



# 컴퓨팅 자원의 가상화 및 최적화



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Beyond Consolidation  
Build **Virtualization**  
Complete Automation  
On the Network Architecture

**Cisco Datacenter Day**

# Agenda

- Data Center 발전 동향
- Data Center 최적화 솔루션
- Cisco 가상화 솔루션 - VFrame
- Cisco사의 SFS(Server Fabric Switch) Overview



# Data Center 발전 동향

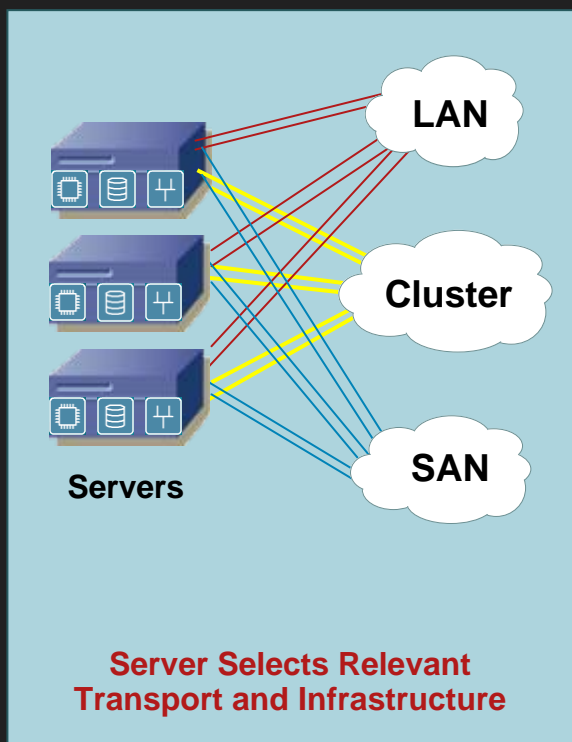


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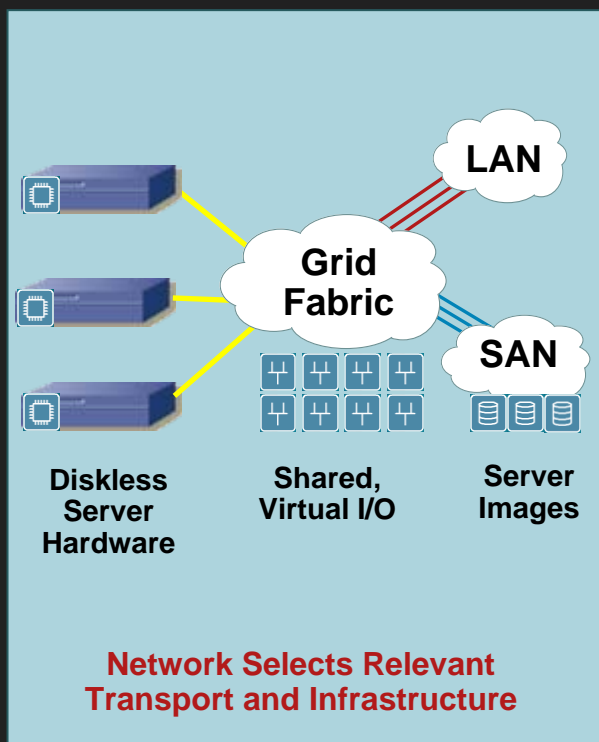
# Data Center 발전 동향

## Server/Compute Consolidation



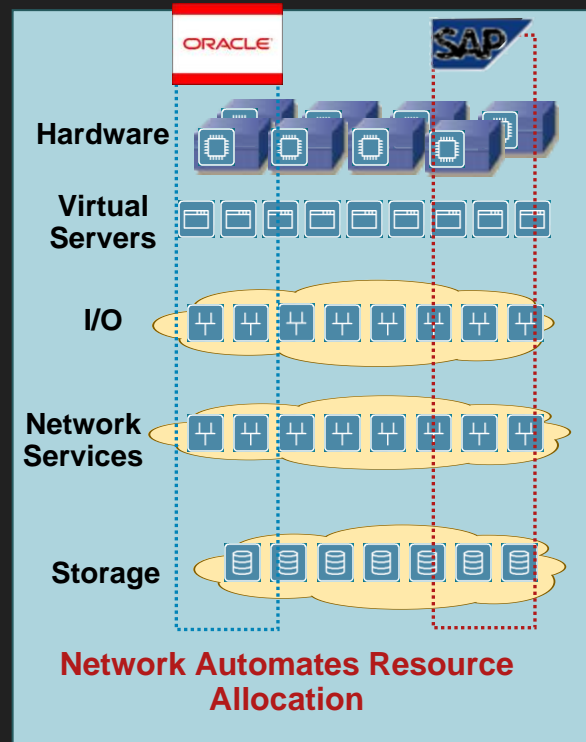
Today: 균일한 LAN, SAN의 복잡한 서버 네트워크

## Server and I/O Virtualization



Next: 일반 서버를 공유하는 통합된 스위칭 구조

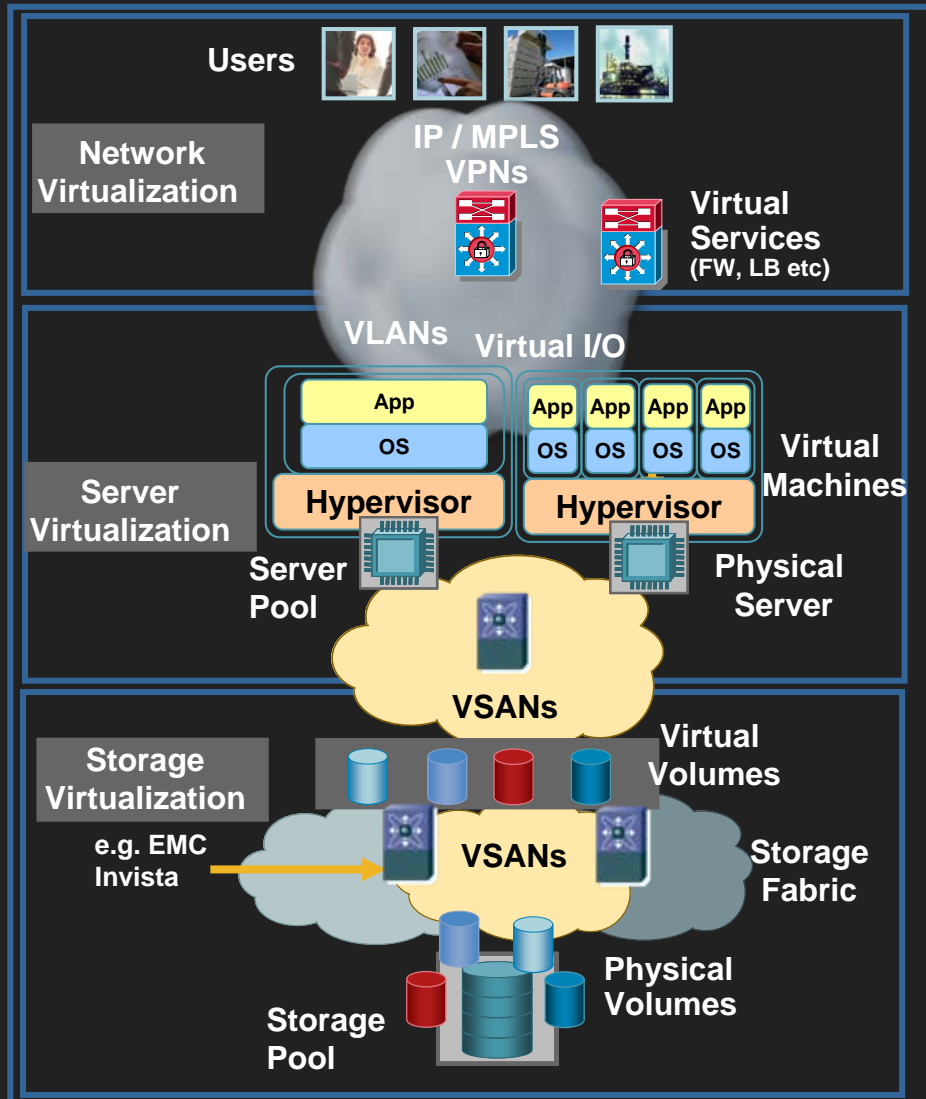
## Automated Application Services



Future: 모든 자원에 대한 가상화 구현

# Data Center Virtualization

## Server, Storage and Networking



### Network Virtualization

- Dynamically creates secure isolated environments for hosting apps on shared infrastructure
- Reduces number of appliances (FW, LB, SSL etc) for lower cost and power consumption
- Unified Fabric and Virtual I/O Reduces Network TCO

