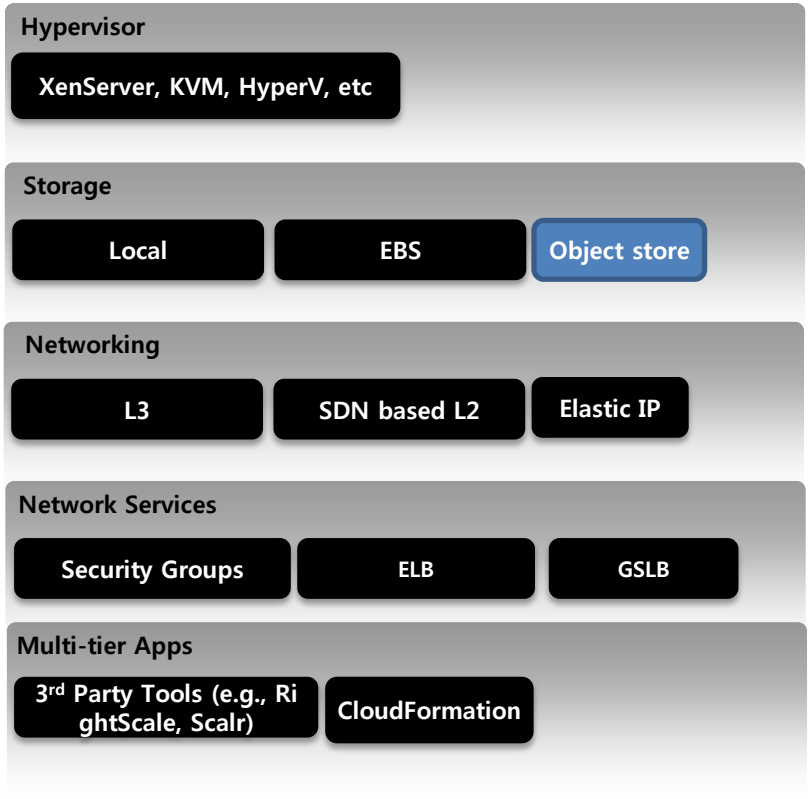
- **Datacenter OS / Cloud OS**

- **Hypervisors**

CloudStack vs OpenStack

Designing for an Cloud-style workload





Experience and Lessons From Production

Cloud in Samsung

Public Cloud / Managed Hosting

amazon web services™

MSCloud

SOFTLAYER® an IBM Company

⋮

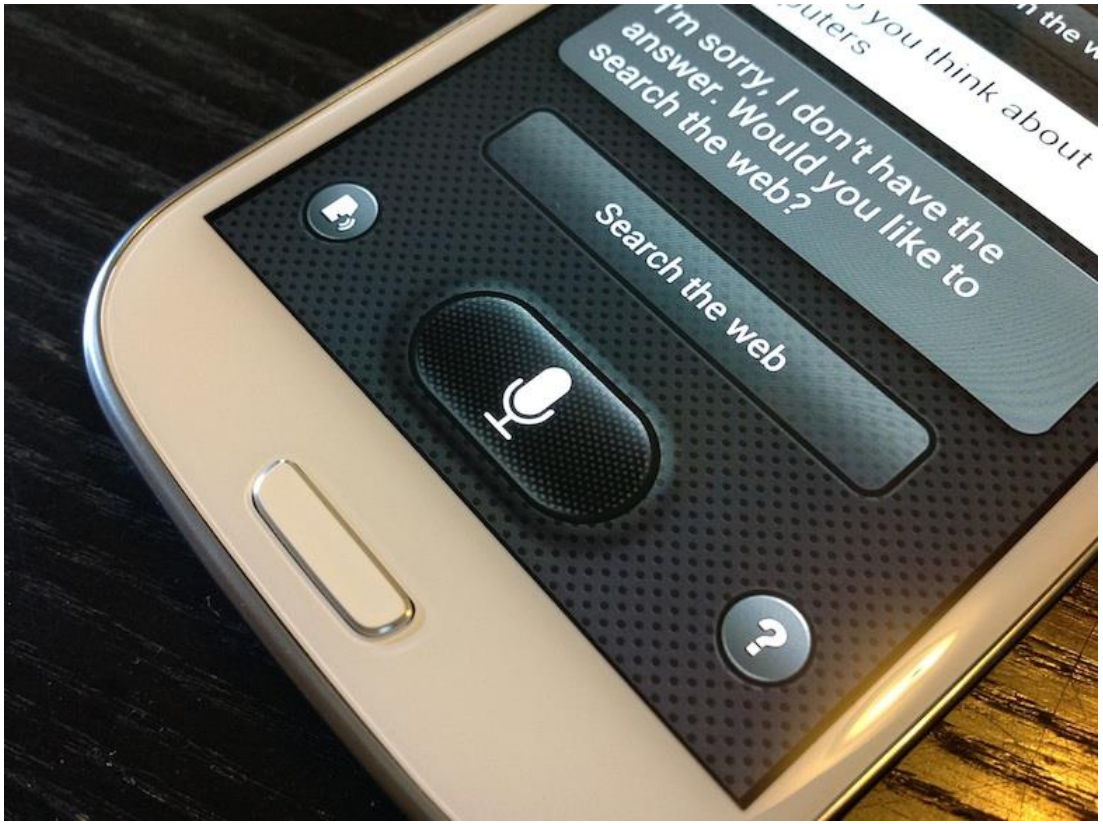
Colocation

Colocation

Phase 1	Phase 2	Phase 3
연구 & 개발용 Infra 활용		당사 서비스
▪ 위치: 한국 ▪ 규모: 000대 ▪ 특징: - Colocation 기반 Cloud Infra - Cloud 설계 및 구축 기술 내재화	▪ 위치: 미국 (동부지역) ▪ 규모: 000대 ▪ 특징: - Hybrid Cloud 기술 내재화 (Amazon AWS + Private Cloud)	▪ 당사 서비스

Cloud Infra Deployment

- **Latency critical Application**
- **Personalization (I/O)**
- **Heavy Engines**
- **Secured Connection**
- **Etc…**

