University of Oklahoma

Network Connectivity

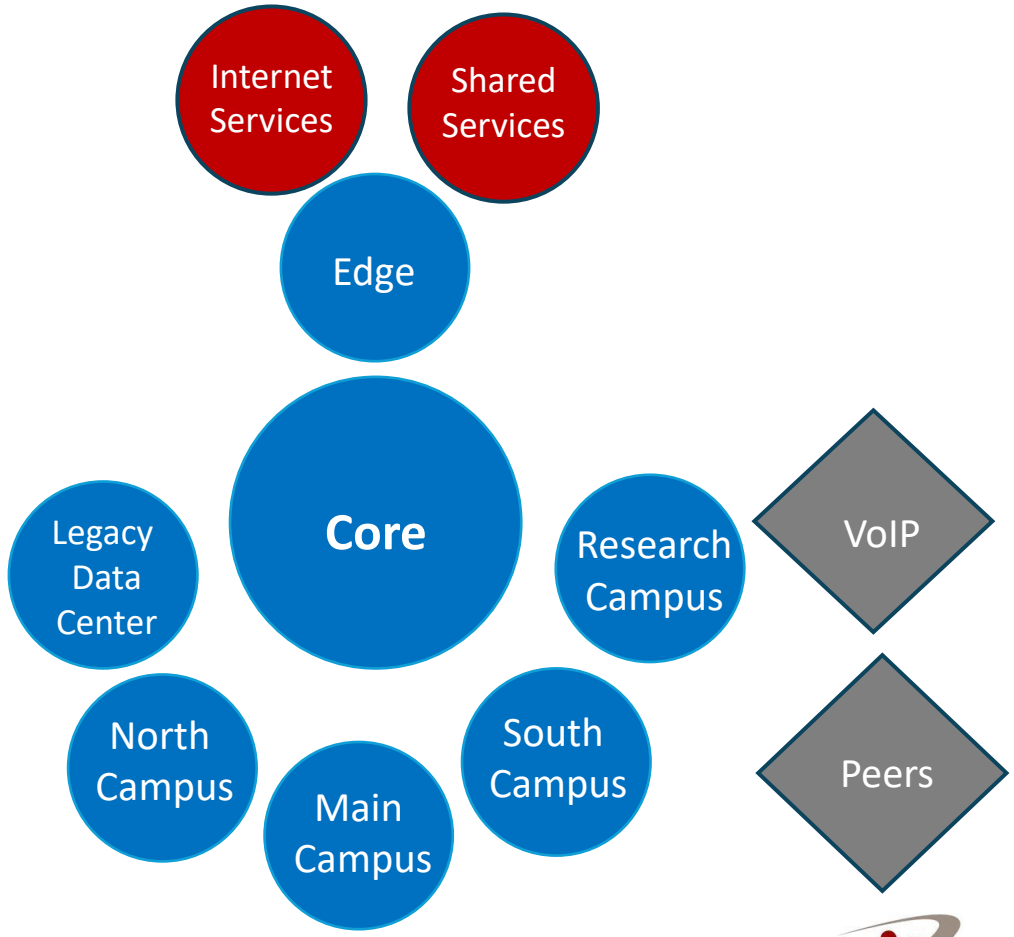
INFORMATION TECHNOLOGY
THE UNIVERSITY OF OKLAHOMA

Connection Suite

- **Three Campus Location**
  - Norman
  - Oklahoma City
  - Tulsa
  - Cameron University
  - Rogers State University

- **Four Geographical Location**
  - North Campus.
  - Main Campus.
  - South Campus.
  - Research Campus.

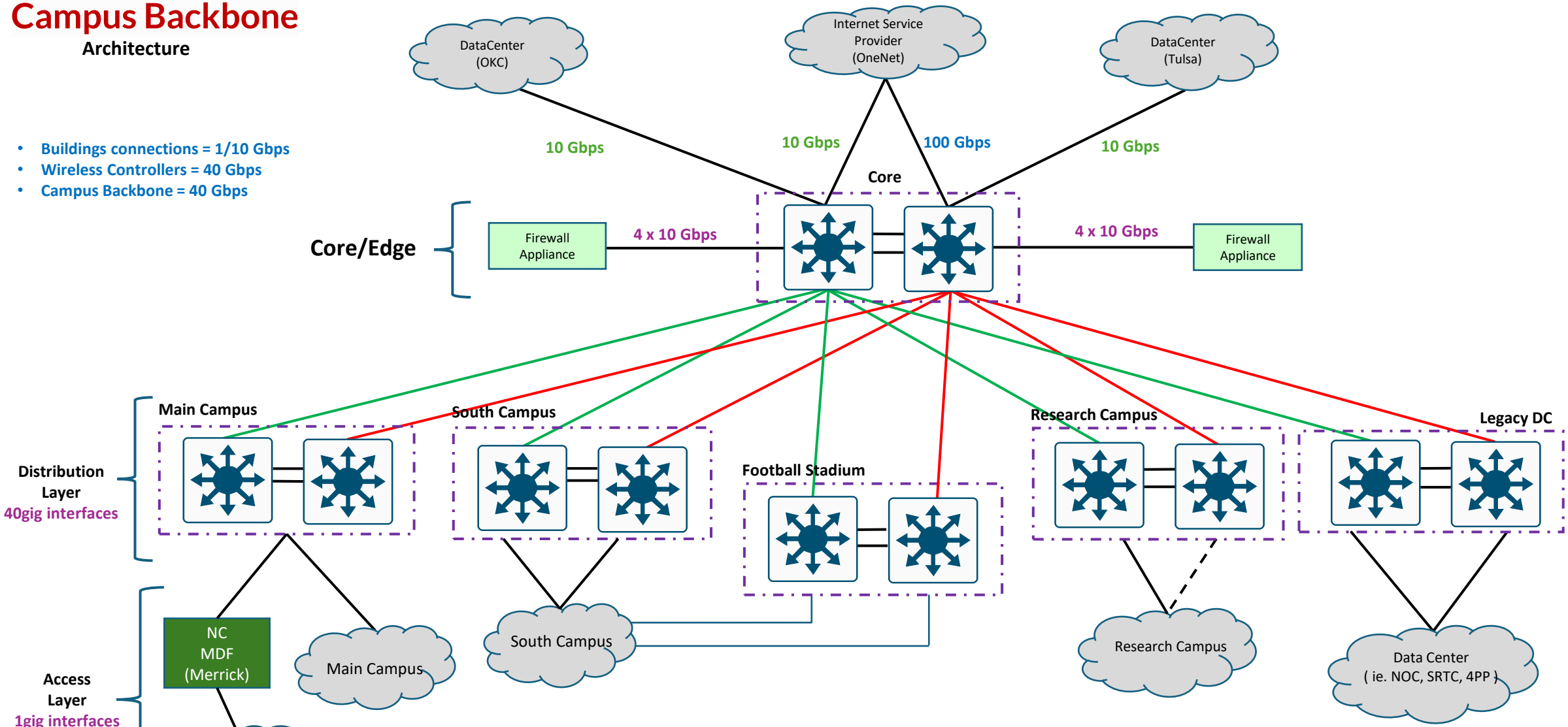
- **Functional Connections**
  - Internet Connectivity
  - Campus Connectivity
  - Local Data Center (aka Legacy DC)
  - Data Center (aka S2 DC)
  - VoIP
  - Peering Connections