### Server Virtualization

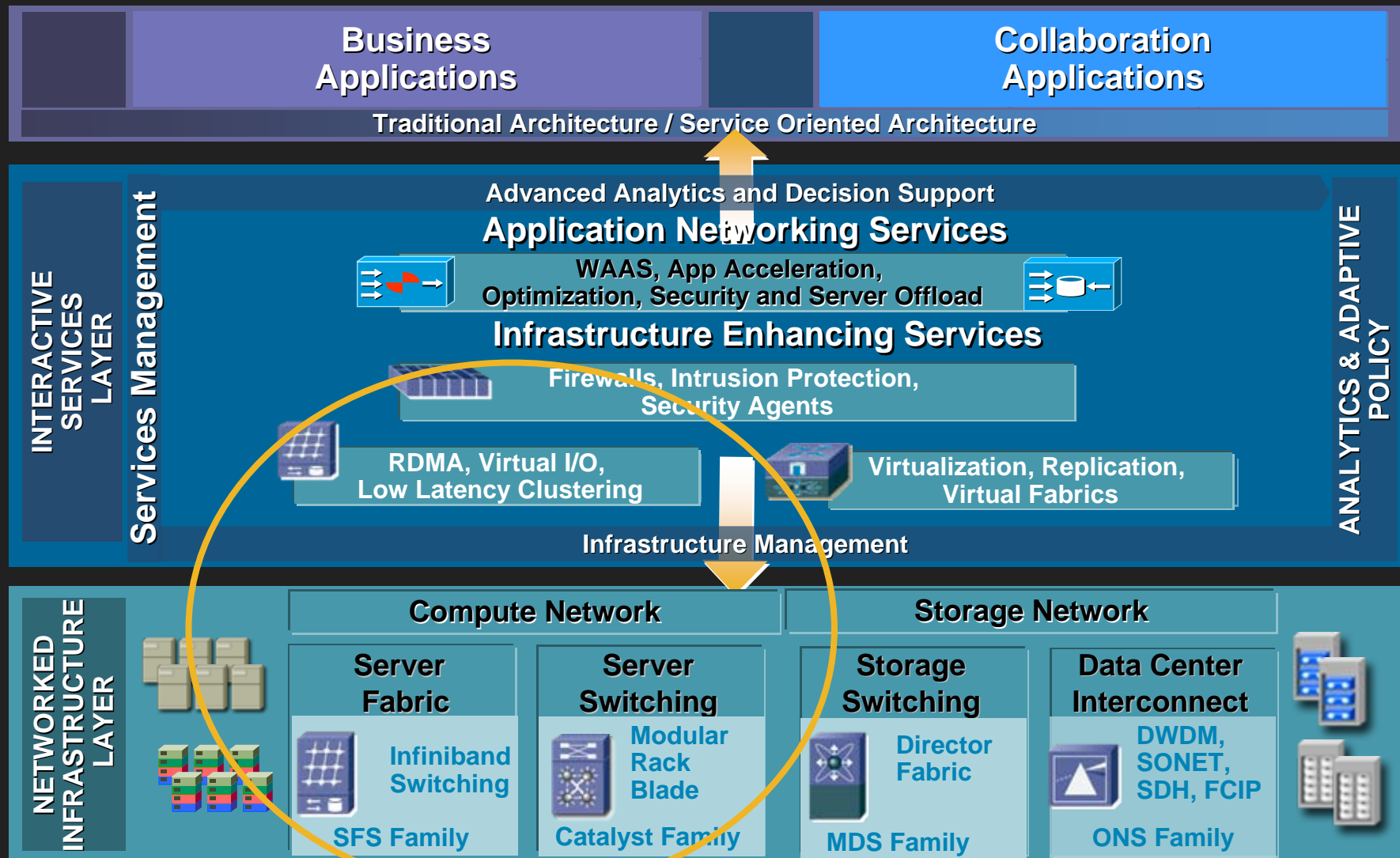
- Virtual Machine consolidation reduces number of servers to manage, deploy, power and cool
- Non-disruptive virtual machine migration allows upgrades, patches etc. without app downtime
- Flexibility: Bare-iron servers and virtual machines can be rapidly deployed to support existing or new apps

### Storage Virtualization

- Network-hosted for scalability, availability and transparency
- Non-disruptive storage provisioning and migration of production data between systems
- Seamlessly upgrade or migrate storage
- Point-in time copy across heterogeneous systems

# Cisco Data Center Network Framework

*Delivering Compute-Centric Fabrics and Services...with Partners*







# Data Center 최적화 솔루션

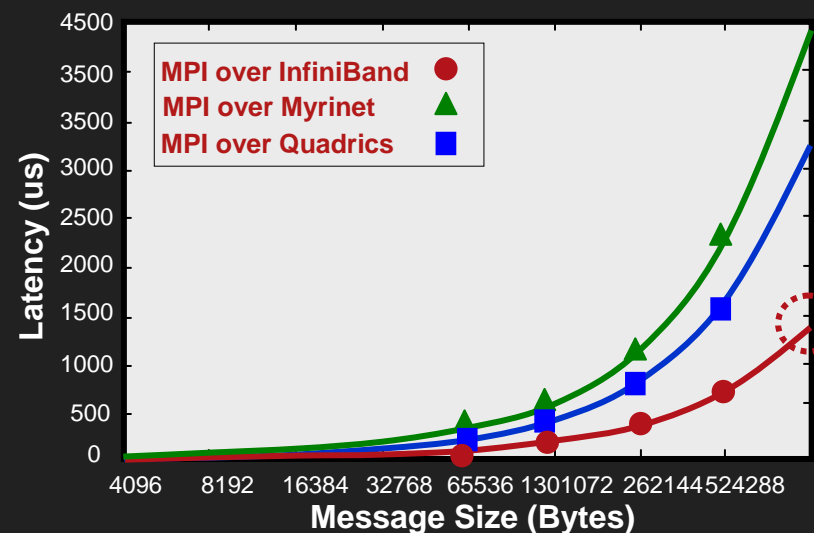
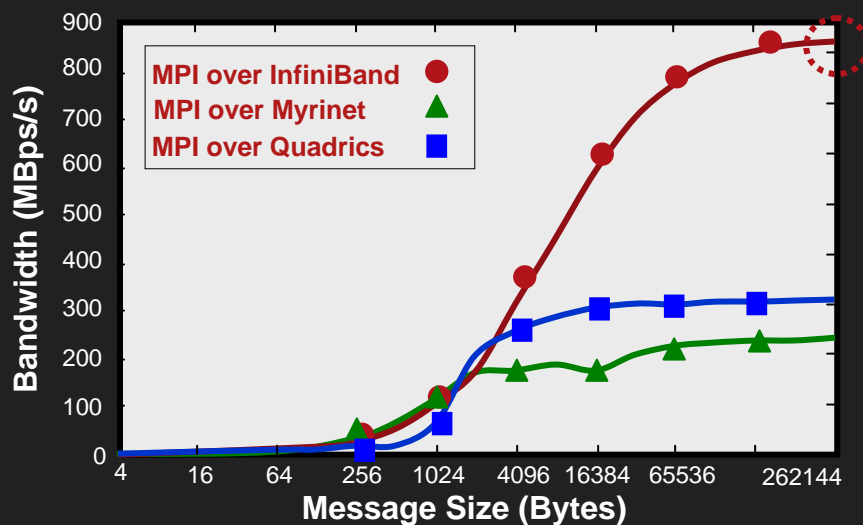
**SFS Infiniband**를 이용한 최적화