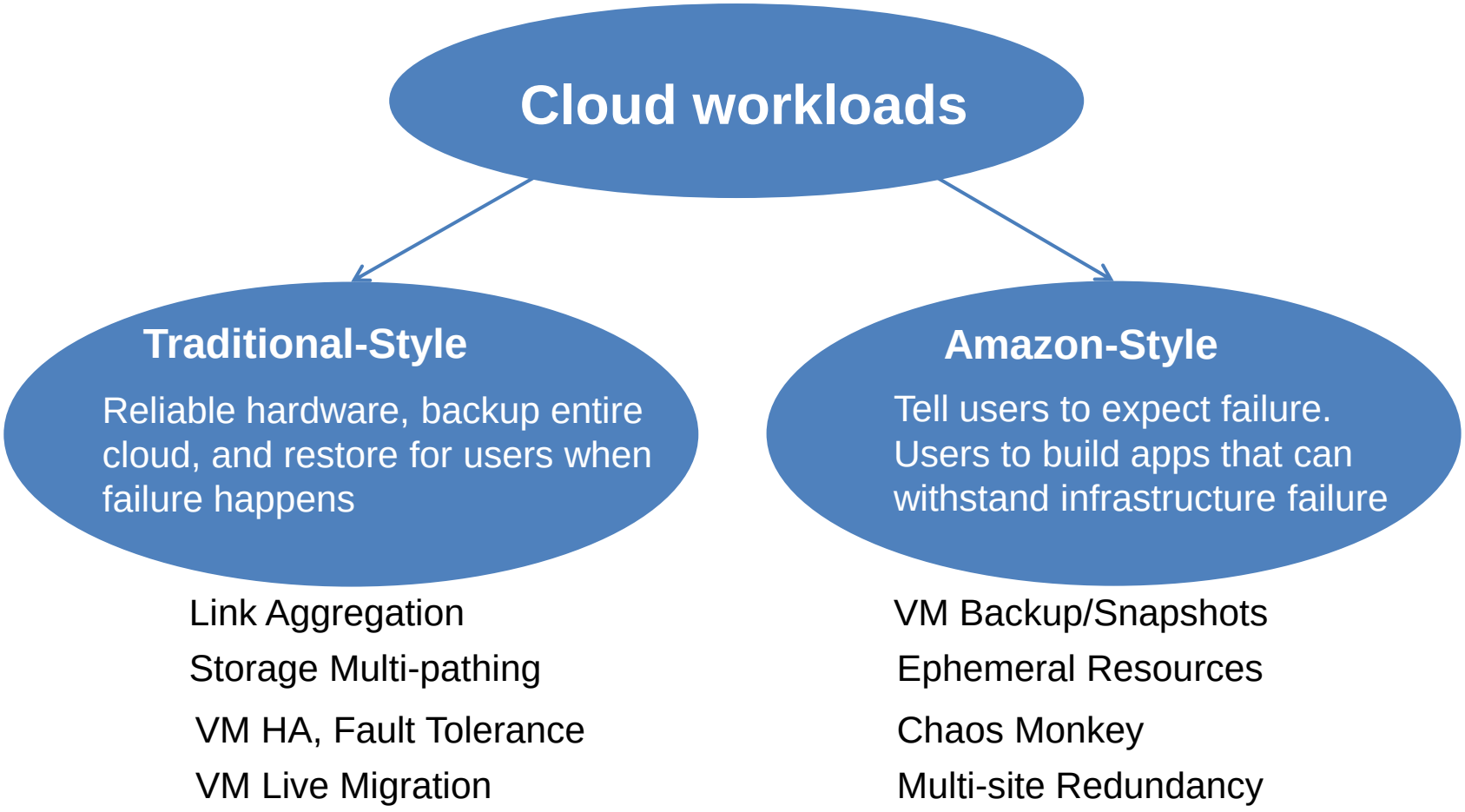


Lessons we learned

- From the scratch
- Automation (No Human errors)
- Cross Layer Optimization
- DevOps
- Reducing Virtualization Overhead
- High Availability
- Hybrid Cloud

Start from scratch (1/3)

- **Design → Building → Optimizing**

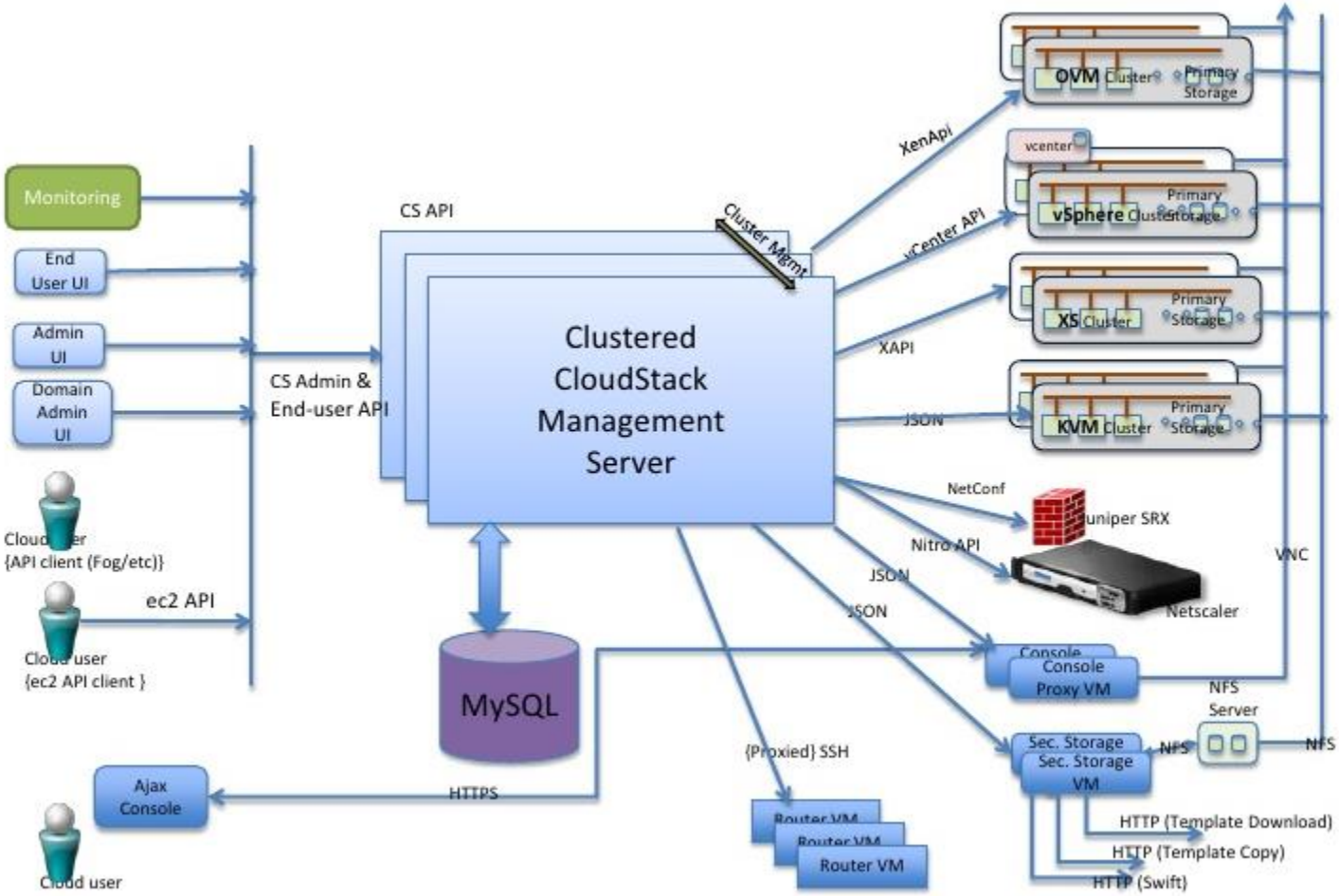


Start from scratch (2/3)

