



Cisco Data Center Networking Architecture



시스코 코리아
박승남 상무(snpark@cisco.com)

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

Cisco Datacenter Day

Agenda

- Why Network? Why Architecture ?
- Cisco Data Center Networking Architecture 개요
- Cisco Data Center Networking 제품군
- Why Cisco ?
- Summary

Why Network ?

Why Architecture ?

누구의 Datacenter 인가 ?

당연히 나!

THE NETWORK

나!

나!

나!

Applications



Network



Server



Storage



Mainframe

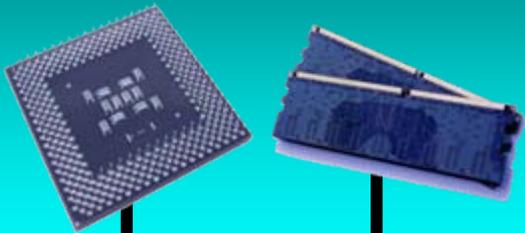


서버 중심에서 Network 중심으로

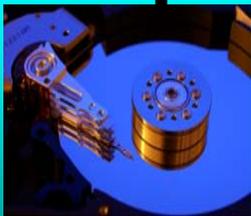
서버

CPU

Memory



Bus



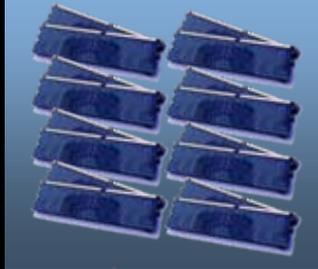
Disk



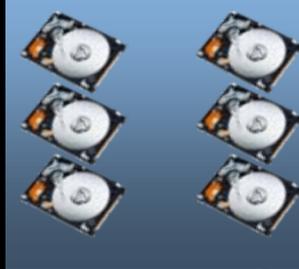
단말

The next 'Server' is the network...

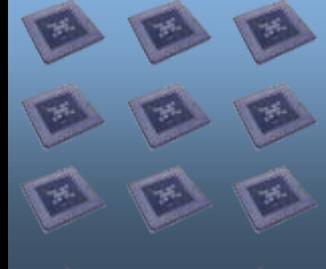
Mem-Array



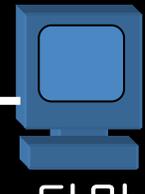
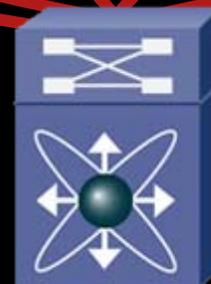
Disk Array



CPU-Array



Network



단말

흰 종이 위에 여러분의 **DC**를 그려보십시오.



Cisco Data Center Architecture 개요

전통적인 기업 Data Center 구성

현황

민첩성 부족

Isolated Application Silos

Rigid Infrastructure Silos

유연성 부족

Inconsistent Security

Inconsistent BC/DR

고 비용

Under-utilized Resources

Operational Complexity and Inefficiency

Enterprise Data Center

Engineering Services

NAS Filers



NetworkAppliance

E-Mail



E-Mail Appliances

IP Services

DNS

RADIUS

LDAP



JBOD



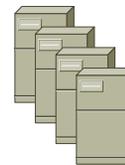
Operations Center



Internet Data Center

Public Web Site

100s of Servers with Integrated Storage



E-Commerce Application

4-Tier Application App. Server



Finance, HR, Payroll and EDI



Tape Backup



Multiple 2-Tier ERP Instances



Internet Data Center

Supply-Chain Management



NCR DB Server



Traditional Voice PBX



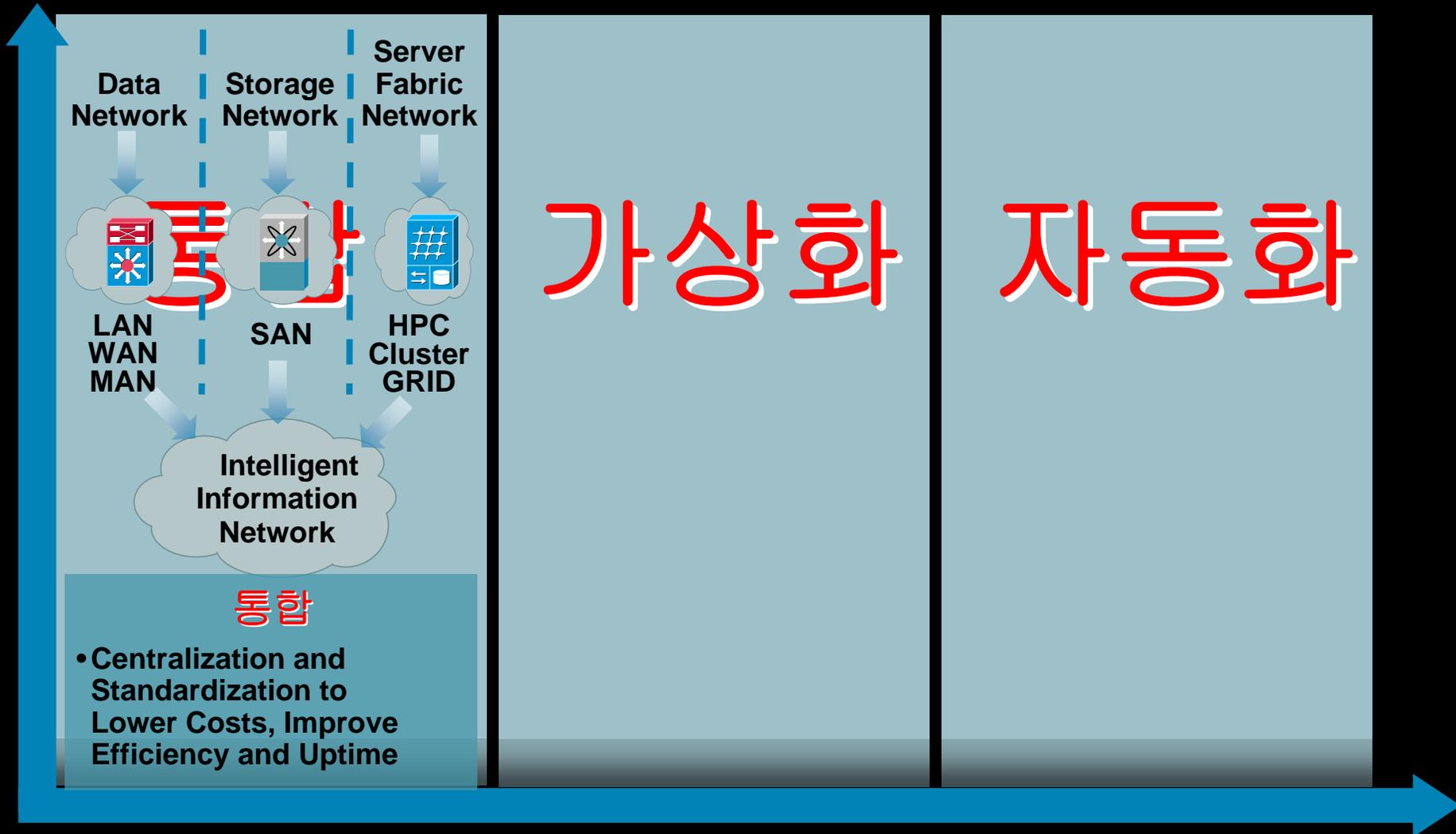
In-House Developed Apps



2-Tier CRM Application



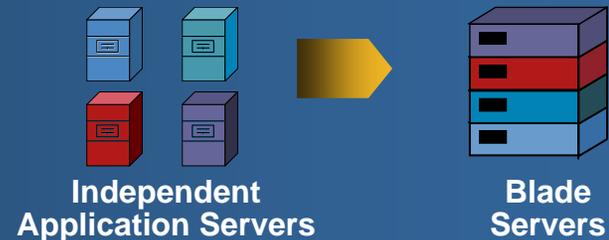
Data Center Network 발전 단계



물리적인 통합

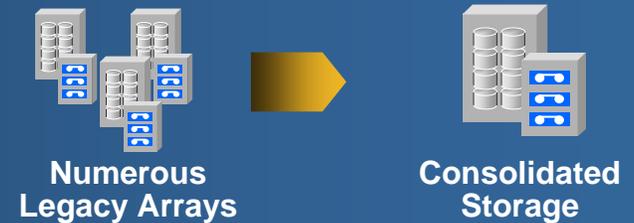
- Server Consolidation

Blade servers



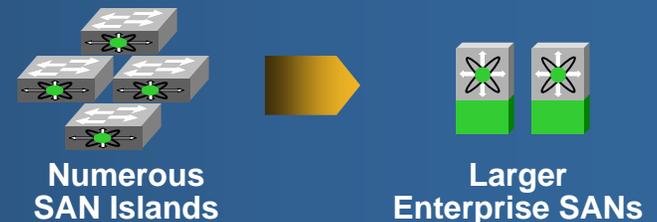
- Storage Consolidation

Higher density arrays



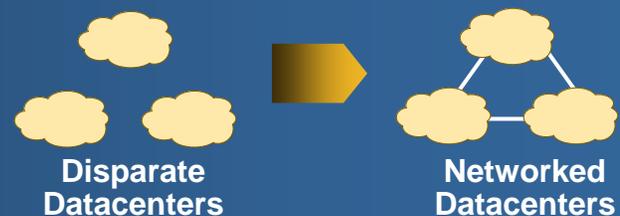
- SAN Consolidation

Increase effective port densities



- Data Center Consolidation

Physical moves and interconnect



기능의 통합

Front End Network

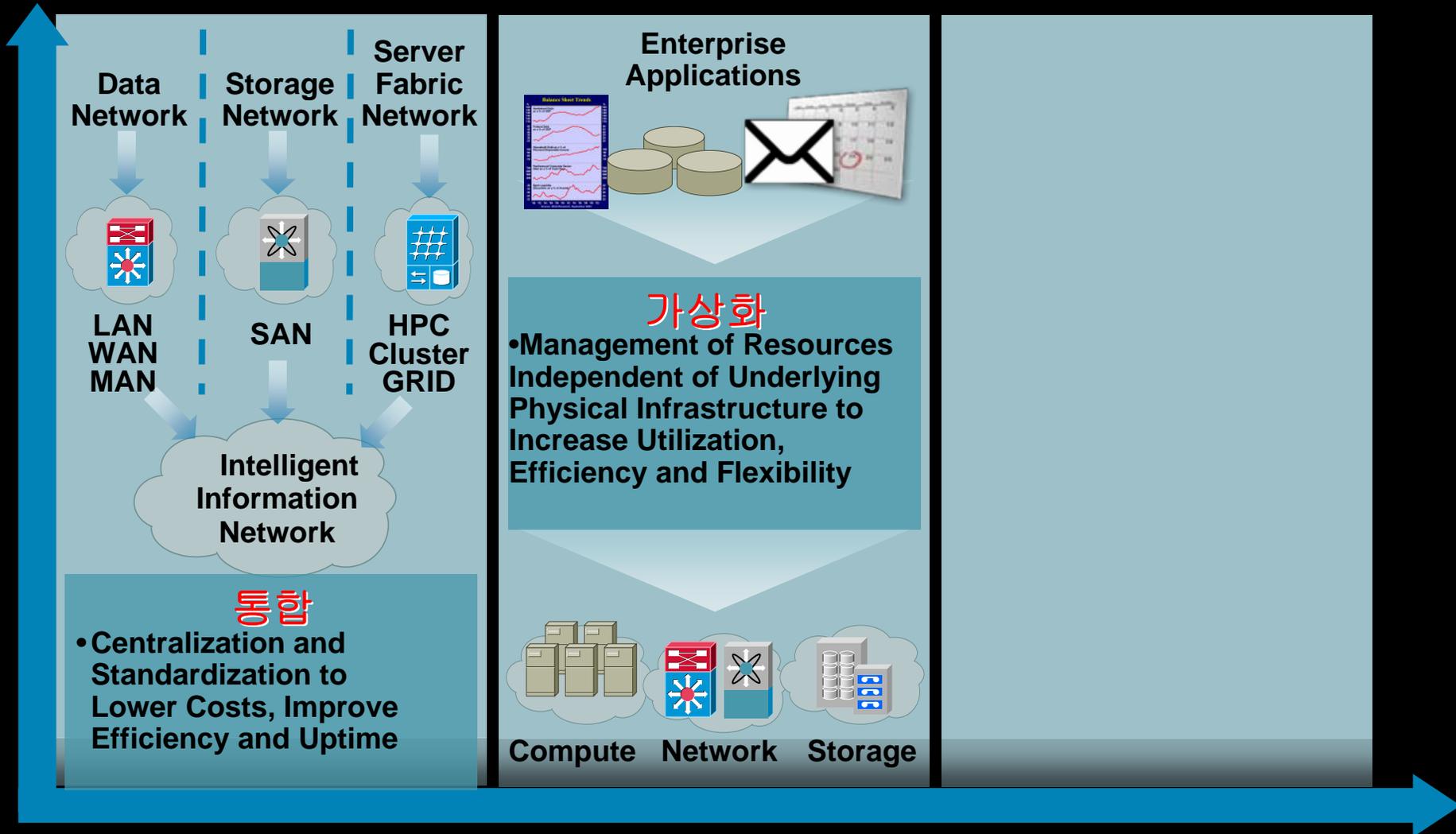
- Data Center Switch
- Security Net
 - IDS, FLB