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# 고속의 대역폭 & 낮은 지연시간



Source: Ohio State

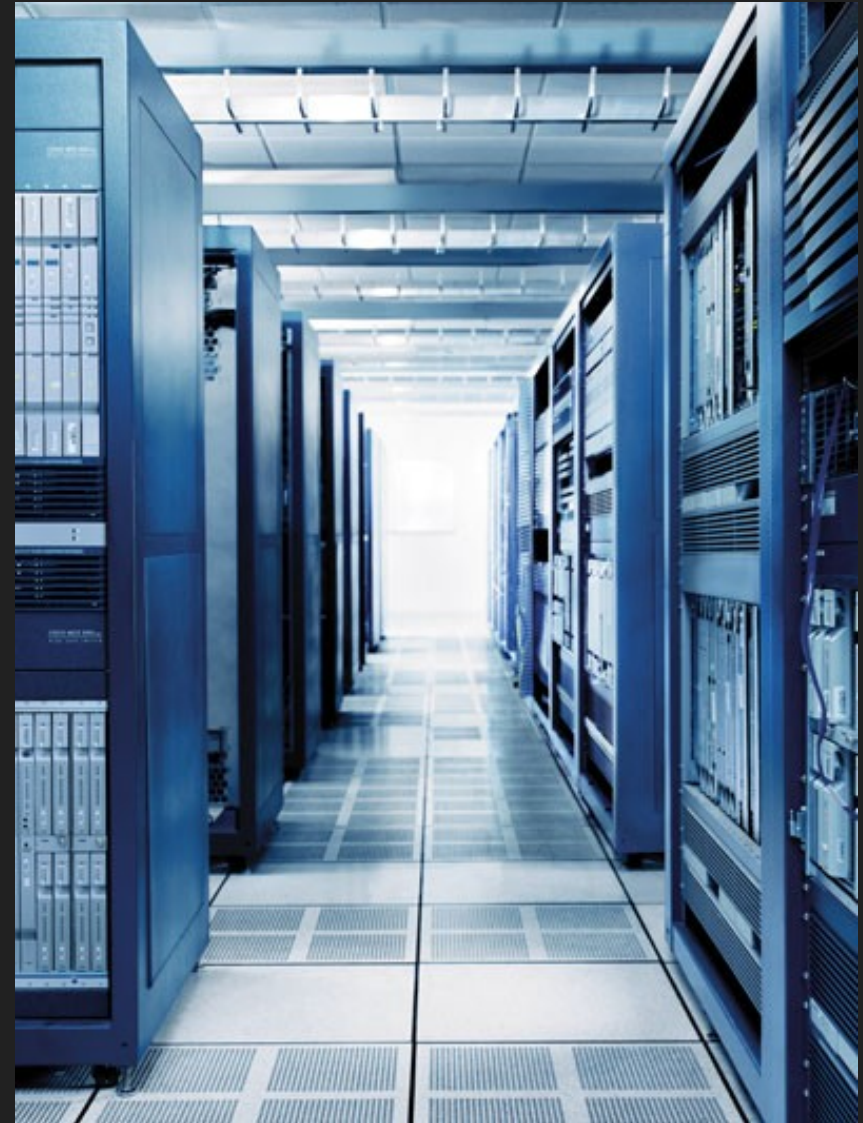
	InfiniBand	Quadrics	Myrinet	GigE
Throughput	940 MBps	300 MBps	800 MBps	120 MBps
Latency (small msg)	3 us	5 us	7 us	70 us
CPU Utilization	1-3%	Not available	Not available	50%

Source: Ohio State and Topspin

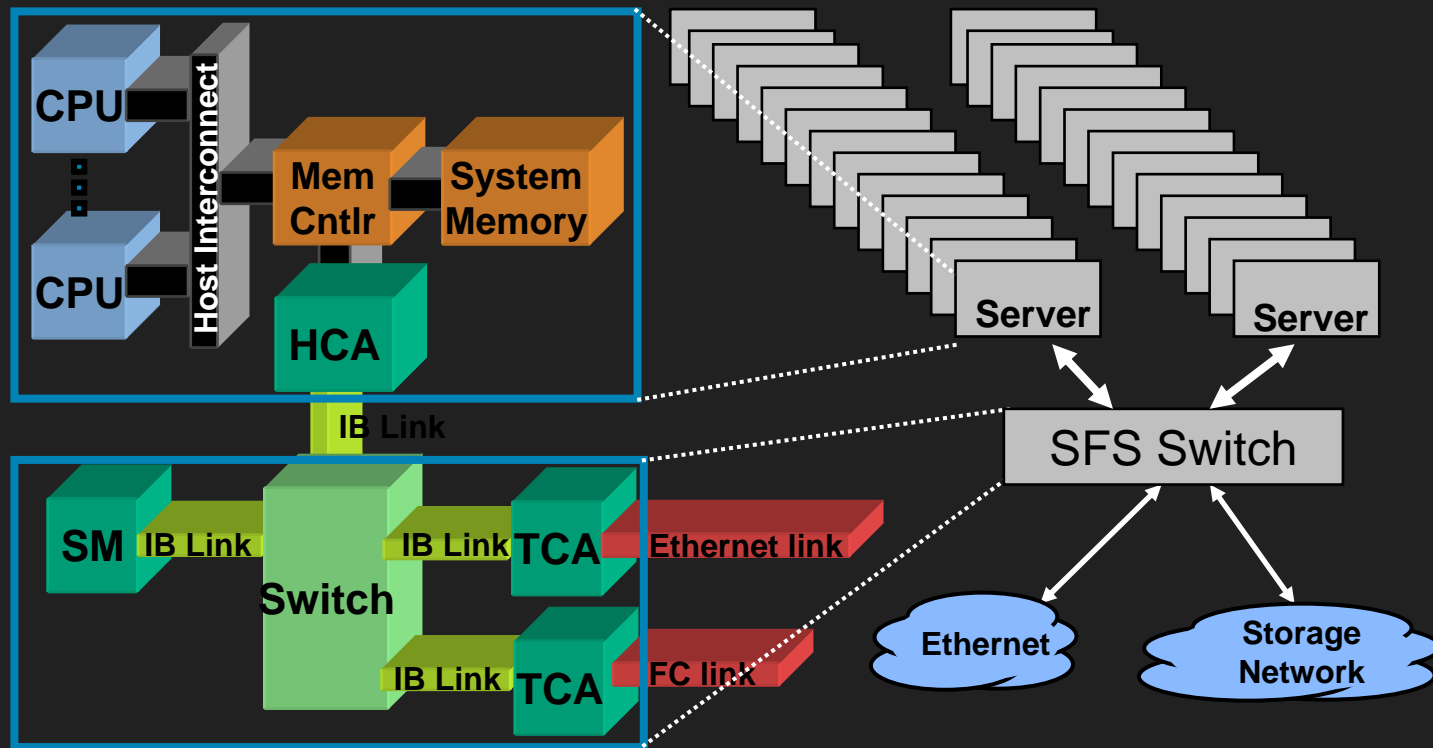


# Infiniband 정의

- Infiniband는 서버 및 스토리지, 데이터 센터내 네트워크간의 상호 접속을 위한 산업 표준 기술
- 동축(<17M) 또는 광케이블(<10Km)상에서 작동됨
- 확장성 있는 상호 접속:  
1X = 2.5Gb/s  
4X = 10Gb/s (현재)  
12X = 30Gb/s
- RDMA를 이용한 다양하고 새로운 프로토콜 지원



