

THE EXPONENTIAL DATA CENTER

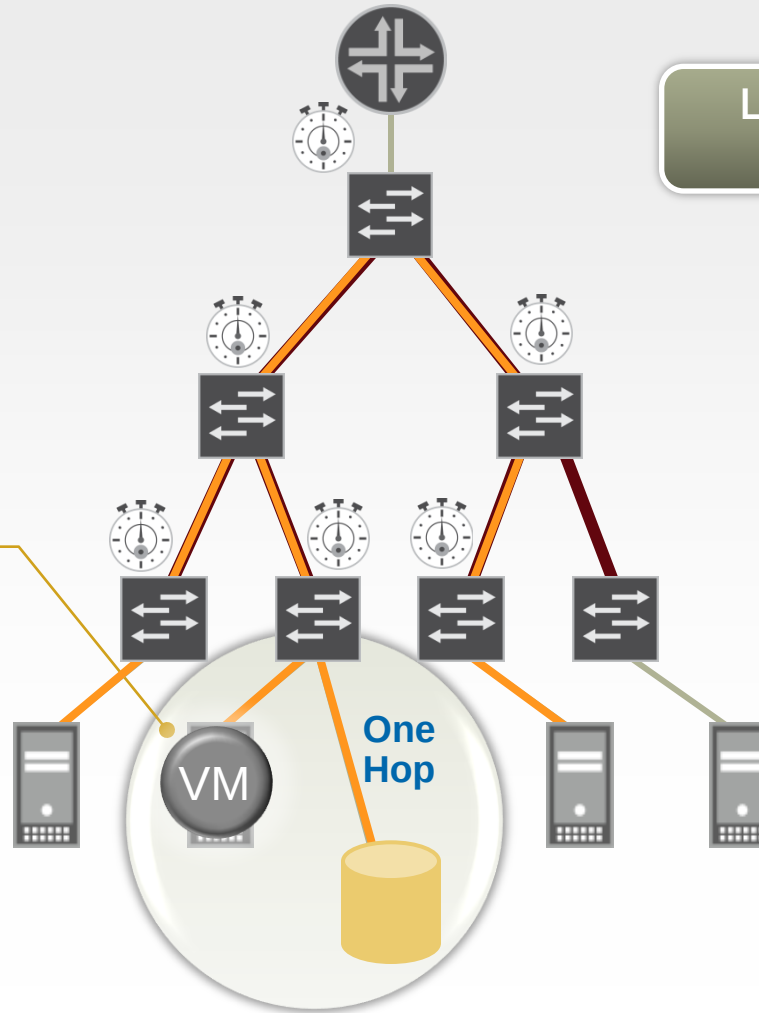


THE TYRANNY OF TREES

Typical tree configuration

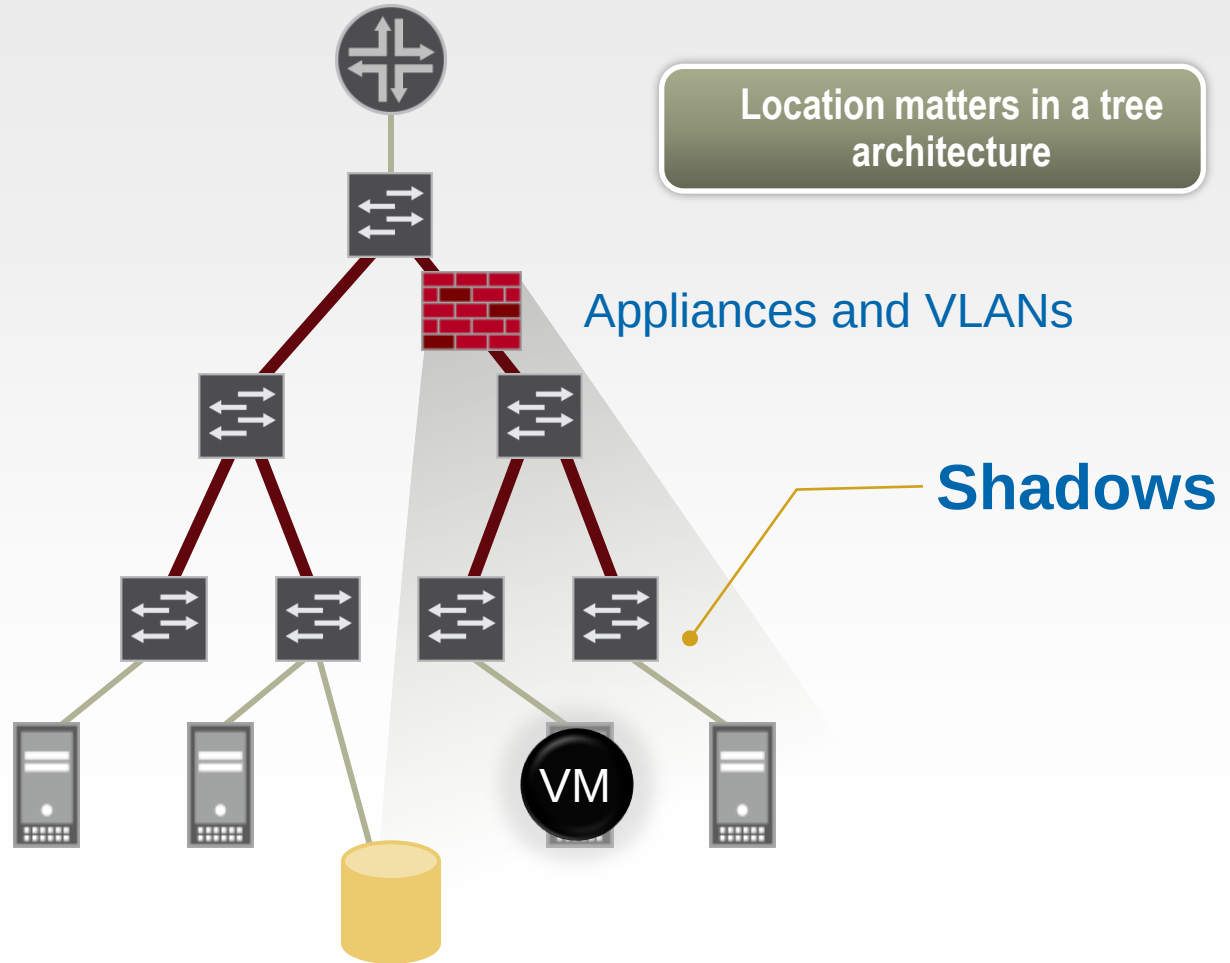
Location matters in a tree architecture

Bubbles
Optimal performance



THE TYRANNY OF TREES

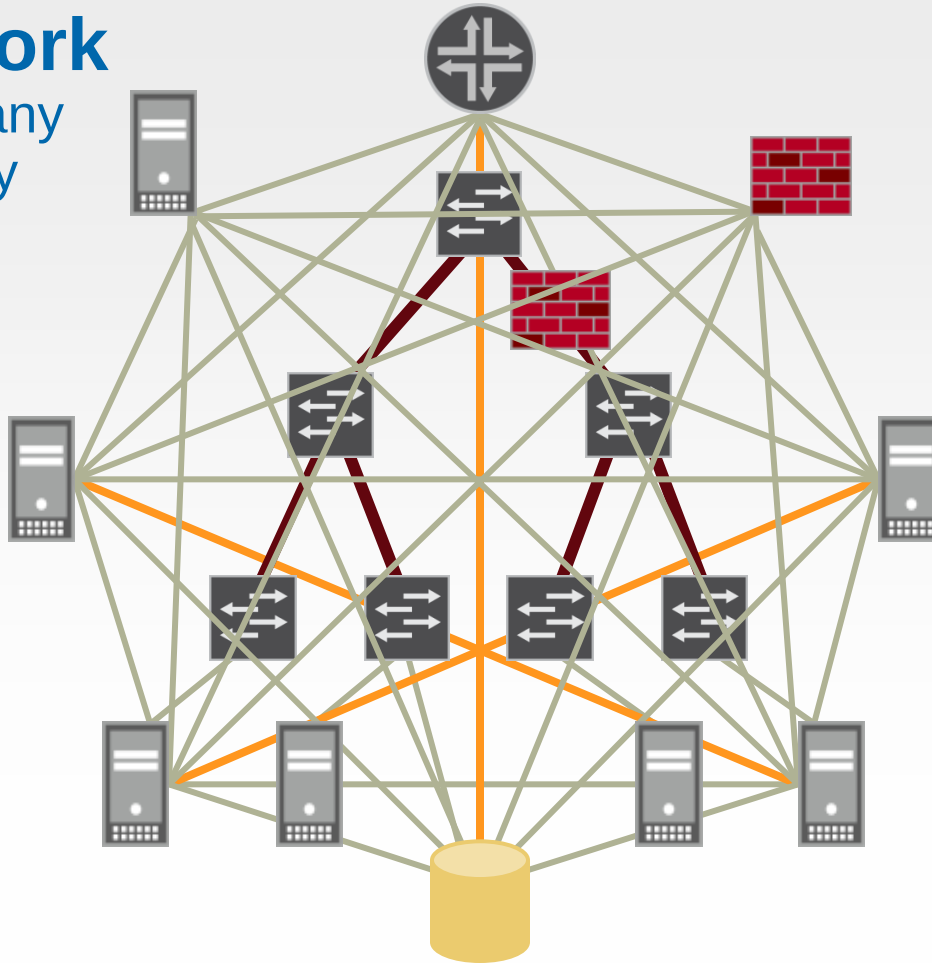
Typical tree configuration



**What does an ideal fabric
look like?**

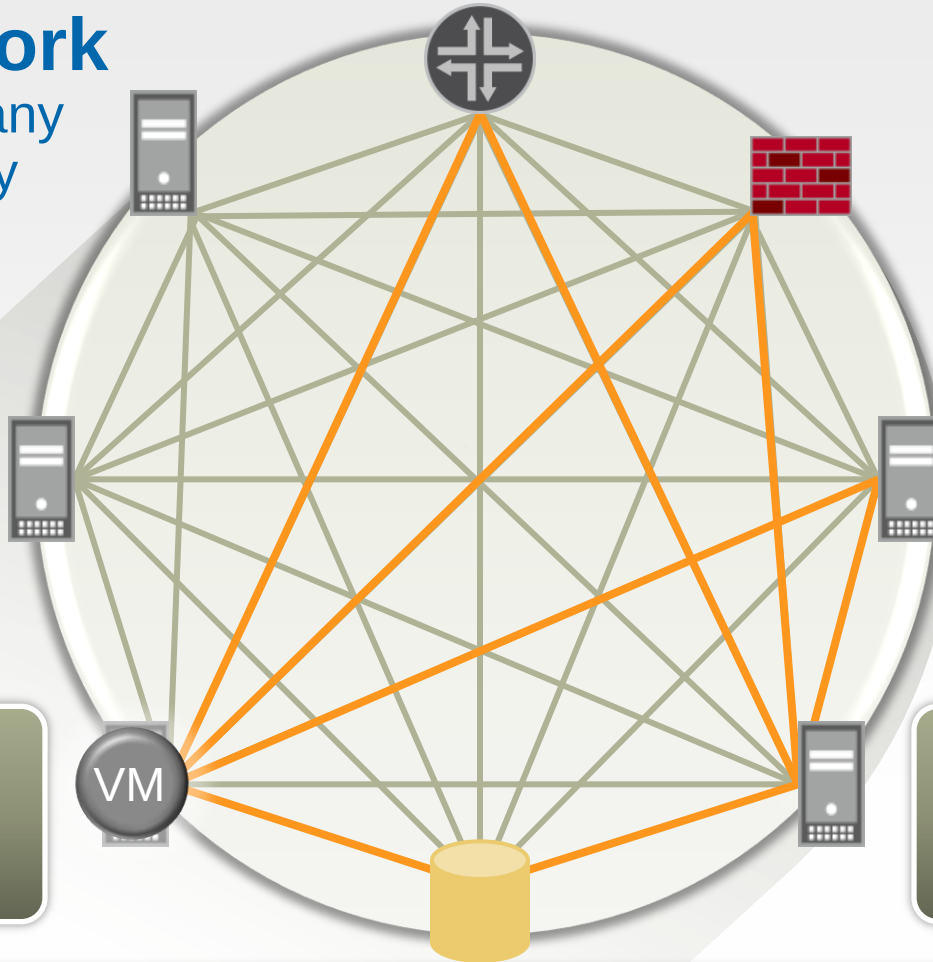
One Network

Flat, any-to-any
connectivity



One Network

Flat, any-to-any
connectivity



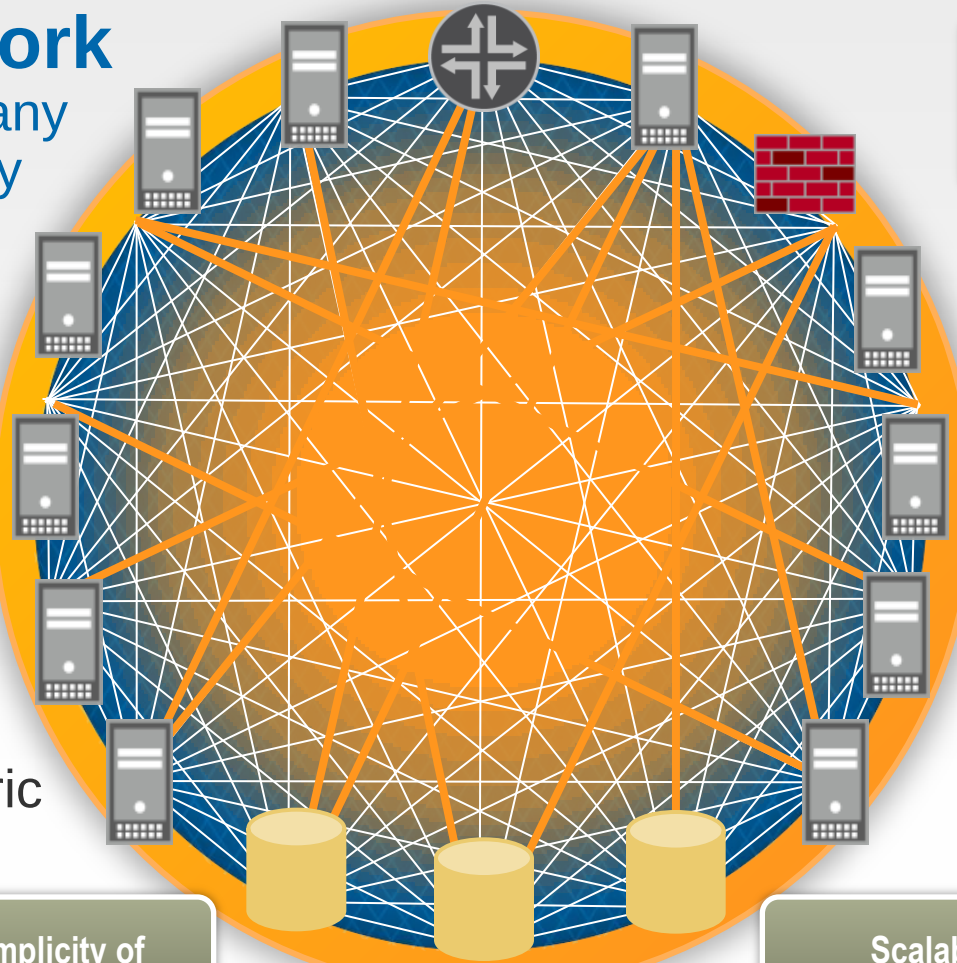
Key resources
are one hop away

Key resources
are ALWAYS one
hop away

Locality should not matter in a virtualized data center

One Network

Flat, any-to-any
connectivity



Single device
N=1

Switch Fabric

Data Plane

- Flat
- Any-to-any

Control Plane

- Single device
- Shared state

A Network Fabric
has the....

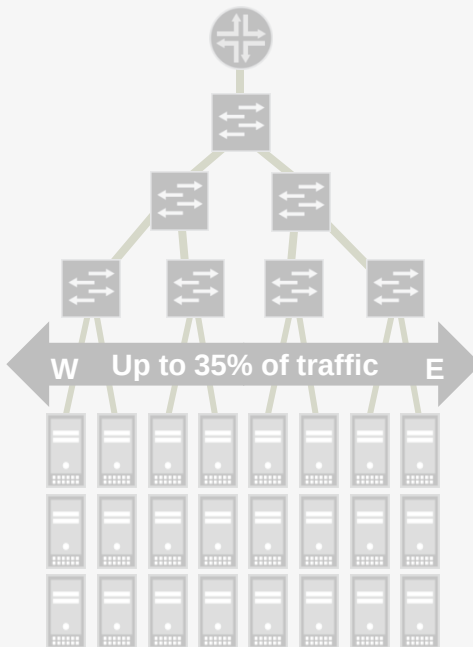
Performance and simplicity of
a single switch

And the...