Campus Backbone

Architecture

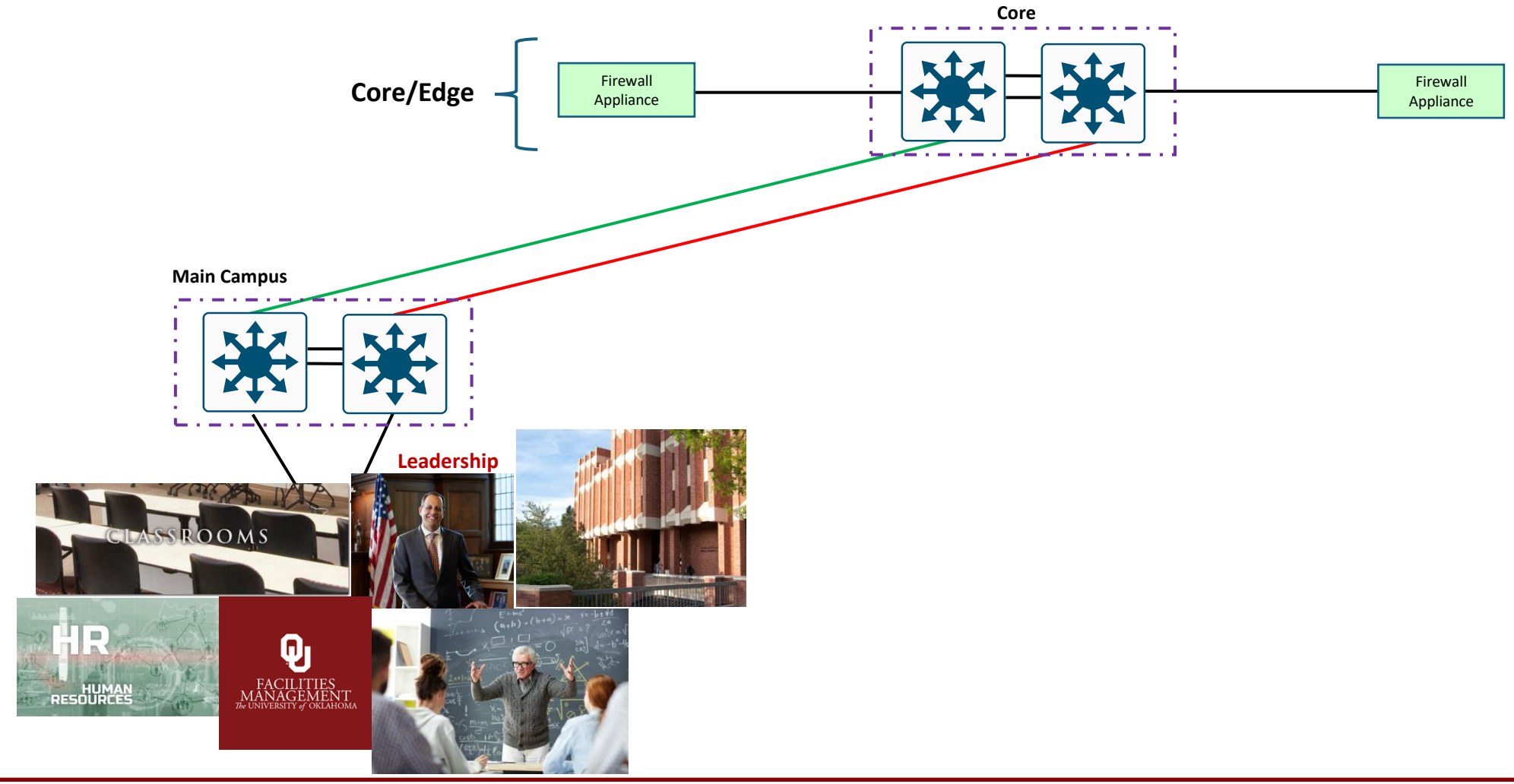
- Buildings connections = 1/10 Gbps
- Wireless Controllers = 40 Gbps
- Campus Backbone = 40 Gbps