N-Tier App

- SLB network
- Web, App, DB, MainFrame



Data Center Network 발전 단계

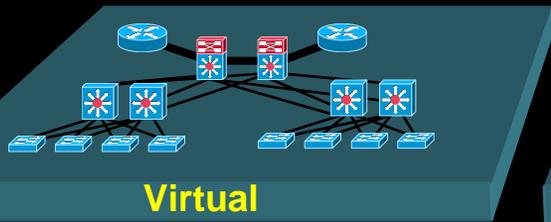


Virtualization : DC Network의 중심기능

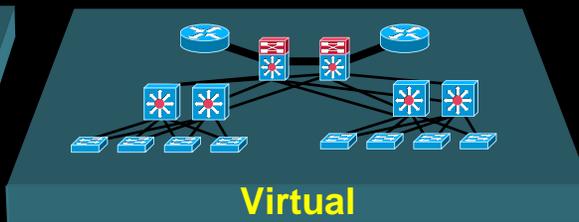
물리적 분리에서 논리적 분할로

- Virtualization: 1 to Many
- One network supports many virtual networks

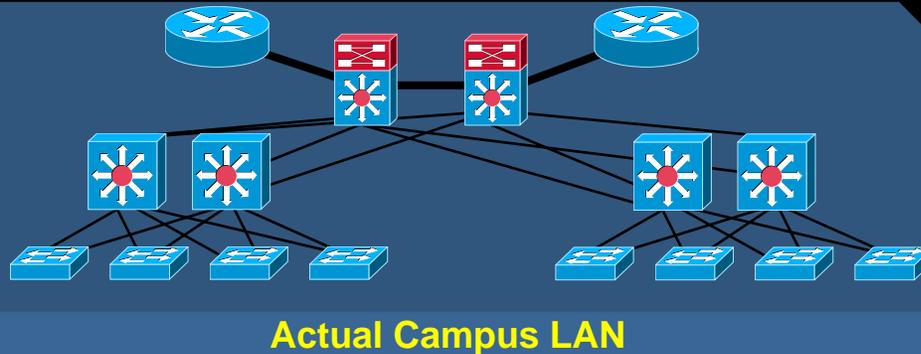
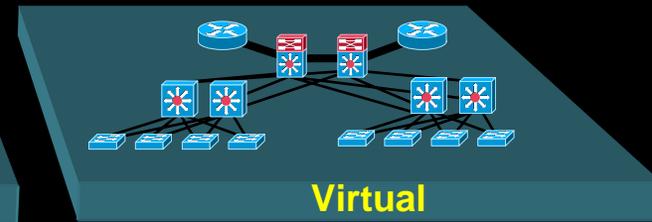
Outsourced
IT Department



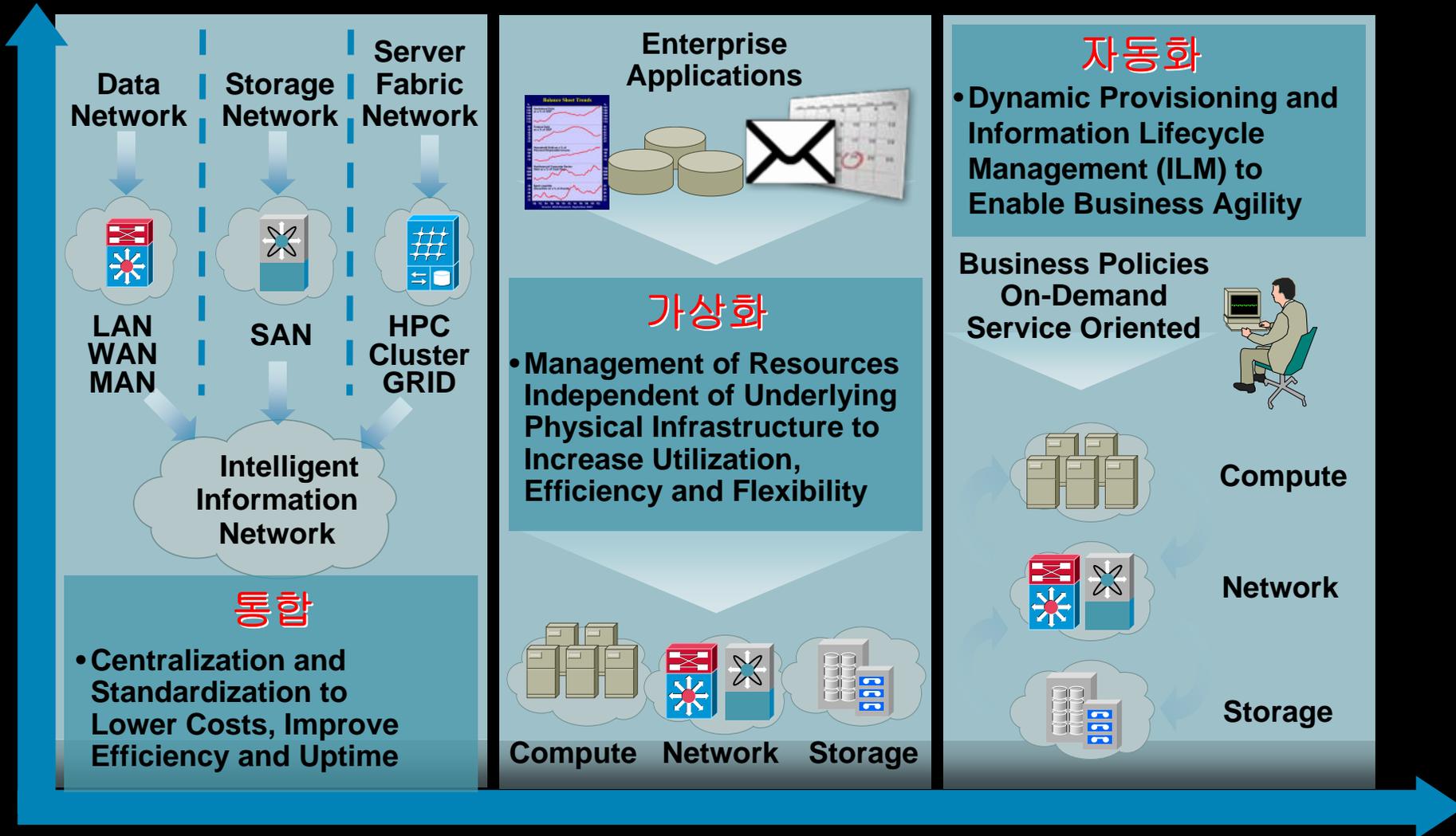
Merged New
Company



Segregated Department
(Regulatory Compliance)



Data Center Network 발전 단계



Data Center 발전 단계 예 : Cisco IT 사례

	Legacy Data Center	Consolidated Data Center	Virtual Data Center	Service Oriented Data Center
Compute	<ul style="list-style-type: none"> • 4 Tier Silos • Heterogeneous OS 	<ul style="list-style-type: none"> • Standardization • Virtual Machines 	<ul style="list-style-type: none"> • Server Repurposing • VM Mobility 	<ul style="list-style-type: none"> • Infrastructure Aligned to Application Services • Policy Based Management • Intelligent Data Management • Tiered Recovery • Usage and SLA-based Funding Model
Storage	<ul style="list-style-type: none"> • Storage Silos • Low Utilization 	<ul style="list-style-type: none"> • SANs, VSANs • Tiered Storage 	<ul style="list-style-type: none"> • Storage Virtualization 	
Network	<ul style="list-style-type: none"> • IP Connectivity 	<ul style="list-style-type: none"> • Consolidated Network Services 	<ul style="list-style-type: none"> • Virtualized Network Services 	
Security	<ul style="list-style-type: none"> • Perimeter Security 	<ul style="list-style-type: none"> • Secure Each Application Tier 	<ul style="list-style-type: none"> • Virtual Firewalls 	
Application	<ul style="list-style-type: none"> • Application Silos • Distributed 	<ul style="list-style-type: none"> • Consolidate, Centralize 	<ul style="list-style-type: none"> • SOA Pockets 	
	2004	2005	2006 - 2007	2008
	Consolidation Phase		Virtualization Phase Integration Phase Automation Phase	

Cisco 전략과 Data Center

Cisco 3-5 Year
Technology Vision

IIN

Why?

Architecture Framework
for implementing IIN in
the Enterprise

SONA

What?