Scalability and resilience
of a network

Juniper has The Answer: 3-2-1

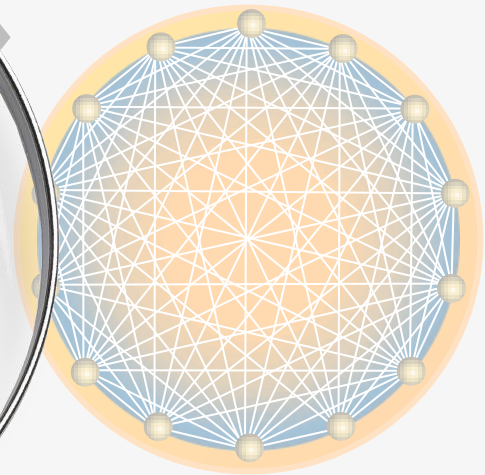
3. Legacy three-tier data center



2. Juniper two-tier data center



1. Juniper's data center fabric

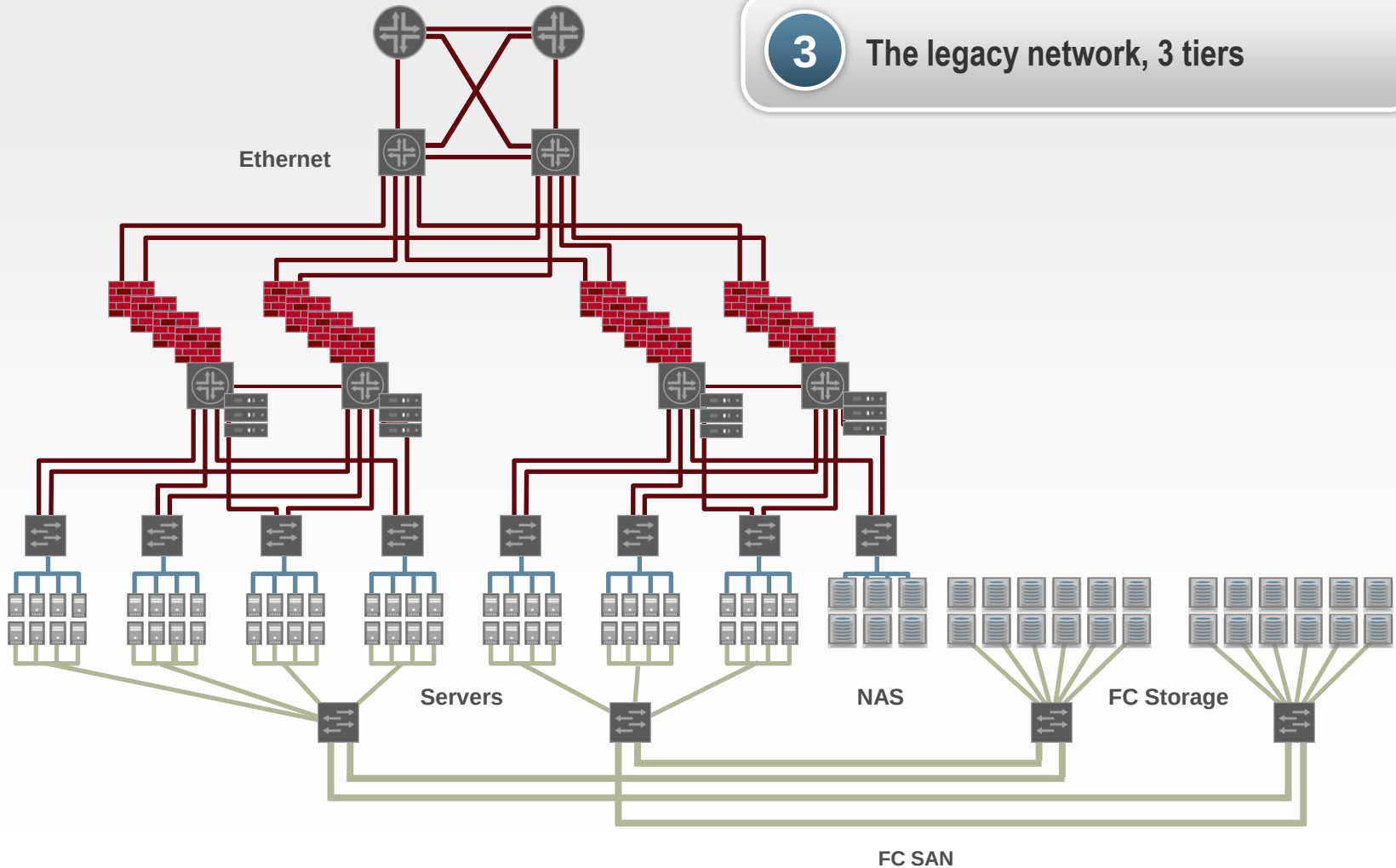


TRANSFORM THE NETWORK

3 — 2 — 1

3

The legacy network, 3 tiers

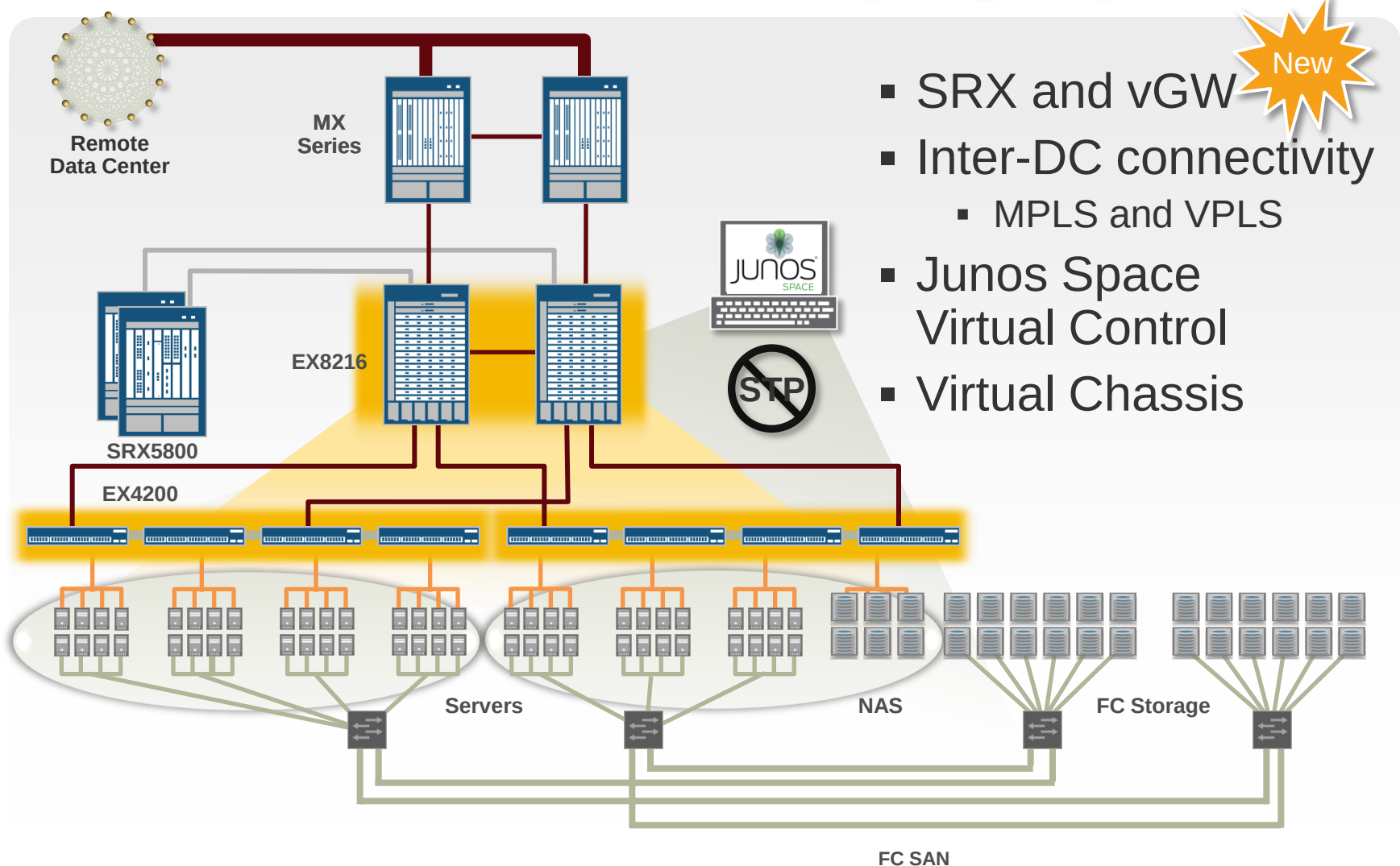