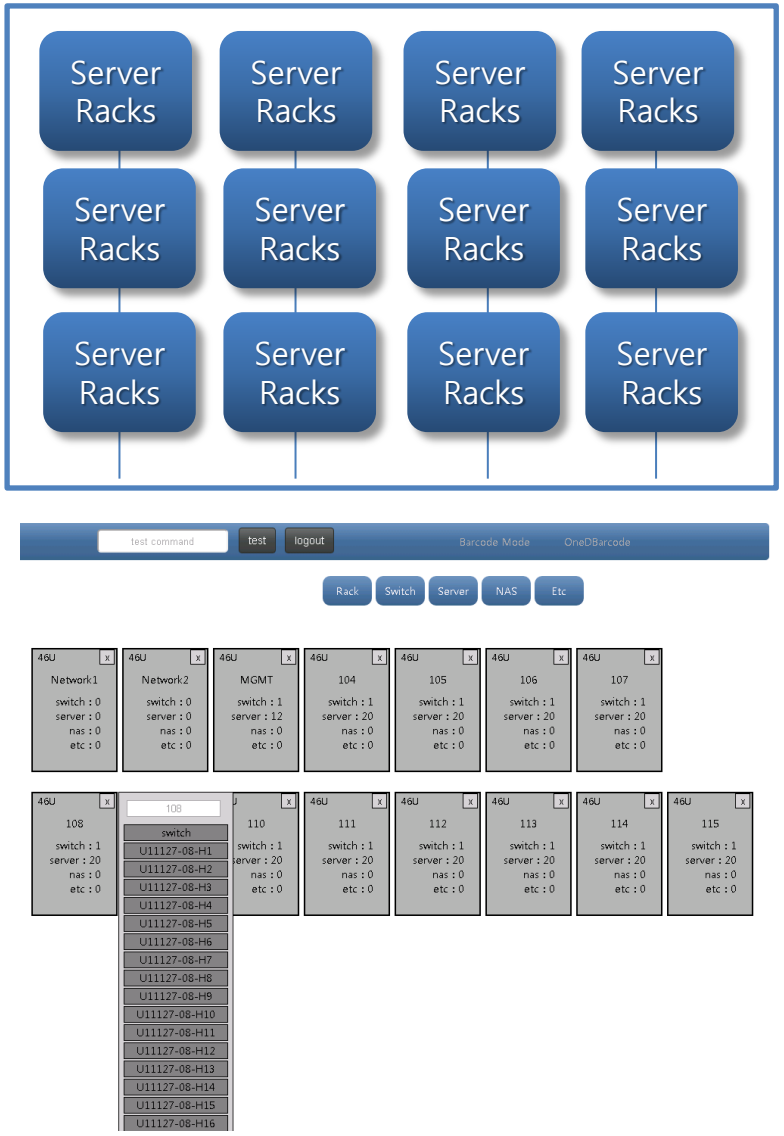
- Design → Building → Optimizing

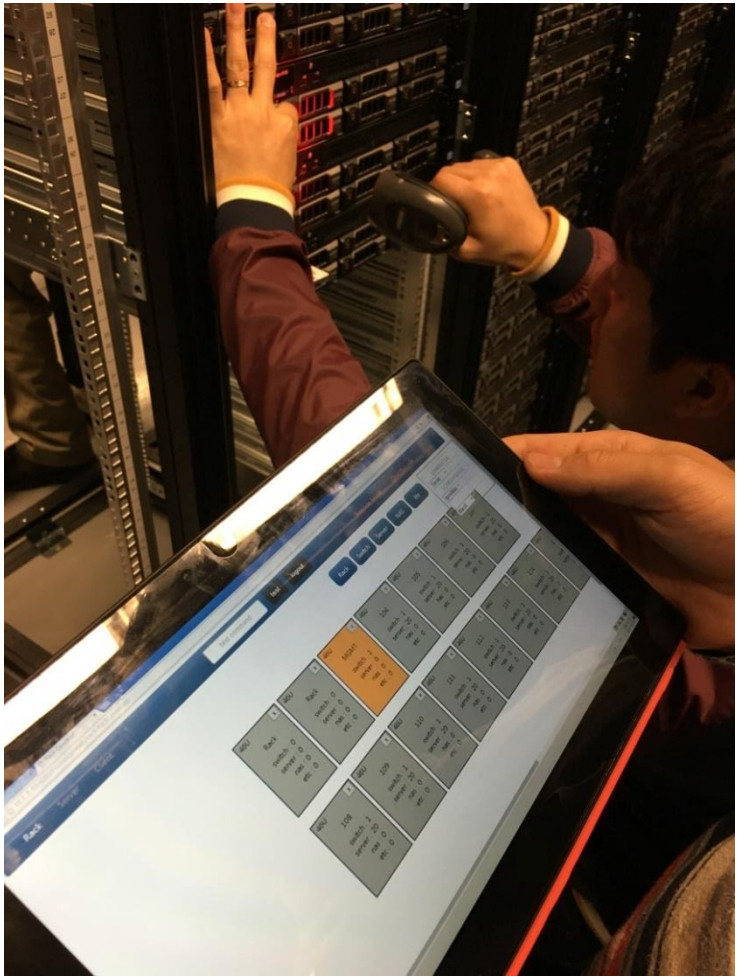
Start from scratch (3/3)

- **Design → Building → Optimizing**

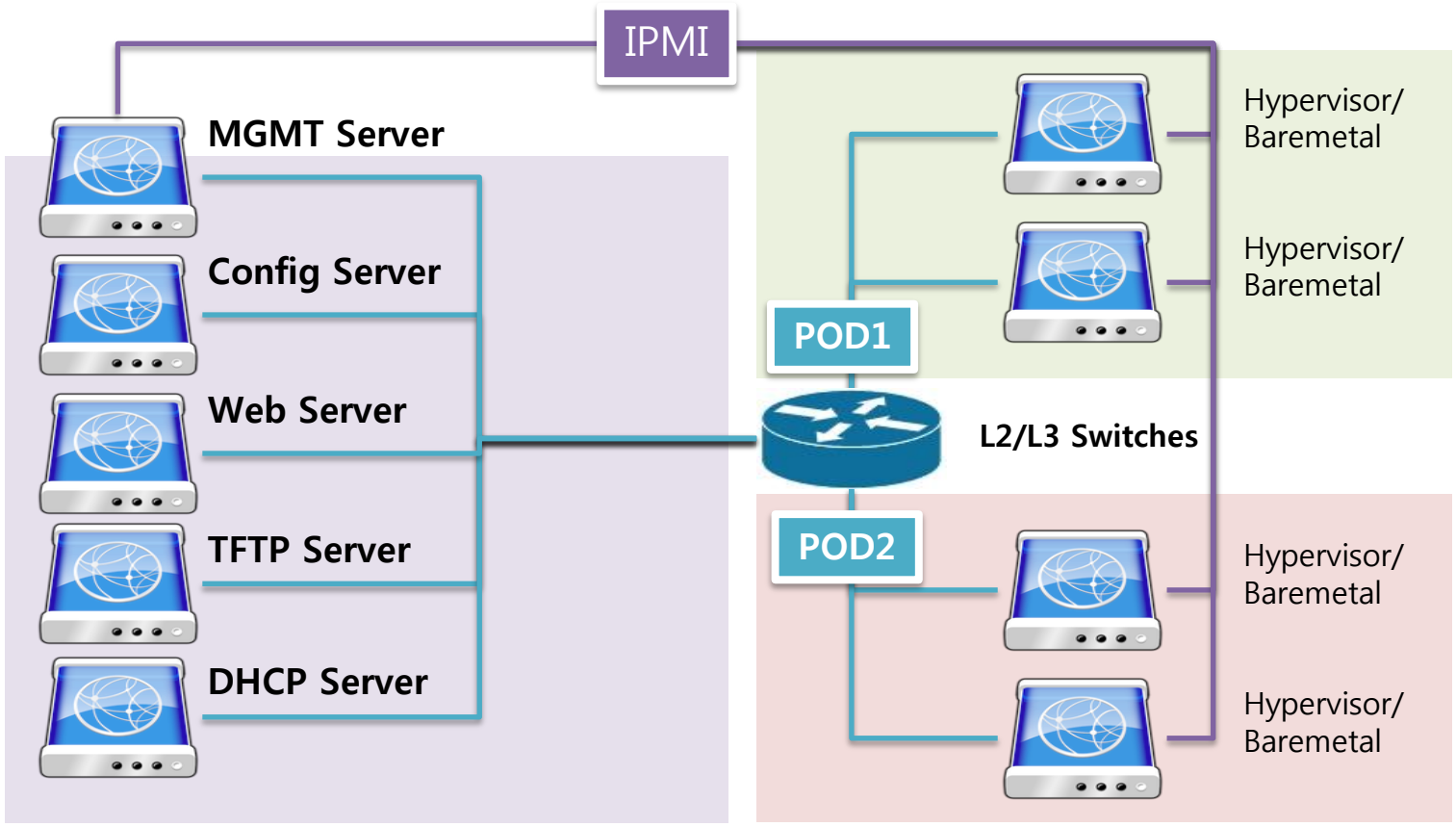


Automation (1/2)