Campus Architecture

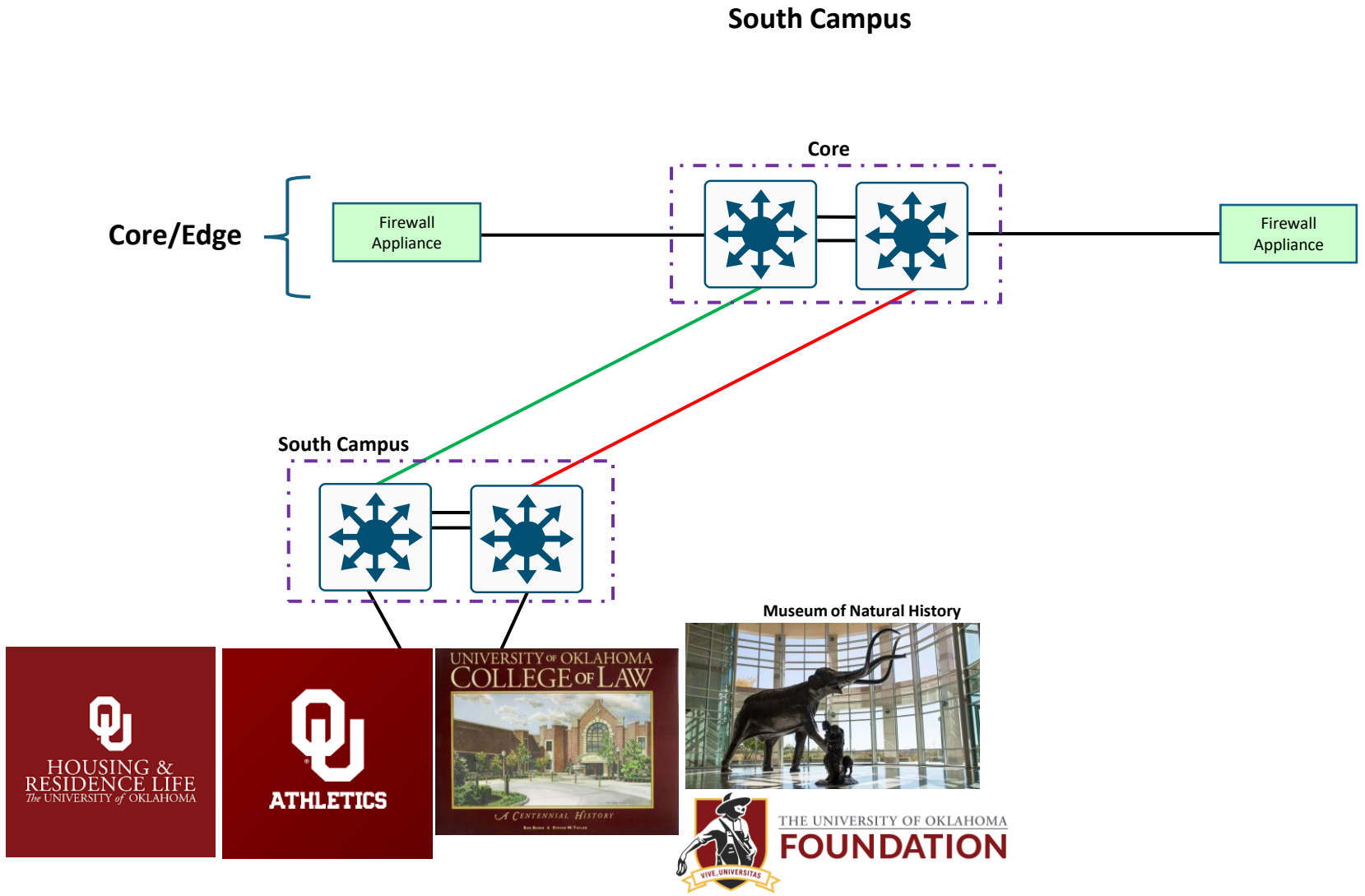
Geographic Locations

North & Main Campus

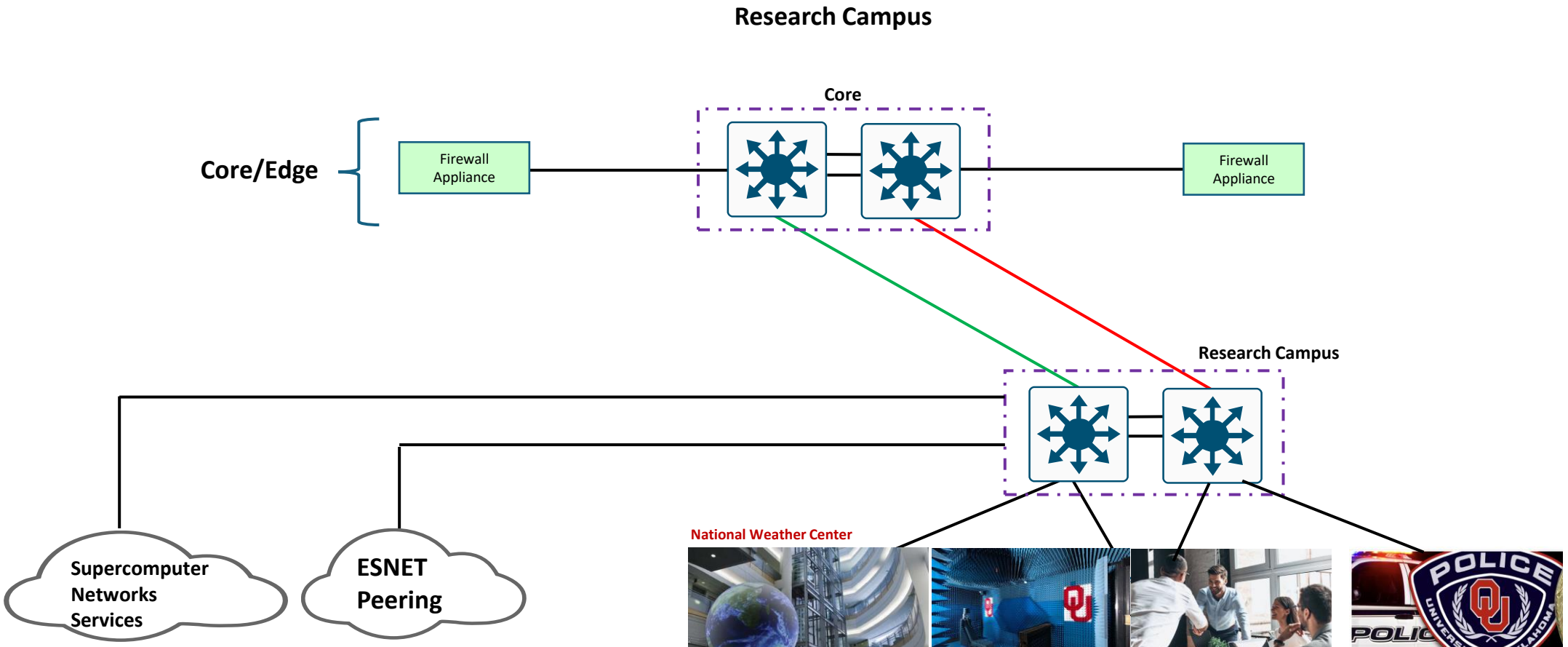


Campus Architecture

Geographic Locations



Campus Backbone

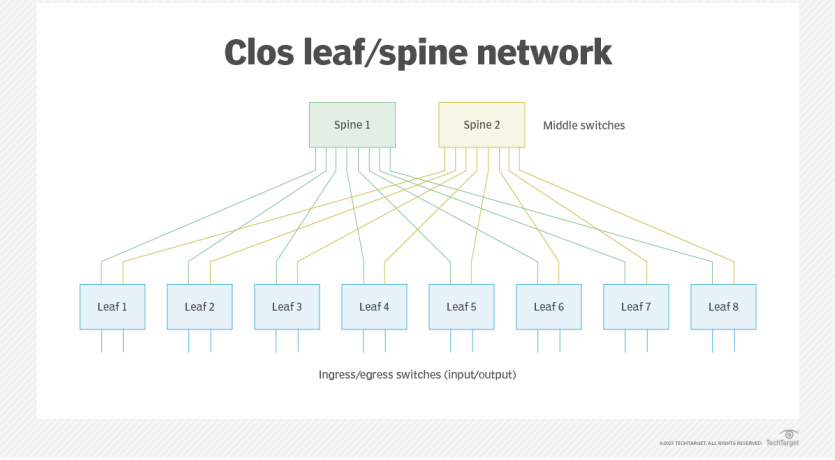


* OU Research Disk (OUR Disk) is a ceph infrastructure. It provides a high performance disk resource that is available both on OU IT's supercomputer, servers in the data center and devices residing on campus.