DELIVER TODAY – 2 TIERS

3

2

1

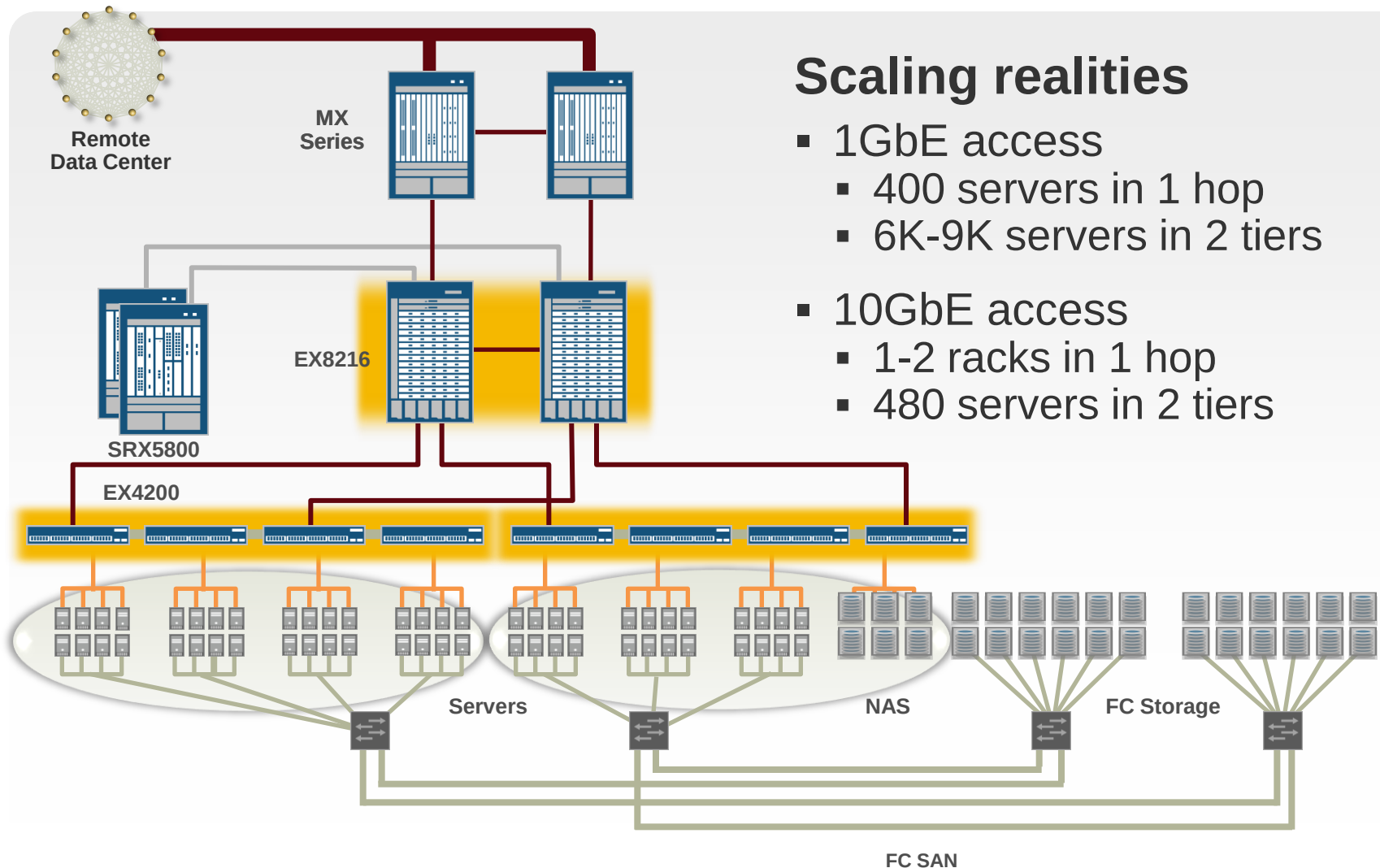


DELIVER TODAY – 2 TIERS

3

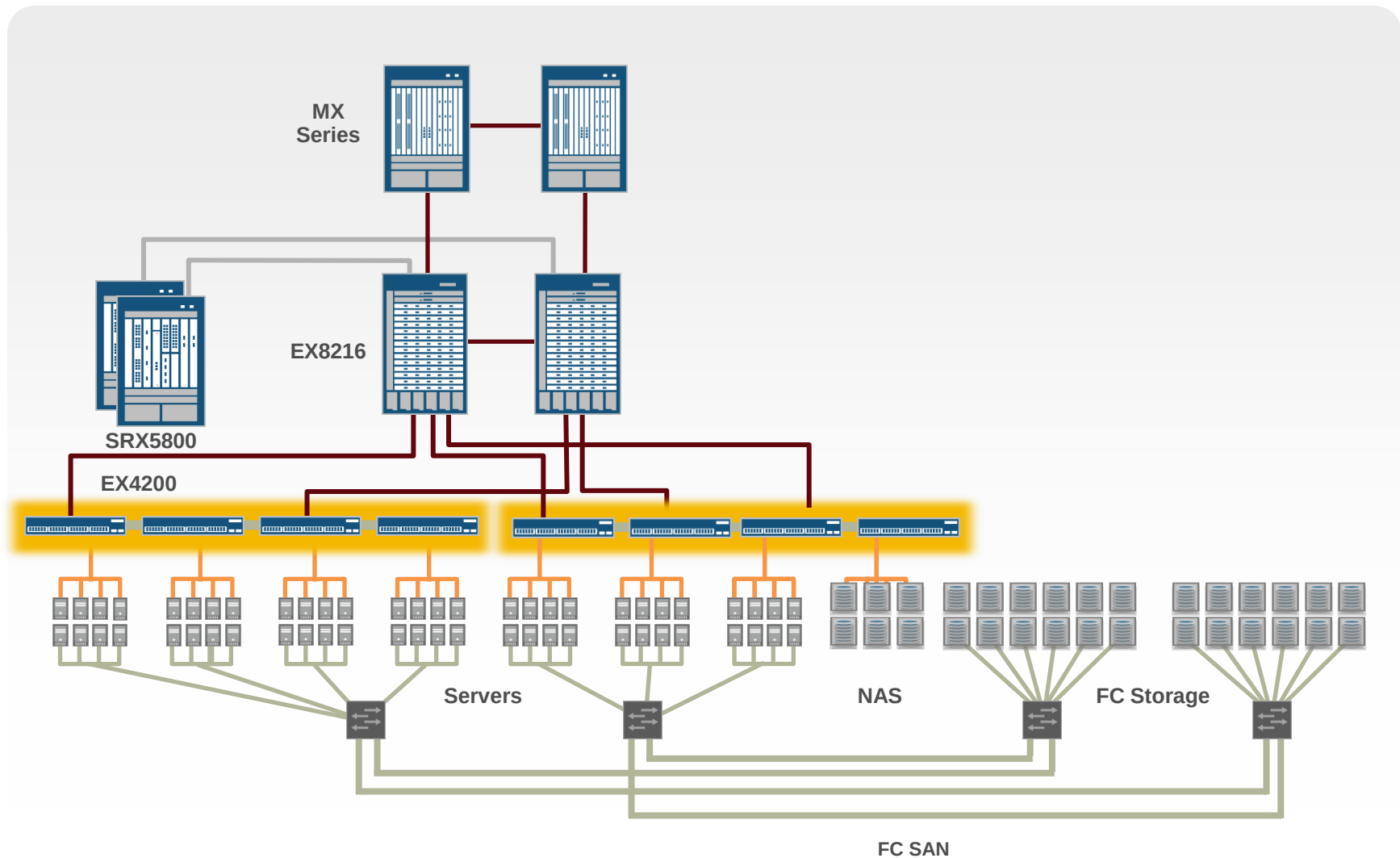
2

1



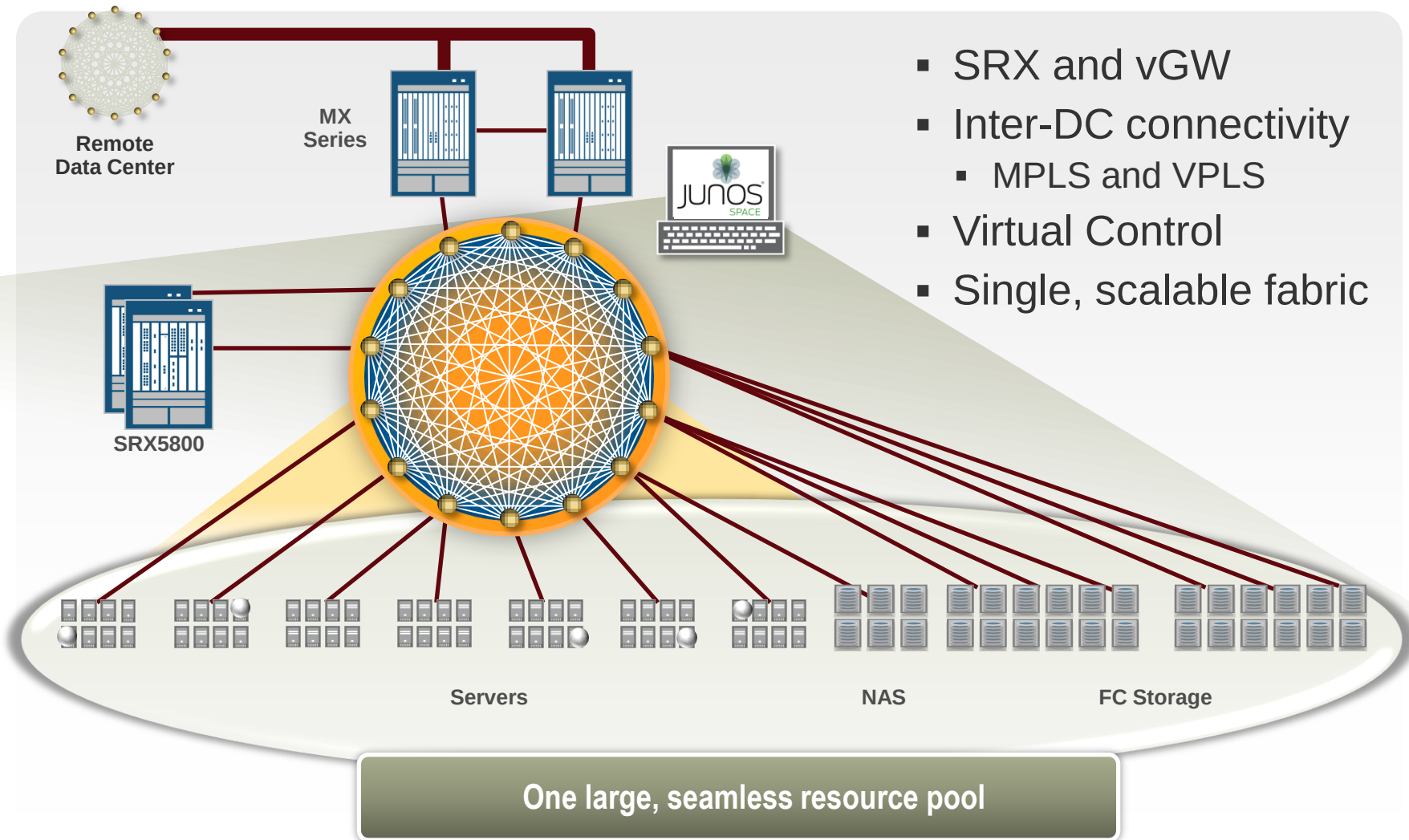
DELIVER SOON – 1 TIER

3 — 2 — 1

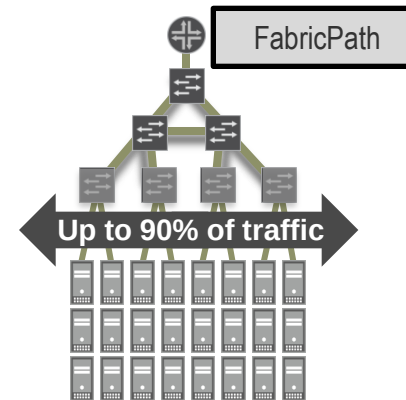
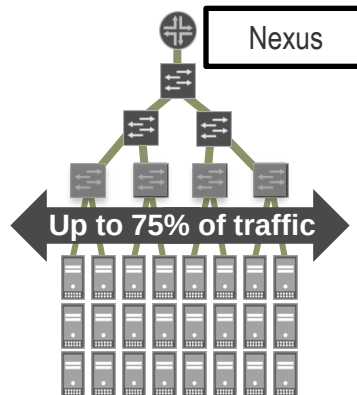
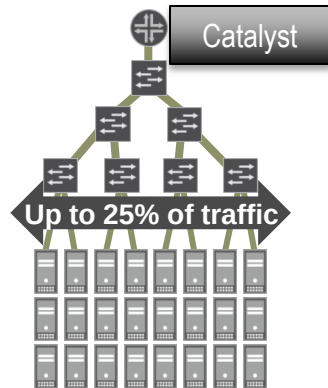