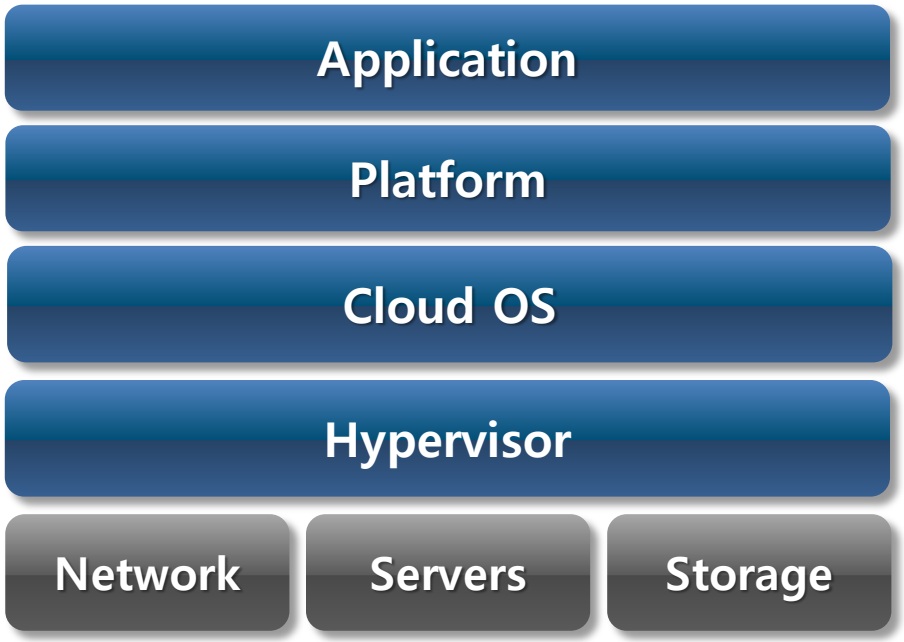


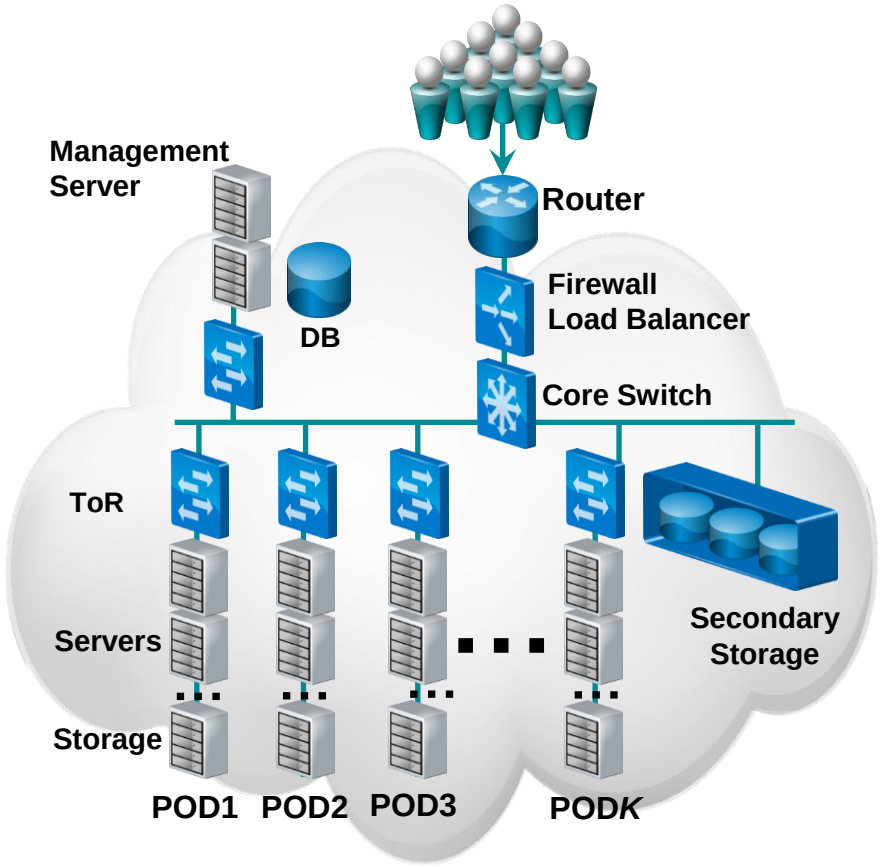
Automation (2/2)



Cross Layer Optimization

- 전체 Layer에 대한 이해는 필수적임.