Solutions @ Work

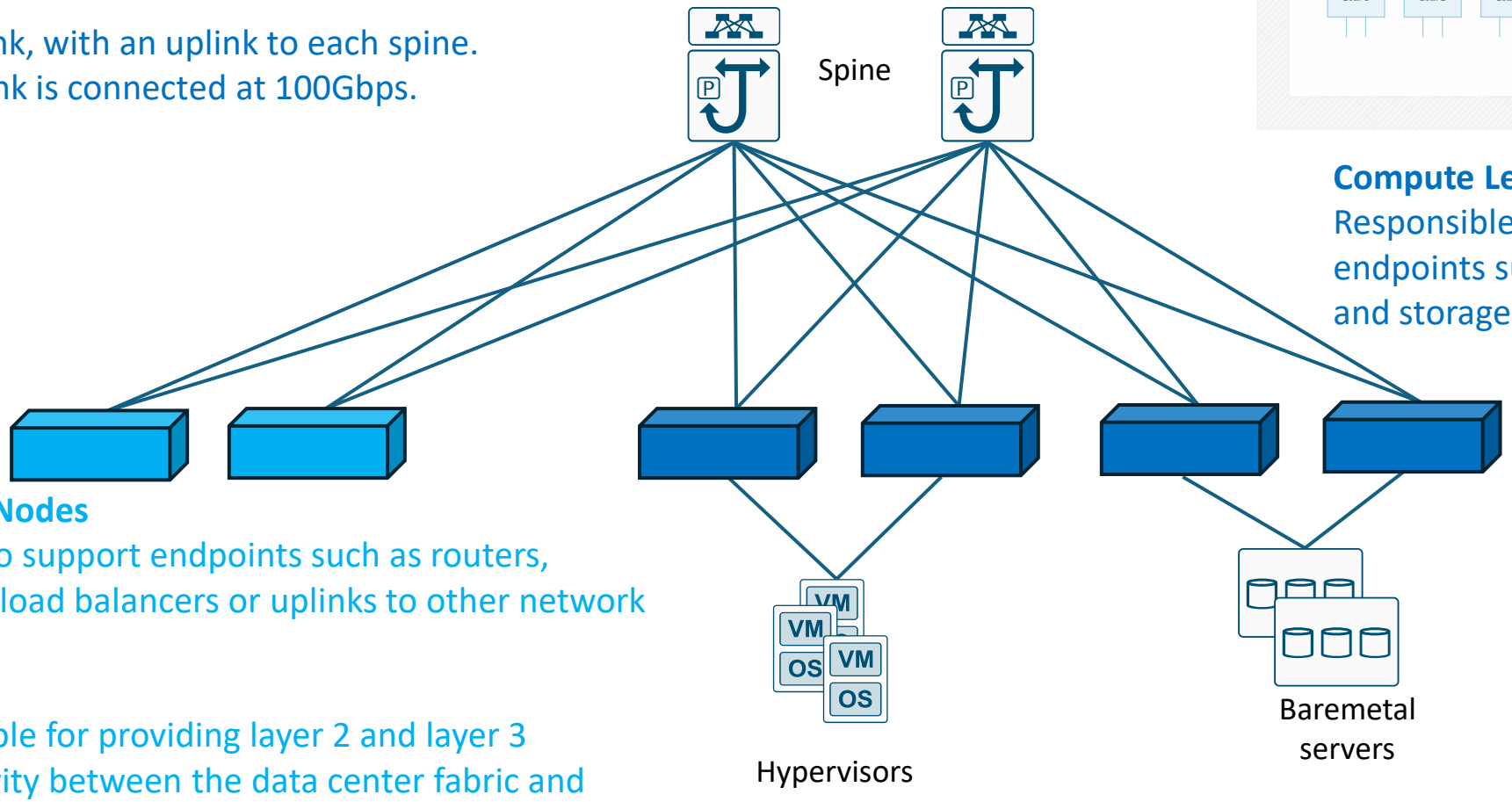
Data Center Network Architecture

Network Architecture



Leaf Nodes

- Dual uplink, with an uplink to each spine.
- Each uplink is connected at 100Gbps.



Compute Leaf Nodes

Responsible for providing connectivity to endpoints such servers, compute nodes and storage appliances.

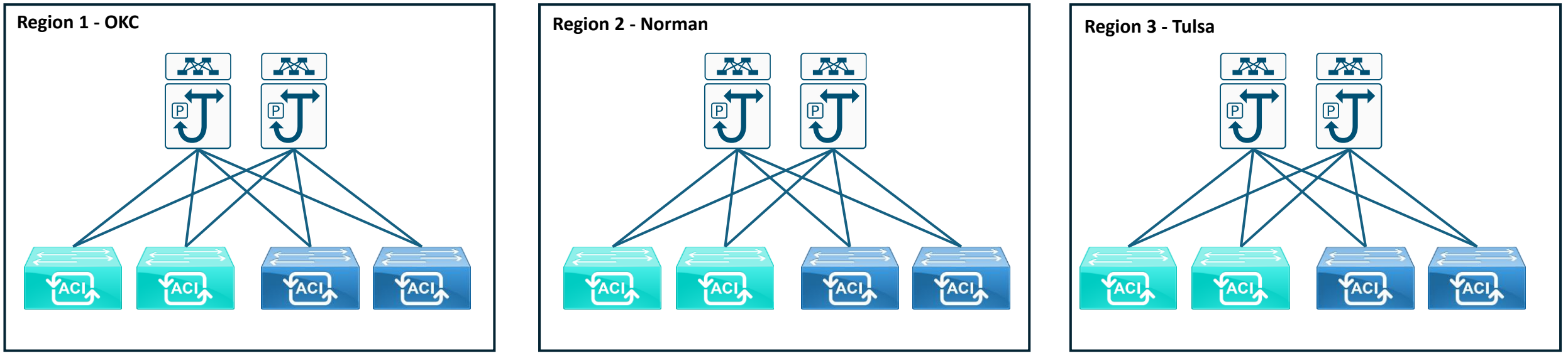
Border Leaf Nodes

- In place to support endpoints such as routers, firewalls, load balancers or uplinks to other network devices.

- Responsible for providing layer 2 and layer 3 connectivity between the data center fabric and anything outside of the data center.

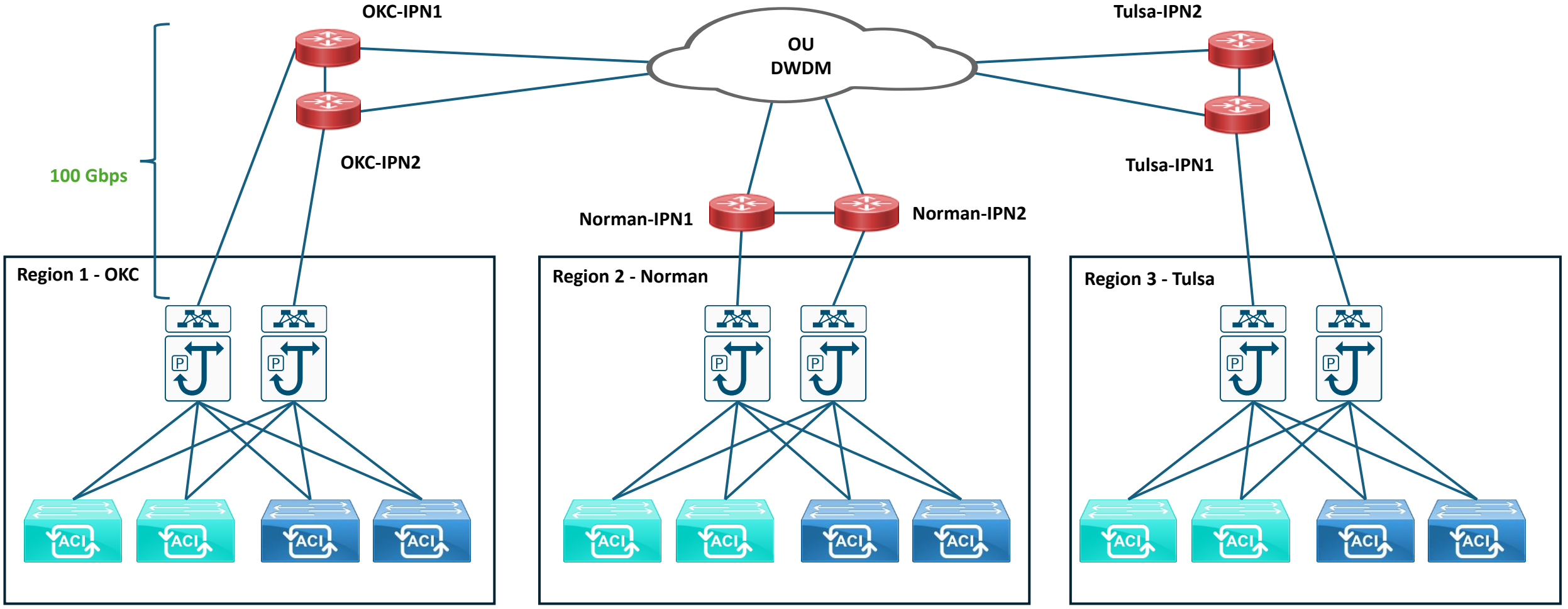
Multi-pod Deployment

Ease of Administration: Single data center fabric and single management cluster.
Resiliency: Each pod runs its own instance of a control-plane. A pod failure does not impact another pod.