DELIVER SOON – 1 TIER

3 — 2 — 1



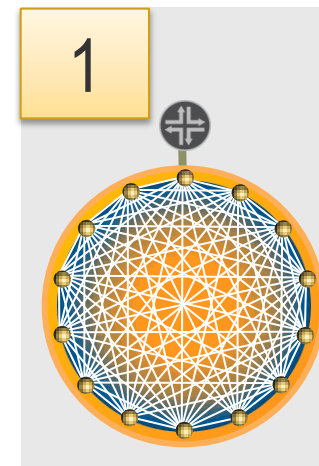
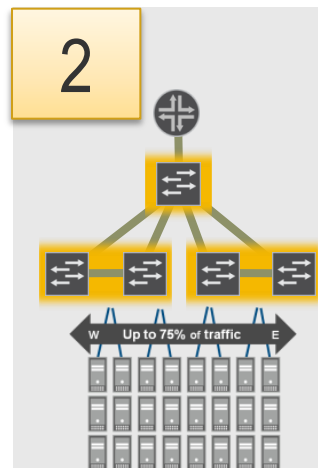
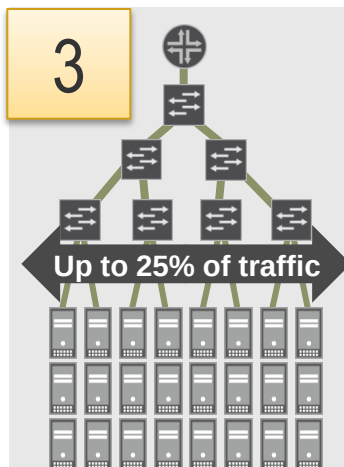
New IT, New Network Decisions



Client Server Apps
Limited VMs
100MB to 1G Servers

Distributed Apps
Agile VMs
1 to 10G Servers

Distributed Apps
Dynamic VMs
10G+ Servers



Simple

Agile

Faster
Applications

Secure

QFABRIC

3 years in development

1 million man hours

\$100s of millions invested

Over 125 patents pending

QFabric

A Revolutionary New
Architecture

Design Goals

Flat, resilient fabric

Everything is one hop away

Scale without complexity

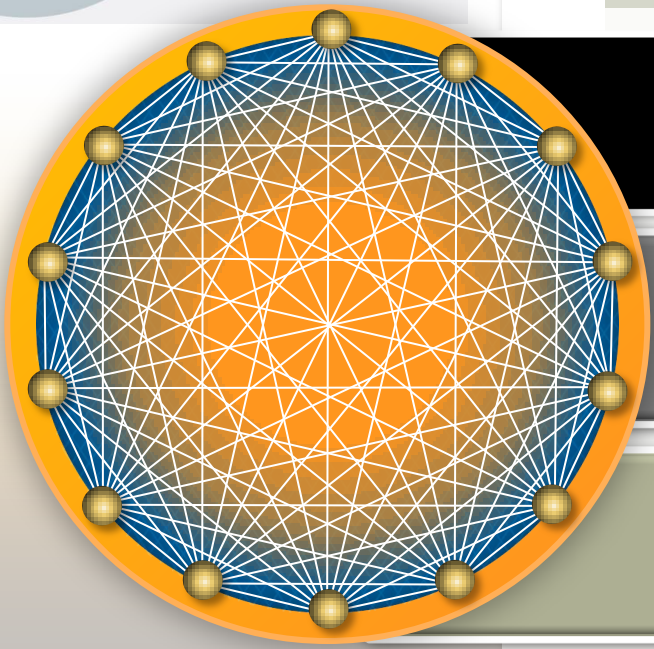
The ability to add capacity without adding
operational complexity

N=1

QFabric

A Revolutionary New Architecture

3 Design Principles



Management Plane

N=1

Operational model of a single switch

Control Plane

Federated Intelligence

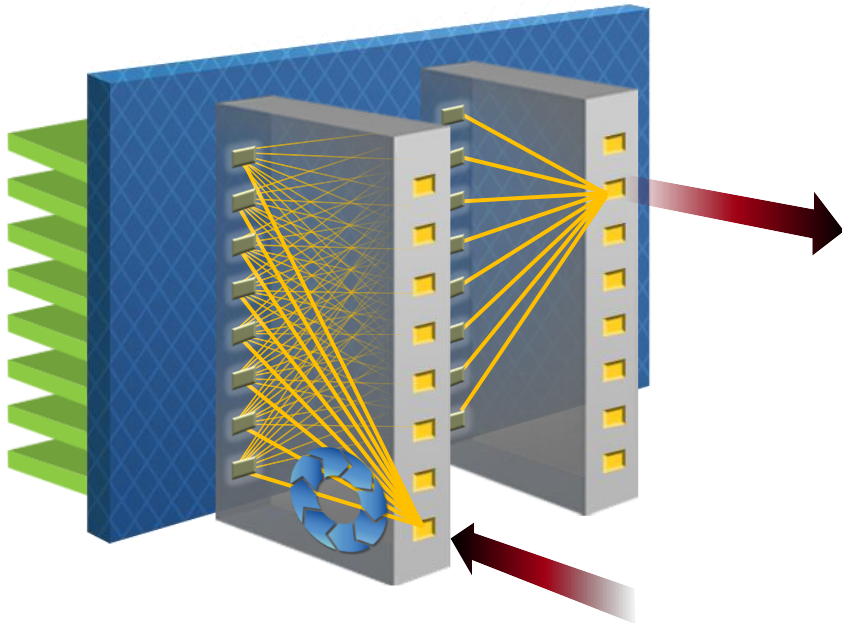
Only way to scale with resilience

Data Plane

Rich edge, Simple core

Everything is one hop away

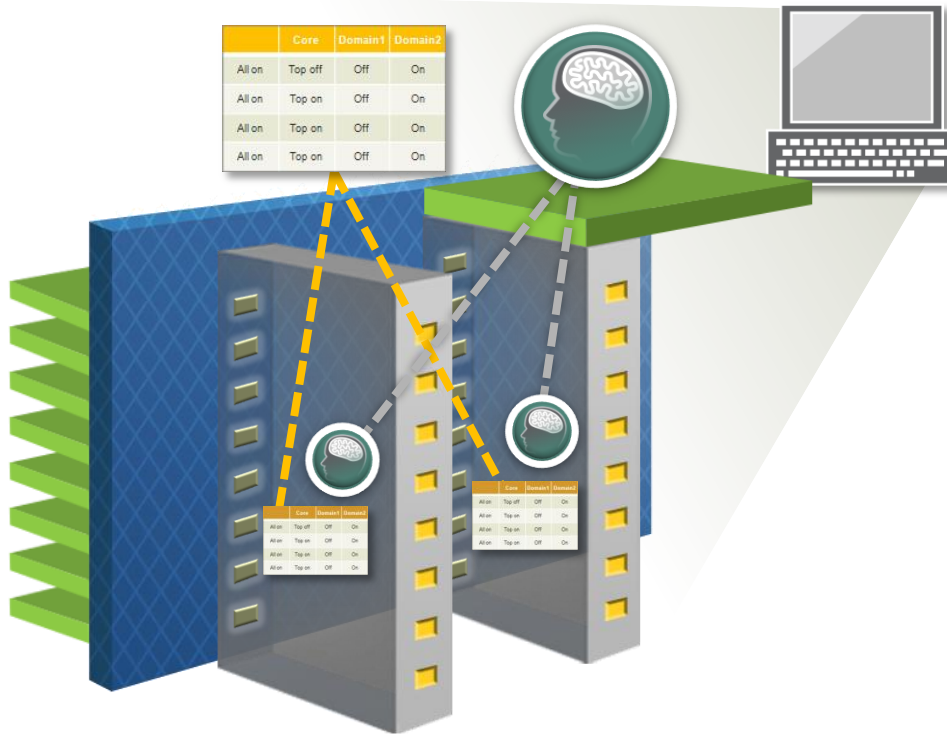
DATA PLANE IN A SINGLE SWITCH



Data Plane

1. All ports are directly connected to every other port
2. A single “full lookup” processes packets

CONTROL PLANE IN A SINGLE SWITCH



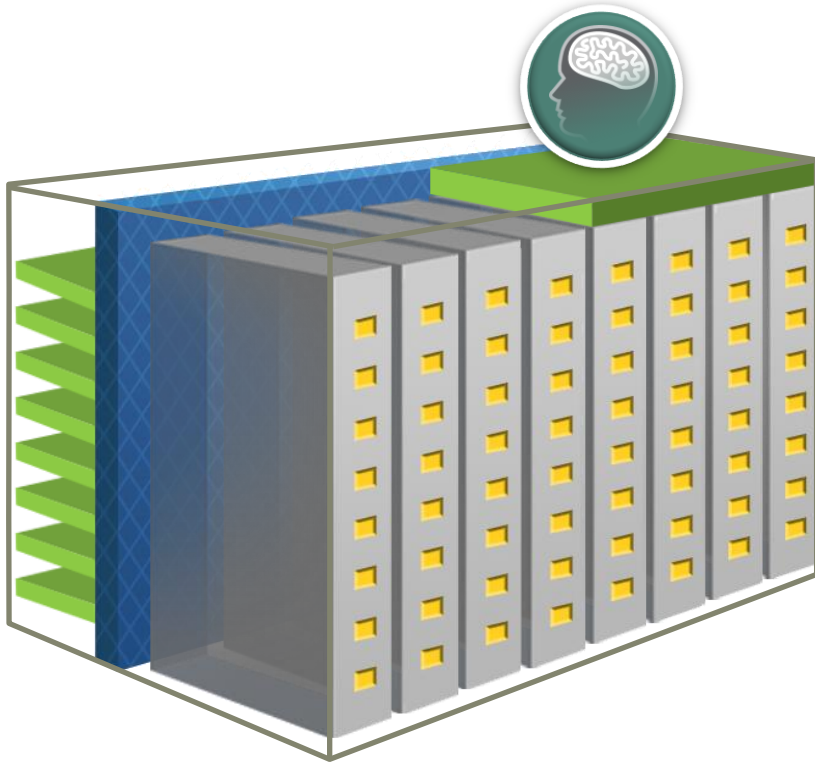
Control Plane

- Single consciousness
- Centralized shared table(s) have information about all ports

Management Plane

- All the ports are managed from a single point

SINGLE SWITCH DOES NOT SCALE



Ports can be added to a single switch fabric.

...but eventually it runs out of real estate.

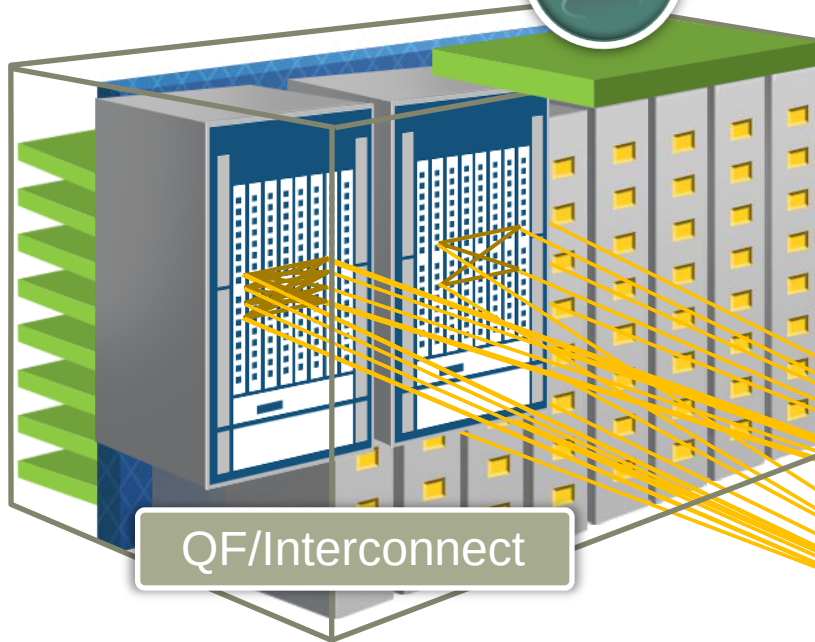
After this, the network cannot be flat.

Choice: Sacrifice simplicity or.....
change the scaling model

Scaling the DATA PLANE



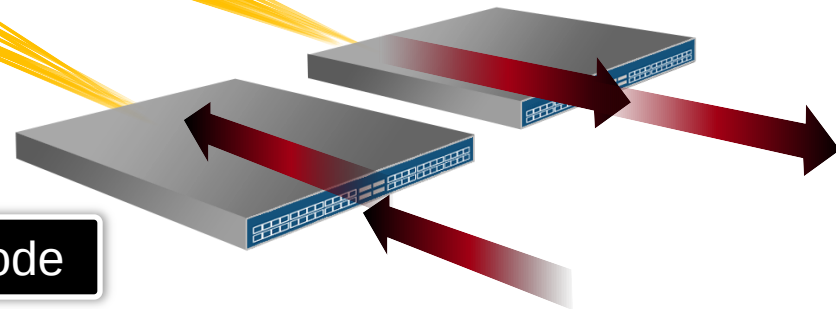
Data Plane



QF/Interconnect

So, we separate the line cards from the fabric.
And replace the copper traces with fiber links.
For redundancy add multiple devices.