- **Failures (’14. 11 ~)**

Hard Disk	RAID	Memory	Network	Human Error
1	0	0	0	0

Production 장비: 2012년 구매 장비 활용

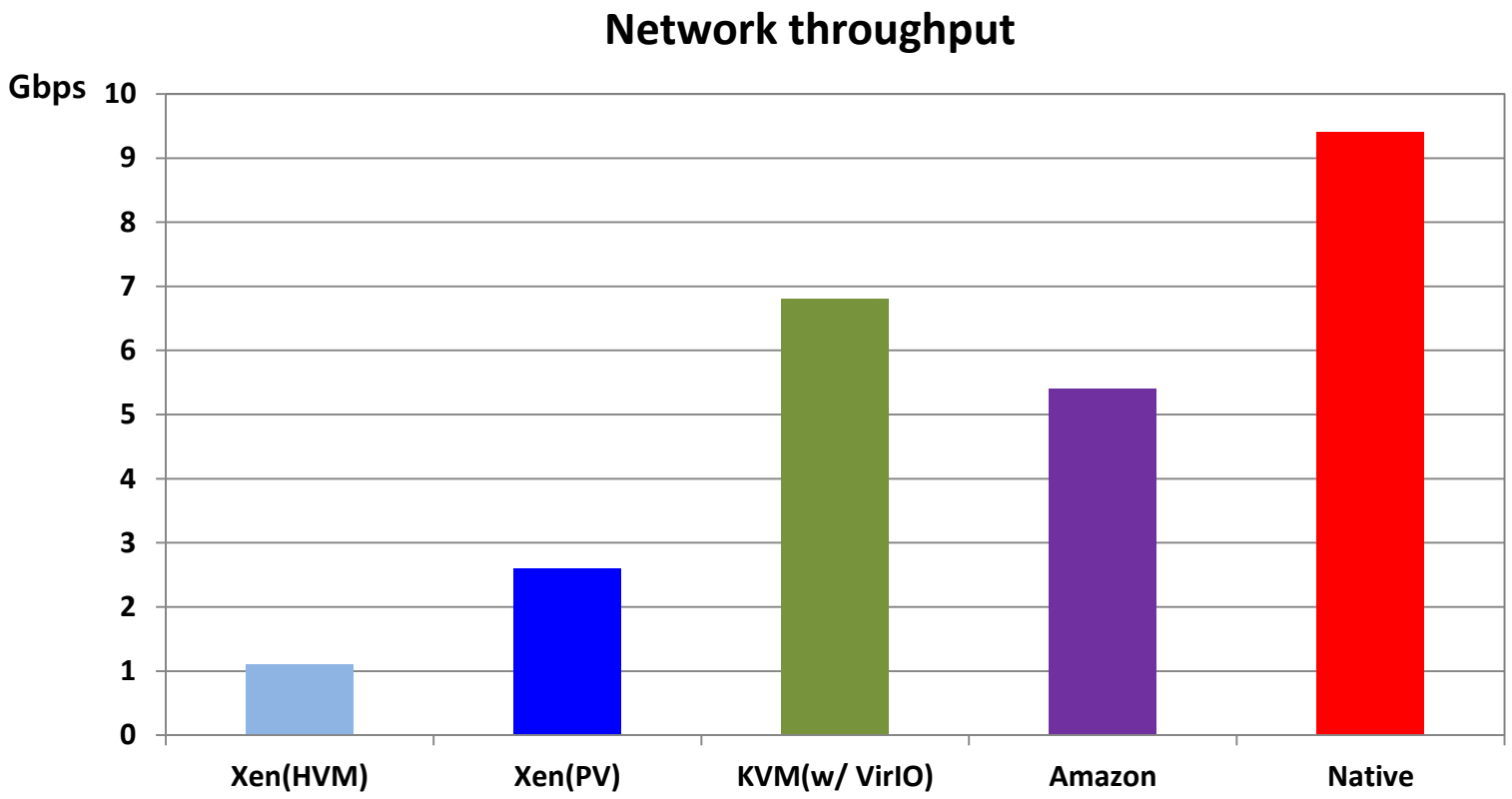
8%

Annual Failure Rate of servers

Kashi Venkatesh Vishwanath and Nachiappan Nagappan, Characterizing Cloud Computing Hardware Reliability, *SoCC’10*

- Server failure comes from
  - 70% - hard disk
  - 6% - RAID controller
  - 5% - memory
  - 18% - other factors
- Application can still fail for other reasons
  - Network failure
  - Software bugs
  - Human admin error

Network Throughput Comparison

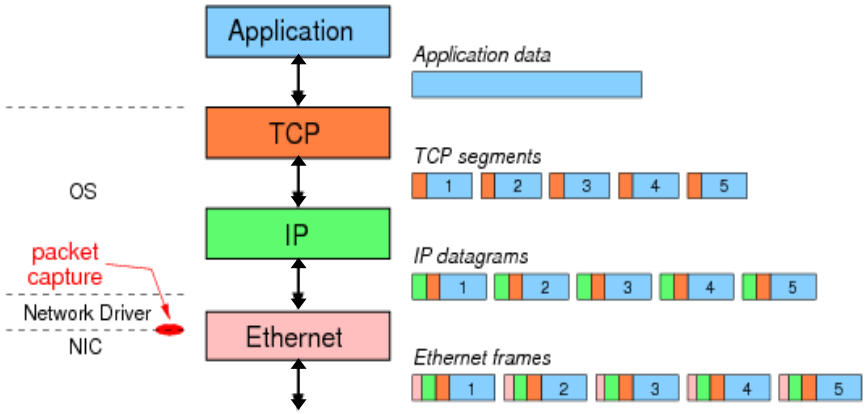


- H/W: E5-2670, NIC: Intel 10Gb 82599, 192GB RAM, OS : CentOS 6.4 (64bits)

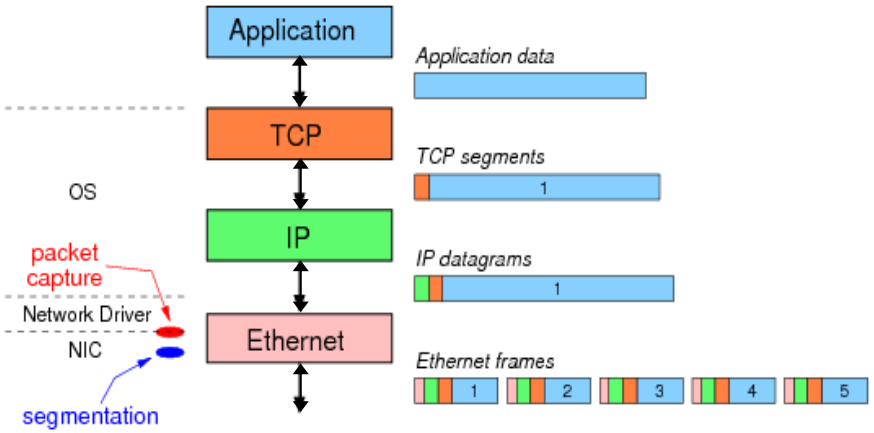
Reducing Virt. Overhead: TCP Offloading

- **Low CPU Overhead : By reducing the number of packet processing operation**
- **Para-virtualized net. of Xen incurs high network performance overhead (Virtual interrupt mechanism)**

적용 전



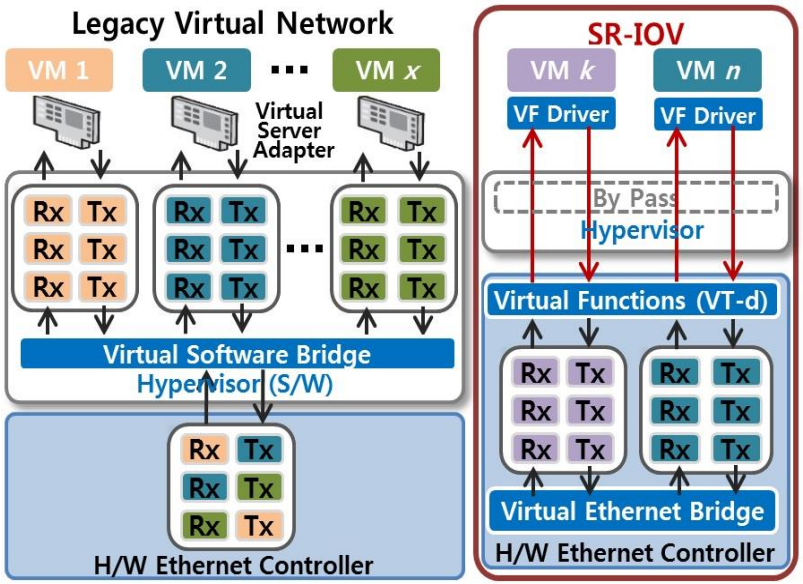
적용 후



Reducing Virt. Overhead: SR-IOV (1/2)

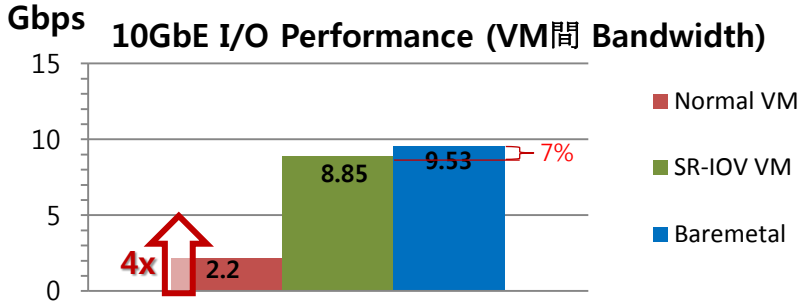
- **No I/O Overhead** : High performance by completely bypassing the hypervisors
- **Direct Access** : Mapping virtual functions in NIC to individual VMs
- **Low latency** : Enabling VM to achieve near-Baremetal network I/O performance

Architecture Diagram



Features & Non-functional Spec.