Multi-pod Deployment East / West Traffic

- An Inter-Pod Network (IPN) is deployed at each pod. This provides Pod-to-Pod communication (also known as east-west traffic).
- The IPN represents an extension of the ACI fabric underlay infrastructure.
- All inter-pod traffic is encapsulated with VXLAN



Hardware

Model	Topology Layer	Media	Port Speeds	Port Quantity Per Switch
N9K-C9364C-GX	Spine	QSFP+	100 Gigabit Ethernet	64 x 100 Gigabit Ethernet
N9K-C93180YC-FX3	Leaf	SFP+	10 Gigabit Ethernet 25 Gigabit Ethernet 100 Gigabit Ethernet	48 x 10/25 Gigabit Ethernet 6 x 100 Gigabit Ethernet
Nexus 93108TC-EX	Leaf	Copper	100 Megabit Ethernet 1 Gigabit Ethernet 10 Gigabit Ethernet 100 Gigabit Ethernet	48 x 100 Mbp, 1,10 Gigabit Ethernet 6 x 100 Gigabit Ethernet
N9K-C93600CD-GX	IPN, Leaf	QSFP+	40/100 Gigabit Ethernet 400 Gigabit Ethernet	28 x 100 Gigabit Ethernet 8 x 400 Gigabit Ethernet