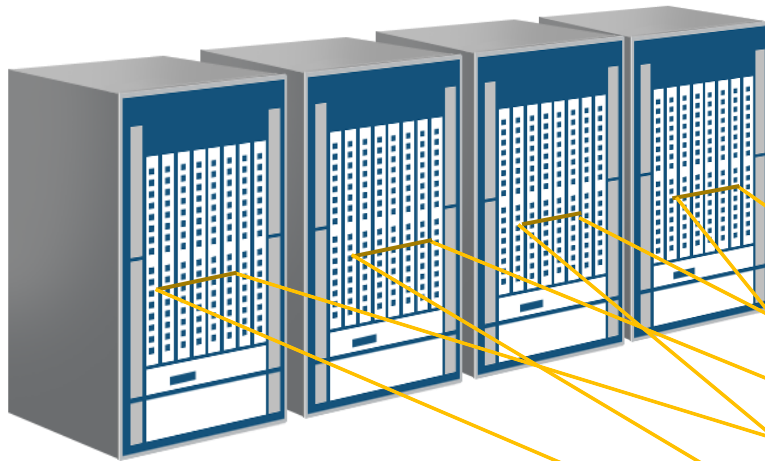
QF/Node



Scaling the DATA PLANE



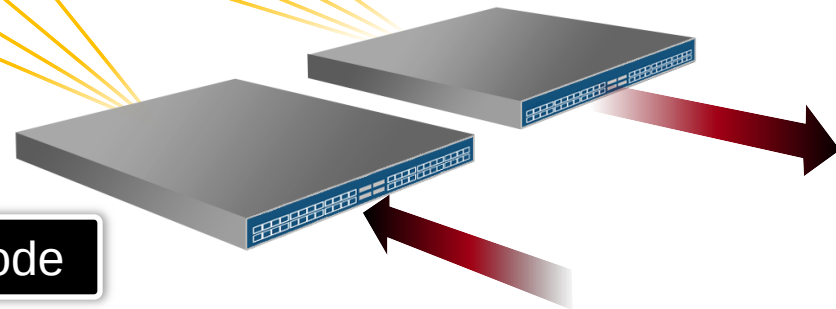
Data Plane



QF/Interconnect

So, we separate the fabric from the I/O ports.
And replace the copper traces with fiber links.
For redundancy add multiple devices.
Enable large scale.

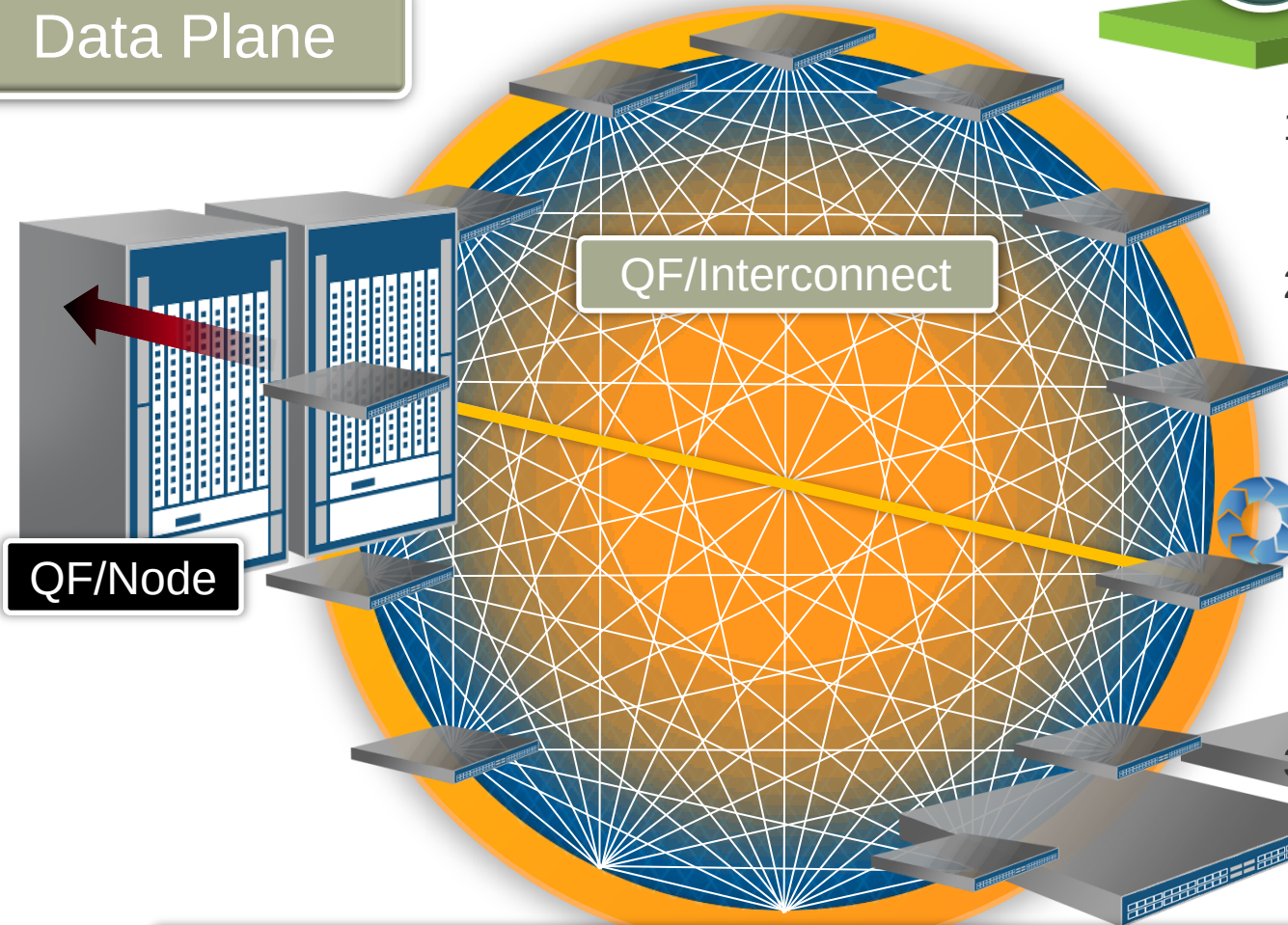
QF/Node



Scaling the DATA PLANE



Data Plane

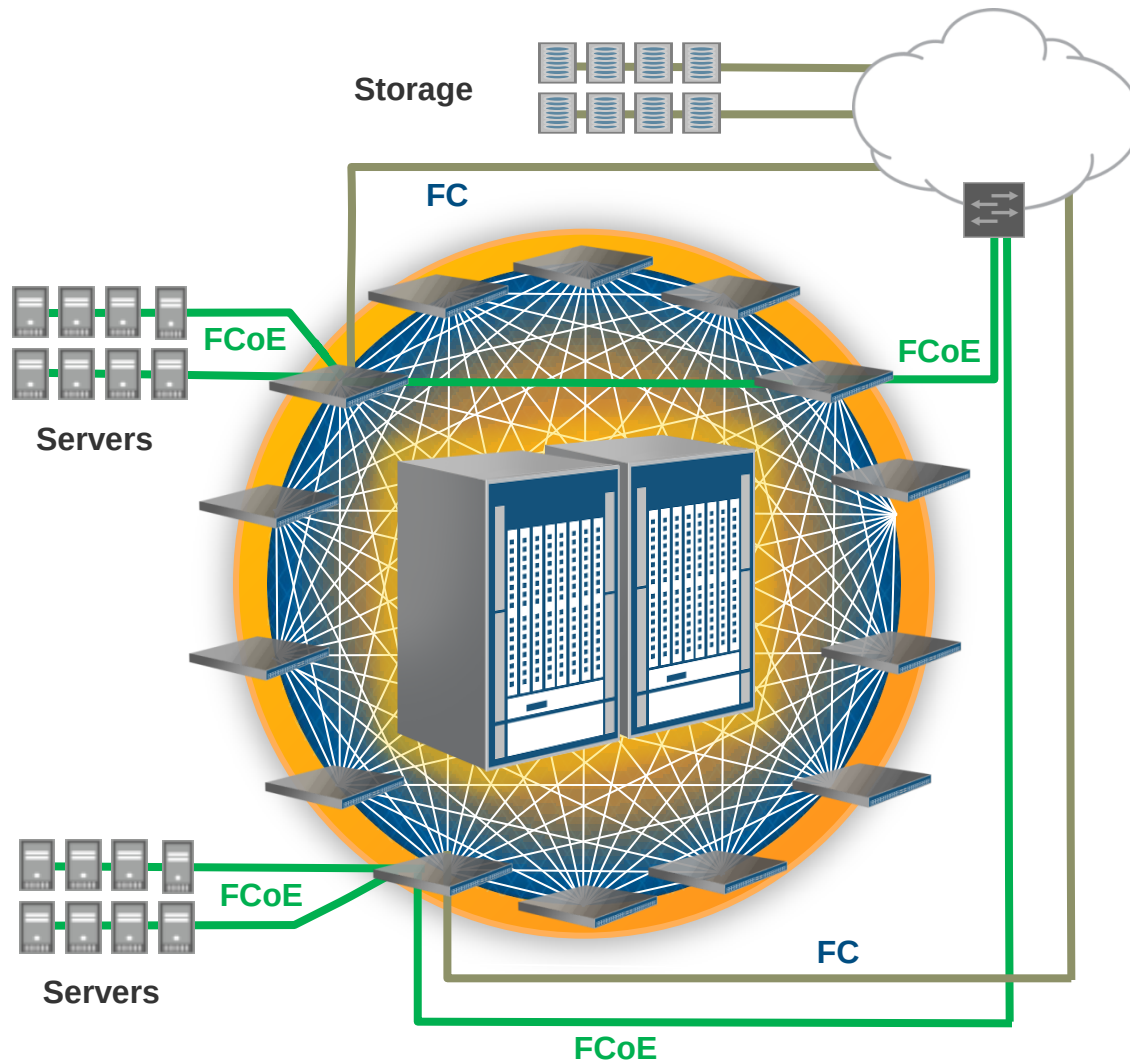


1. All ports are directly connected to every other port

2. A single “full lookup” at the ingress edge device

3. Blazingly fast:
Always under 5us
3.71us (short cables)

QFabric is faster than any Ethernet chassis switch ever built



Convergence

FCoE Transit Switch

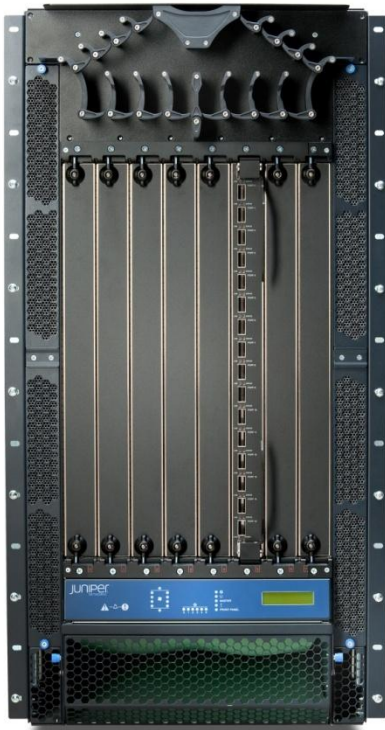
- Converged Enhanced Ethernet – Standards based (CEE or DCB)
- Provides Perimeter protection with FIP Snooping.

FCoE-FC Gateway

- Ethernet or Fibre channel gateway with FC ports at the edge
- Interoperates with existing SANs

QFabric hardware – INTERCONNECT

QF/Interconnect



Front View



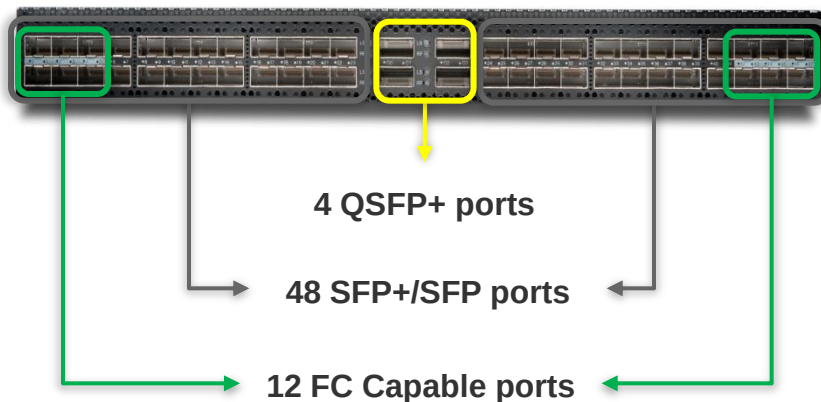
Rear View

- 21 RU high 8 slot chassis
- 128 QSFP 40G ports – wire speed
- 8 fabric cards (10.24Tbps/chassis)
- Dual redundant control board
- Redundant AC power supply
- Front to back air flow

Front View



Rear View



QF/Node

- 1 RU high fixed configuration
- 48 SFP+/SFP ports
- 12 FC capable (2/4/8G) ports
- 4 * 40G fabric uplink ports (can also operate in 10G mode)
- Redundant AC power supply
- Front to back air flow

Will also operate as a
Stand Alone Switch
QFX3500

QFabric hardware – Director



- 2RU device
- Has GE ports to connect to edge and interconnect devices
- Based on x86 architecture