Enterprise
Architectures
based on SONA

Campus

Branch

Data
Center

MAN /
WAN

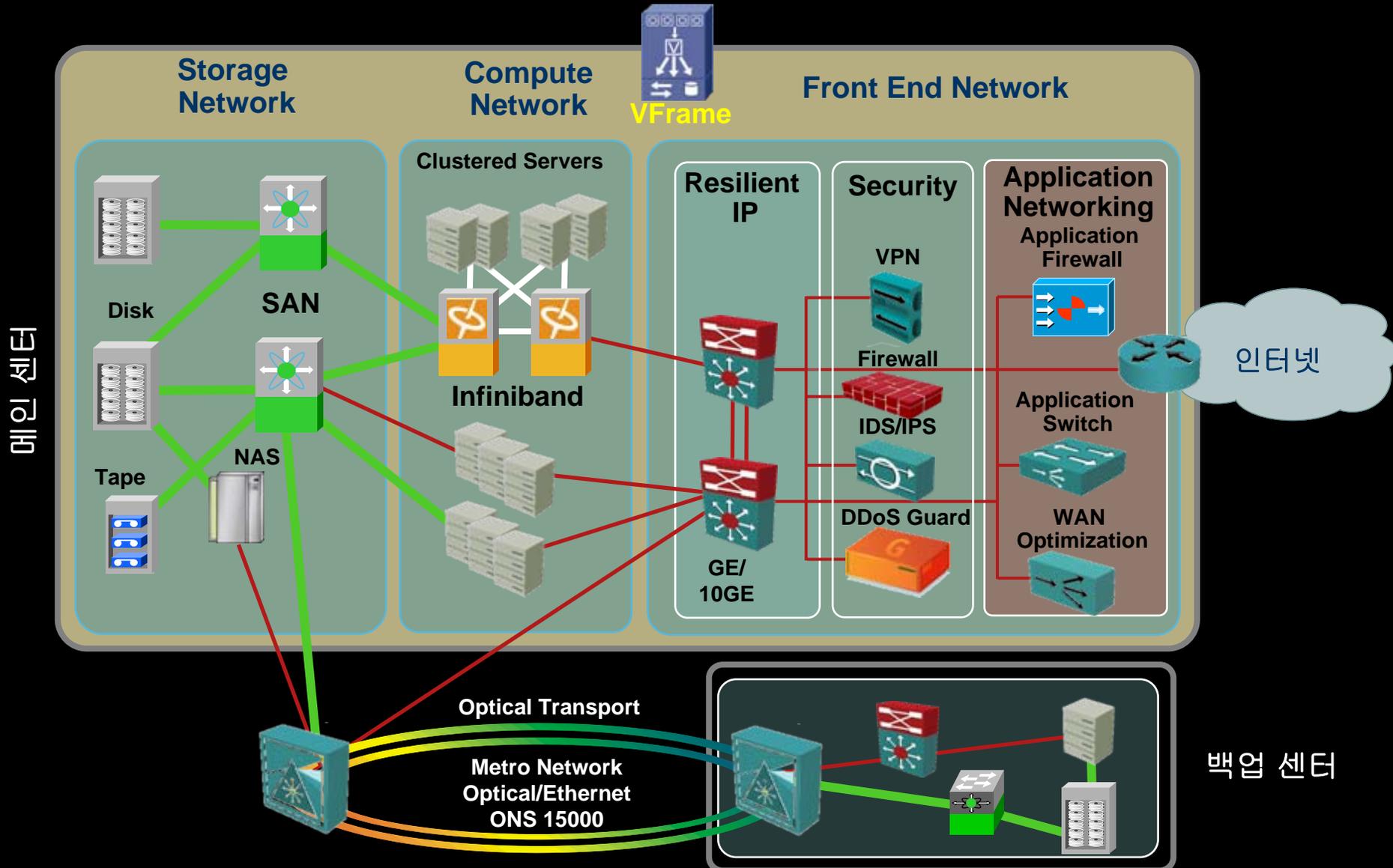
Branch
of One

How?

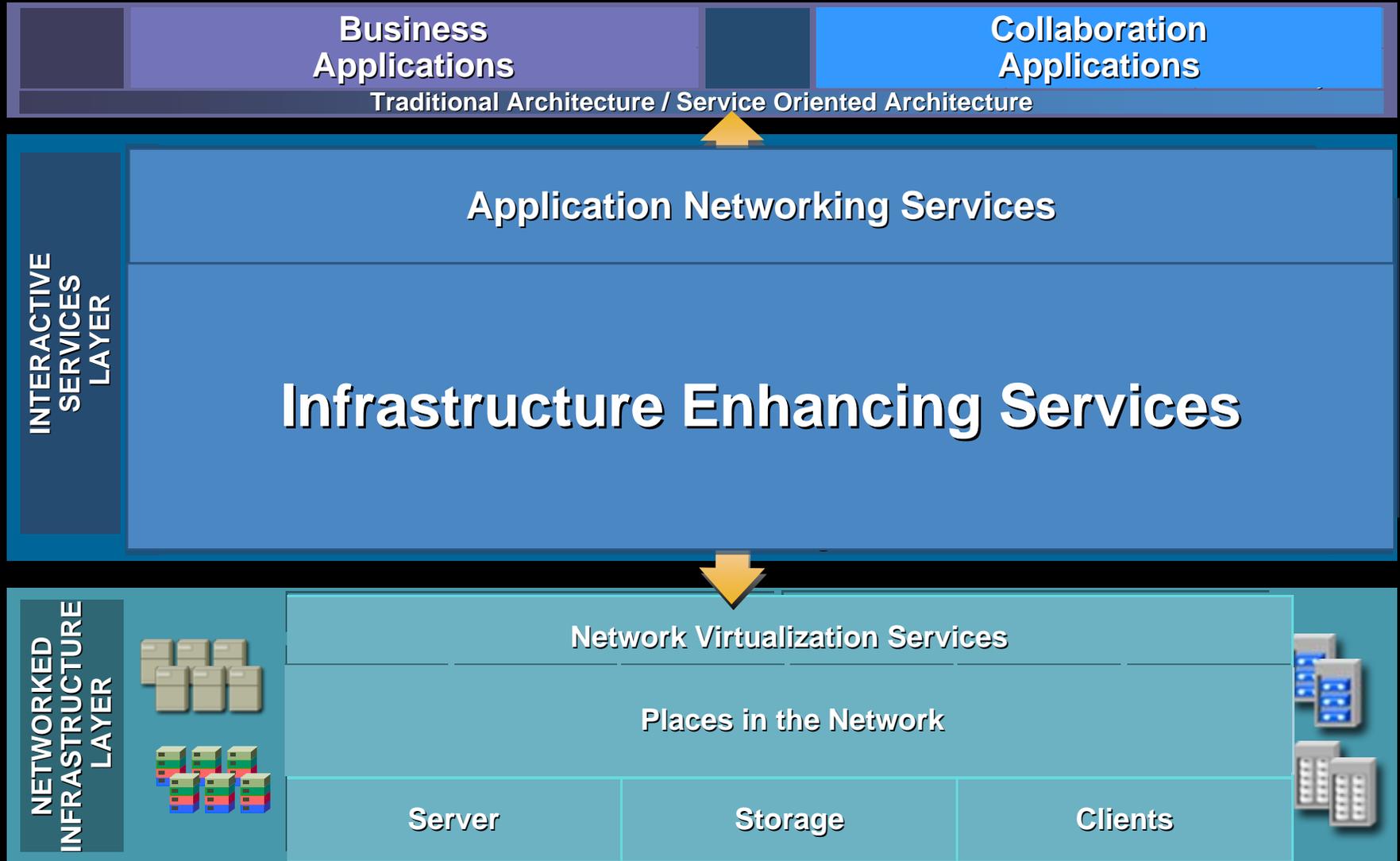
Technologies

Security, IPC, Application Networking,
Storage, Routing, Switching, Network
Mgmt

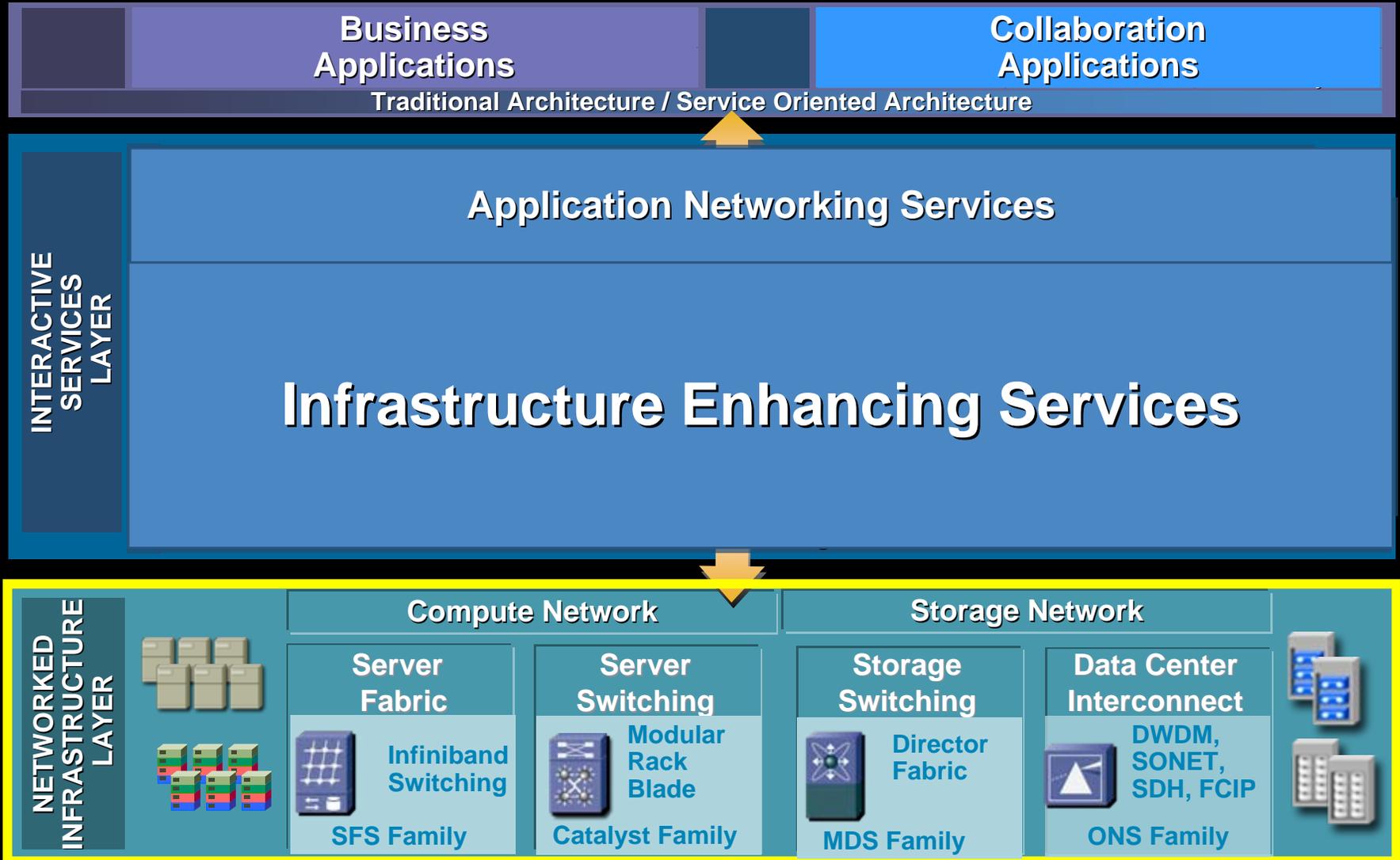
Cisco Data Center Network Architecture 개요



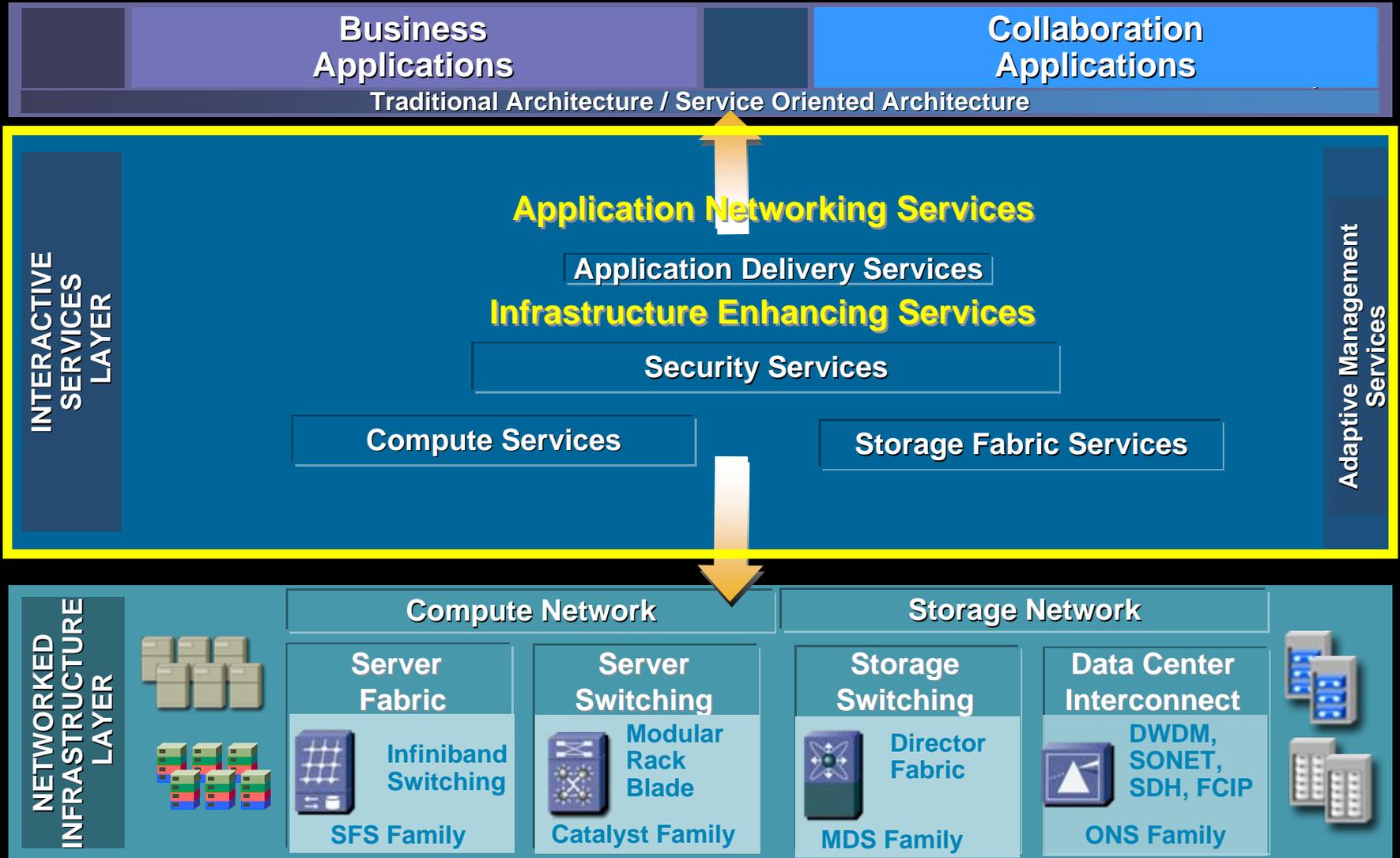
Cisco Data Center Network Architecture Framework