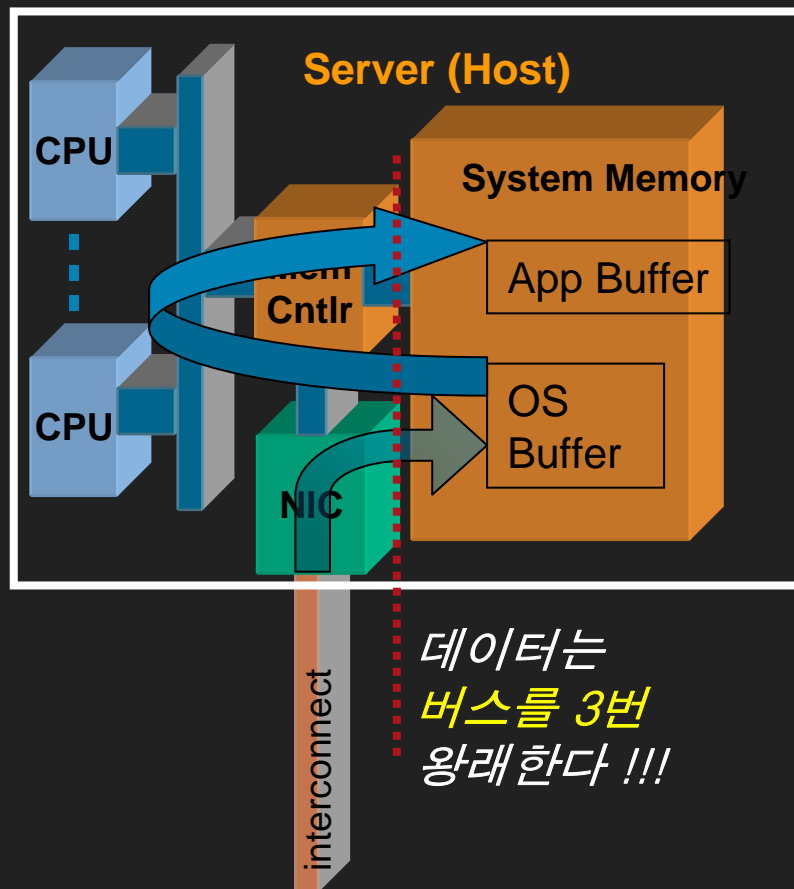
# Infiniband 구조



- HCA : Host Channel Adapter
- TCA : Target Channel Adapter
- SM : Subnet Manager

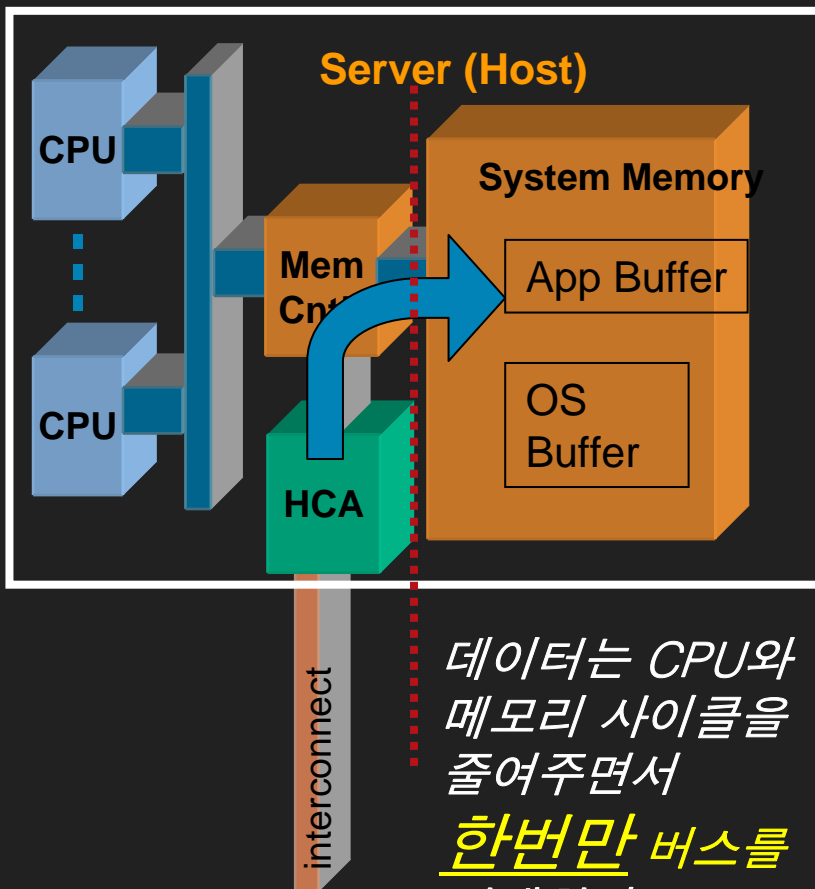
# RDMA (Remote Direct Memory Access)

현재 서버 방식



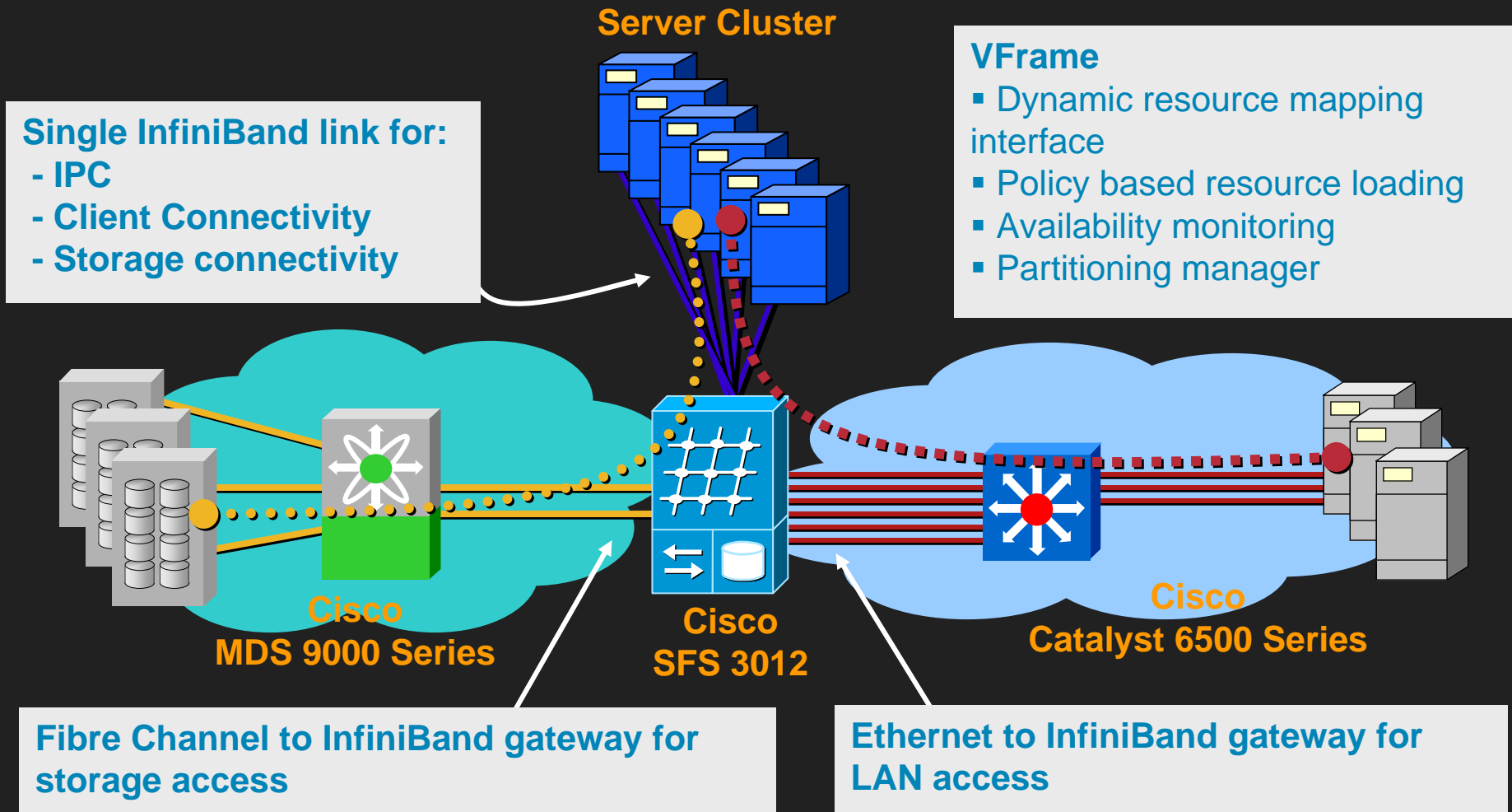
데이터는  
버스를 3번  
왕래한다 !!!