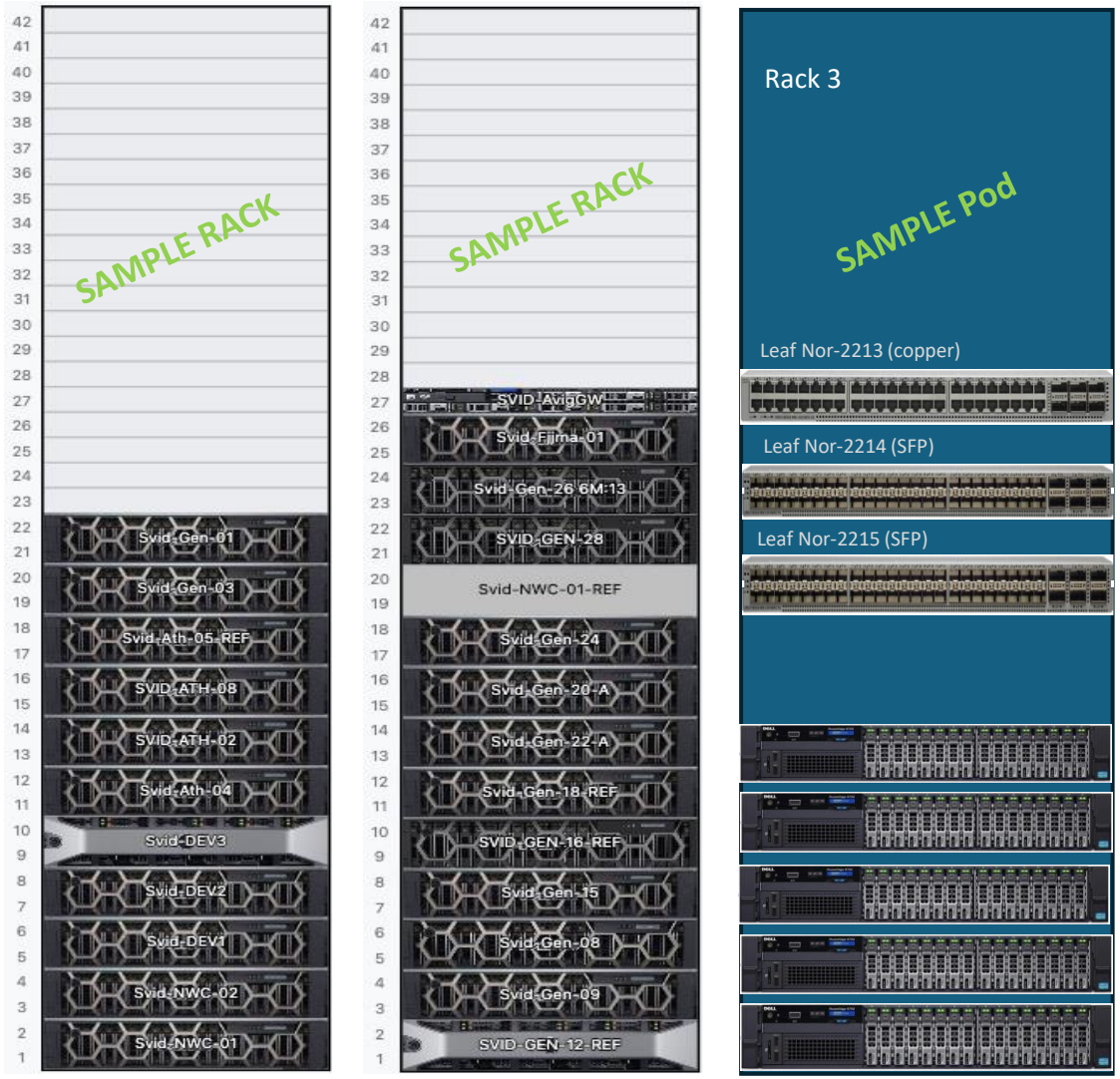
N9K-C9364C-GX

Nexus 93108TC-EX

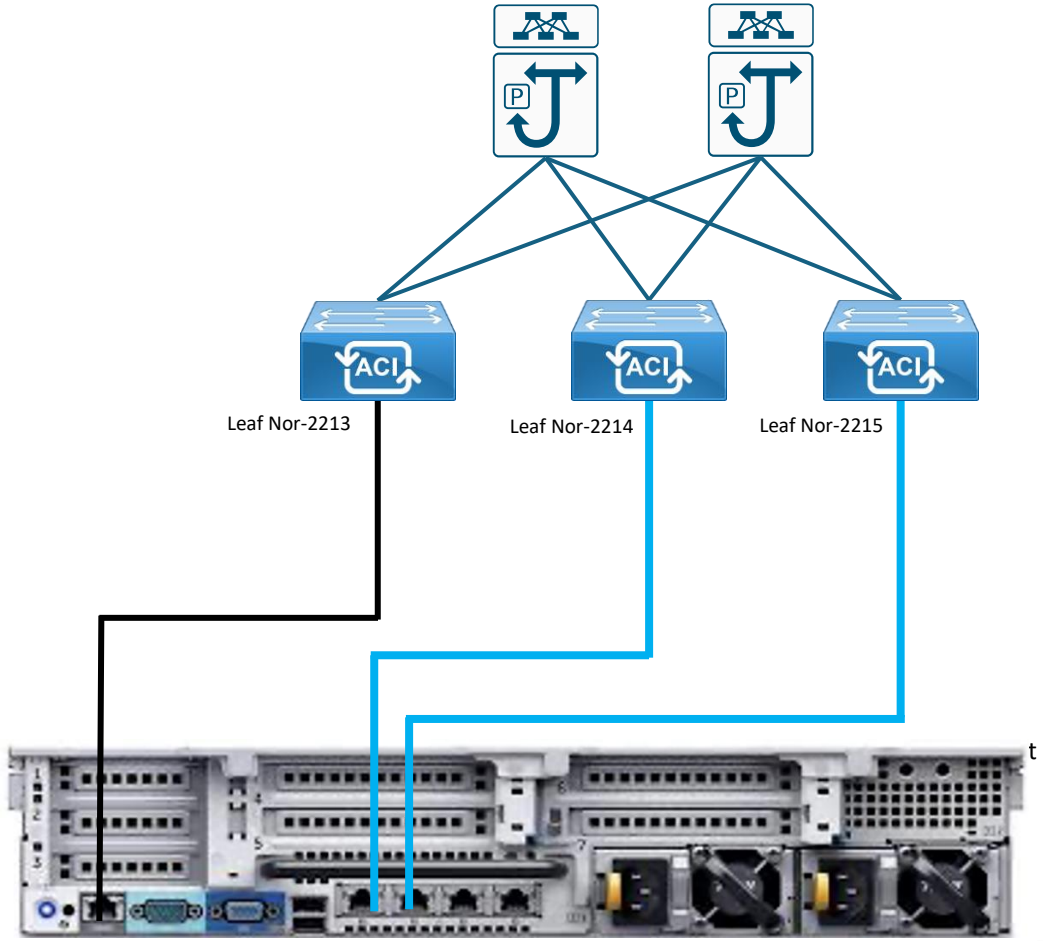
N9K-C93180YC-FX3

N9K-C93600CD-GX

Hosting Endpoints

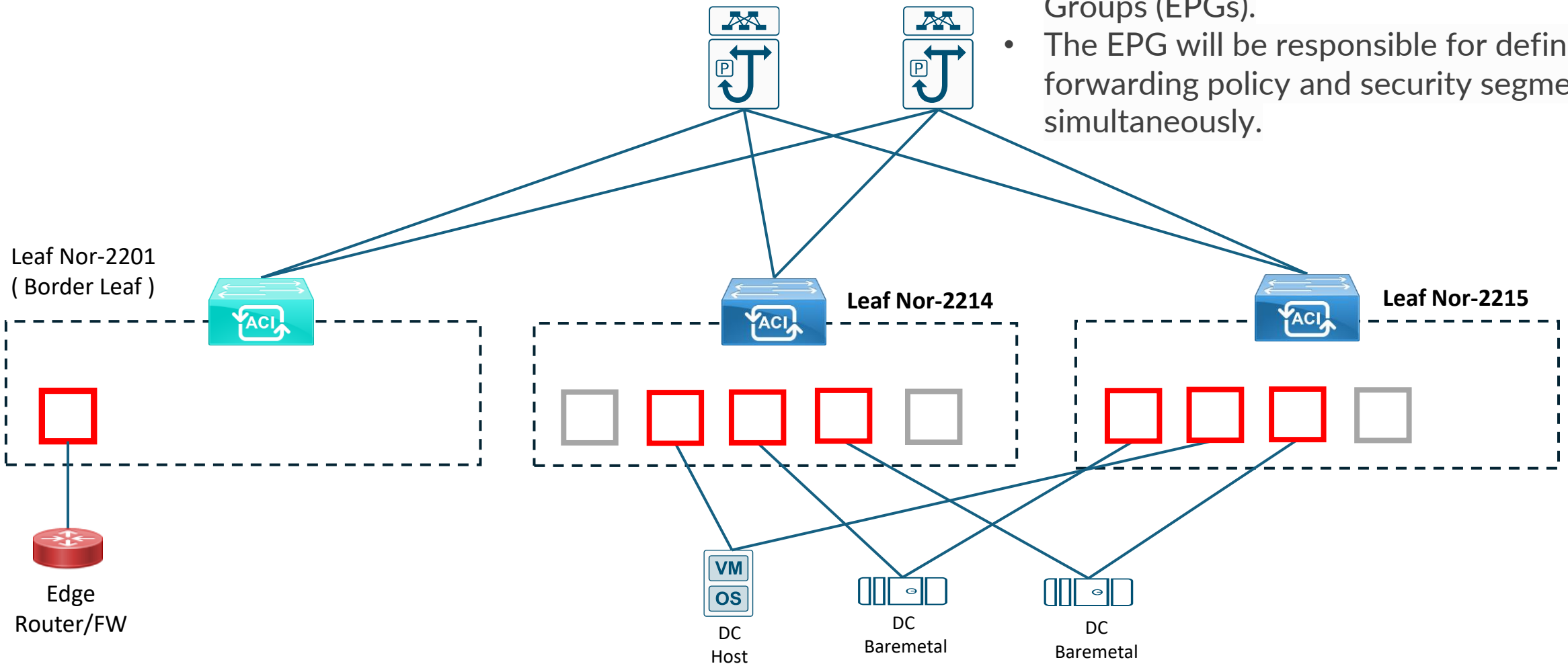


Pod Deployment: 3 switches (1 x copper and 2 x SFP).
Pod supports up to three racks of servers.
Pod supports dual connectivity of servers.



Hosting Endpoints

- Each leaf has the ability to host different endpoints.
- Each port will be assigned to an Endpoint Groups (EPGs).
- The EPG will be responsible for defining both forwarding policy and security segmentation simultaneously.