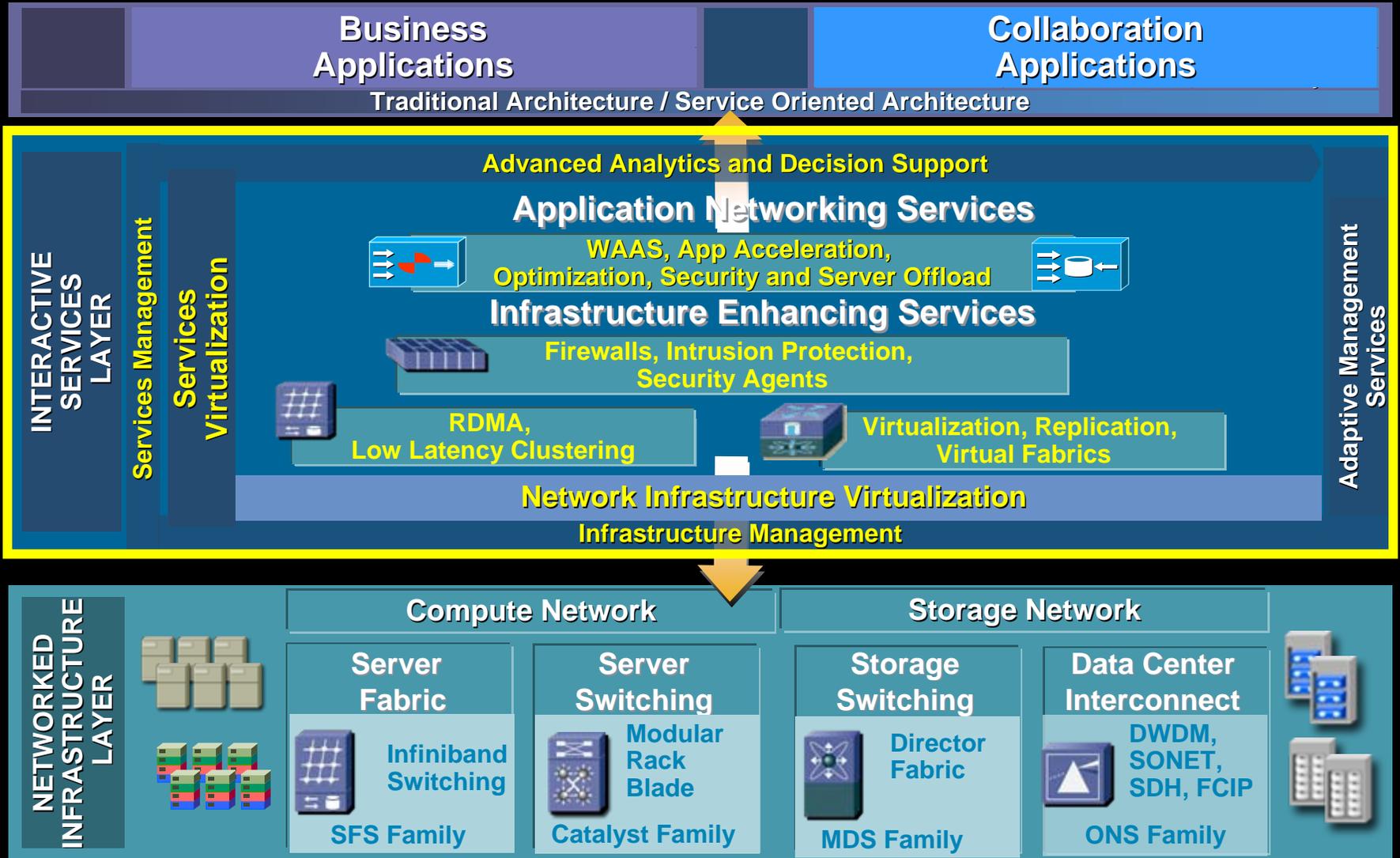
Cisco Data Center Network Architecture Framework



Cisco Data Center Network Architecture Framework

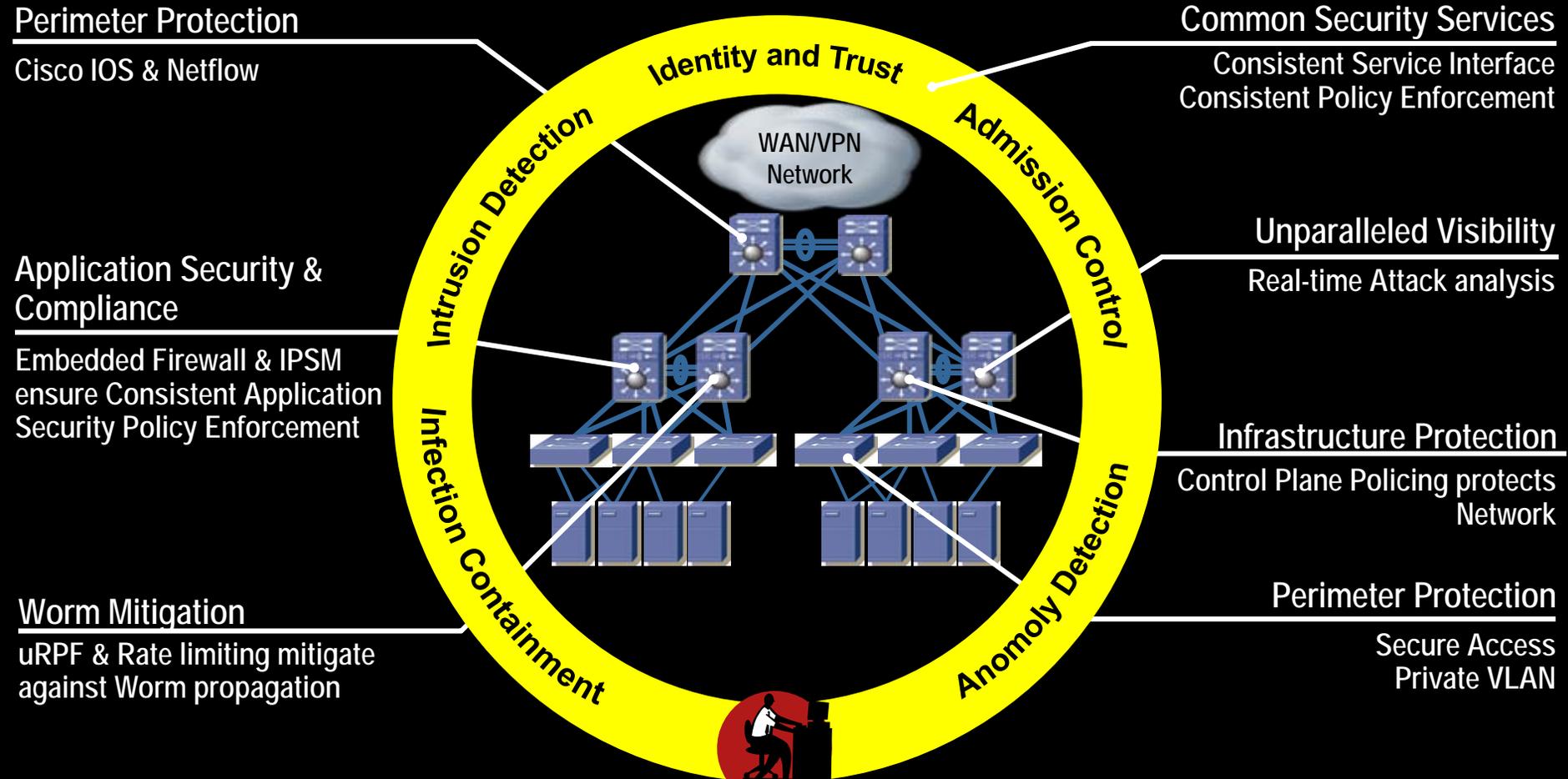


Cisco Data Center Network Architecture Framework



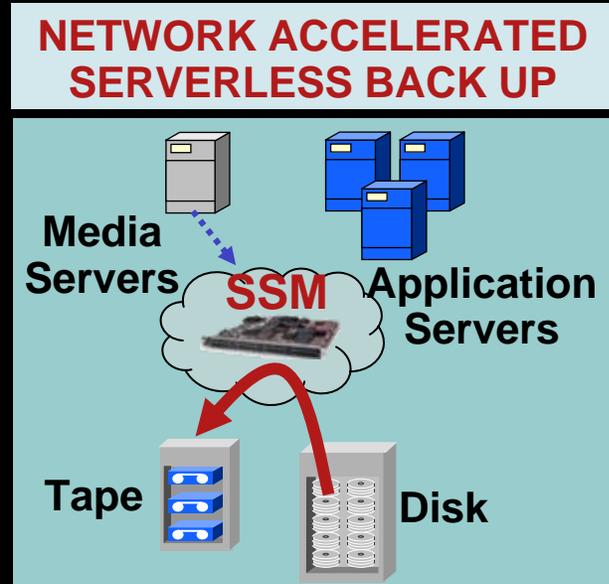
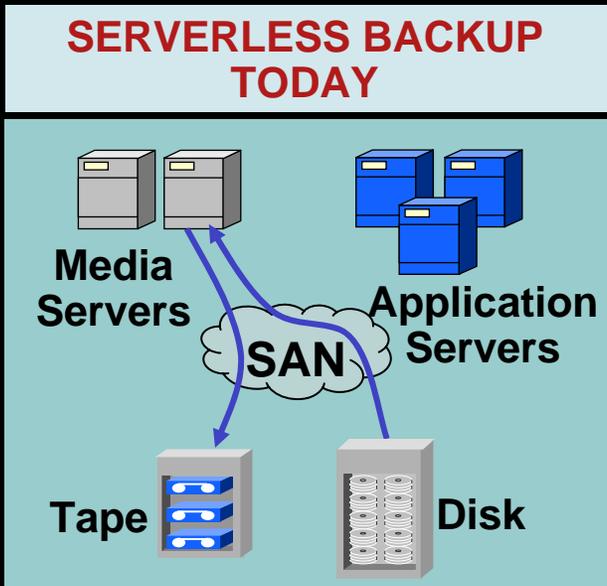
Infrastructure Service : Security Service

Common Network-based Security Policy Management and Enforcement



Infrastructure Service : Storage Services

Network Accelerated Serverless Backup



Customer Benefit	Proof Points
Lower TCO	<ul style="list-style-type: none"> Offload I/O & CPU work from Media Servers to SSM Reduce server administration & management tasks
Higher Performance & Reliability	<ul style="list-style-type: none"> Each SSM delivers up to 16 Gbps throughput SSM integrated into a high availability MDS platform
Investment Protection	<ul style="list-style-type: none"> No changes to existing backup environment SSM Data Movement can be enabled w/ software

현재의 Enterprise Service Provisioning 현황

NetOps ensures Branch connectivity/ Routable Subnet



SecOps checks security policy, expands FW Port Range



SLB Admin Adds Server to Pool



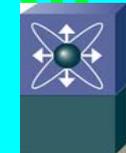
NetOps connects Ethernet cabling, configures VLAN/Port Config



SysAdmin racks new server Loads O/S and Applications



StorageOps configures LUN, maps to Server



StorageOps provisions disk volume and resources

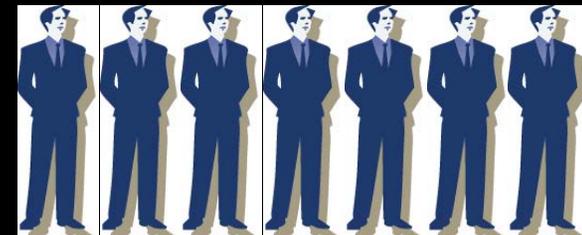


Assume you just want to add one server to a web-farm...