QFABRIC AT A GLANCE



Scalability

10's to 6000 ports



Runs Junos

Rich functionality



Performance

<5us, Low jitter



Lossless

DCB compliant



Simplicity

N=1



Storage

FCoE gateway
and transit



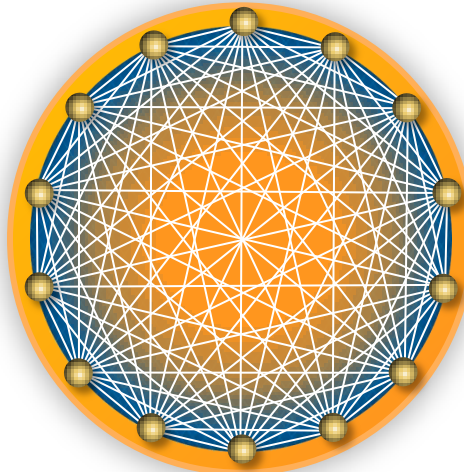
Designed for Modern DC

Virtualization and Convergence



Seamless Layer 2 and Layer 3

Flexible VLAN capability





Performs

- Every application performs better



Scales

- Build large, efficient clouds



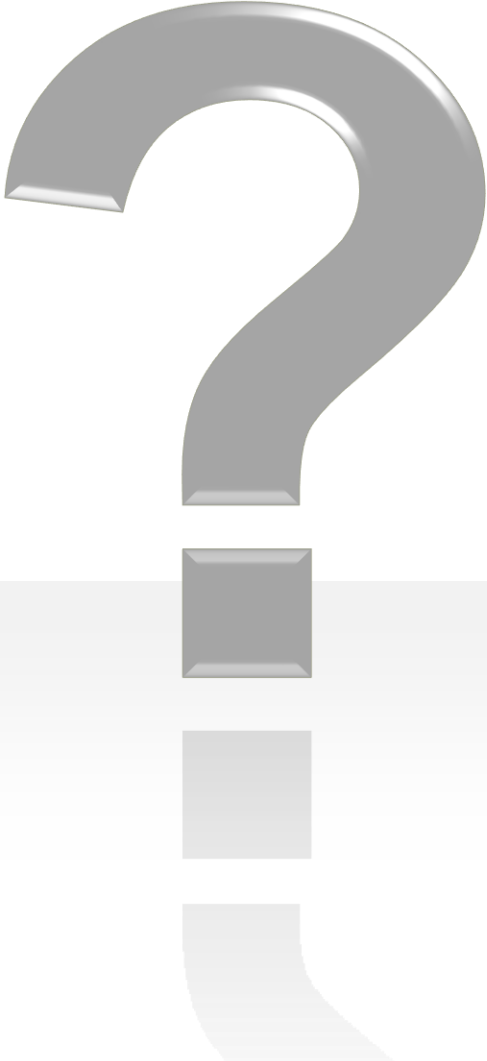
Simplifies

- Less hardware
- Operational simplicity of a switch
- Greater reliability



Lowers Cost

- Elegance of design delivers lower OPEX and CAPEX



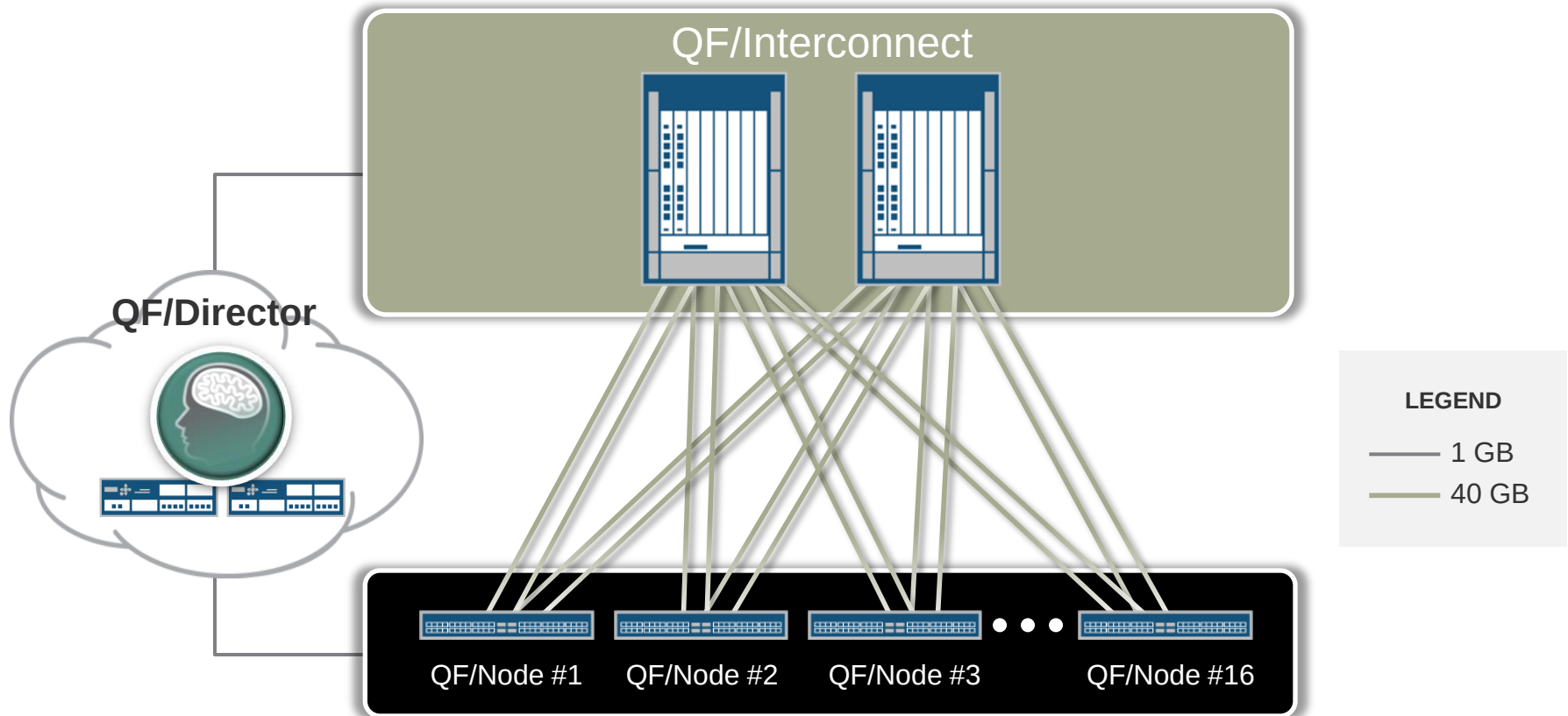
Deployment

Migration

Competition

Timing and Direction

QFABRIC CONFIGURATION FOR SMALL DEPLOYMENT

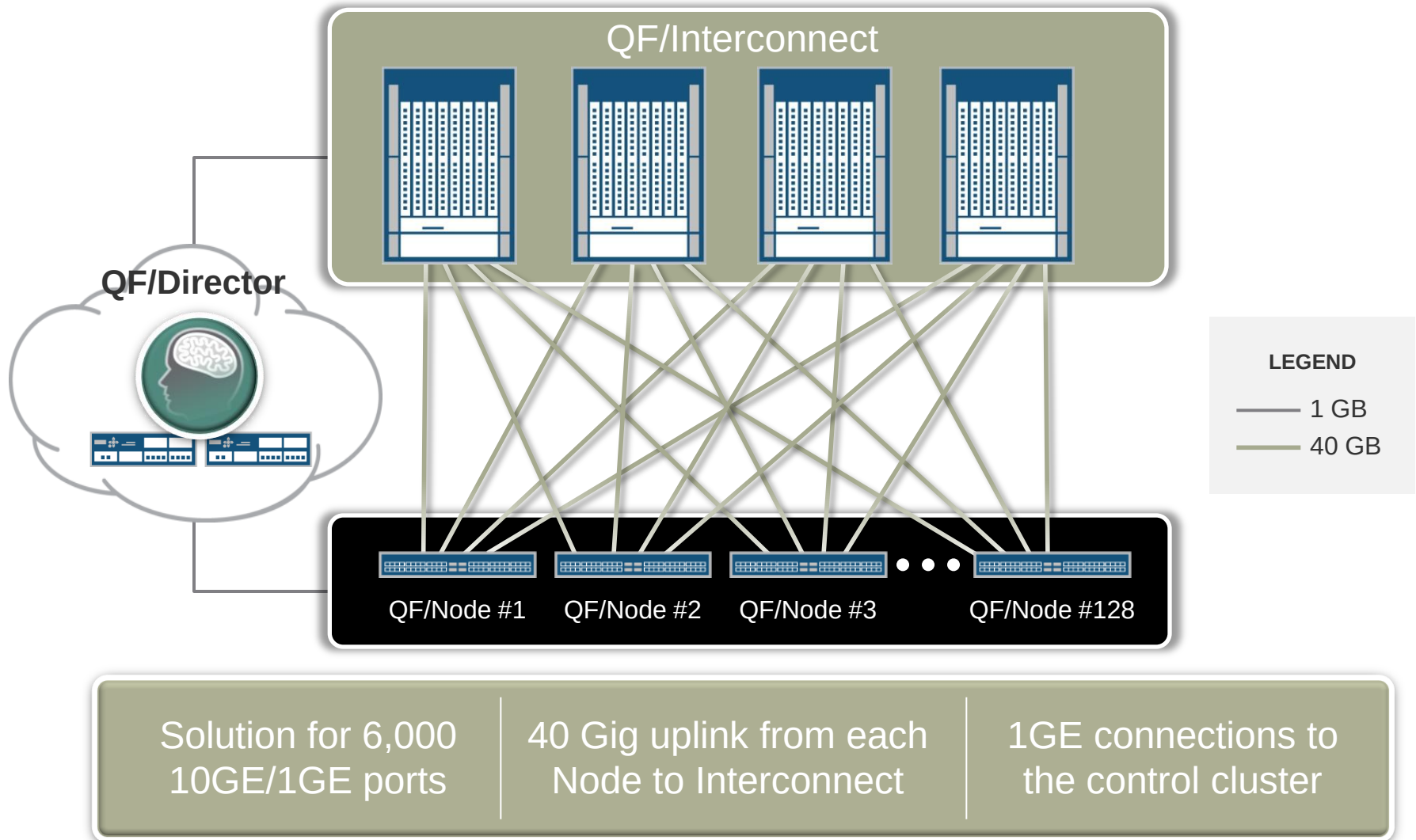


Solution for 768
10GE/1GE ports

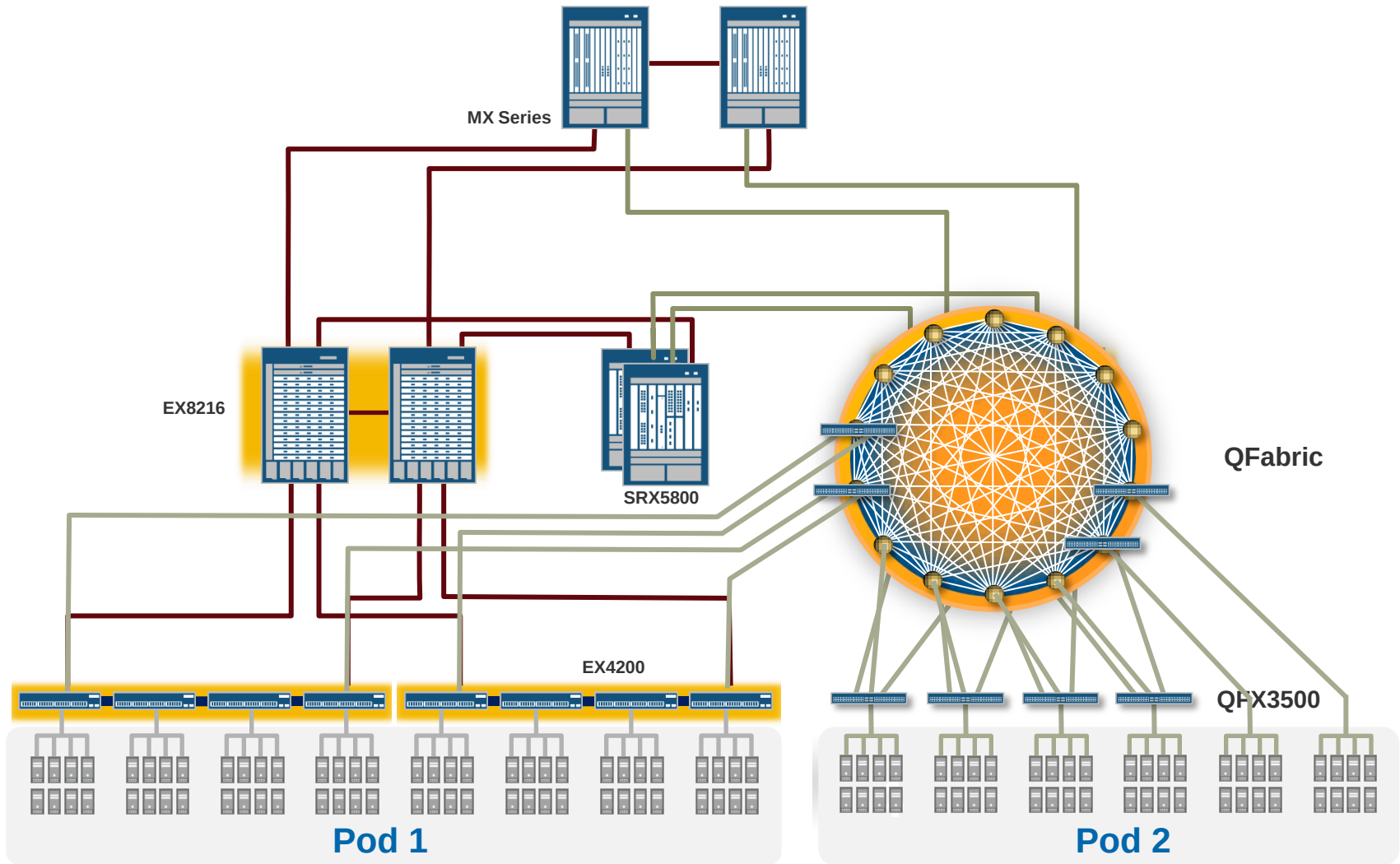
2 Fabric cards per
chassis (25% fill rate)

