NETWORK ARCHITECTURES AND CONVERGED NETWORKS FABRICS FOR CLOUD COMPUTING

BROCADE

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Agenda

- Brocade One

- Industry's First Converged Fabric Products

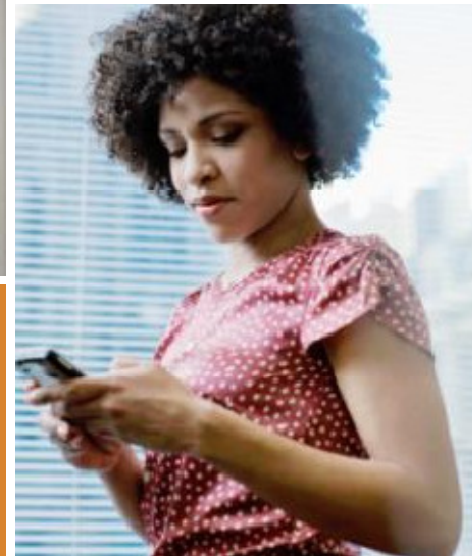- Virtual Access Layer

- Virtual Cluster Switching

Brocade One

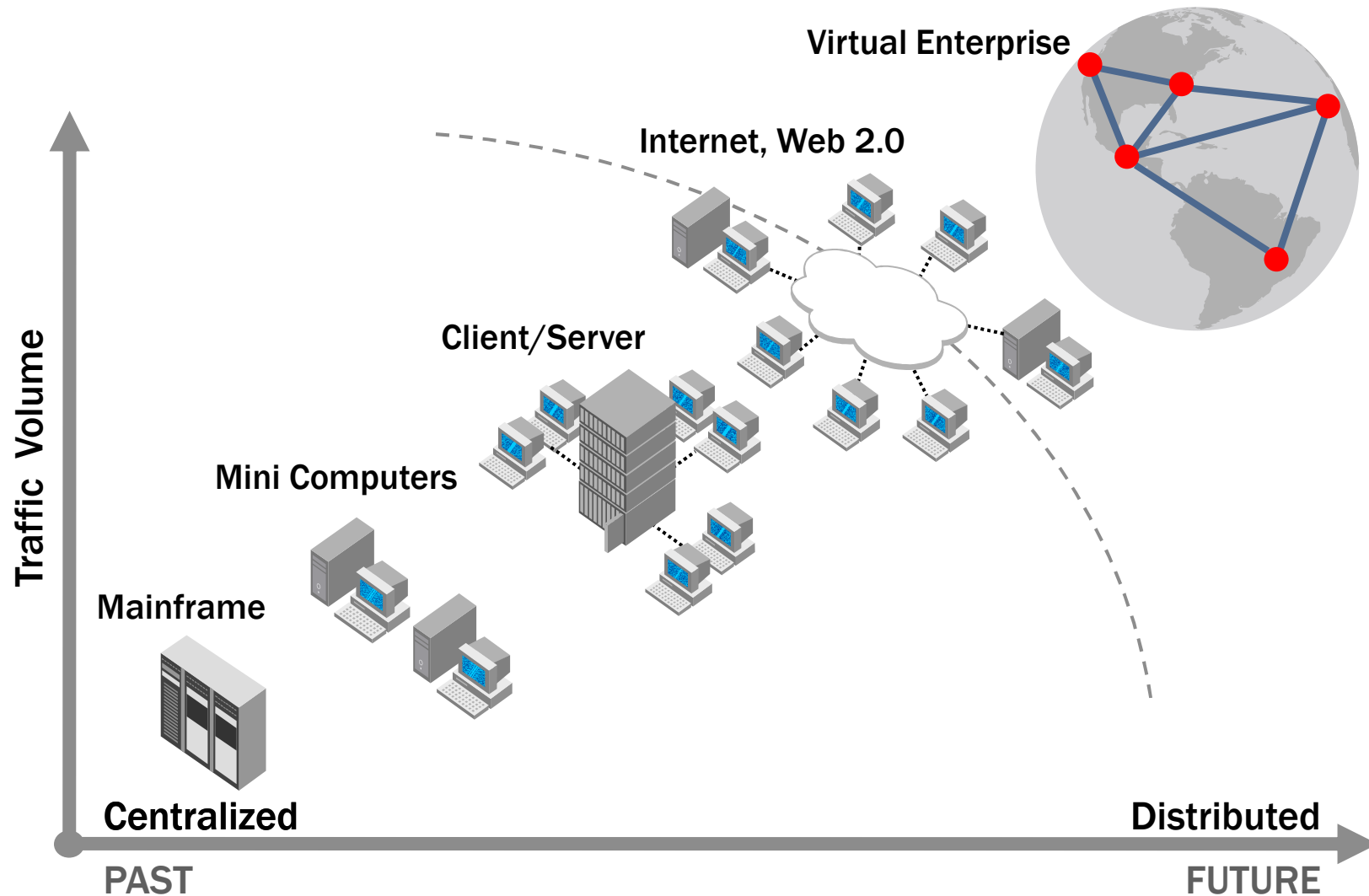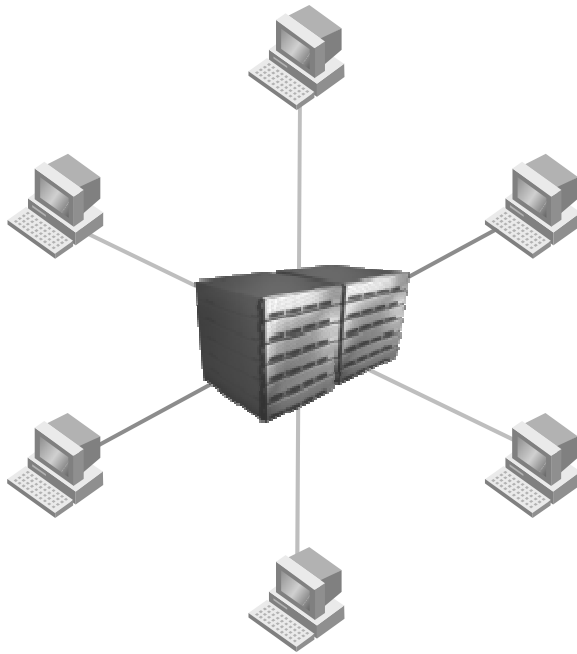September, 2010