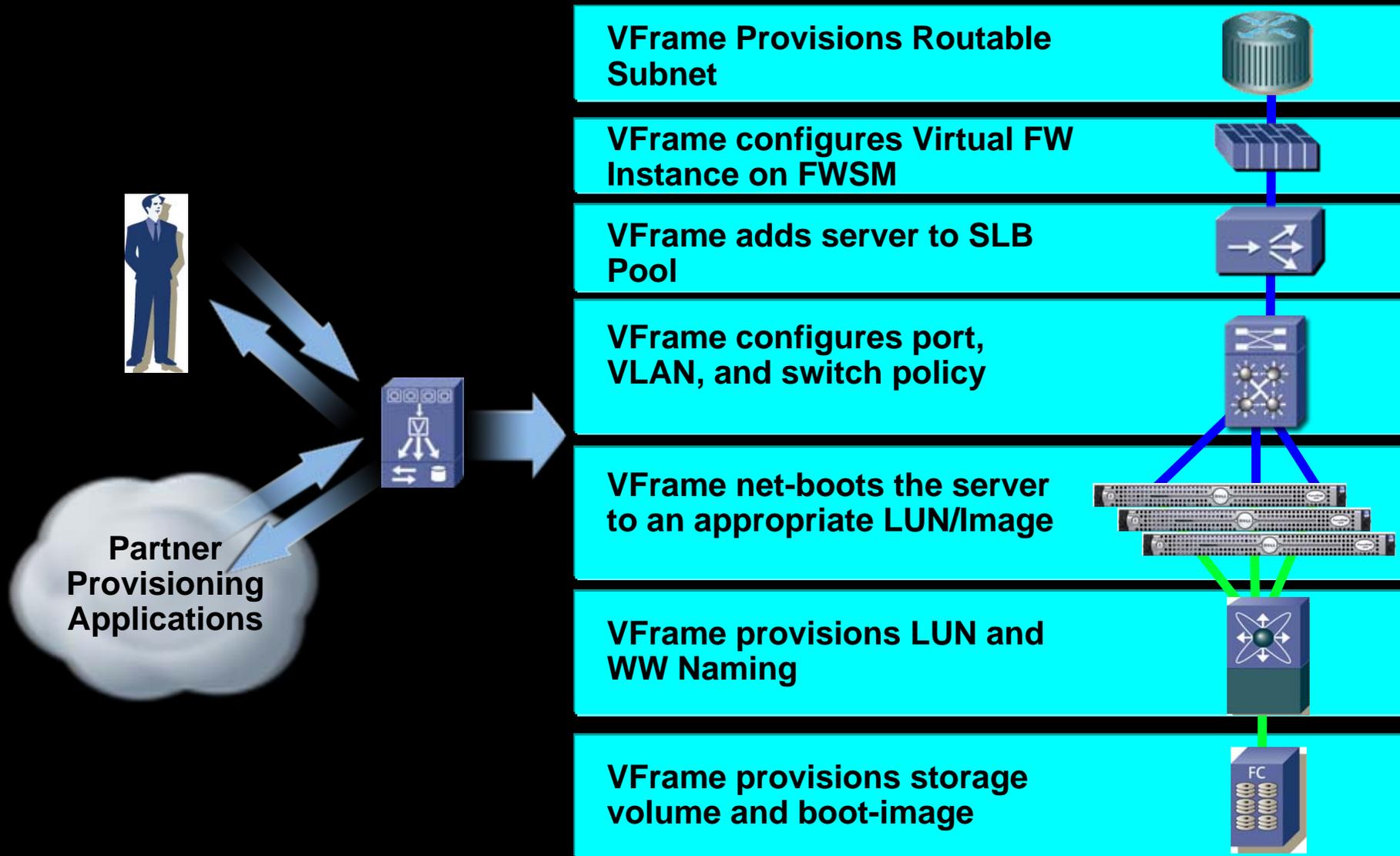
The challenge is one of 'coordination delays'. This type of simple scale-out of an existing serve often takes enterprises 90-days.

New service turn-ups, after the application has been developed, often take 180+ days.

VFrame is designed to eliminate these delays and automate the provisioning of services

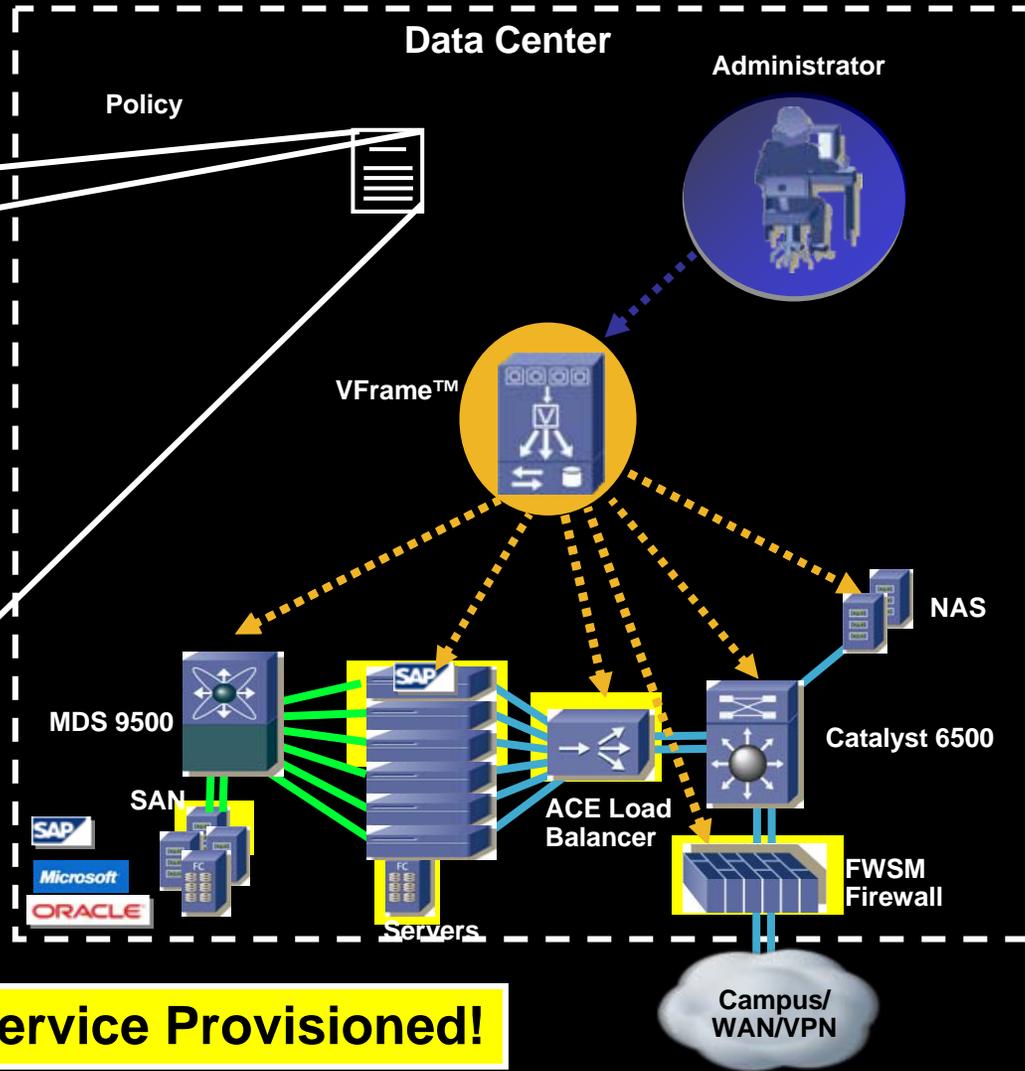


VFrame 을 이용한 Enterprise Service Provisioning



Vframe

: End-to-end Data Center Provisioning VISION



애플리케이션 정의 후
관련 정책을
Vframe으로 전달

받은 정책을 VFrame
수행 업무로 변환하여
인프라로 전달

Vframe이 스토리지로부터
필요한 App/OS Image 를
선택

Vframe이 적당한 서버를
골라 해당 App 을 로딩한 후
부팅 시킴

Vframe이 사용자 및
스토리지와의 통신을 위한
VLAN 및 LUN을 생성하여
인프라로 전달

Vframe이 FWSM으로 관련된
보안 정책을 전달

Vframe이 ACE/CSM에게
적절한 SLB pool 할당

Cisco Data Center Network 구조와 End-to-End 가상화

Storage Virtualization

- San Fabric virtualization – VSAN
- Network-based Virtualization-e.g. Storage Service Module

Computer Virtualization

- Virtual Machine Hypervisors
- Server Clustering
- Bare-iron Server Provisioning