- **Network Performance improvement (x4)**
- Performance improvement in Web services, distributed systems
- **Environment:** XenServer, CentOS 6.4+



Reducing Virt. Overhead: SR-IOV (2/2)

Bandwidth for a single TCP steam

Network	Number of Guest VMs on a Host					Sum
	1	2	3	4	5	
PV	2.189	-	-	-	-	2.189
	0.968	1.260	-	-	-	2.229
	1.031	0.608	0.958	-	-	2.596
	0.631	0.637	0.627	0.629	-	2.524
	0.703	0.427	0.493	0.517	0.456	2.595
Samsung Solution	9.328	-	-	-	-	9.328
	4.729	4.909	-	-	-	9.638
	3.484	3.224	2.971	-	-	9.679
	2.345	2.405	2.501	2.354	-	9.606
	1.953	1.973	1.986	1.927	1.823	9.662

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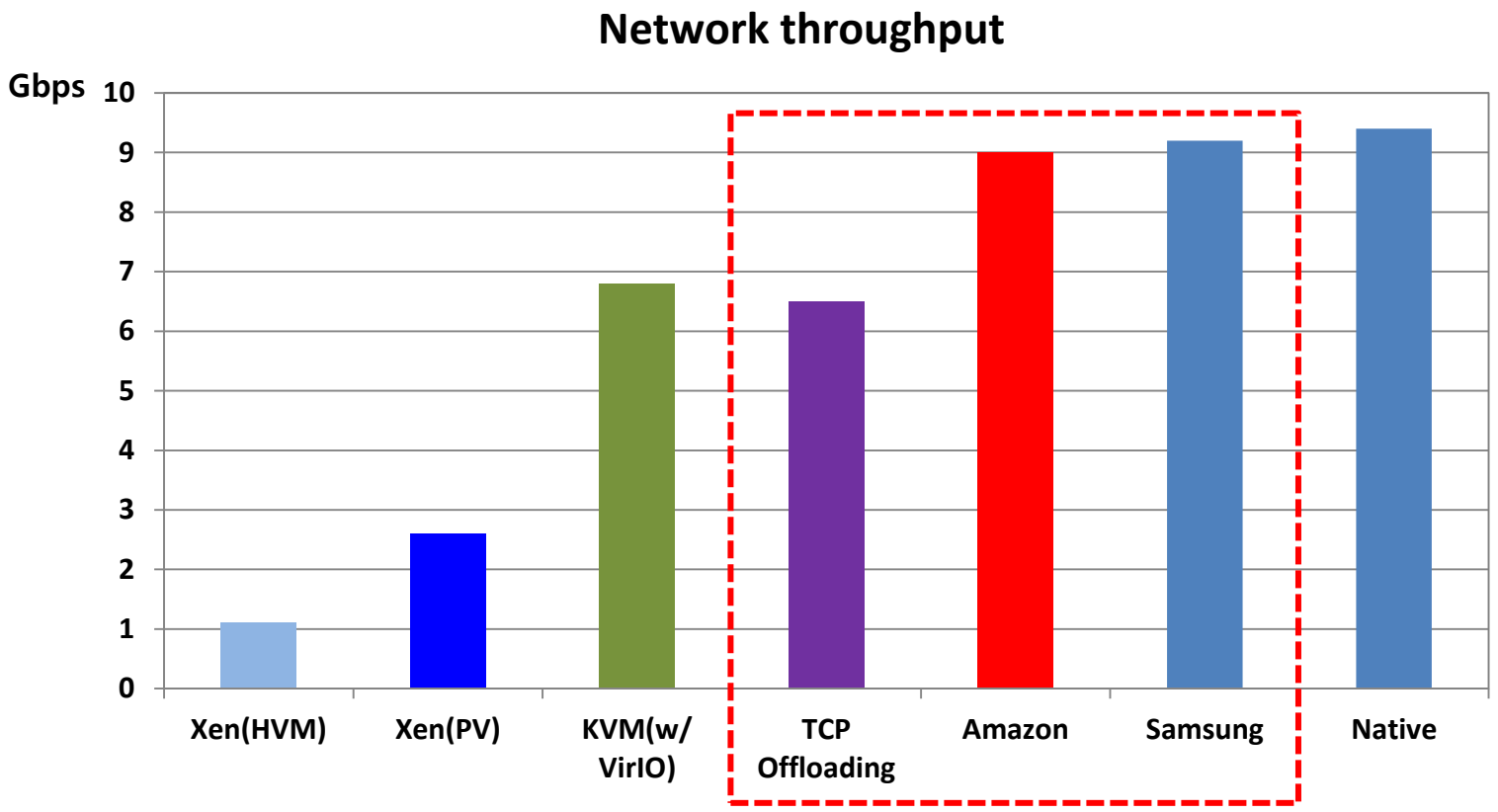
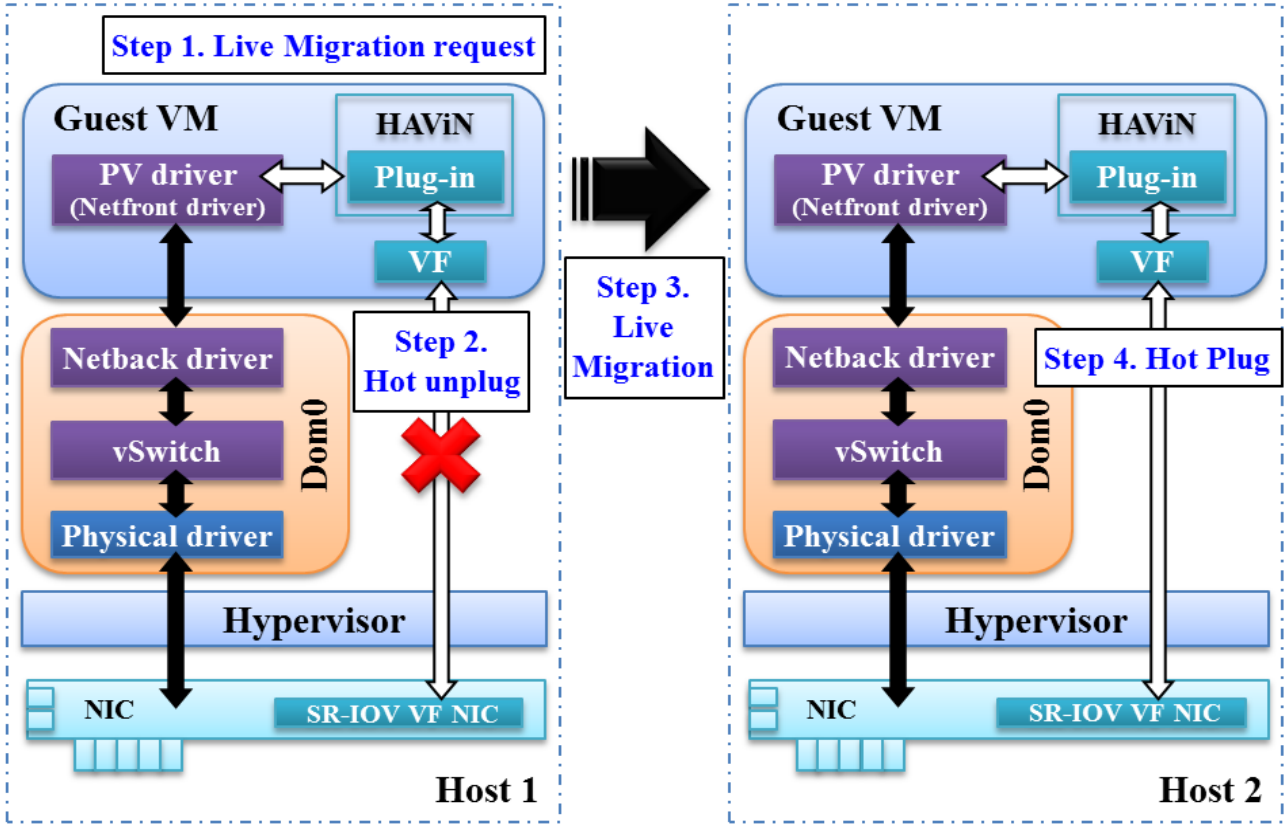
Network Throughput Comparison