VIRTUALIZATION

CLOUD

CONVERGENCE

The Dawn of the Virtual Enterprise

Virtual Enterprise

Internet, Web 2.0

Client/Server

Mini Computers

Mainframe

Traffic Volume

Centralized

Distributed

PAST

FUTURE

Convergence 2.0
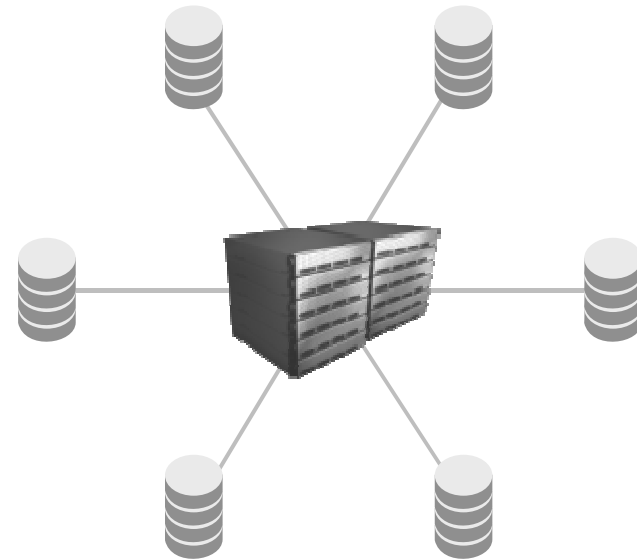
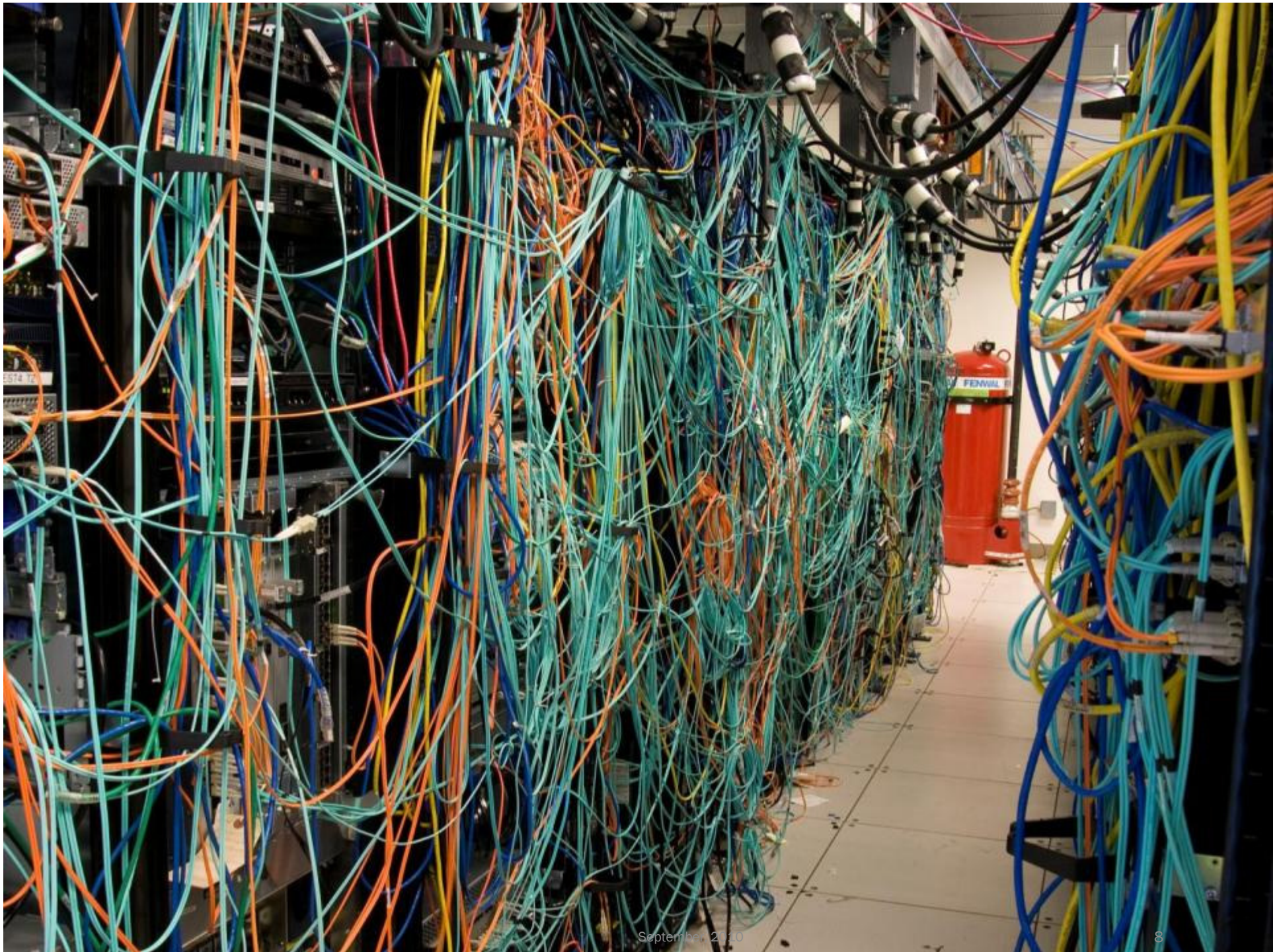DATA NETWORK   CONVERGED NETWORK   STORAGE NETWORK

The Power of Convergence to Simplify

BROCADE ONE™

A Unified Network Strategy and Architecture

Brocade One Architecture

- Unmatched simplicity

- Investment protection

- Non-stop networking

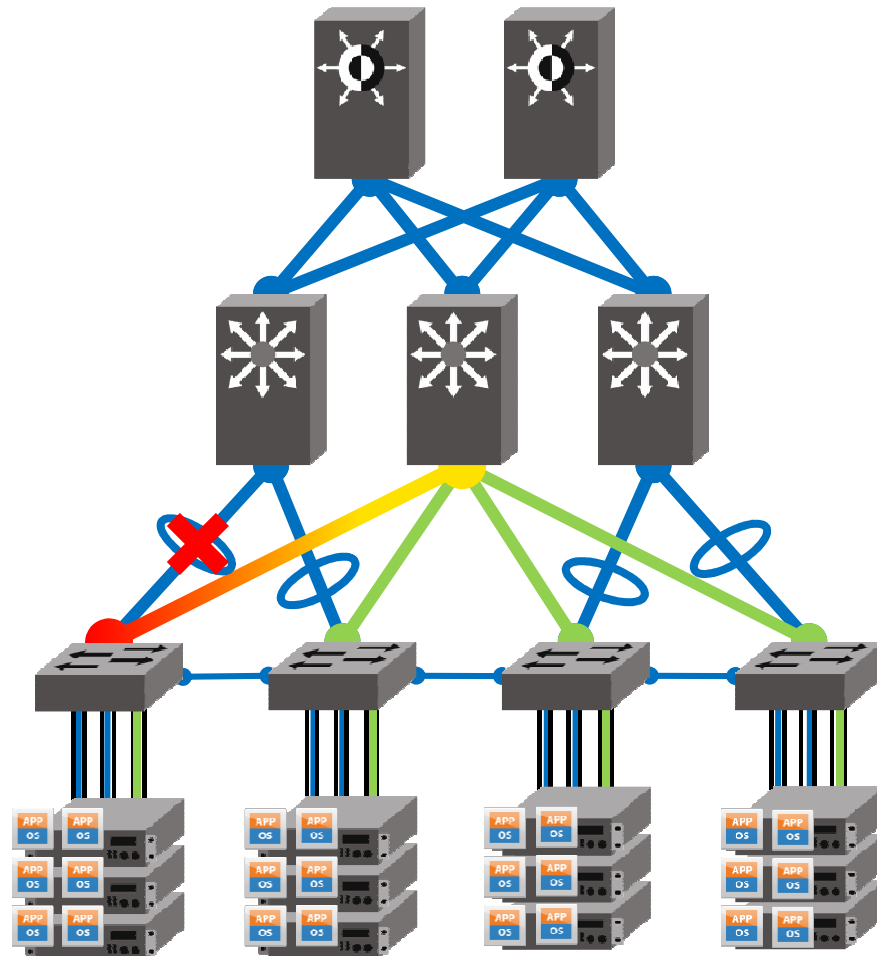- Optimized applications

- Standards based

Addressing Today's Challenges

Scaling Virtual Server Environments

Challenges Today

Layer 2: only 1 active path
- STP disables other paths
- Not "virtualization optimized"