Redundant uplinks

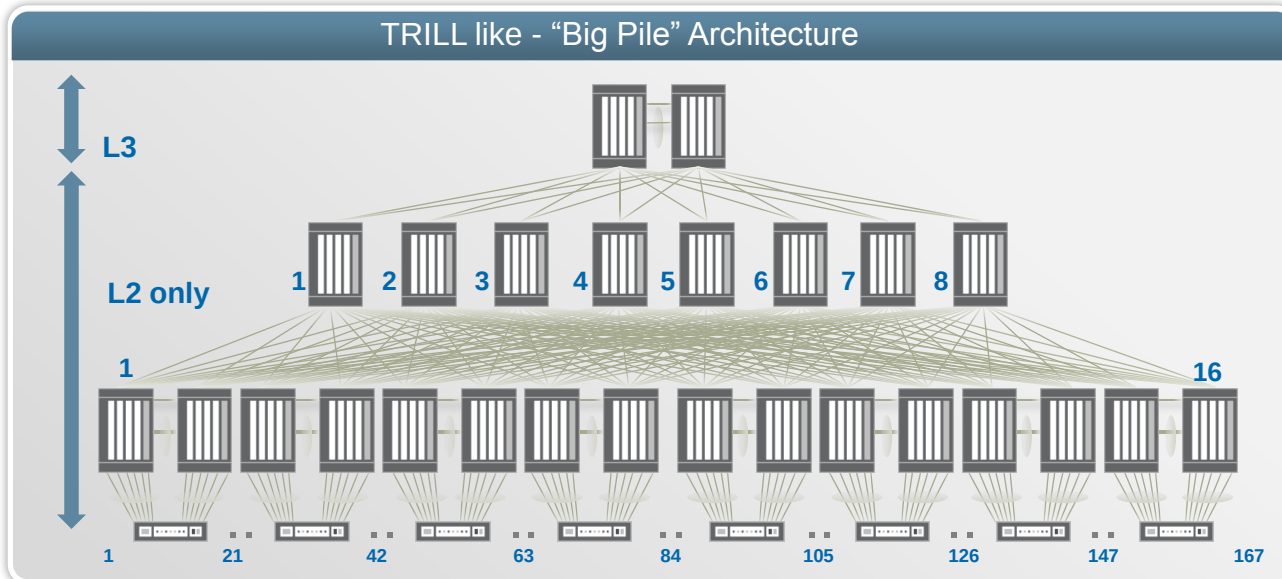
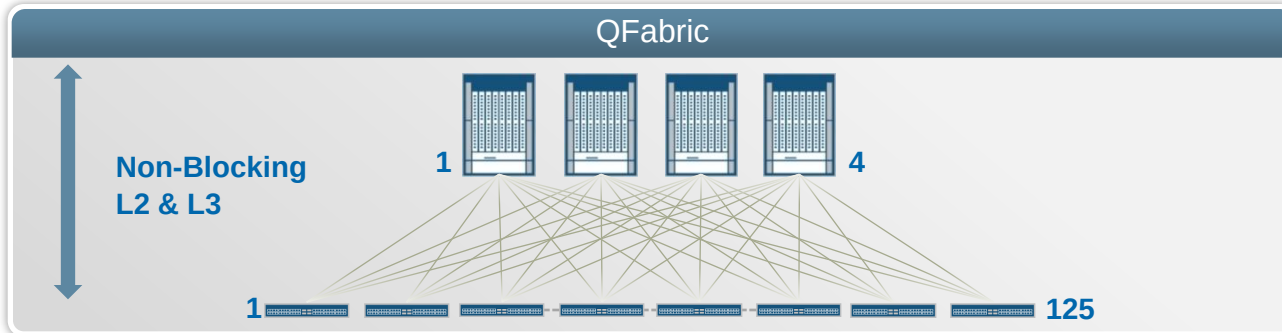
QFABRIC configuration for large deployment



Migrating to Qfabric



QFabric vs. competition – 6000 10 GbE ports



QFabric

- 1/3 fewer devices ↓
- 77% less power Savings: \$360K/Yr ↓
- 90% less floor space ↓
- 85% fewer links ↓
- 12-16x faster ↓
- Mgd. Devices 1 vs. 193 ↓
- L2 AND L3 ★

The QFabric is faster than any chassis switch ever built!

Note:

- OS* Over Subscription 3:1
- Ports: 6000 server ports

Multiple Port Configuration Comparisons

500 ports¹

- 1/6 fewer devices ↓
- 45% less power Savings: \$28K/Yr ↓
- 50% less floor space ↓
- 74% fewer links ↓
- 2-3x faster ↓
- Mgd. Devices 1 vs. 18 ↓



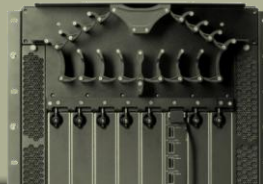
1000 ports²

- 1/5 fewer devices ↓
- 46% less power Savings: \$33K/Yr ↓
- 50% less floor space ↓
- 84% fewer links ↓
- 2-3x faster ↓
- Mgd. Devices 1 vs. 32 ↓
- L2 & L3* ★



3000 ports²

- 1/3 fewer devices ↓
- 73% less power Savings: \$180K/Yr ↓
- 85% less floor space ↓
- 85% fewer links ↓
- 12-16x faster ↓
- Mgd. Devices 1 vs. 98 ↓
- L2 & L3* ★



6000 ports²

- 1/3 fewer devices ↓
- 77% less power Savings: \$360K/Yr ↓
- 90% less floor space ↓
- 85% fewer links ↓
- 12-16x faster ↓
- Mgd. Devices 1 vs. 193 ↓
- L2 & L3* ★



1: Multi chassis LAG like

2: TRILL like

*: Non-Blocking

Timing

- QFX3500 ships in this quarter

- QFabric is in customer trials

- QFabric ships in Q3 2011

Future directions

Scale up – Mega-Fabrics

10s of 1000s of 10GbE ports,
100s of thousands of
Virtual Ports

Scale down – Micro-Fabrics

50-750 ports

**40 GbE and 100 GbE
access speeds**

**Provide a fully blended
fabric with full fibre
channel services**



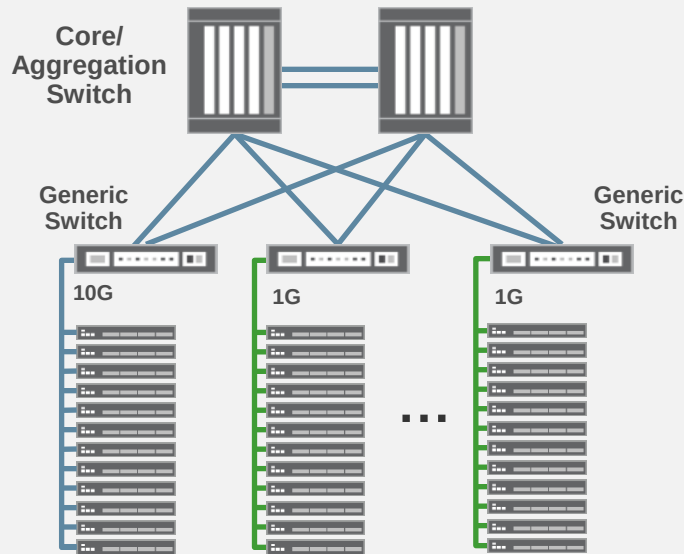
everywhere

BACKUP



Migration scenario #1: High Performance Access

Before (1GbE Access)

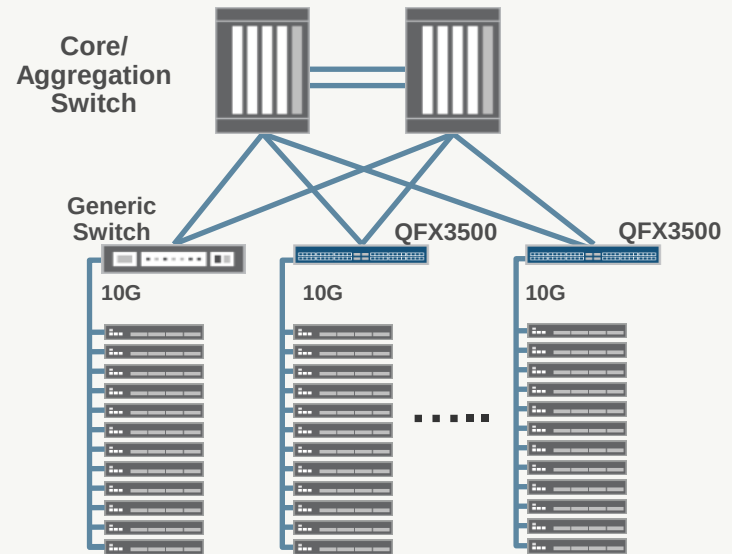


Limited performance

Challenges

Server virtualization increasing network utilization and requiring 10 GbE access connectivity.

After (10GbE Access)



High performance and low latency

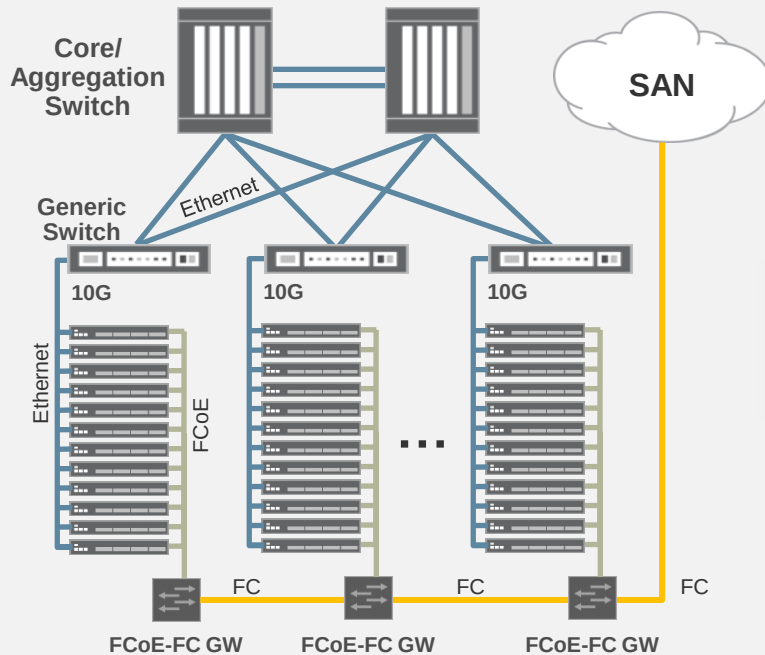
Solution

QFX3500 wire-speed 48x10G and 4x40G ports, with ultra low latency, low power consumption and compact design (1RU)

Migration scenario #2: Converged Access

Before

Non-Converged Access
(10G)

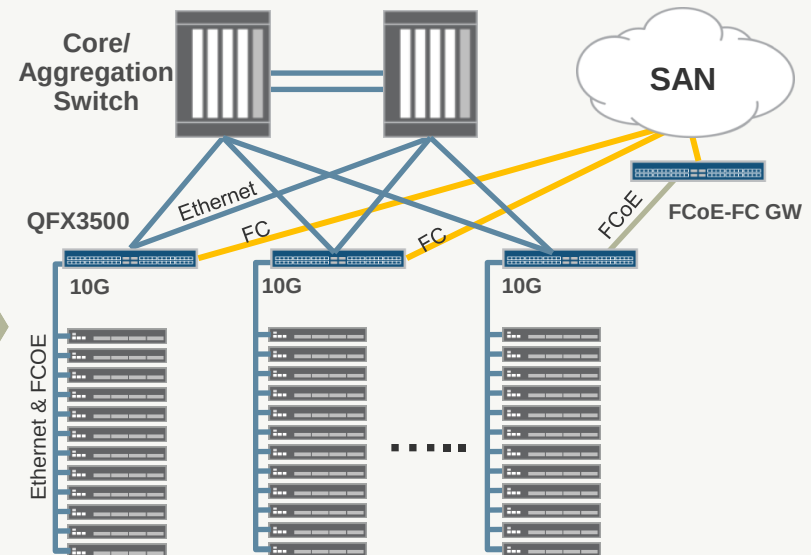


Challenges

Operational simplicity by preserving existing investments in SAN and LAN infrastructure and reduce management complexity.