Cisco SFS 의 RDMA 방식



데이터는 CPU와  
메모리 사이클을  
줄여주면서  
한번만 버스를  
왕래한다 !!!

# 최적의 네트워크 구성



# SFS 3000 시리즈

## ❖ Cisco SFS 3001



- 1-rack-unit (1-RU)
- 12 4X InfiniBand ports (10Gbps)
- 1개의 gateway slot
- 2-ports 2Gbps Fibre Channel
- 4-ports Gigabit Ethernet
- 내장형 subnet manager
- Non-blocking 구조
- Power / Cooling 이중화
- 이중화된 제어 기능

## ❖ Cisco SFS 3012



- 4-rack-unit (4-RU)
- 24 4X InfiniBand ports (10Gbps)
- 12-port 4X InfiniBand LIM card
- 최대 12개의 확장 slot 장착
- 2-ports 2Gbps Fibre Channel
- 4-ports Gigabit Ethernet
- 내장형 subnet manager
- Non-blocking 구조
- Power / Cooling 이중화
- 이중화된 제어 기능

# SFS 7000 시리즈

## ❖ Cisco SFS 7000 P/D



- **1-rack-unit (1-RU)**
- **24 4X InfiniBand ports (10Gbps)**
- Embedded subnet manager
- Non-blocking 구조
- Power / Cooling 이중화
- 7000D: 24 Dual-speed 4XInfiniBand DDR(20Gbps) 와 SDR (10Gbps) 제공

## ❖ Cisco SFS 7008 P



- **6-rack-unit (6-RU)**
- **96 4X InfiniBand ports (10Gbps)**
- **Full Bi-Sectional Bandwidth**  
based on 12 InfiniSwitch-III Chips  
Maximum 3 hops through fabric  
<500W power consumption
- 내장형 subnet manager
- Non-blocking 구조
- Power / Cooling 이중화



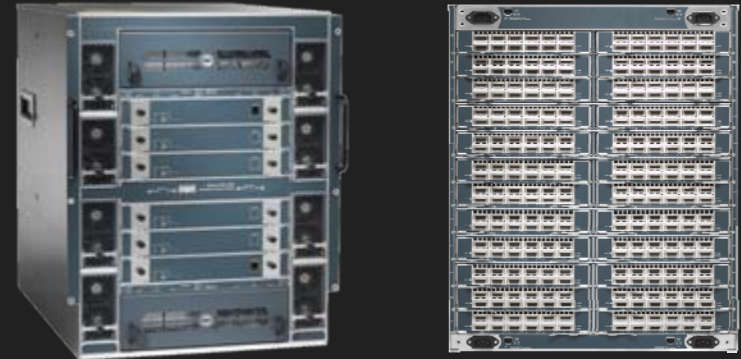
# SFS 7000 시리즈

## ❖ Cisco SFS 7012 P/D



- 7-rack-unit (7-RU)
- 144 4X InfiniBand ports (10Gbps)
- 외장형 subnet manager
- Non-blocking 구조
- Power / Cooling 이중화
- Redundant Management
- 7012D: 144 Dual-speed 4XInfiniBand DDR(20Gbps) 와 SDR (10Gbps) 제공

## ❖ Cisco SFS 7024 P/D



- 14-rack-unit (14-RU)
- 288 4X InfiniBand ports (10Gbps)
- 외장형 subnet manager
- Non-blocking 구조
- Power / Cooling 이중화
- Redundant Management
- 7012D: 288 Dual-speed 4XInfiniBand DDR(20Gbps) 와 SDR (10Gbps) 제공



# MFIO Modules



- IB to Fibre Channel Gateway
- Two 1-2Gb FC ports
- >700 MB/s throughput
- Scale-up I/O dynamically by hot plugging new cards
- Proven Hardware Interoperability
  - IBM Storage Proven
  - Brocade Fabric Aware
  - EMC local certification
  - and many more



- IB to Ethernet Gateway
- Four Gigabit Ethernet ports
- Two 4X InfiniBand ports
- Flexible Deployment
  - L3 Routing or
  - L2 Bridging
- Supports IPoIB, VLAN, DHCP
- Link Aggregation

# HCA

- PCI-X 와 PCI-Express 두 타입을 제공
- Low profile 제공
- 결합된 host protocol 제공
- 전송 지원 protocol
  - uDAPL/VIPL/MPI/IPoIB/  
SDP/SRP
- 지원 운영 체제
  - Linux
  - Windows
  - Solaris



# Cisco Server Fabric Switch Value

- 총 소유 비용의 절감
- 구축 및 운영비용 절감
- 표준 기반의 구축
- 서버와 네트워크의 효율성 개선
- 어플리케이션의 성능과 가용성 향상
- 자동화된 어플리케이션과 자원 할당이 가능
- 요구에 따라 데이터 센터 자원의 효율적 분배가 가능
- 스토리지의 병목 현상 해소
- Local Service 지원



# Cisco의 가상화 솔루션 - VFrame



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# 가상화 도입을 위한 Challenges

## ■ 확장성의 한계

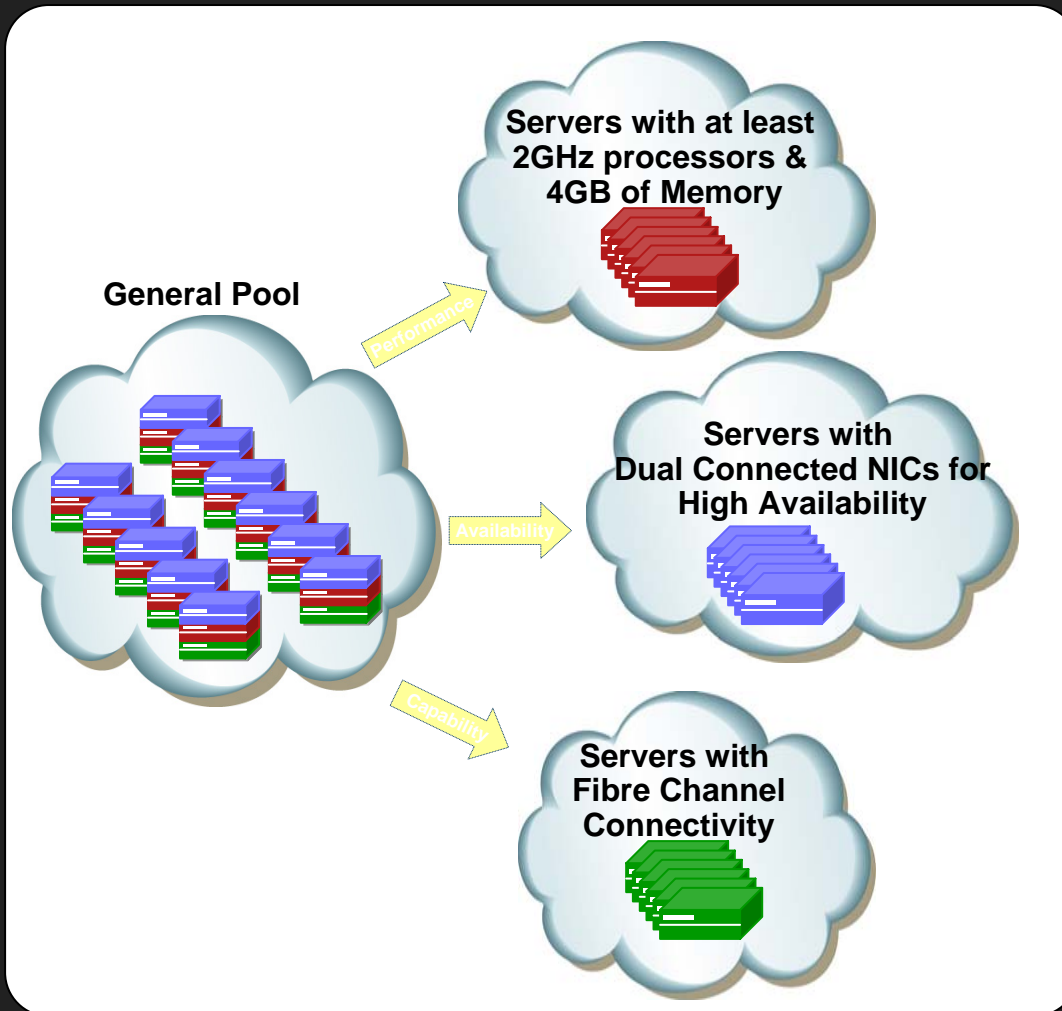
- Multiple networking bottlenecks, including:  
SAN and IP scalability, additional latency, Multicast loss, limitations by rack, etc.
- Difficult to upgrade I/O capacity.
- Difficult to maintain reliability while changing I/O.