Add Virtual Machines
- Add additional GbE connections
- Move to 10 GbE for simplicity and more performance
- Uplinks are stressed; need more connections in LAG

Increase utilization using MSTP (spanning tree per VLAN)
- Increases complexity
- Creates multiple single-path networks; limits sphere of mobility

Link failure
- STP reconvergence – network is down
- Broadcast storms stress network

Layer 3 as an alternative
- Greater complexity; higher cost
- VM mobility limited to rack

Imagine if...

- There was no requirement for STP in Layer 2 networks
- All paths in the networks were utilized with traffic automatically distributed
- Link failure did not result in a temporary outage and paths were always deterministic
- The network provided low latency, lossless transmission and could carry both IP and storage traffic, without compromise

Ethernet
Fabric

1st Ethernet Fabric
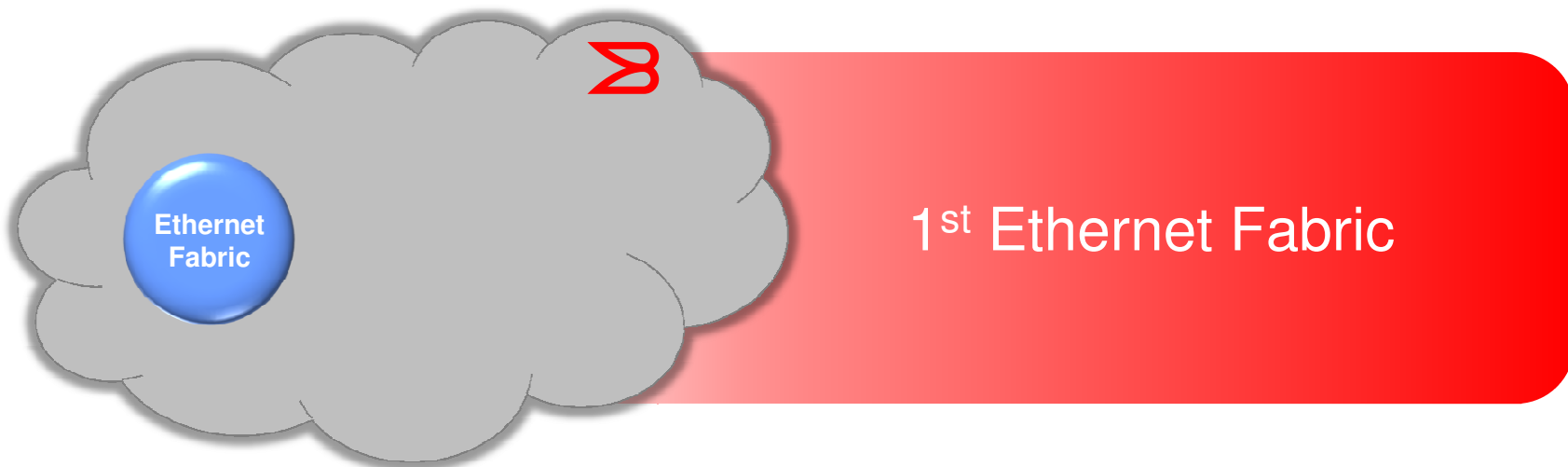
Virtual Machine Mobility

Challenges Today

L3 to
Agg. Layer

L2
STP

Distributed
vSwitch

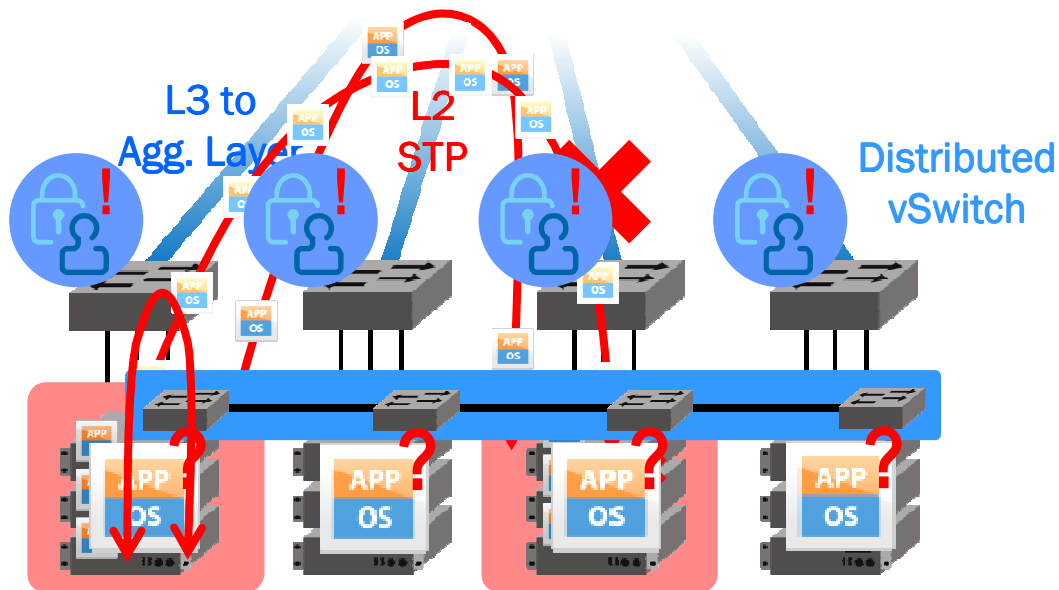**Limited sphere of mobility**

STP limits flexibility to a minimized,
defined tree of switches

L3 limits mobility to a single rack

**VM migration can break
network/application access**

Port setting information must be identical
at destination

**Map services (VLANs, QoS,
security, etc.) to all physical ports**

Eases mobility, but undermines network
and security best practices

Distributed Virtual Switch

Addresses configuration needs

Consumes server resources and still
restricted by physical limits

**Limited insight into where VMs
are running**

VMs exist anywhere in the cluster

Imagine if...