- H/W: E5-2670, NIC: Intel 10Gb 82599, 192GB RAM, OS : CentOS 6.4 (64bits)

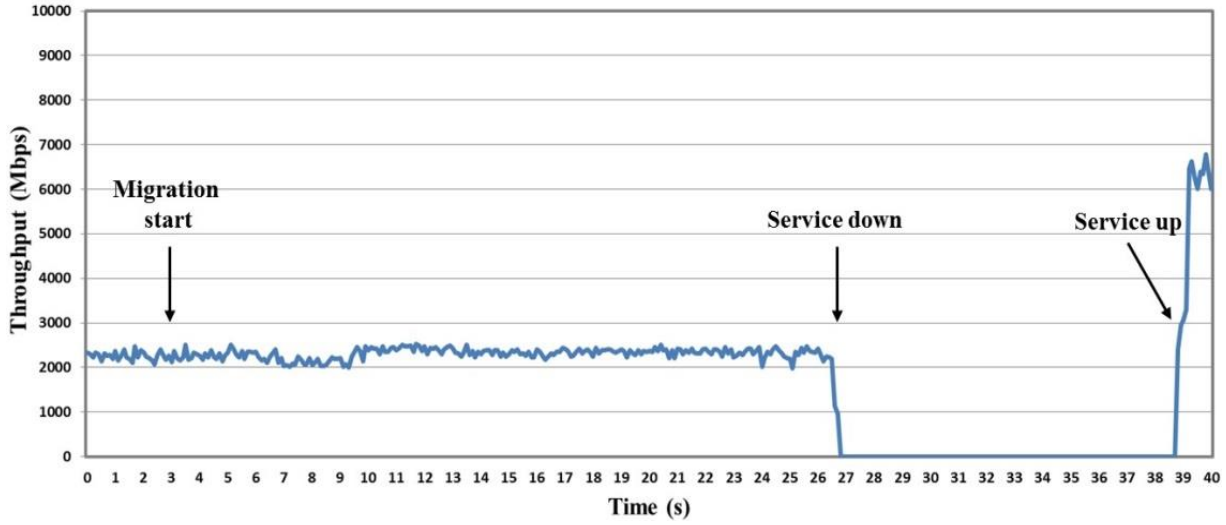
Live Migration on SR-IOV

- 일반적으로, SR-IOV 사용 시 VM Migration 불가
- From one host to another host when using SR-IOV

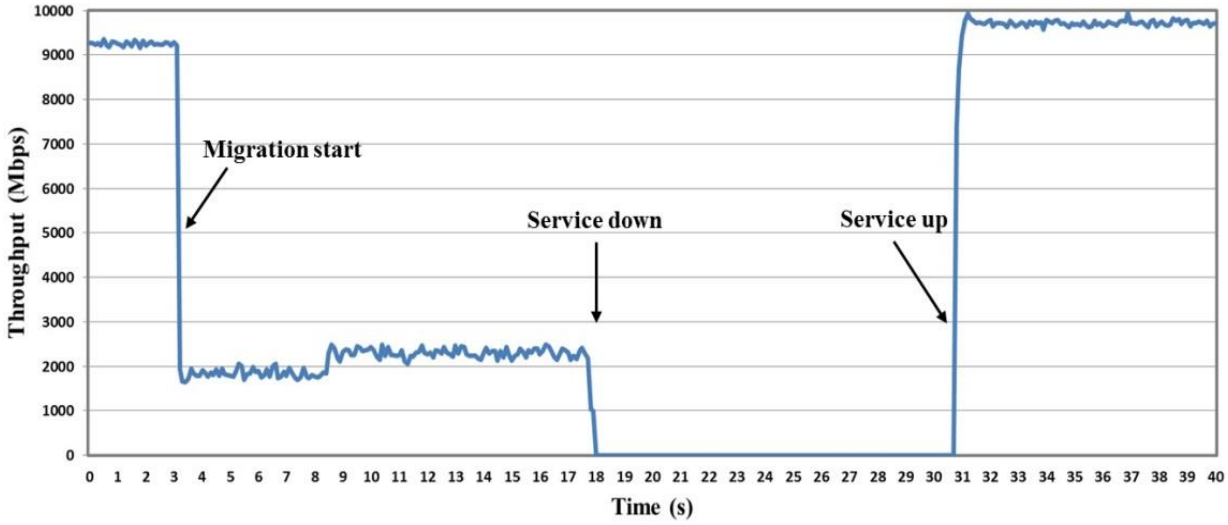


Throughput Comparison during Live Migration

PV Device

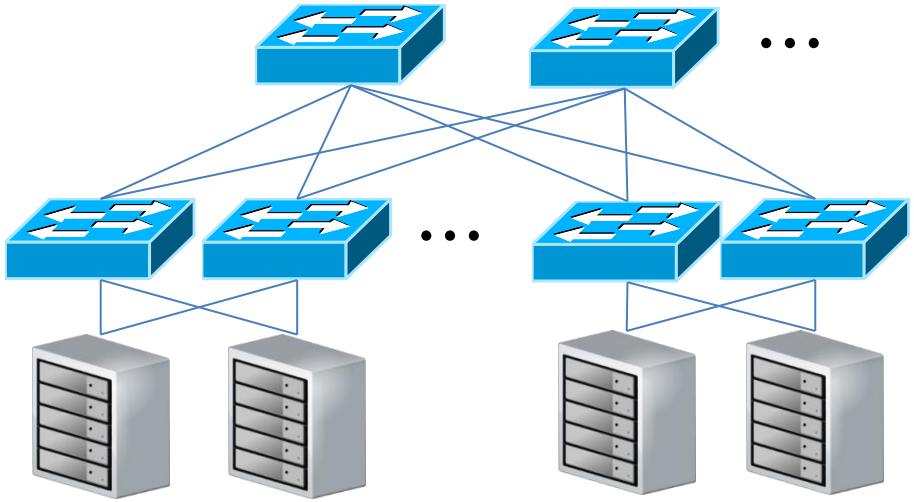


Samsung SR-IOV



High Availability

- 전이중화 구성 (Active-Active 구성)
- MLAG: Single Point of Failure 방지
- LACP: HA 및 대역폭 향상