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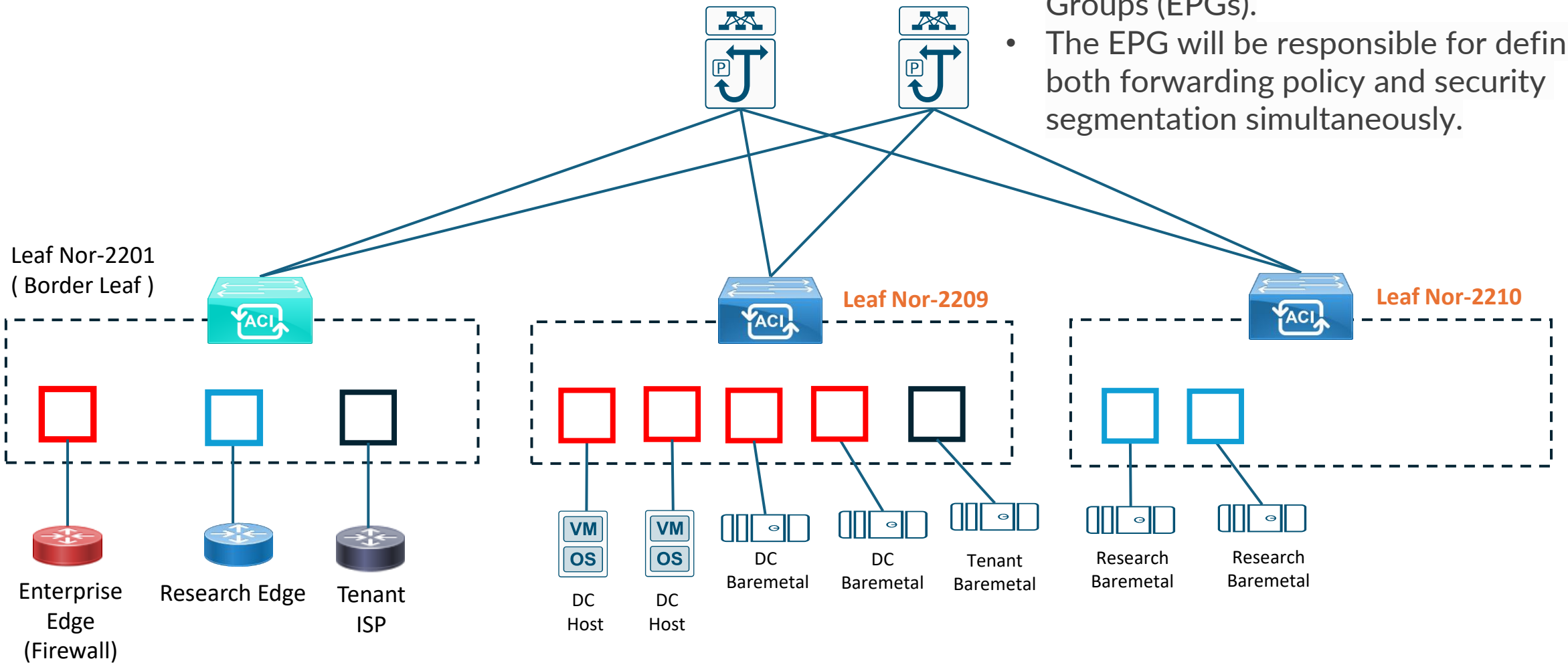
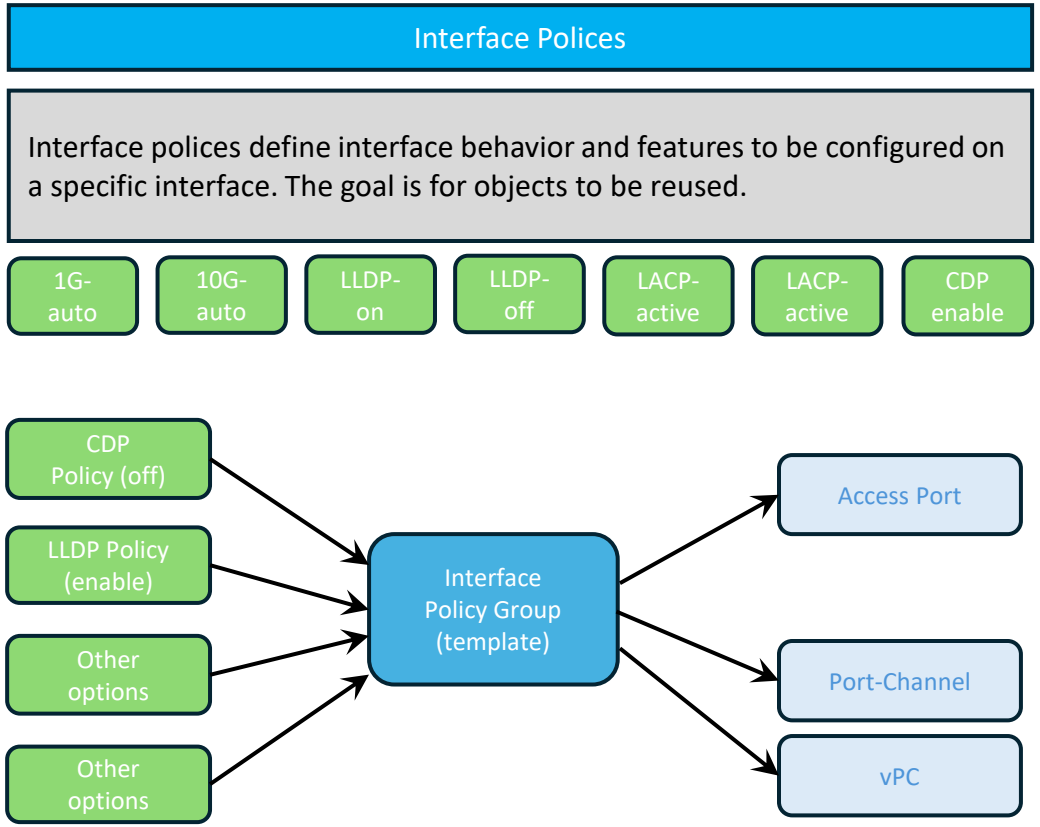


Hosting Endpoints

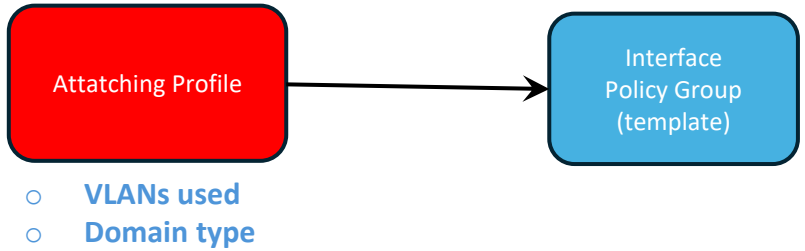
Sample Interface Policy



CEPH_Cloud_Trunk_PolicyGroup
CDP Policy: disabled
LLDP Policy: enable
Attached Entity Profile (VLANs allowed): VLAN 112,212,1062, trunk

Baremetal_Trunk_PolicyGroup
CDP Policy: disabled
LLDP Policy: enable
Attached Entity Profile (VLANs allowed): VLANs 2-200, trunk

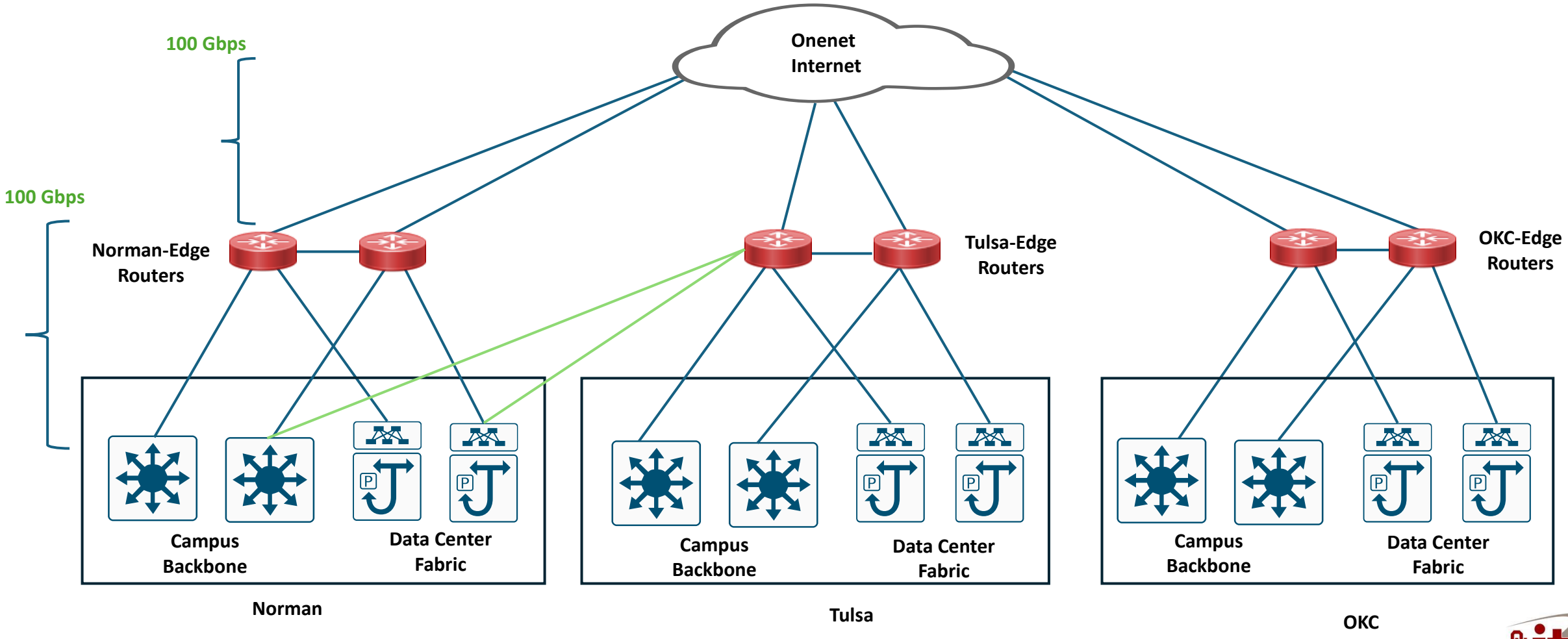
IDRAC_V251_PolicyGroup
CDP Policy: disabled
LLDP Policy: enable
Attached Entity Profile (VLANs allowed): VLANs 251, untagged