- There were no physical barriers of VM migration

- Your network was aware of all VMs at all times

- Mobility did not come with a cost in compute resources

- You could leverage your entire server environment to maximize application performance and availability

Ethernet Fabric

Distributed Intelligence

1st Intelligent Layer 2 Network
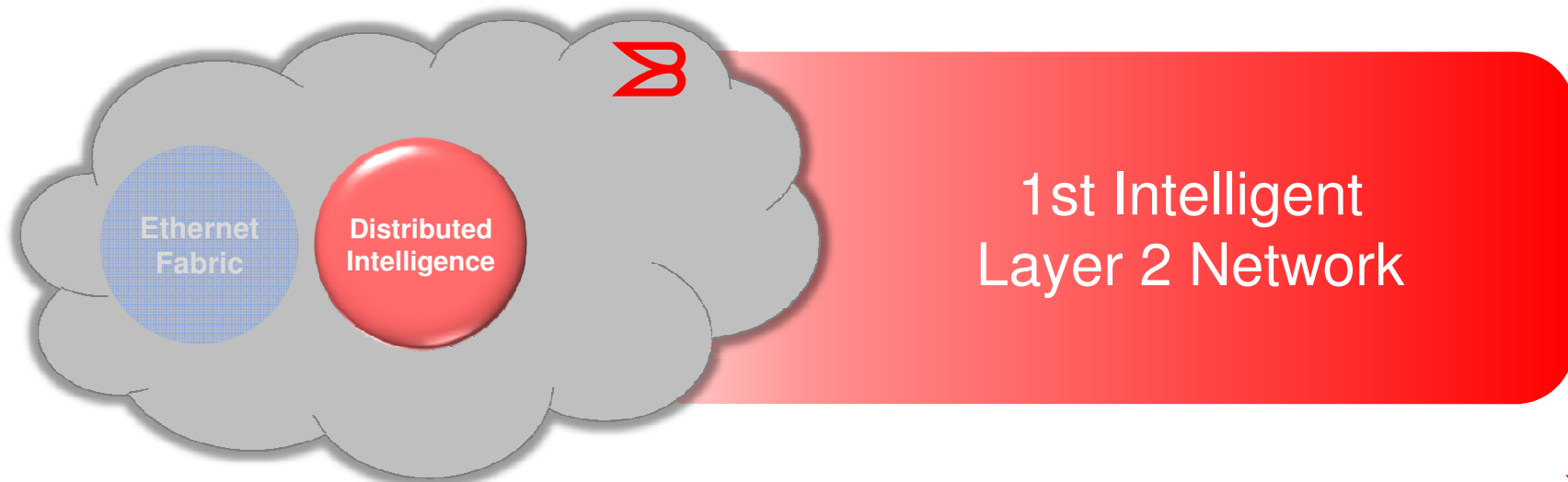
Network Management

Challenges Today

Core
Layer 3
BGP, EIGRP,
OSPF, PIM

Aggregation/ Distribution
Layer 2/3
IS-IS, OSPF, PIM, RIP

Access (fixed & bladed)
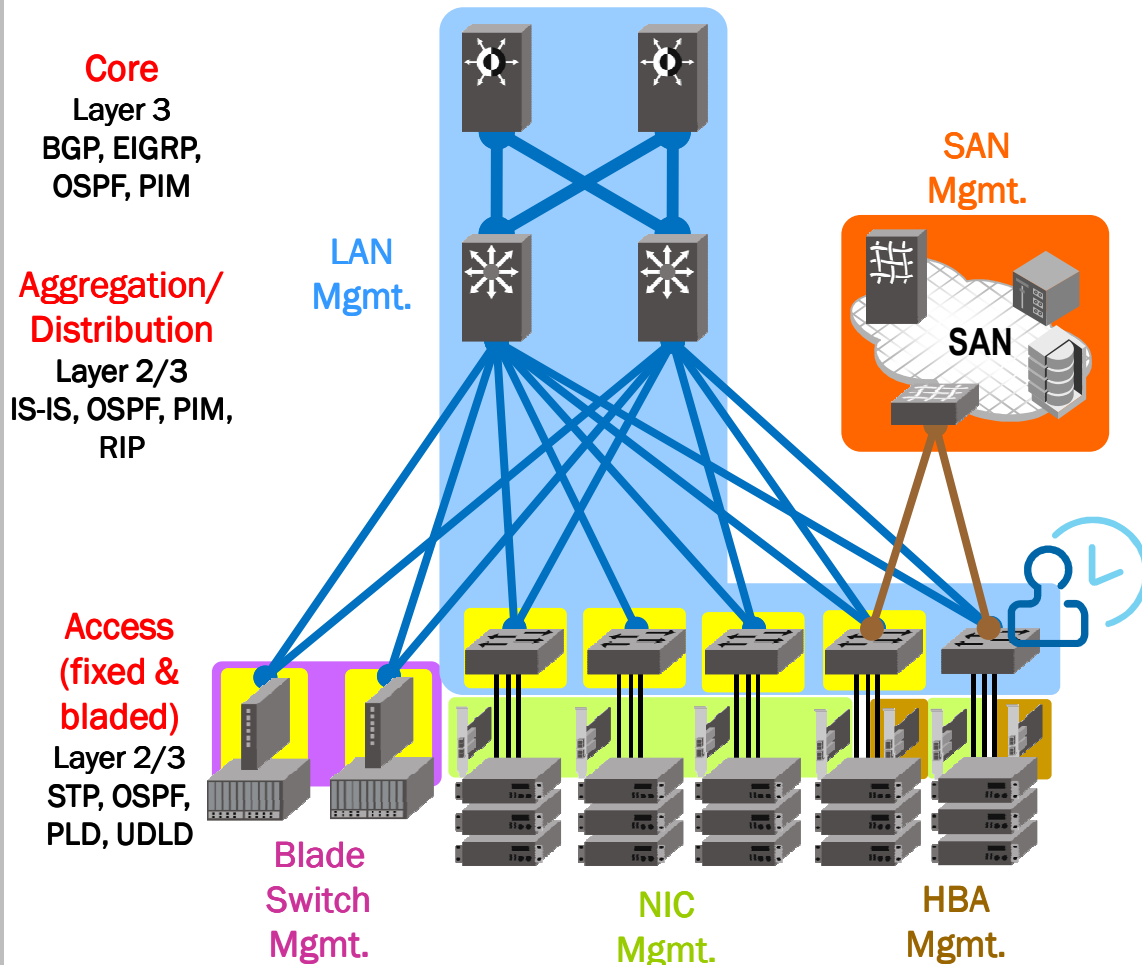Layer 2/3
STP, OSPF, PLD, UDLD

LAN Mgmt.

SAN Mgmt.

SAN

Blade Switch Mgmt.

NIC Mgmt.

HBA Mgmt.

Too many network layers

Utilize many L2/L3 protocols

Lots of small-form-factor switches at the edge

Each switch has to be managed

Because of the number, they need to be aggregated

Configuration time when deploying new switches

Switch has to be set up

Network settings must be configured

Separate management tools for LAN, SAN, NICs/HBAs

Management silos do not fit in a virtualized data center

Drives up OpEx

Imagine if...