Virtualized Network Services

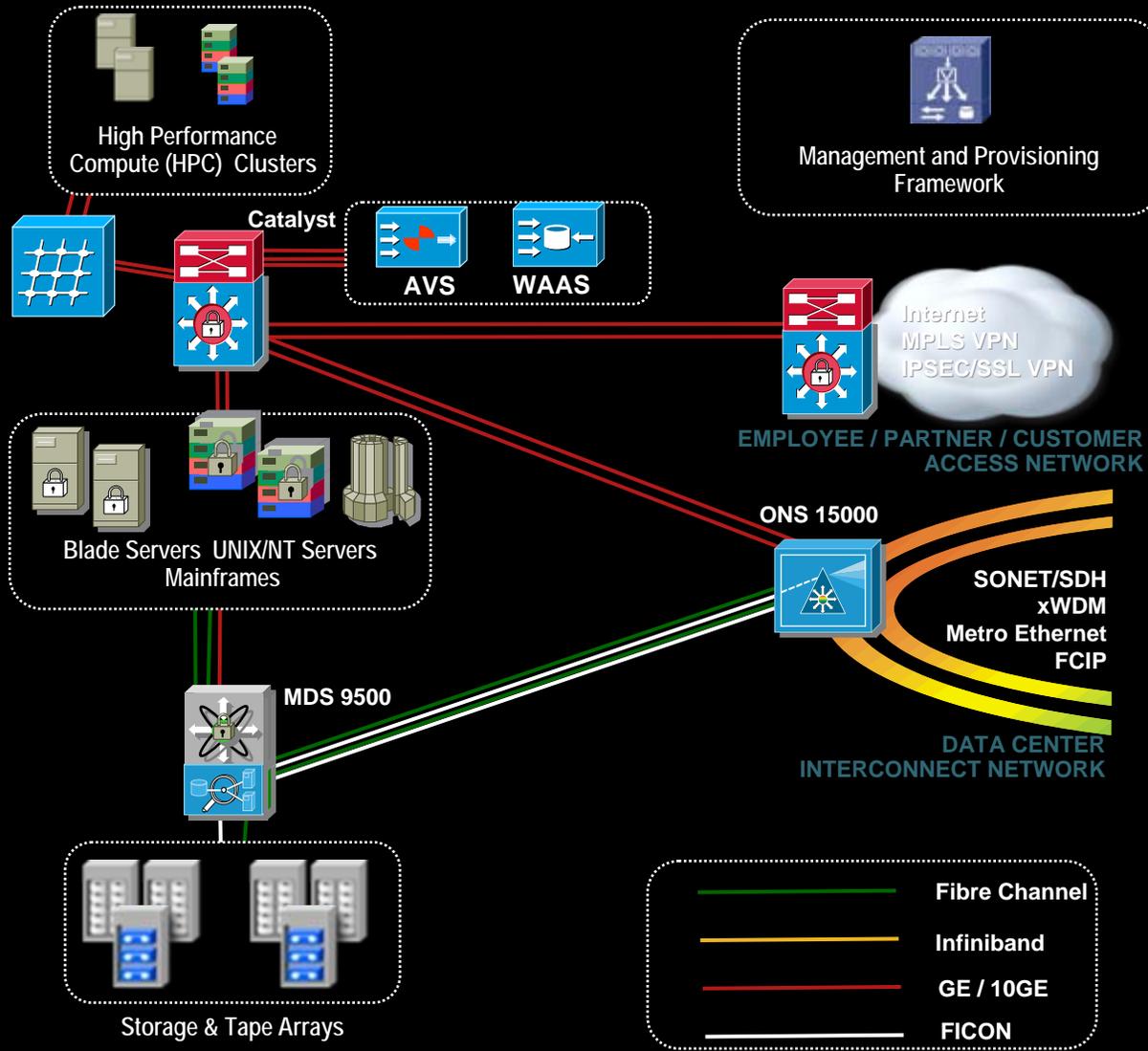
- Virtual LANs (VLANs)
- Virtual Firewalls
- Service Chaining and Virtualization

Virtualized User Connectivity

- GLB, SSL/IPSEC VPN
- MPLS, VRF mapping

Virtualized DC Interconnect

- DWDM, Sonet
- InterVSAN Routing



Cisco Data Center Network Architecture

개념부터 Design까지

www.cisco.com/go/datacenter



**Cisco Data Center Infrastructure 2.1
Design Guide**

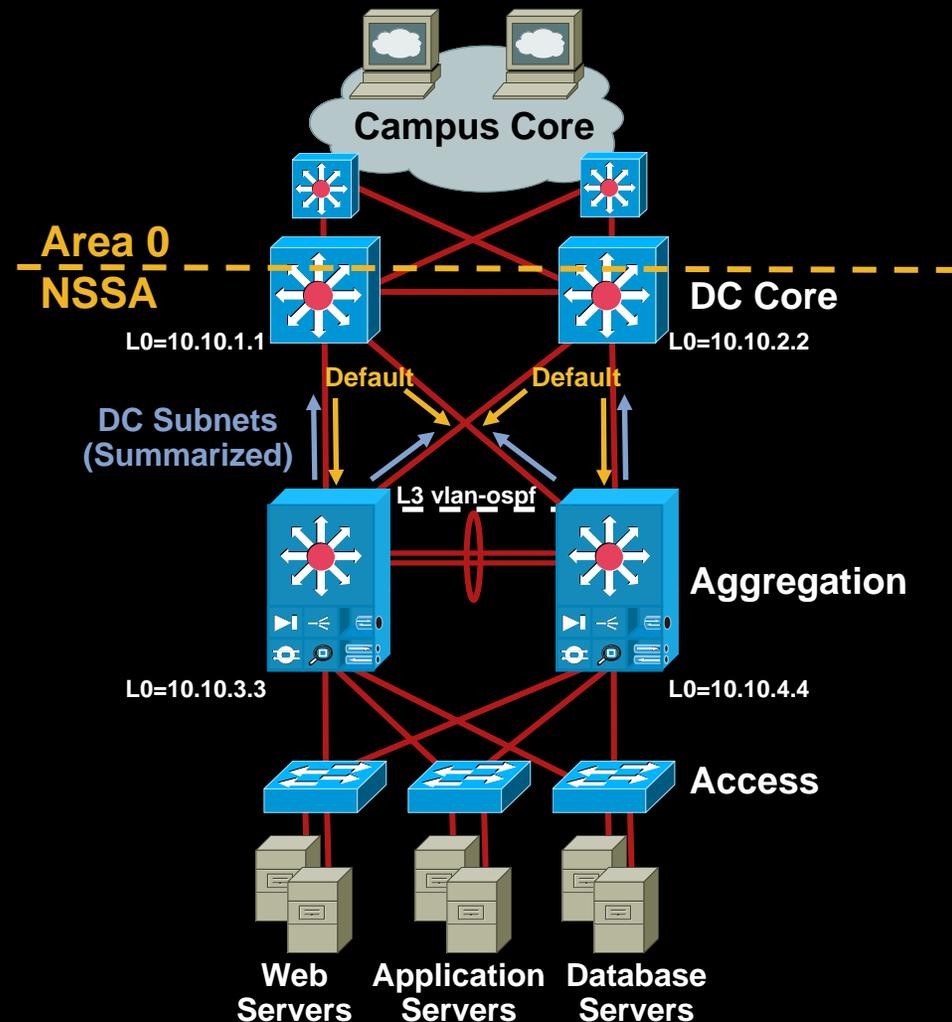
Agenda Data Center Infrastructure

- Core Layer Design
- Aggregation Layer Design
- Access Layer Design
- Density and Scalability Implications
- Scaling Bandwidth and Density
- Spanning Tree Design and Scalability
- Increasing HA in the DC

상세 디자인 예

Core Layer Design Routing Protocol Design: OSPF

- NSSA helps to limit LSA propagation, but permits route redistribution (RHI)
- Advertise default into NSSA, summarize routes out
- OSPF default reference b/w is 100M, use “auto-cost reference-bandwidth” set to 10G value
- VLANs on 10GE trunks have OSPF cost = 1G (cost 1000), adjust bandwidth value to reflect 10GE for interswitch L3 vlan
- Loopback interfaces simplify troubleshooting (neighbor ID)
- Use passive-network default: open up only links to allow
- Use authentication: more secure and avoids undesired adjacencies
- Timers spf 1/1, interface hello-dead = 1/3



상세 디자인 예

Aggregation Layer Design Spanning Tree Design

- Rapid-PVST+ (802.1w) or MIST (802.1s),
- Choice of .1w/.1s based on scale of logical+virtual ports required
- R-PVST+ is recommended and best replacement for 802.1d

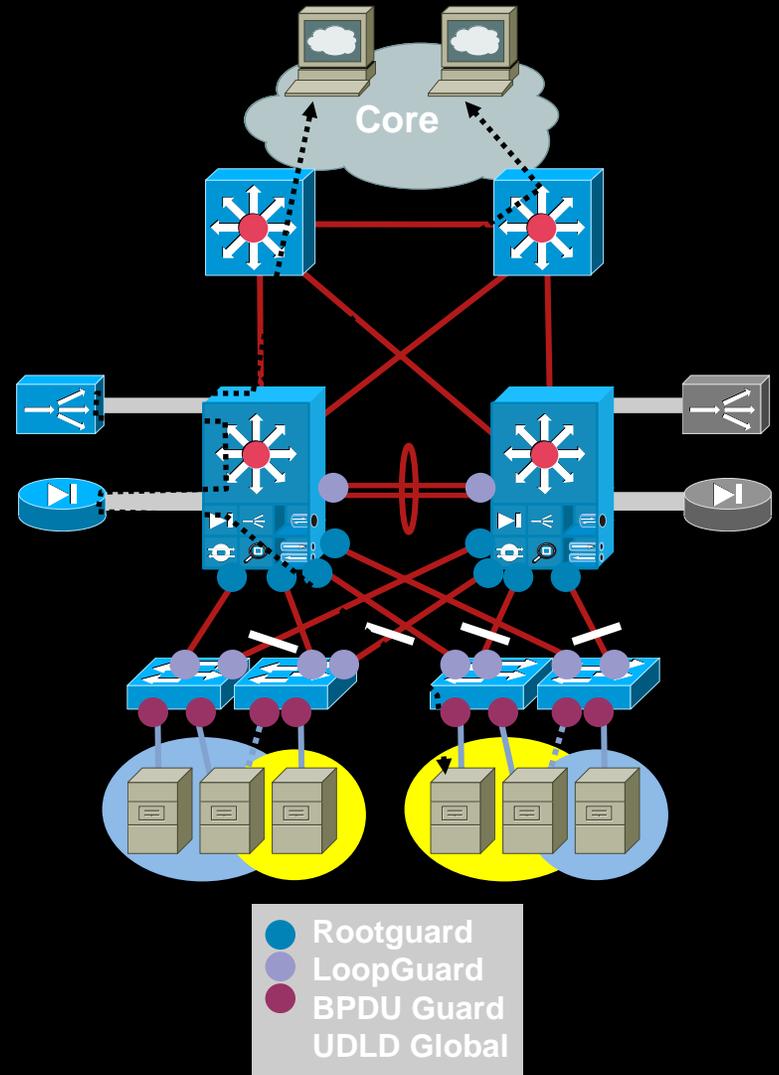
Fast converging: inherits proprietary enhancements (Uplink-fast, Backbone-fast)

Access layer uplink failures: ~300ms – 2sec

Most flexible design options

Combined with RootGuard, BPDUGuard, LoopGuard, and UDLD achieves most stable STP environment

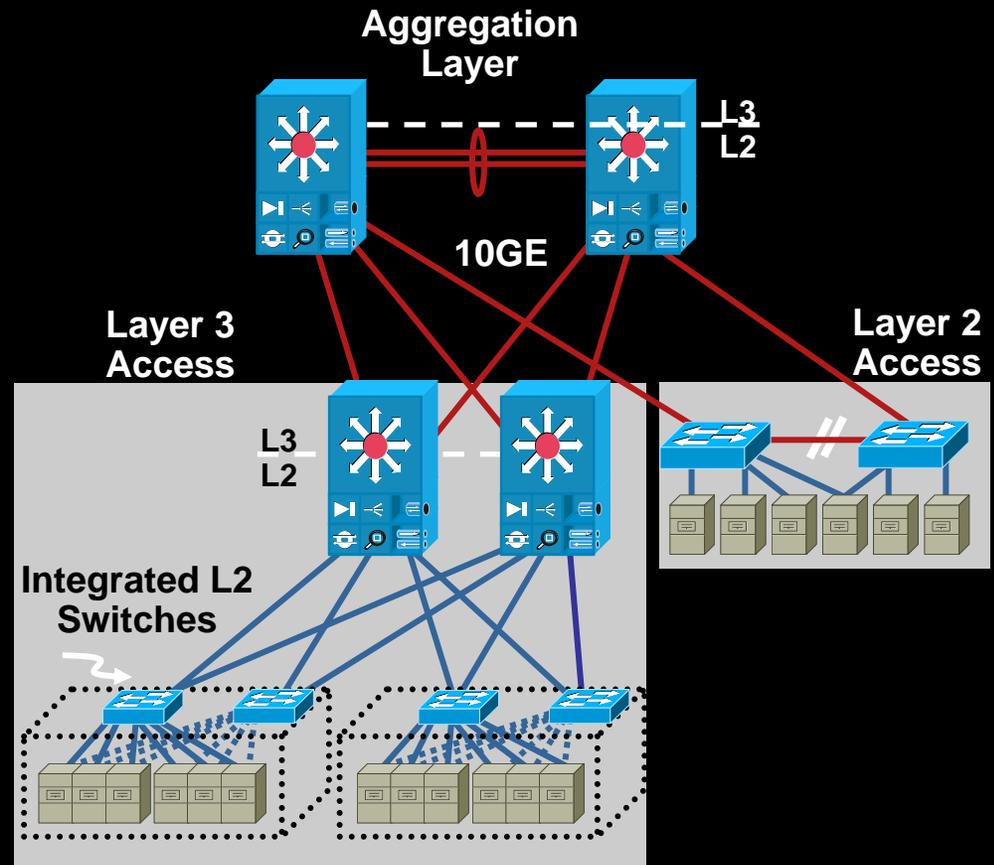
UDLD global only enables on Fiber ports, must enable manually on copper ports