## ■ 관리의 복잡성

- Need to coordinate multiple types of networks, including switches, HBAs, NICs, and drivers
- Need to touch physical servers to configure boot services or upgrade/migrate.
- Need to change security (VLAN/SAN Zoning)

# Cisco의 VFrame Overview

## Right Size Your Application Infrastructure



Example: Server Pooling with performance, availability and capability filters

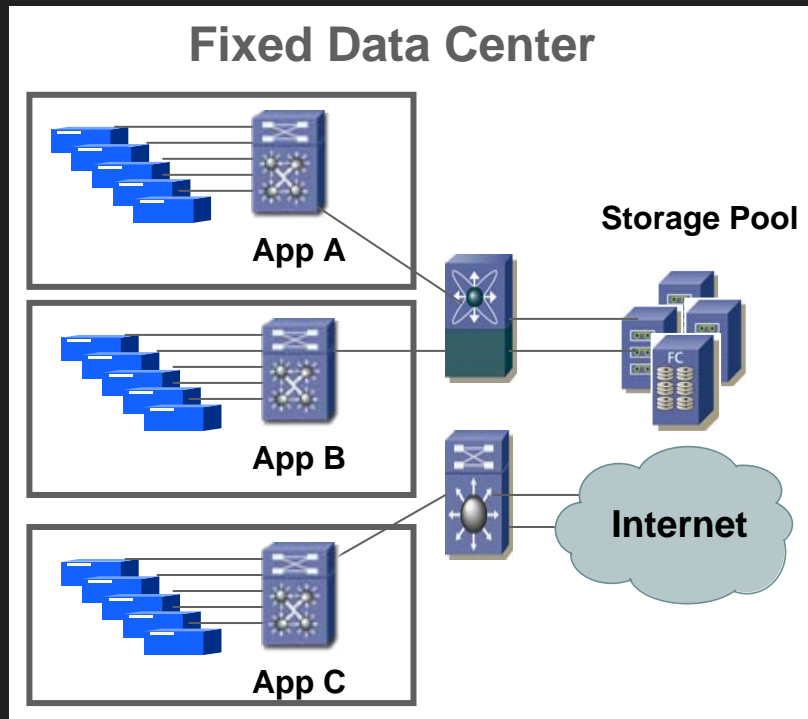
**Set application requirements using Dynamic Pooling**

**Select appropriate resource automatically from the pool**

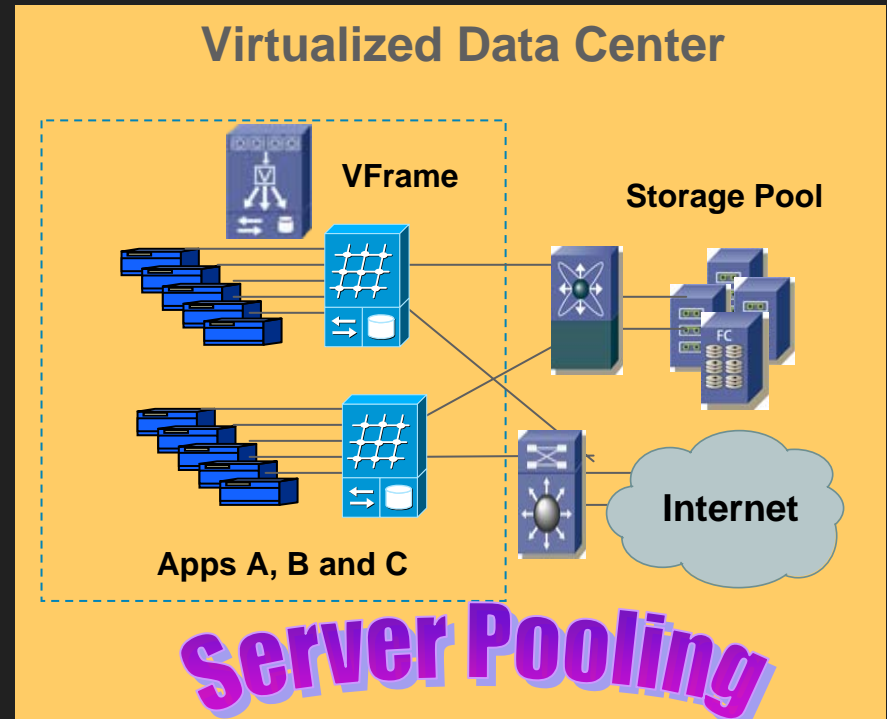
**Manage server I/O through EtherChannel**

**Enable path HA through server connection redundancy**

# VFrame Virtualization



- One to one ratio of servers to apps
- Majority of server under-utilized
- No flexibility to reallocate server power
- Over provisioning of back-up servers

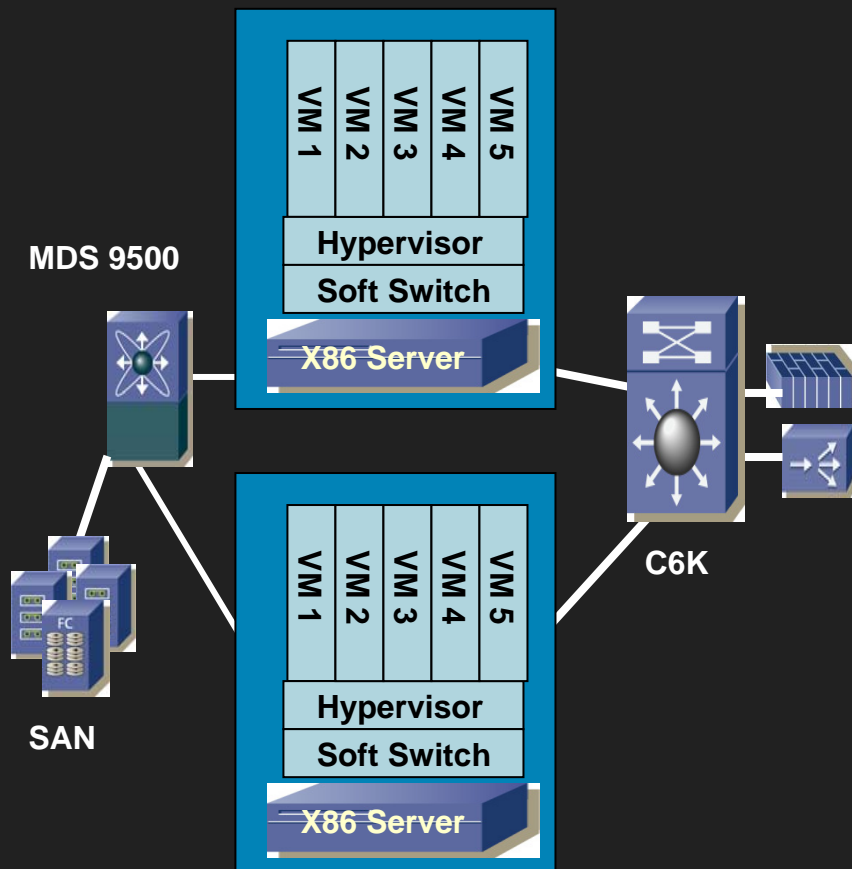


- Reduction  
servers per application/server ports  
/power and cooling/ real estate and  
racks / service contracts
- Elimination of local disks