- You could logically eliminate a layer of the network

- You could connect 10, 20... edge switches and manage them as one

- You could scale the network without added complexity

- There was a common tool to manage all components of the SAN and LAN

Ethernet Fabric

Distributed Intelligence

Logical Chassis

1st 1000 Port
Logical Chassis

Virtual Cluster Switching (VCS)

VCS

Ethernet Fabric

Distributed Intelligence
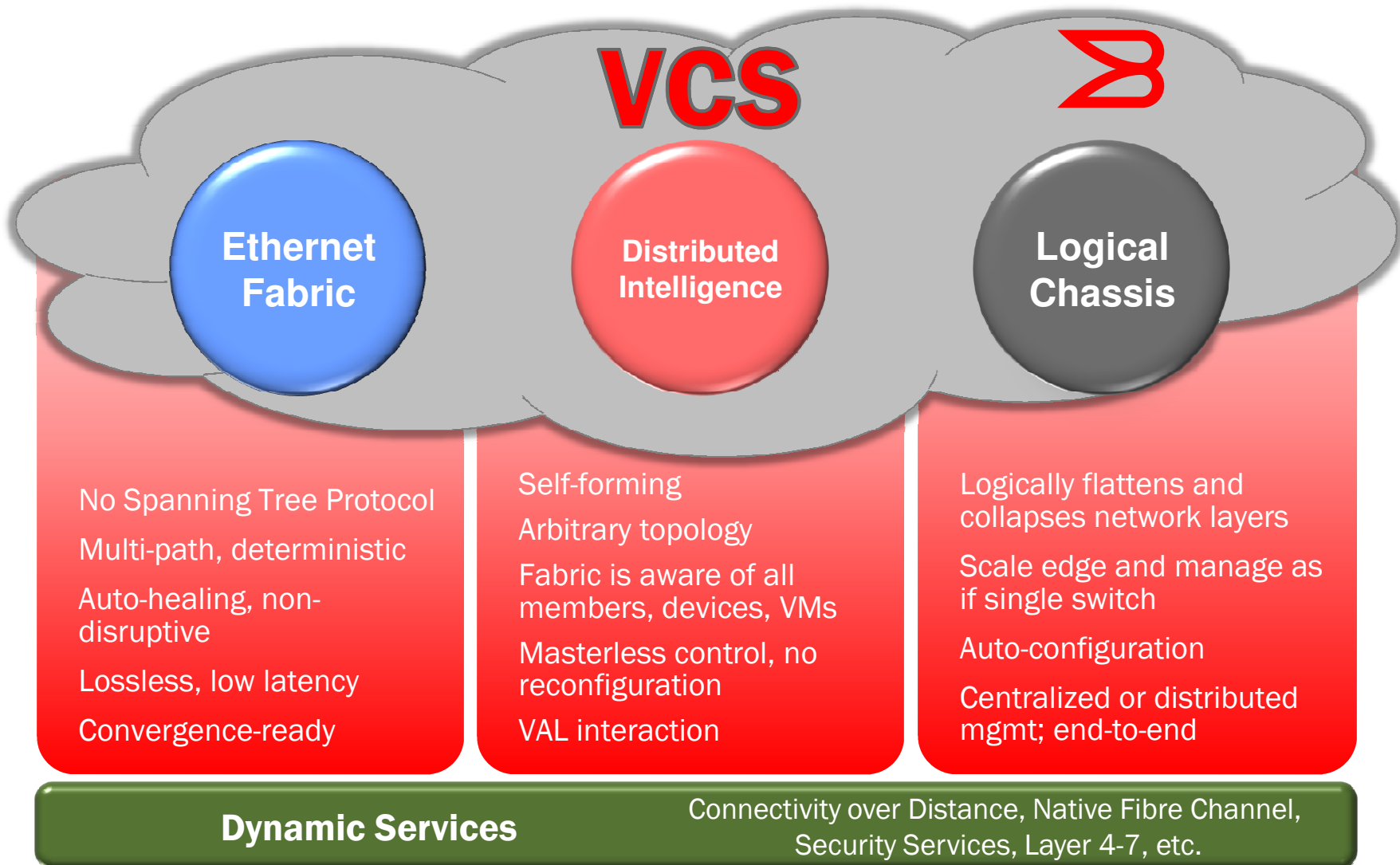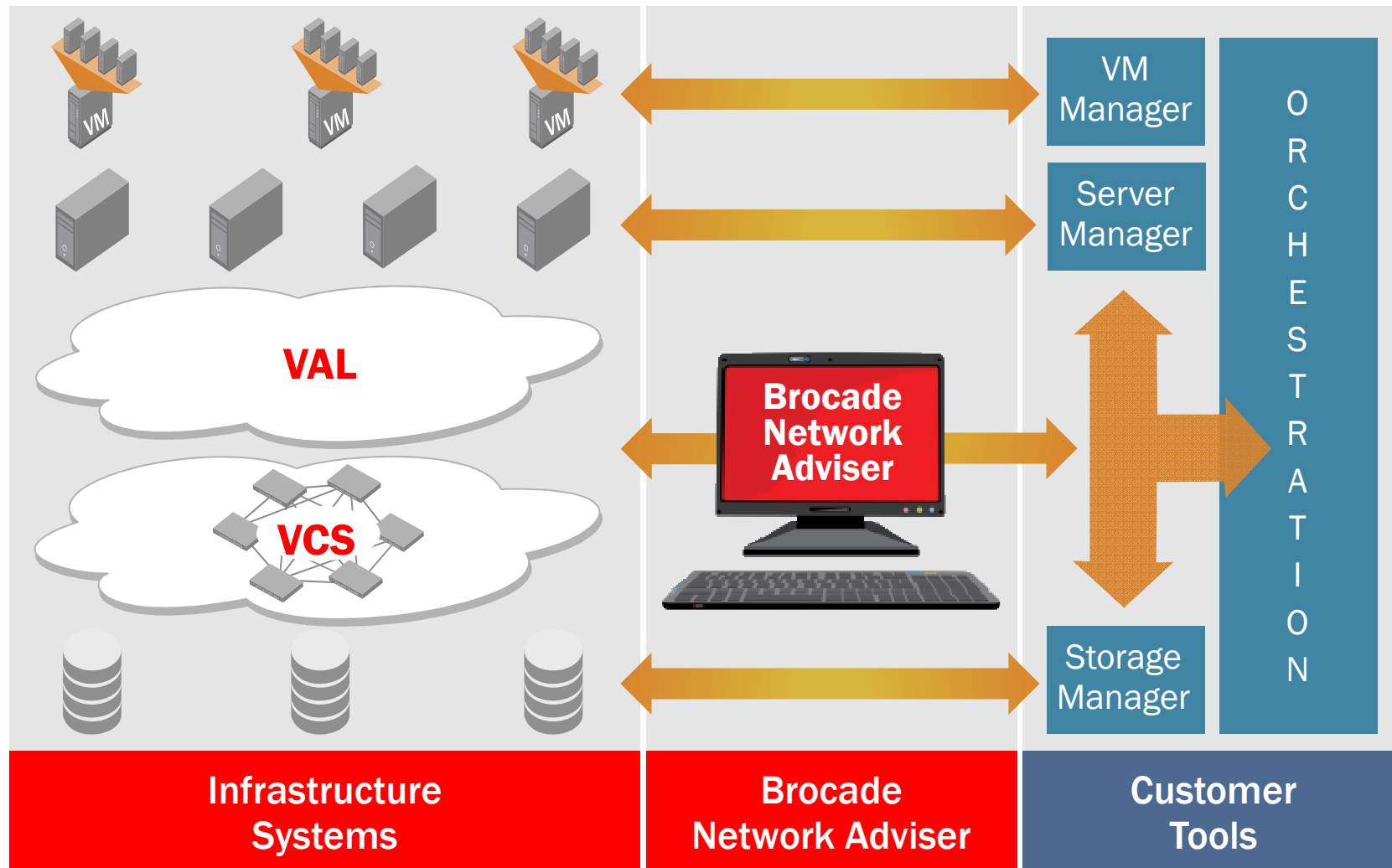
Logical Chassis