After

Converged Access
(10G)

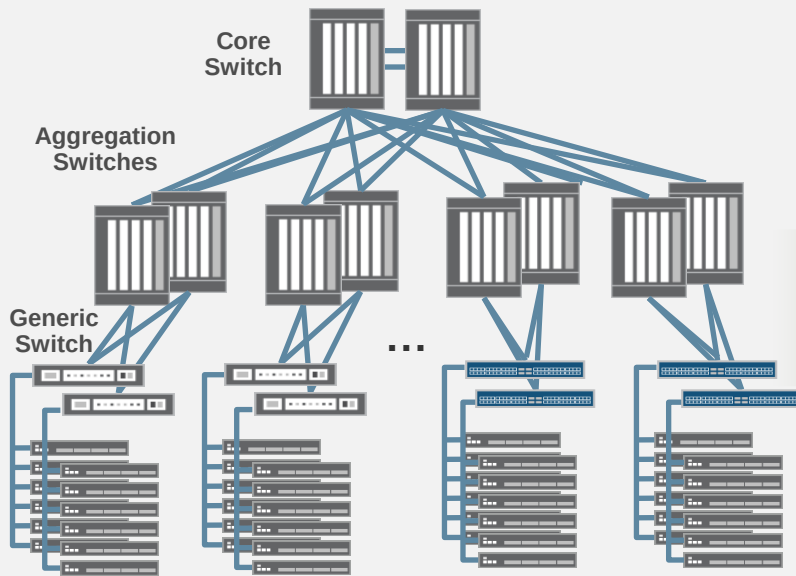


Solution

QFX3500 support standards-based FCoE and DCB features. QFX3500 is a ultra low-latency, lossless switch with 12 FC ports.

Migration scenario #3: Cloud-ready

Before (Traditional)

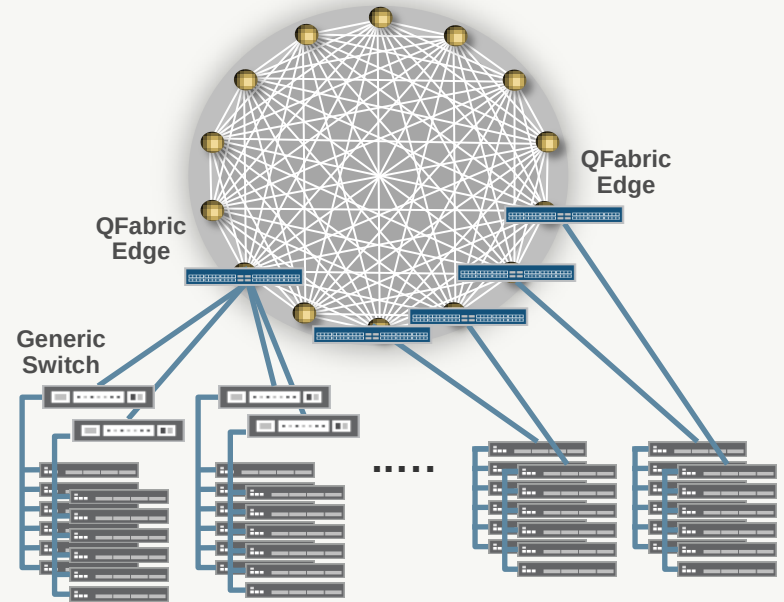


Limited Scale

Challenges

Traditional multi-tiered architectures are too complex and inflexible. Cost increase exponentially as network grows.

After (QFabric)



Exponential Scale

Solution

The QFabric architecture provides a quantum leap in performance, scale and simplicity. Scales from few hundred to thousands of ports.

SECURING THE VIRTUALIZED DATA CENTER





And Virtual Security

- Data center scale and virtualization driving enforcement and compliance requirements in both physical and virtual environments
- Physical security is not enough
 - enforcement flexibility needed
 - security services at any location on any flow
- Best in class approach
 - hardware efficiency for physical security
 - software efficiency for virtual security

SECURITY IMPLICATIONS OF VIRTUALIZATION:

Dynamic VMs create blind spots and Increase Risk

VMworld 2010 Survey Respondents

- 55% Move VMs multiple times per day
- 70% Consolidating mixed trust workloads
- Lack of clear responsibility for virtualization security

Inter VM traffic is handled by the vSwitch

- Flows between VMs on the same machine don't go through the physical security infrastructure

VMs change all the time

- At-a-click provisioning means new VMs sprawl in number and may proliferate risky configurations

VMs move

- VMs can migrate between trust zones automatically and security configuration is not tracked



virtualized Data Center Security Strategy



Securing across Physical and Virtual

- New visibility into virtualization security blind spots
- Visibility and enforcement for any flow in the fabric



Adaptive security for dynamic changes

- Visibility and enforcement for new, changing and moving Virtual Machines
- Automated VM detection and intelligent enforcement



Part of the Data Center Fabric

- Maximize resource use by eliminating stranded security capacity
- Efficient delivery of security services at scale (no shadow problem)

Building A data center security Solution

Management and Security Services



**Security
Design**



**Security Threat
Response Manager**



Physical



SRX Series

← Services →



Firewall



IPS



DoS Protection



AppSecure

Virtual



vGW Series

Hypervisor



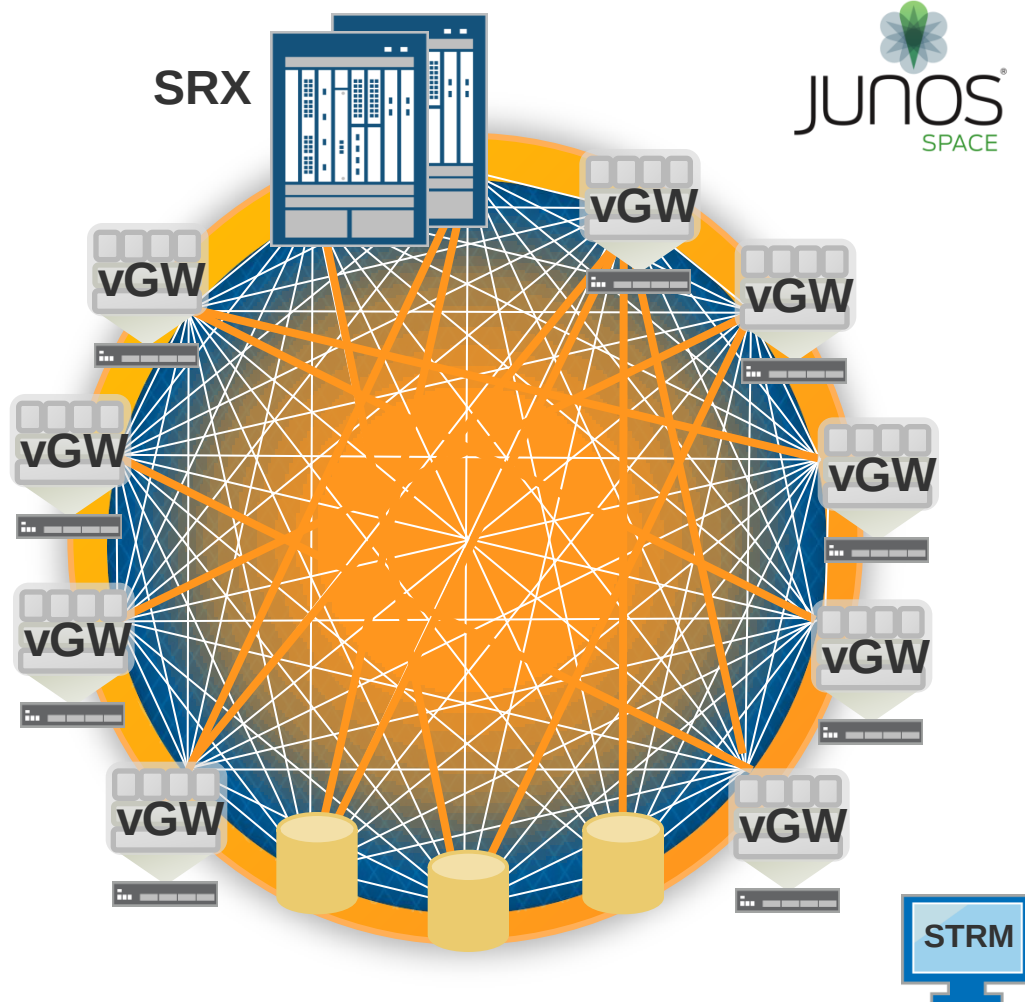
vGW Series

INTEGRATING SECURITY AS PART OF THE FABRIC WITH THE SRX & vGW SERIES

Only solution to integrate
physical and virtual network
security

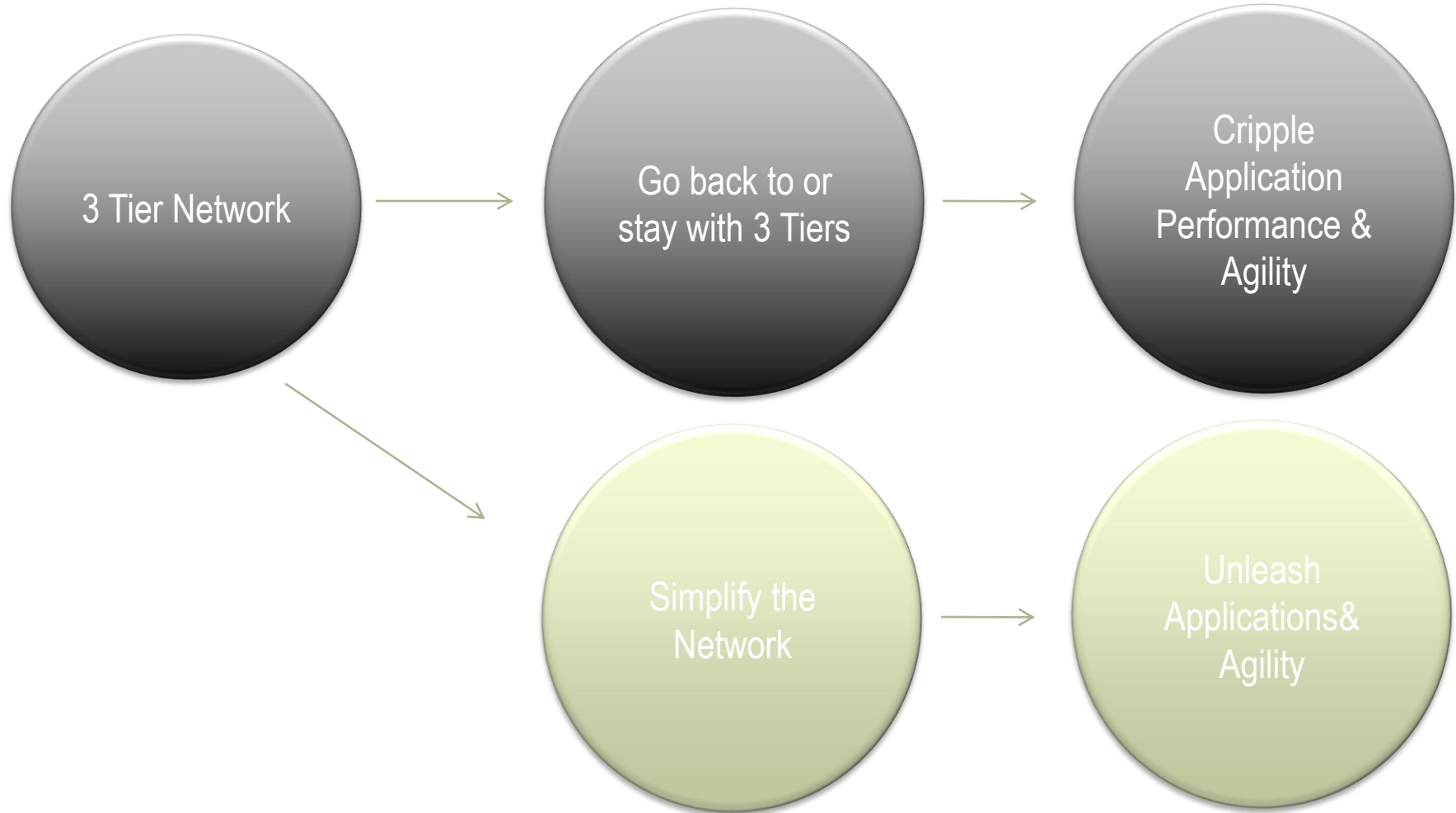
First to visualize all traffic
flows in the data center

Allows 5x more secure VMs
per ESX host than
alternatives



- **1. How can maximize the lifetime of server & app investments?**
- **2. What is the best way to move traffic around the datacenter?**
- **3. What is the best way to connect datacenters, colo, & cloud?**
- **4. How can you secure both physical and virtual traffic flows?**
- **5. Can you do all of the above while simplifying the infrastructure and reducing spend?**

The fork in the road – 10G & Distributed Apps



How does this translate to juniper?

MOBILITY



NEW APPLICATIONS



ECONOMICS & IT PRODUCTIVITY

Agility



**Pulse
Unified Access Control
WLAN**

**Don't lock the app to the
network.
Enable Change**

**Service Now
JUNOS Rollback / Skills
Transferability
Safe to Migrate**



THANK YOU!