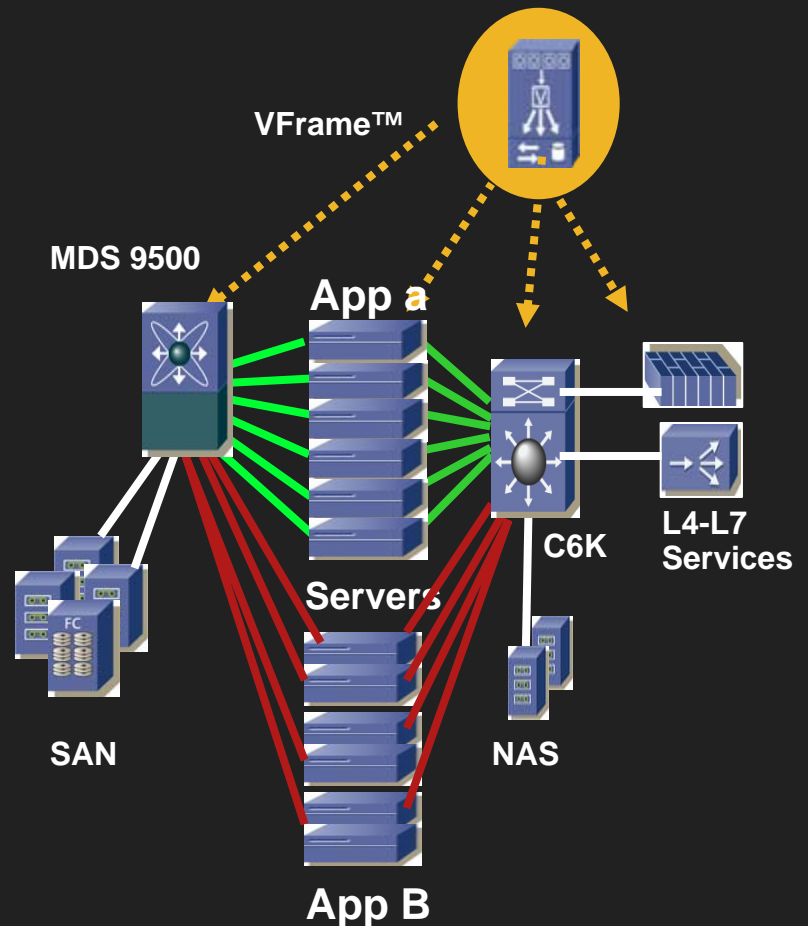


# Two Virtualization Models

## Server Virtualization Model

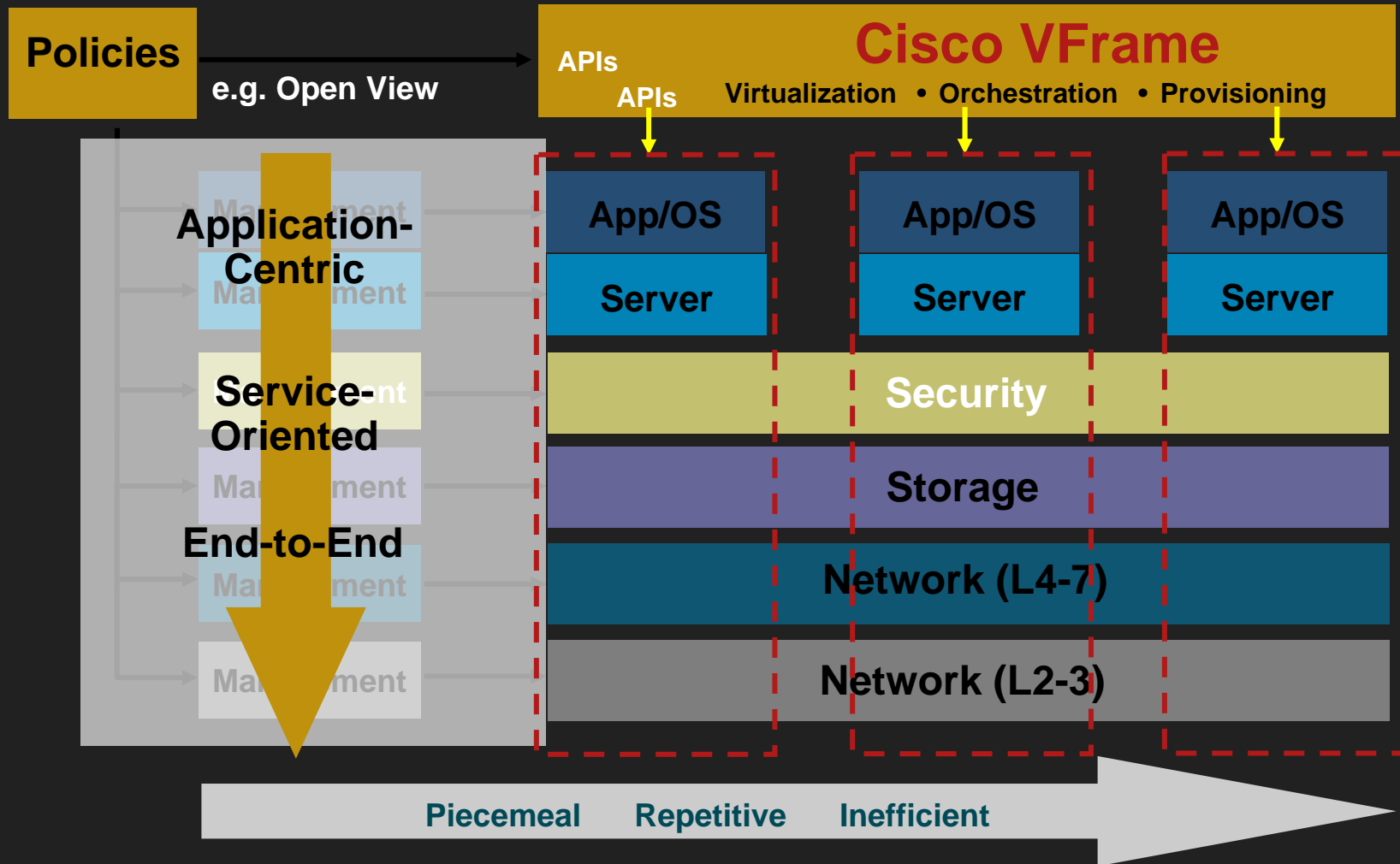


## Services Orchestration

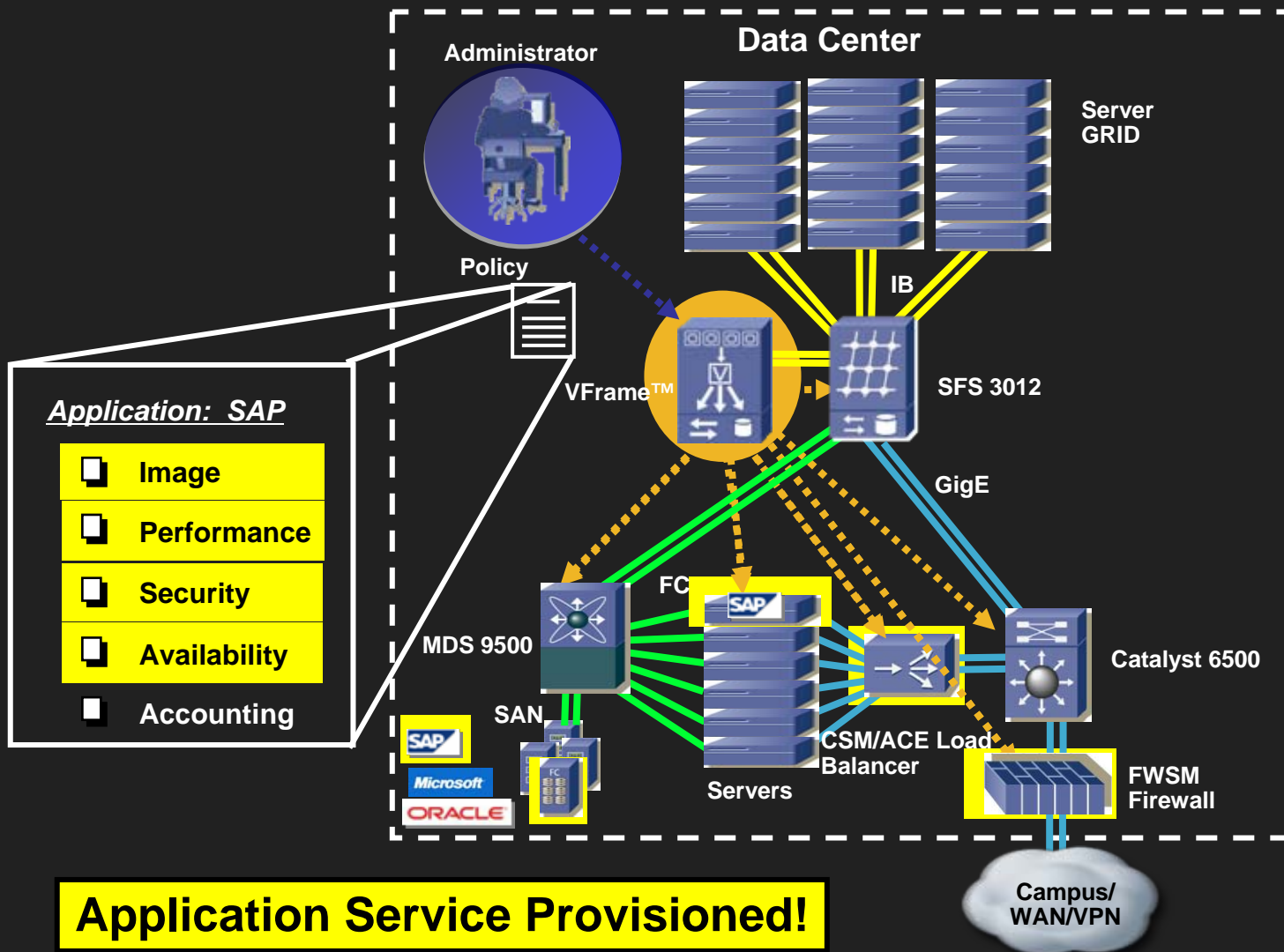


# Cisco의 VFrame Overview

- **High Complexity, Cost, Limited Scale**을 극복
- **Server Provisioning**을 위한 최적의 **Tool**



# VFrame을 통한 Automated Service 프로비저닝



애플리케이션 정의 후  
관련 정책을  
**Vframe**으로 전달

받은 정책을 **VFrame**  