No Spanning Tree Protocol

Multi-path, deterministic

Auto-healing, non-disruptive

Lossless, low latency

Convergence-ready

Self-forming

Arbitrary topology

Fabric is aware of all members, devices, VMs

Masterless control, no reconfiguration

VAL interaction

Logically flattens and collapses network layers

Scale edge and manage as if single switch

Auto-configuration

Centralized or distributed mgmt; end-to-end

Dynamic Services   Connectivity over Distance, Native Fibre Channel, Security Services, Layer 4-7, etc.

Data Center Technology Areas

Brocade Virtual Access Layer (VAL) Functionality

Application-aware networking

VAL

Logical construct that extends network connectivity to VMs

Optimizes application service levels and scalability

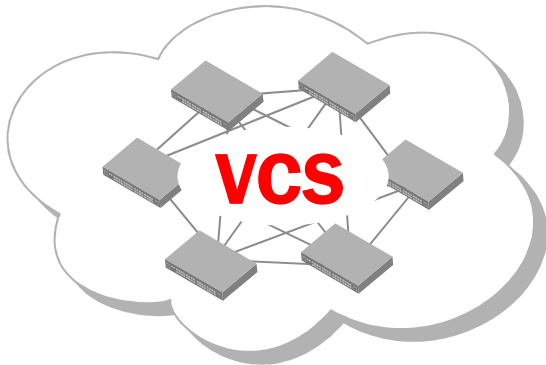Allows per-VM QoS, connectivity persistence, and visibility

Supports emerging IEEE Edge Virtual Bridging standards

Brocade Virtual Cluster Switching (VCS)

VCS

First true data center Ethernet fabric

Revolutionizes Layer 2 connectivity

Increases scalability of virtual server environments and sphere of mobility

Maximizes network performance—reduces network complexity

Brocade Virtual Cluster Switching (VCS)

ETHERNET FABRIC	DISTRIBUTED INTELLIGENCE	LOGICAL CHASSIS	DYNAMIC SERVICE INSERTION

- First data center Ethernet fabric

- No Spanning Tree Protocol

- Multi-path, deterministic

- Auto-healing, non-disruptive

- Lossless, low latency

- Built for convergence
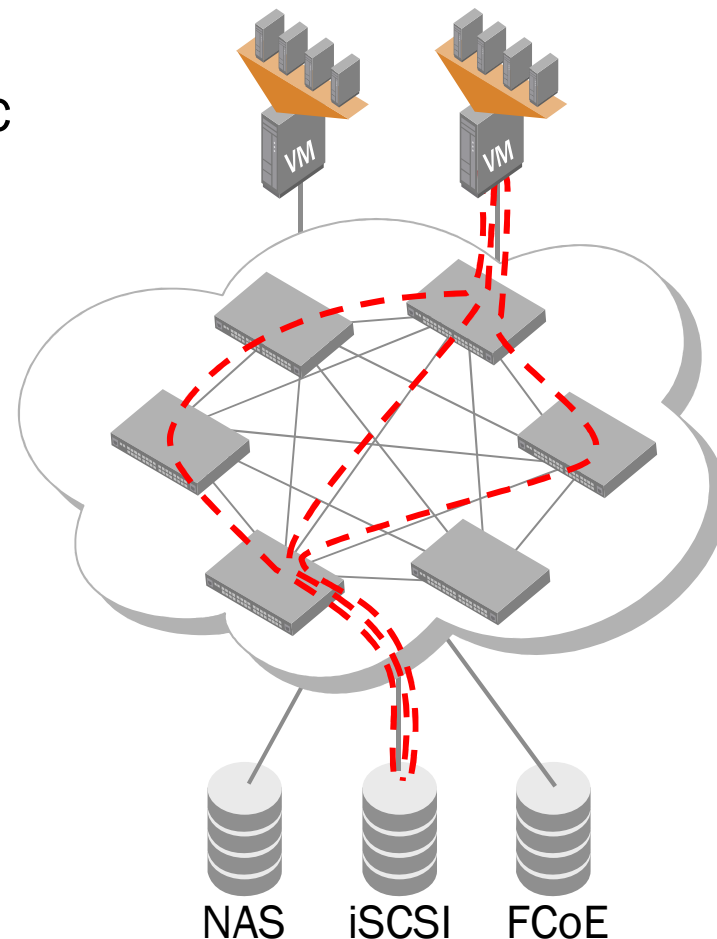
VM

VM

NAS   iSCSI   FCoE

Brocade Virtual Cluster Switching (VCS)

