Campus Network Design Workshop

Campus Network Design Best Practices

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Network Startup Resource Center

Campus Network Rules

- Separate in layers
- Minimize number of network devices in any path
- Provision central services near the core
- Route near the core, switch at the edges
- Use standard solutions for common situations
- Use DHCP centrally

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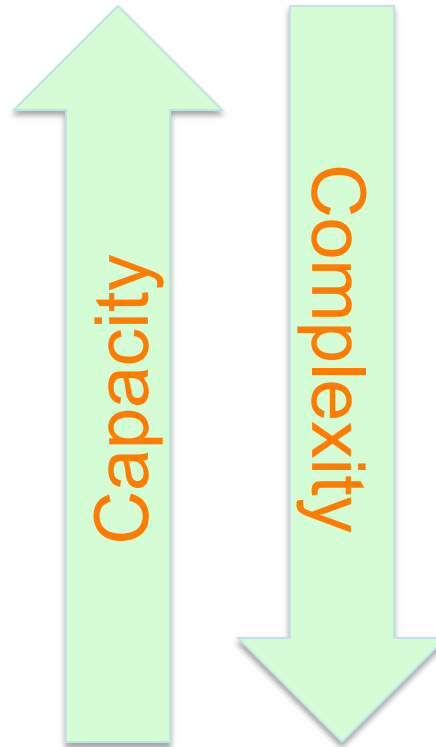
Campus Network Design

- A good network design is <u>modular</u> and <u>hierarchical</u>, with a clear separation of functions:
  - **Core**: Resilient, few changes, few features, high link and CPU capacity
  - **Distribution**: Aggregation, redundancy
  - **Access**: Port density, affordability, security features, many adds, moves and changes
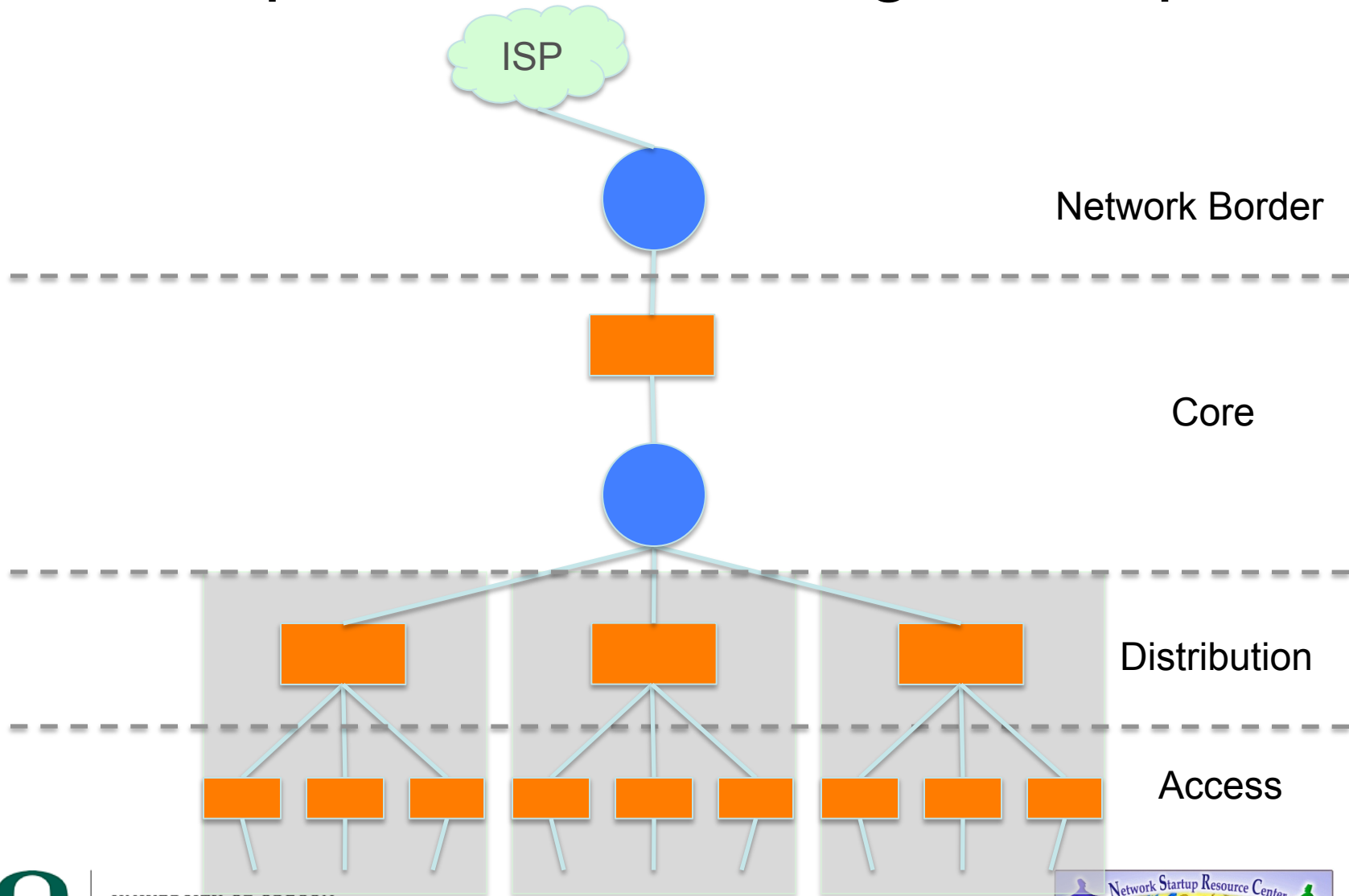
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Layers Features