상세 디자인 예

Blade Server Requirements Connectivity Options

- Layer 3 access tier may be used to aggregate blade server uplinks
 - Permits using 10GE uplinks into agg layer
- Avoid dual tier Layer 2 access designs
 - STP blocking
 - Over-subscription
 - Larger failure domain
- Consider “Trunk Failover” feature of integrated switch



Cisco DC Network 제품군

Cisco Data Center Networking 제품군

전세계 시장점유율 1위

Data Center Switching



Catalyst 6500 Series

Catalyst 4948 Top-of-Rack

Catalyst Blade Server Switches

Storage



MDS 9500 Storage Directors

MDS 91xx/90xx Fabric Switches

Storage Service Modules

Data Center Security



Firewall Services Module

Intrusion Detection Module

CSA Server Security Agent

Compute Clustering



SFS 7000 High-Density Infiniband Compute Fabric Switch

SFS 3000 Infiniband Gateway

Application Network Services



L4-7 Content Services Module

Wide-Area Application Services

SSL Termination

CSS SLBs

GSS

Data Center Provisioning

VFrame Server/Service Provisioning System



Data Center Management

Fabric Manager – Topology Discovery/ Visualization and Transport Provisioning

IME – Advanced L4-7 Services Module Management

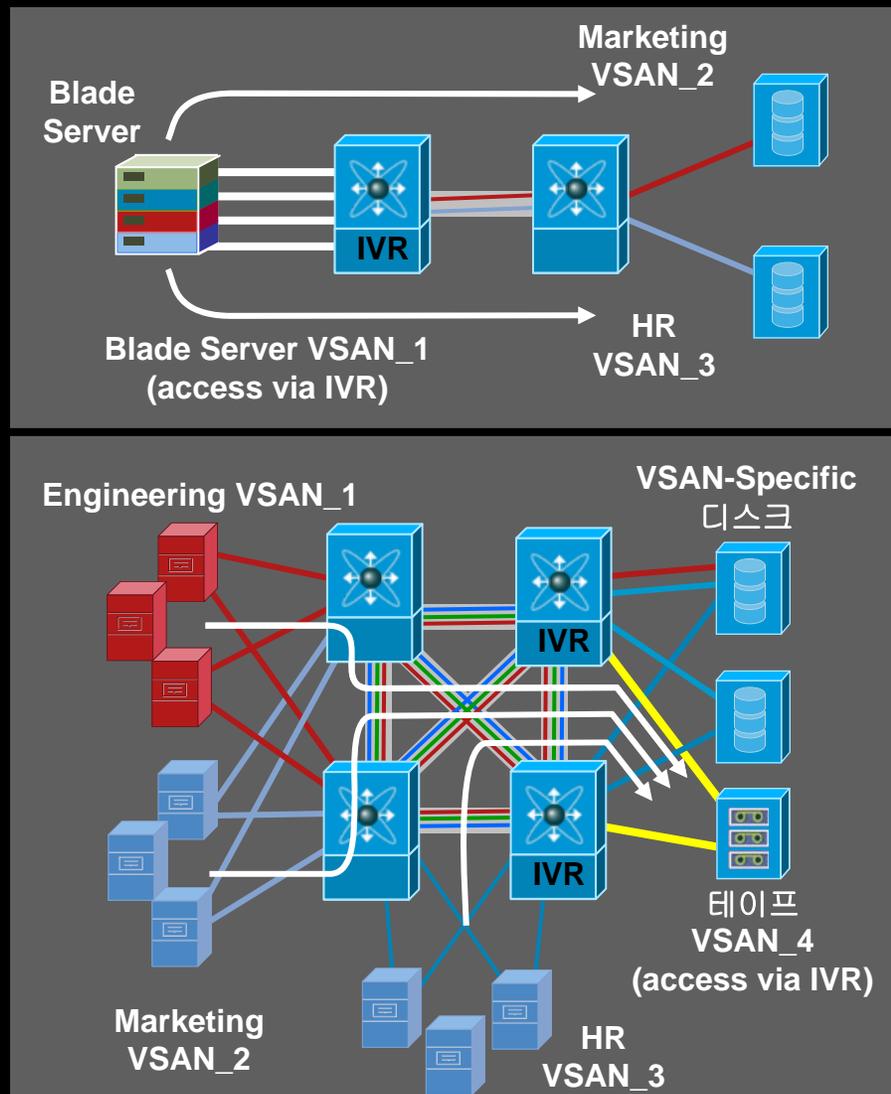
Data Center Networking을 위한 기술 진화 VSAN 간 라우팅 (IVR)

- 테이프 장치나 디스크 장치를 VSAN 을 통해 공유할 수 있게—
분리된 패브릭(VSANs)의
결합(merging) 불필요

고가용 패브릭 및 VSAN 기반
관리기능 제공

분산형 구조, 확장성, 그리고
높은 고가용 아키텍처

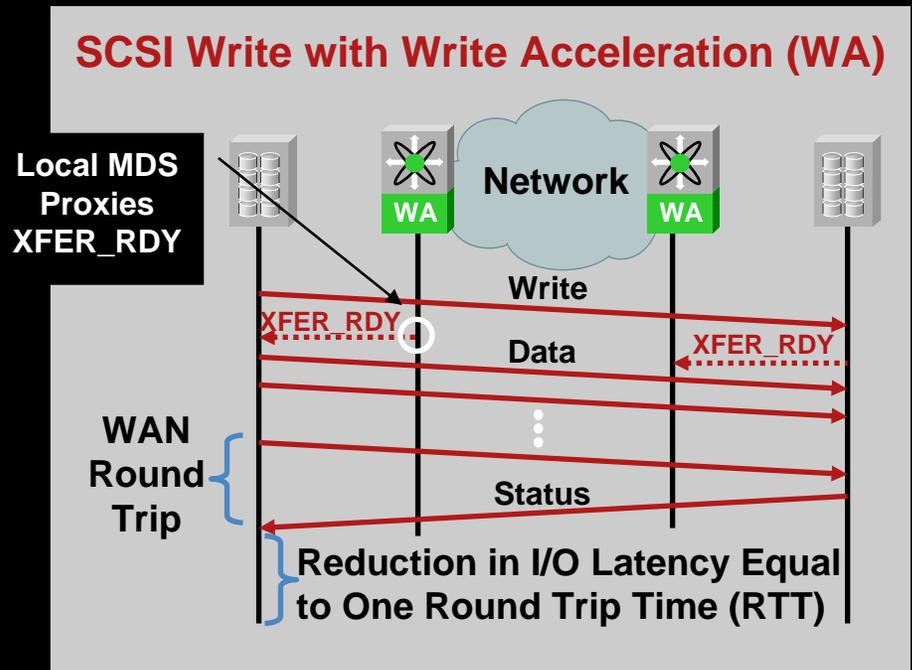
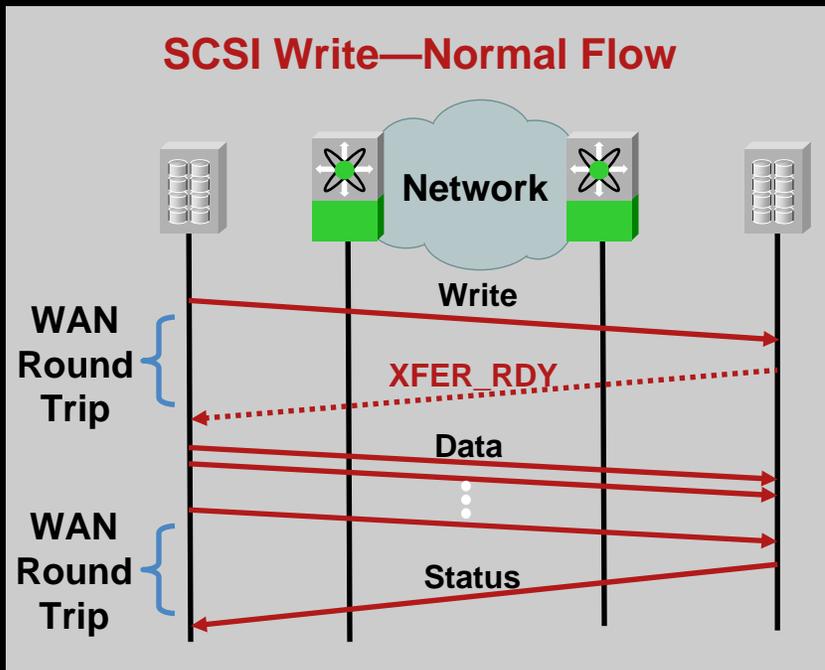
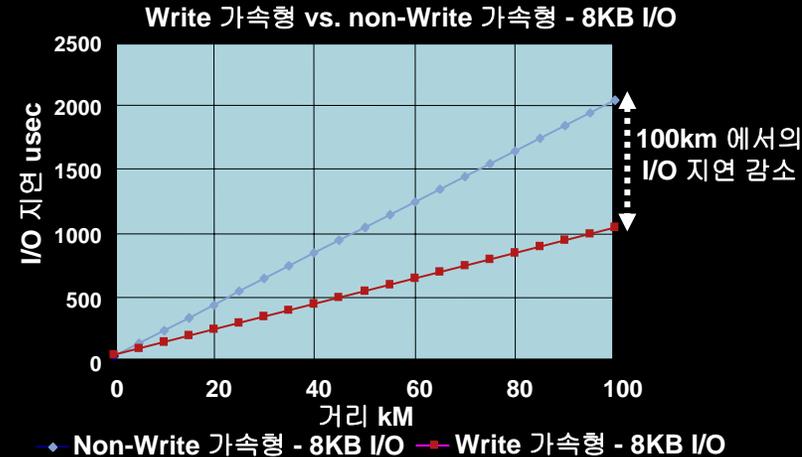
- 뛰어난 타사 스위치 연동성
- 블레이드 서버를 위한 블레이드 별
VSAN 가능