ETHERNET FABRIC	DISTRIBUTED INTELLIGENCE	LOGICAL CHASSIS	DYNAMIC SERVICE INSERTION

- Fully distributed control plane

- Arbitrary topology, self-forming

- Network-wide knowledge of all members, devices, VMs

- Automatic Migration of Port Profiles (AMPP)
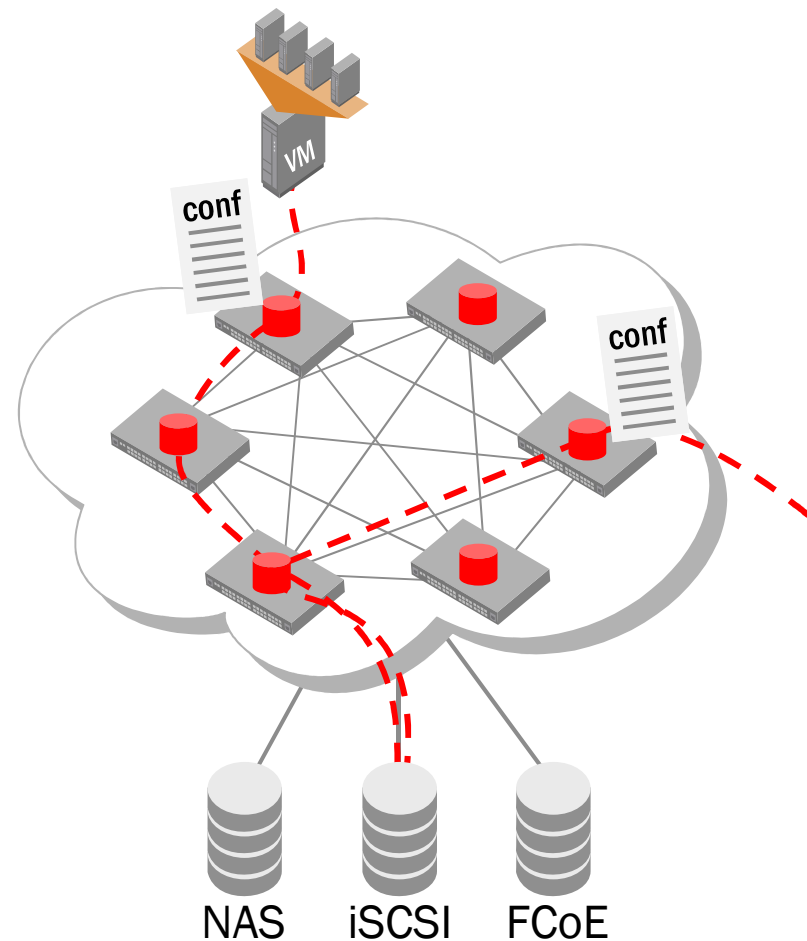
VM

conf

conf

NAS   iSCSI   FCoE

Brocade Virtual Cluster Switching (VCS)

ETHERNET FABRIC	DISTRIBUTED INTELLIGENCE	LOGICAL CHASSIS	DYNAMIC SERVICE INSERTION

- Managed as a single switch

- Logically collapses network layers

- Auto-configuration for new devices

- Centralized or distributed management

- Radically reduces managed elements
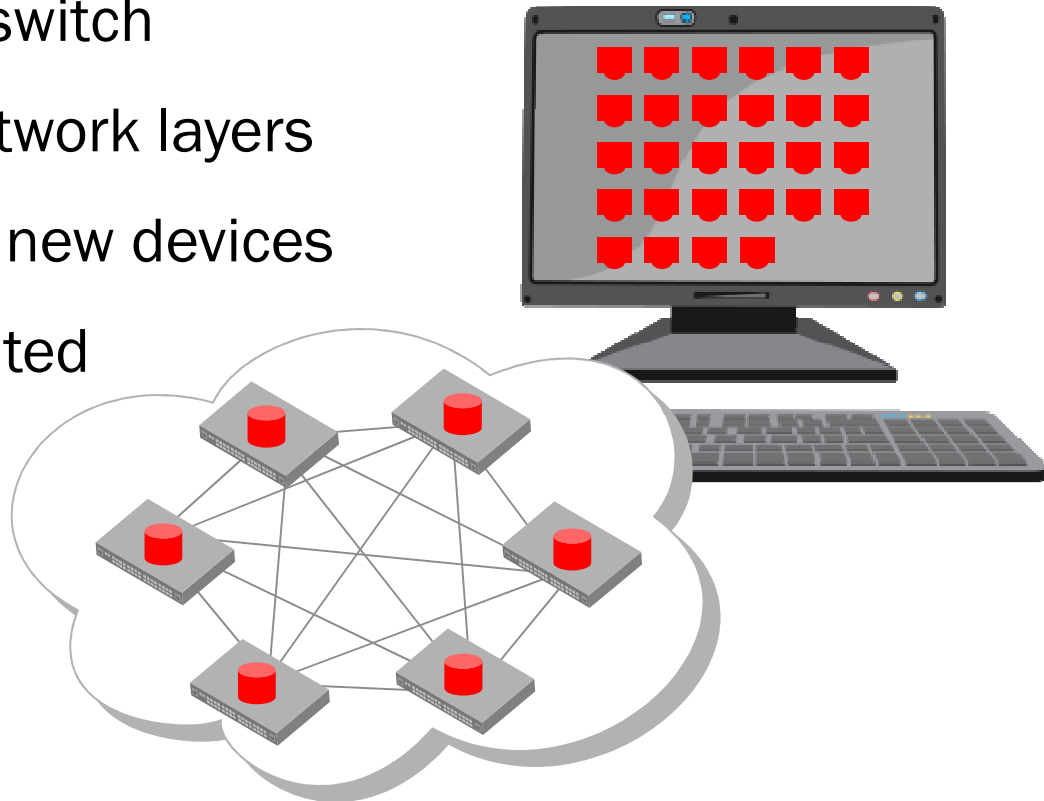
Brocade Virtual Cluster Switching (VCS)

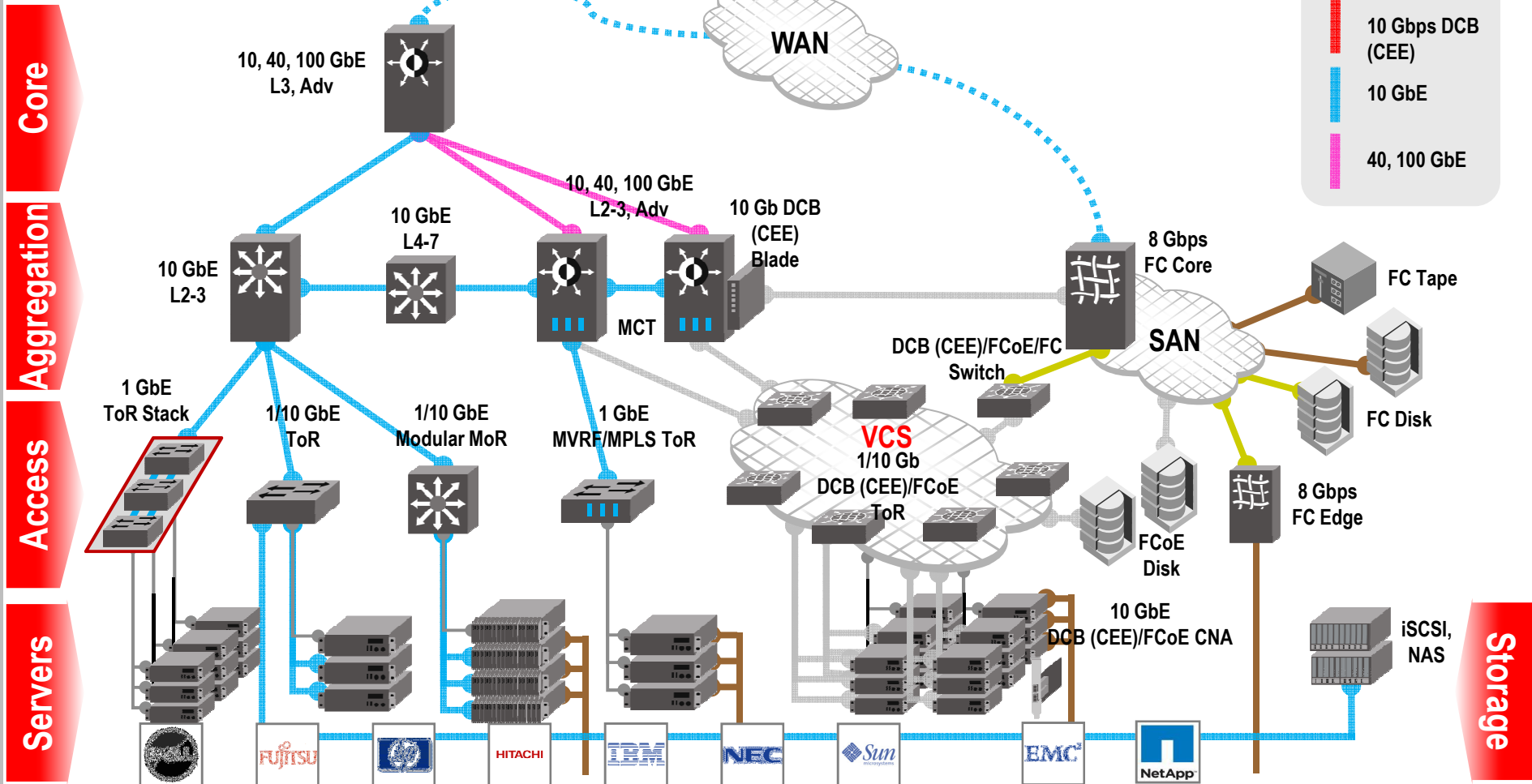| ETHERNET FABRIC	DISTRIBUTED INTELLIGENCE	LOGICAL CHASSIS	DYNAMIC SERVICE INSERTION