Looking Ahead

Edge Routers

1. Tri-Campus WAN Connectivity
2. Internet Connectivity
3. Campus to Data Center Connectivity
4. Physical Connectivity: 100 Gbps



Hardware

Model	Topology Layer	Media	Port Speeds	Port Quantity Per Switch
DCS-7280CR3K-32D4-F	-	-	100 Gigabit Ethernet 400 Gigabit Ethernet	32 x 100 Gigabit Ethernet and 4 x 400 Gigabit Ethernet

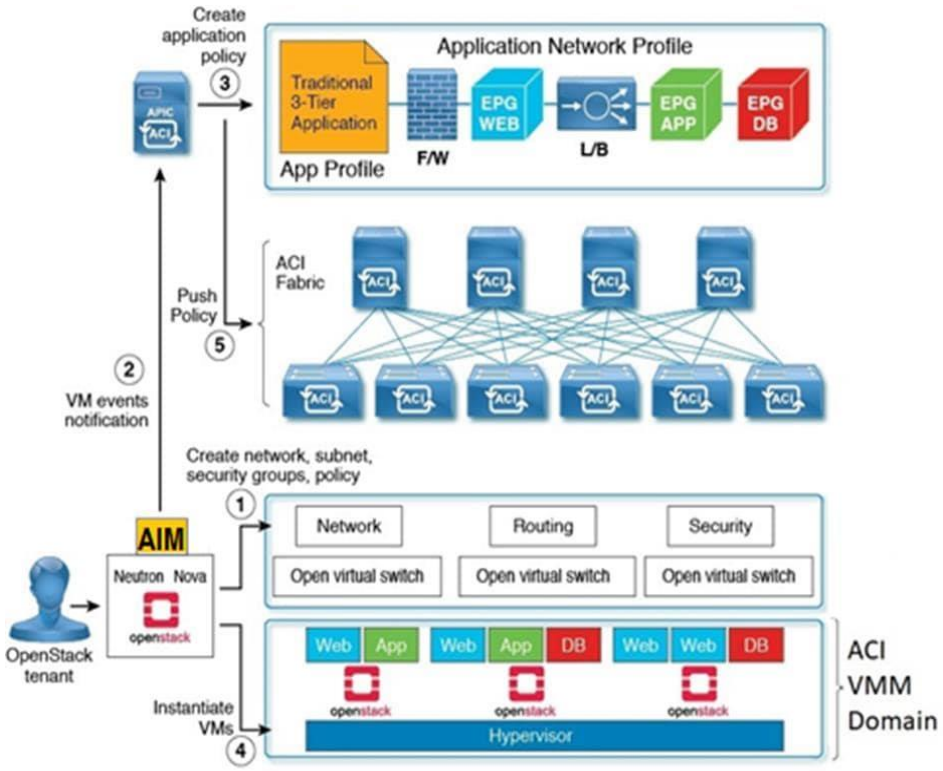
DCS-7280CR3K-32D4-F

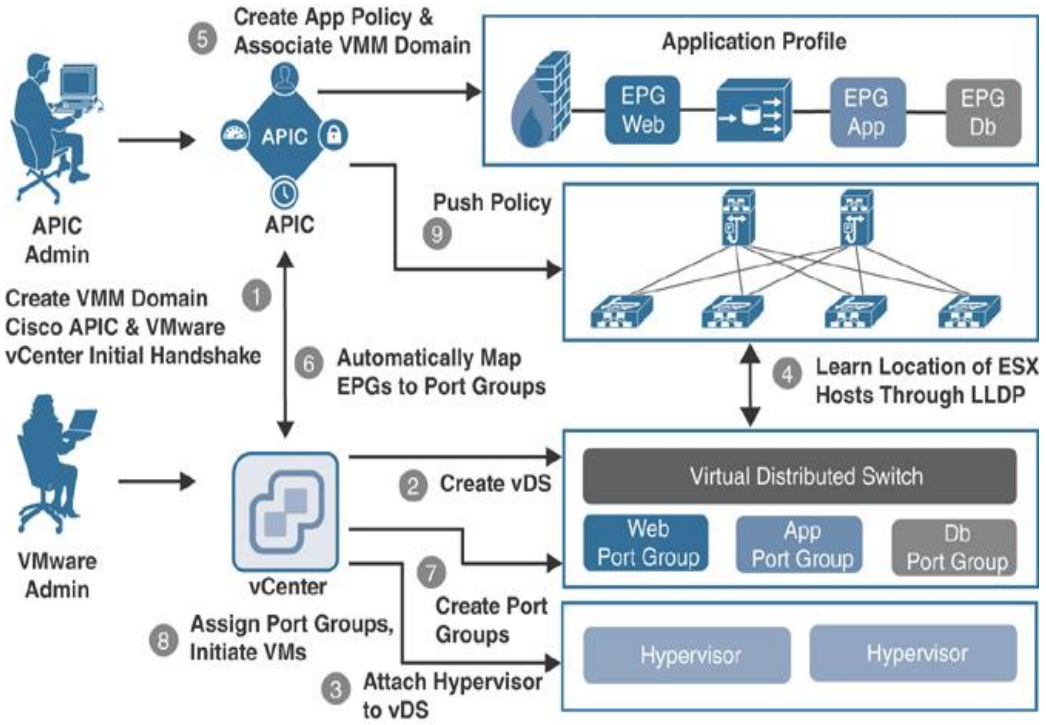
Virtual Machine Managers Integration

- Simplifying tasks by automating network functions.
- Manage network policies in your virtual environment.

ACI Integrates with the following VMM

- Microsoft
- Vmware
- Red Hat
- OpenStack





ACI Integrates with the following Container Domain

- Cloud Foundry
- Kubernetes
- OpenShift

END