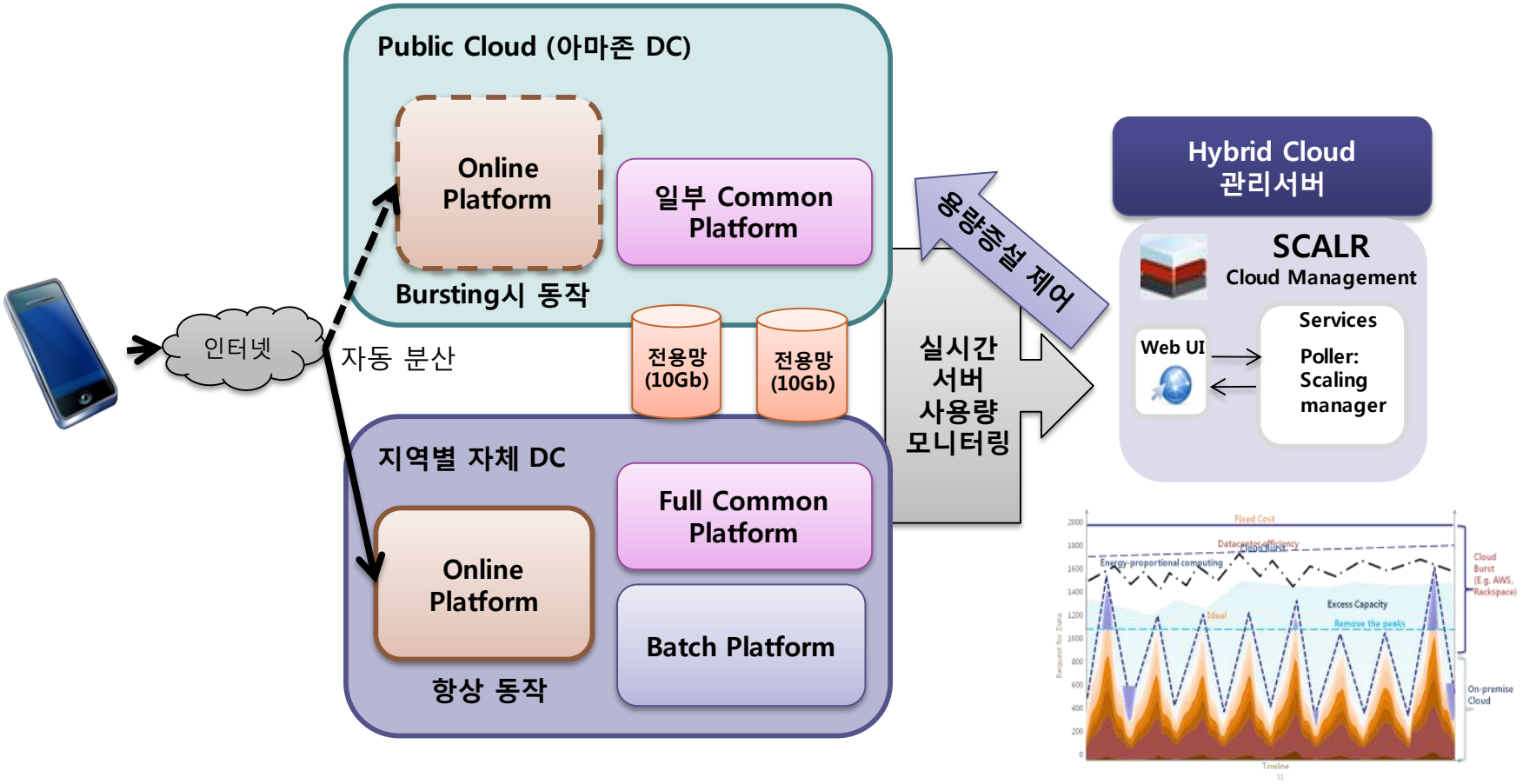
40%

Effectiveness of network redundancy in reducing failures

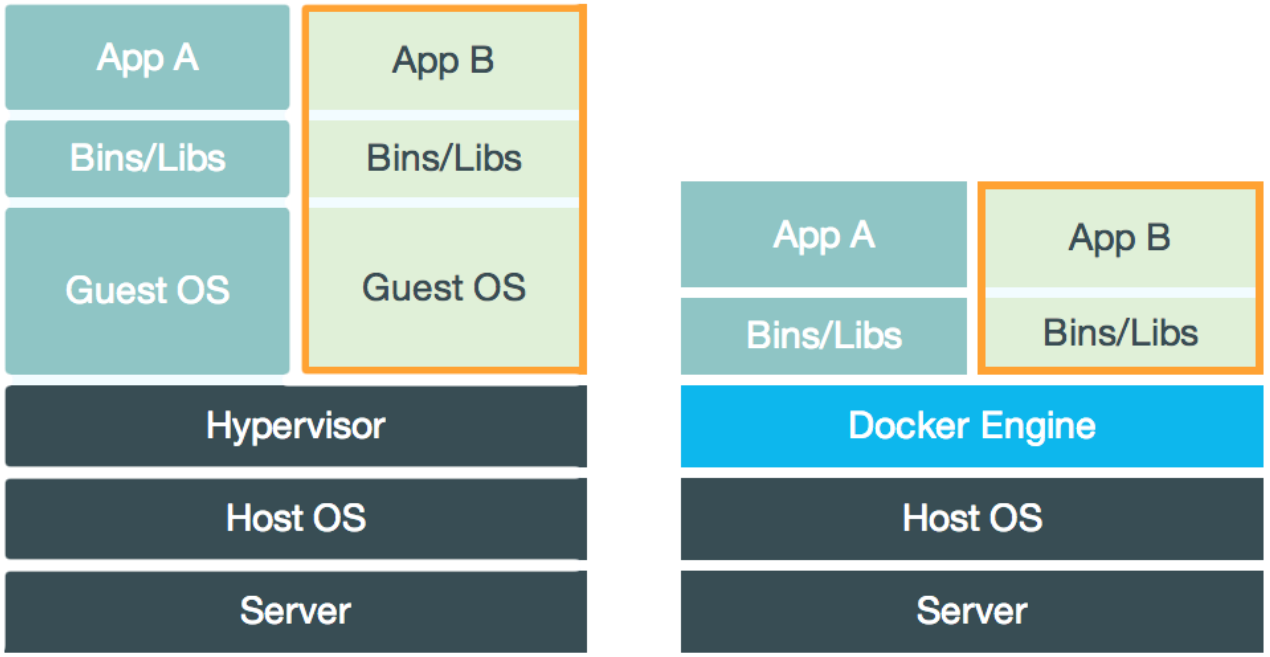
Phillipa Gill, Navendu Jain, and N. Nagappan, Understanding Network Failures in Data Centers: Measurement, Analysis and Implications, SIGCOMM 2011

- Bugs in failover mechanism
- Incorrect configuration
- Protocol issues such as TCP back-off, timeouts, and spanning tree reconfiguration

Hybrid Cloud (2/2)

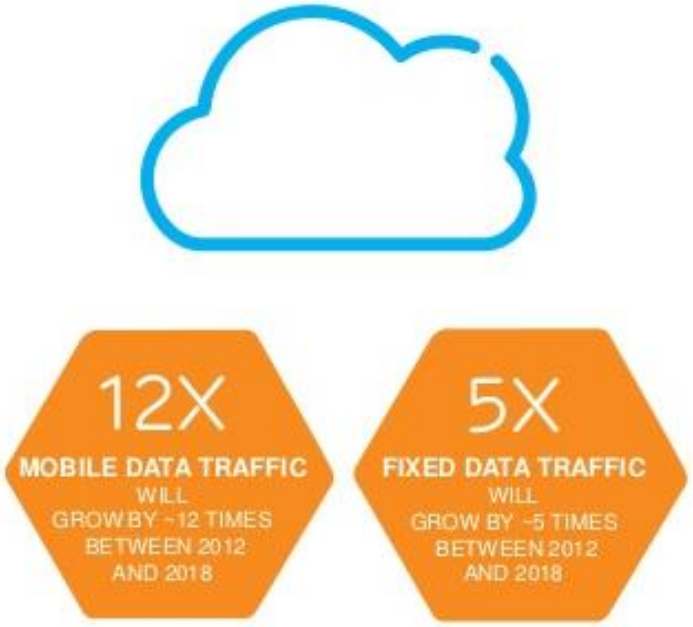


Cloud Evolution



Summary

- Growing number of cloud services
- Consumers and enterprises turn to the cloud
- Investments in data traffic
- Automation and flexibility
- Aggressive Investment



Source: Ericsson 2013

THANK YOU!

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삼성전자

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Q&A