수행 업무로 변환하여  
인프라로 전달

**Vframe**이 스토리지로  
부터 필요한 **App/OS**  
**Image**를 선택

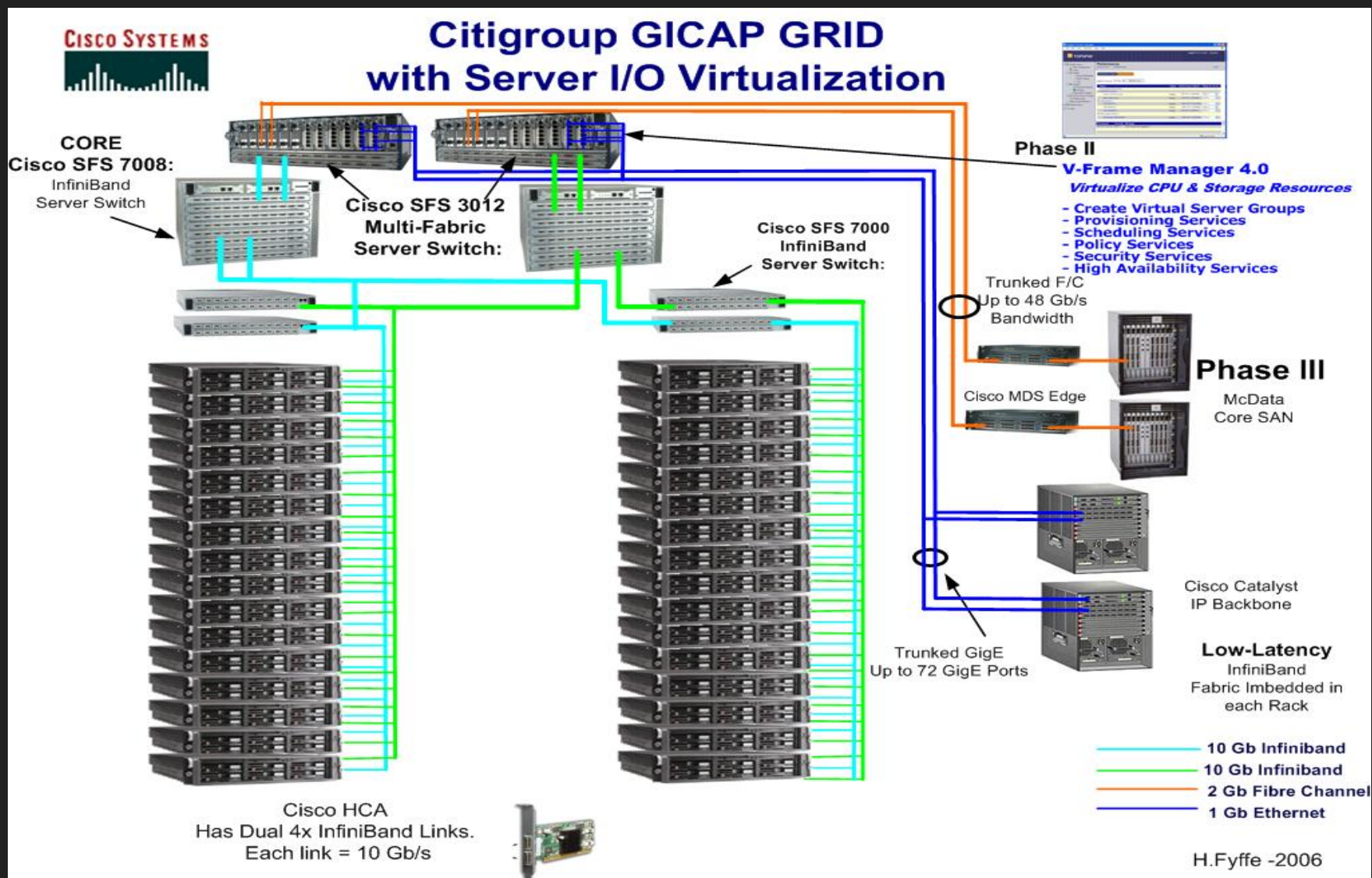
**Vframe**이 적당한 서버를  
골라 해당 **App**을 로딩한  
후 부팅 시킴

**Vframe**이 사용자 및  
스토리지와의 통신을 위한  
**VLAN** 및 **LUN**을  
생성하여 인프라로 전달

**Vframe**이 **FWSM**으로  
관련된 보안 정책을 전달

**Vframe**이 **ACE/CSM**에게  
적절한 **SLB pool** 할당

# 구성 사례 : CitiGroup





# Q & A



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