- Reconfigure network via software

- Hardware-based flow redirection

- Incorporation of partner services

- Non-stop service insertion

- Minimizes cost and physical moves

Network Services

Encryption

Extension

Security

ADC
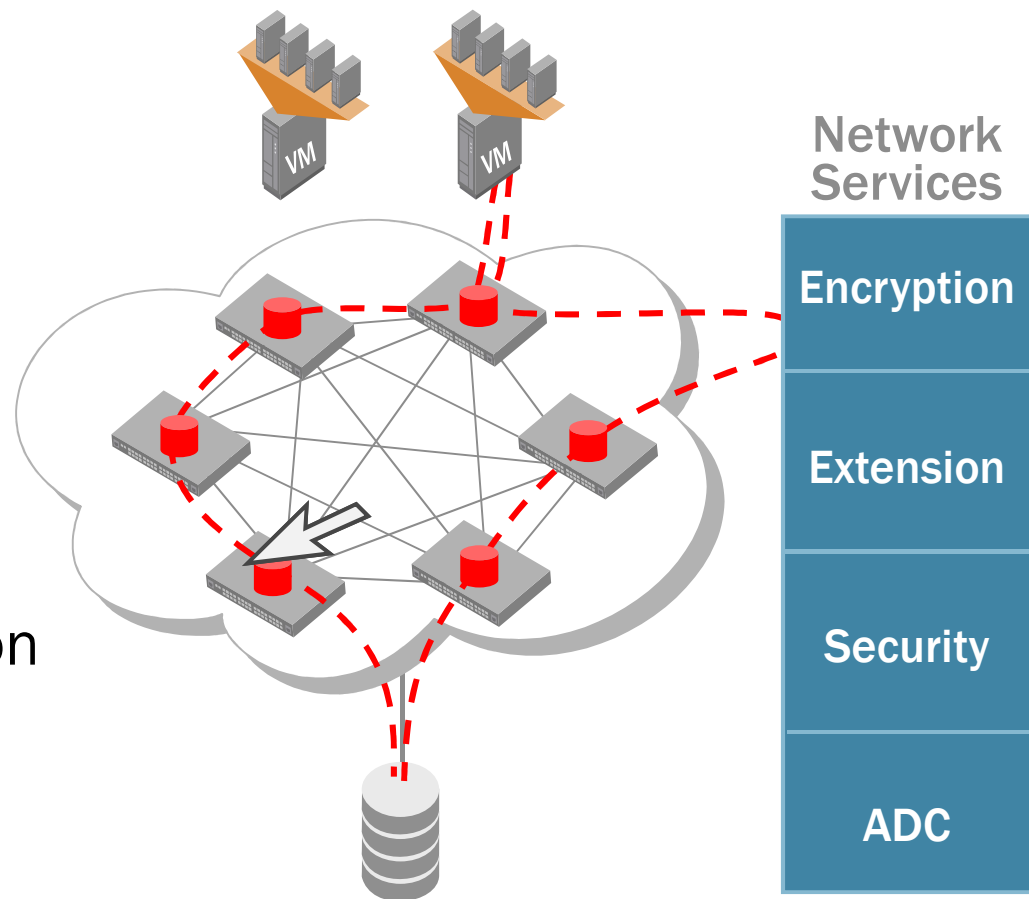
Data Center Network
Tomorrow – VCS as a part of it!

Core

Aggregation

Access

Servers

Storage

WAN

SAN

VCS

1 GbE

8 Gbps FC

16 Gbps FC

10 Gbps DCB (CEE)

10 GbE

40, 100 GbE

10, 40, 100 GbE L3, Adv

10, 40, 100 GbE L2-3, Adv

10 GbE L2-3

10 GbE L4-7

10 Gb DCB (CEE) Blade

MCT

8 Gbps FC Core

DCB (CEE)/FCoE/FC Switch

FC Tape

FC Disk

8 Gbps FC Edge

FCoE Disk

1 GbE ToR Stack

1/10 GbE ToR

1/10 GbE Modular MoR

1 GbE MVRF/MPLS ToR

VCS 1/10 Gb DCB (CEE)/FCoE ToR

10 GbE DCB (CEE)/FCoE CNA

iSCSI, NAS

Fujitsu

HITACHI

IBM

NEC

Sun microsystems

EMC²

NetApp

Brocade Ecosystem

Providing investment protection and best-of-class choice
for highly virtualized networks

HYPERVISOR	**vm**ware™	**Hyper-V**	Xen	ORACLE®
SERVER	IBM	D&LL	hp	ORACLE® Sun microsystems	FUJITSU
NETWORK	**BROCADE ONE ARCHITECTURE**			
SECURITY	symantec.	McAfee	RSA® The Security Division of EMC	
STORAGE	EMC²	IBM	NetApp	hp	HITACHI DATA SYSTEMS

Building Blocks for the Virtual Enterprise

BROCADE ONE
A Unified Network Strategy and Architecture

- **Introducing:** Brocade One, a new network strategy and architecture to enable the evolution to a fully virtualized enterprise

- **Introducing:** New converged data center fabric architecture to simplify, automate, and scale the data center for highly virtualized environments

- **Introducing:** Industry's first class of converged fabric products, technologies, and services
  - New family of ASICs, Brocade Network OS, Brocade Virtual Cluster Switching (VCS), New access and aggregation layer switches and Brocade Network Adviser

- **On-Going:** Continued innovation in Ethernet and Fibre Channel families

Thank You! Danke! Gracias! Grazie! Merci! Tak!