Data Center Networking을 위한 기술 진화

: SAN Write Acceleration

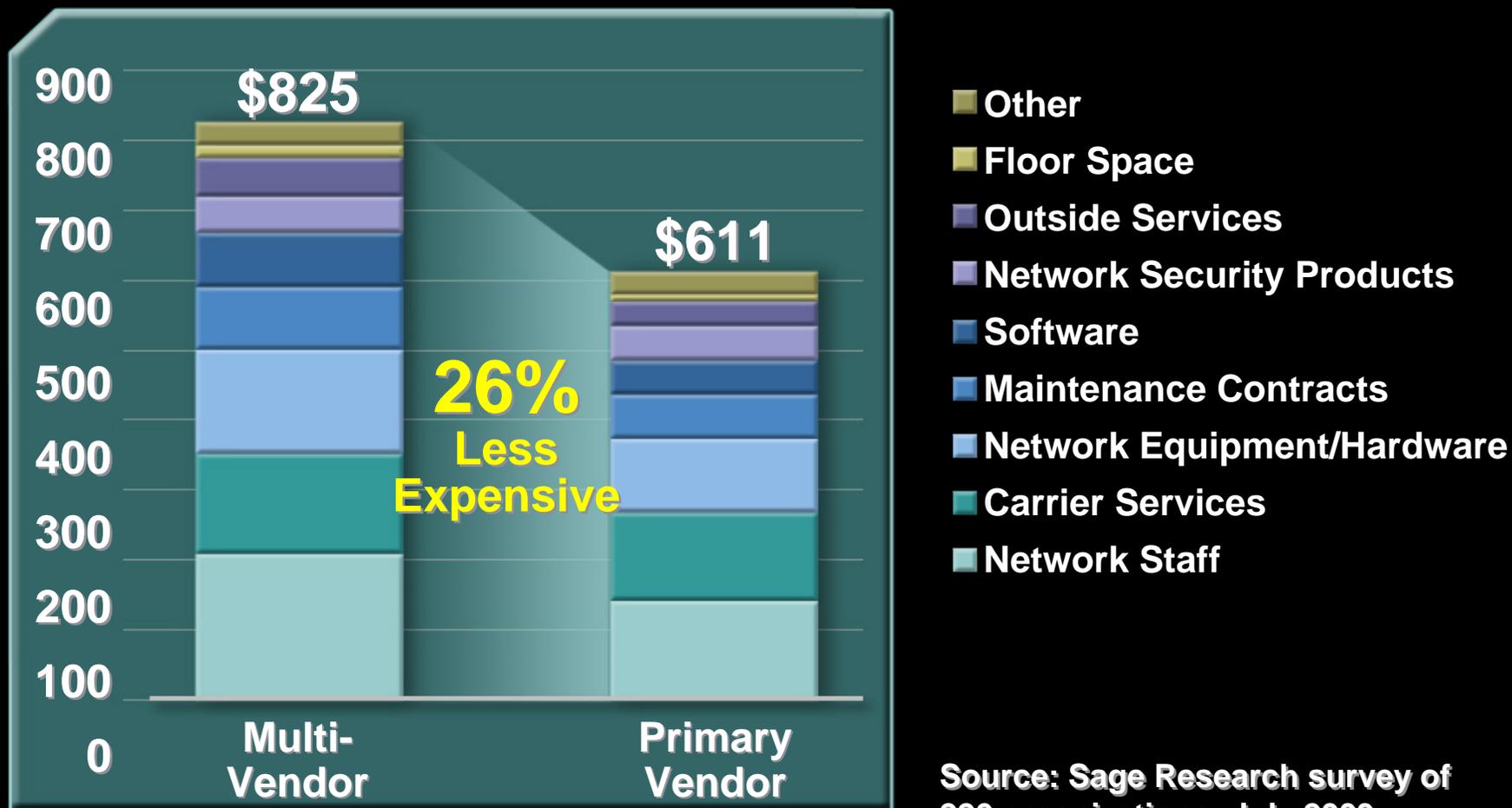
- 장거리 DR 솔루션들의 I/O 지연을 효과적으로 감소
- 동기식 재해복구 어플리케이션의 거리 연장 및 성능 향상
- FC 및 FCIP 에서 지원
- 고도로 resilient 한 솔루션—Data 를 저장하는 것이 아니라, 초기 Control 명령에 대한 Spoofing 만을 수행



Why Cisco ?

Primary Vendor 정책 효과

Total Cost of Network Ownership \$/ Node / Year



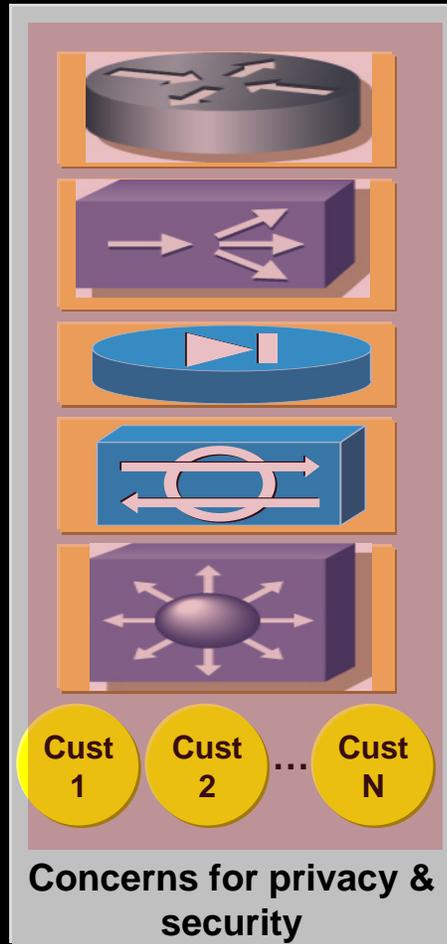
Source: Sage Research survey of 226 organizations; July 2003

End to End Virtualization

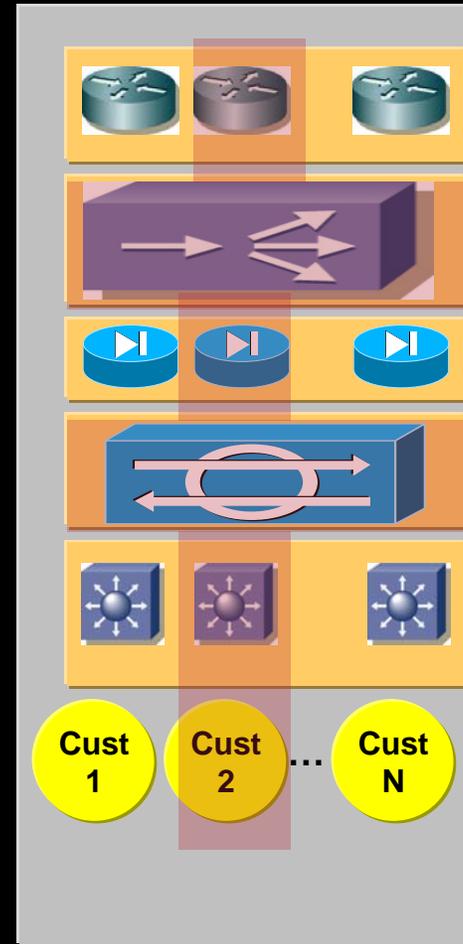
Dedicated



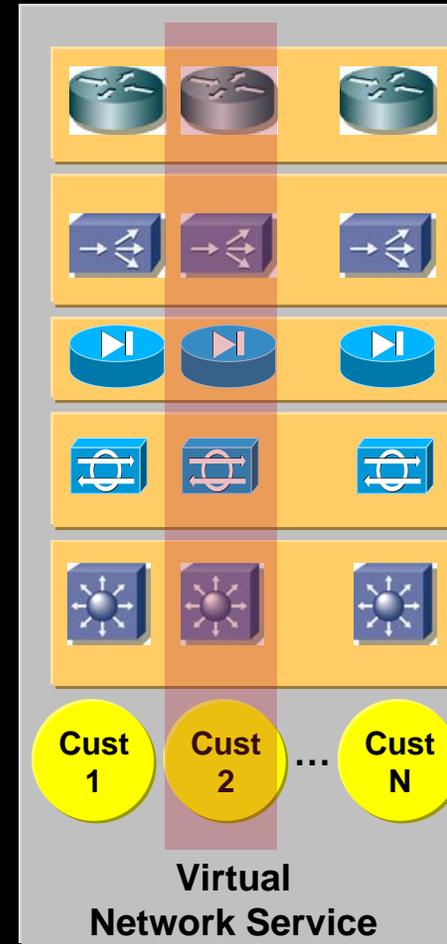
Shared



Quasi Virtualized



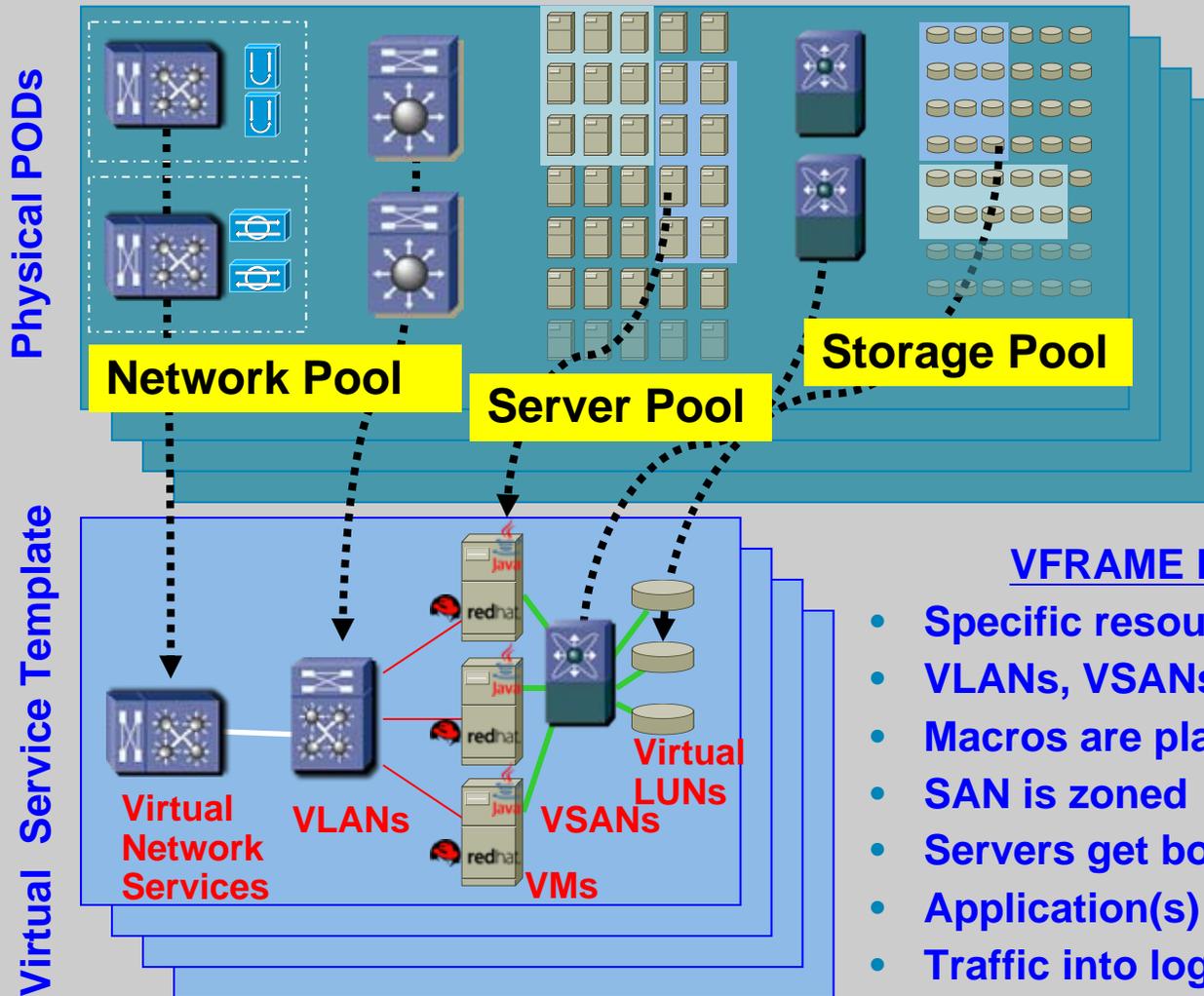
Virtualized



 Physical Resource

 Service context

Cisco가 제공하는 Virtual Service



VFRAME Data Center Automation

- Specific resources selected from pools
- VLANs, VSANs are configured
- Macros are played
- SAN is zoned
- Servers get booted with assigned image
- Application(s) are started
- Traffic into logical network turned “on”

Why Cisco ?

□ Data Center Architecture를 고려한 제품/기능개발

□ End-to-End Virtualization

□ End-to-End Automation

□ 경제성

□ 유연성, 민첩성

결론



- **Data Center** 영역에서 **Computing**과 **Networking**의 변화가 시작되고 있습니다.
- **Cisco**는 **Storage, Compute, Connectivity systems**을 통합 제공하는 유일한 **Vendor**입니다.
- **Cisco**가 **DC** 전 시스템에 대한 통합, 가상화, 자동화를 통하여 **Data Center Networking**을 선도합니다.