Core

Distribution

Access

Capacity

Complexity

Campus Network Design - Simple

ISP

Network Border

Core

Distribution

Access

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Campus Network Design - Redundant
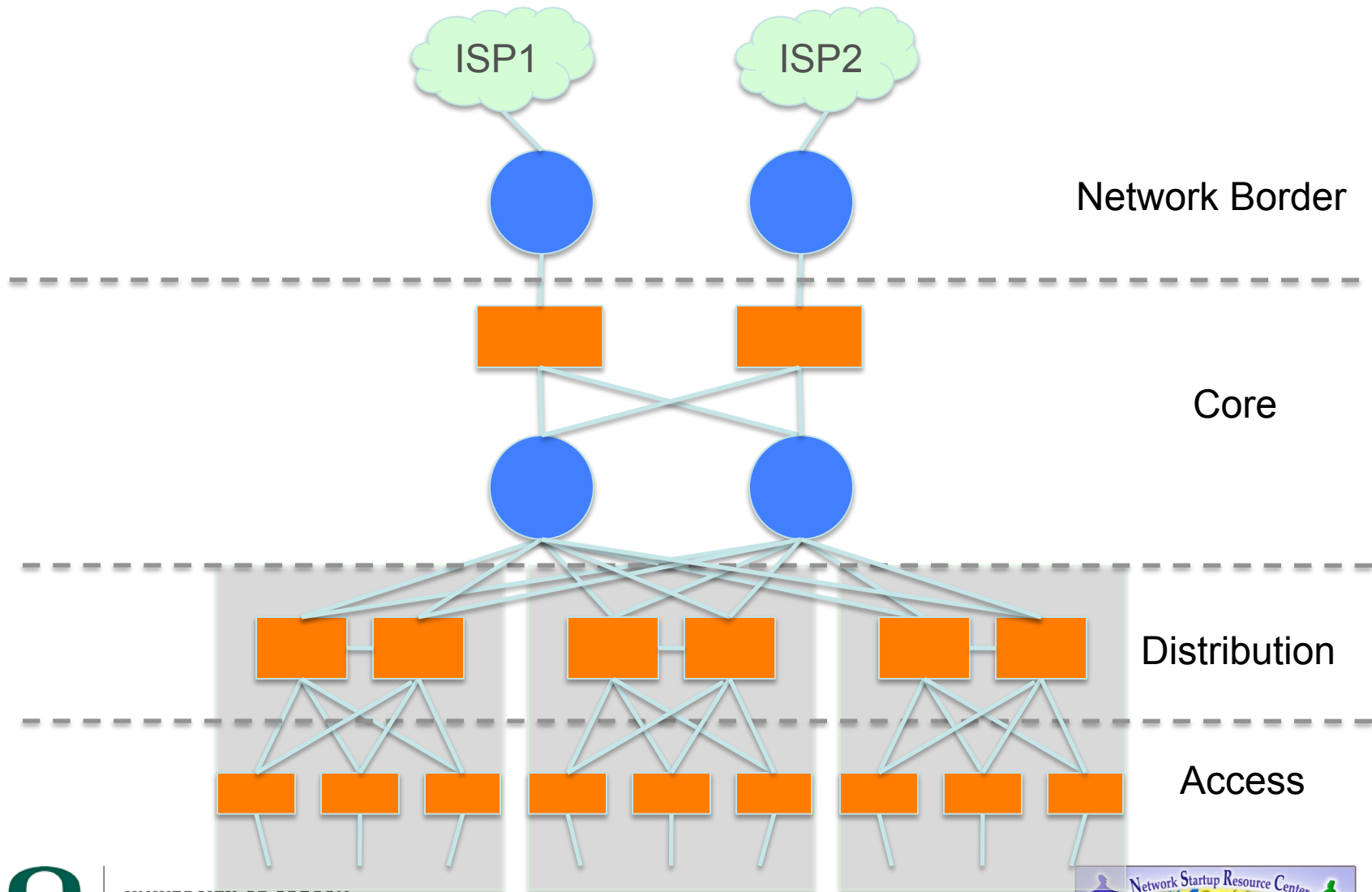
Core Layer

- Core network is the "core" of your network
  - Reliability is key
    - Keep it simple!
  - Always route (not switch) in the core
  - Reliable power and air conditioning
  - As you grow:
    - Add more devices for redundancy or better performance
    - Use dual power supplies fed from separate UPSs

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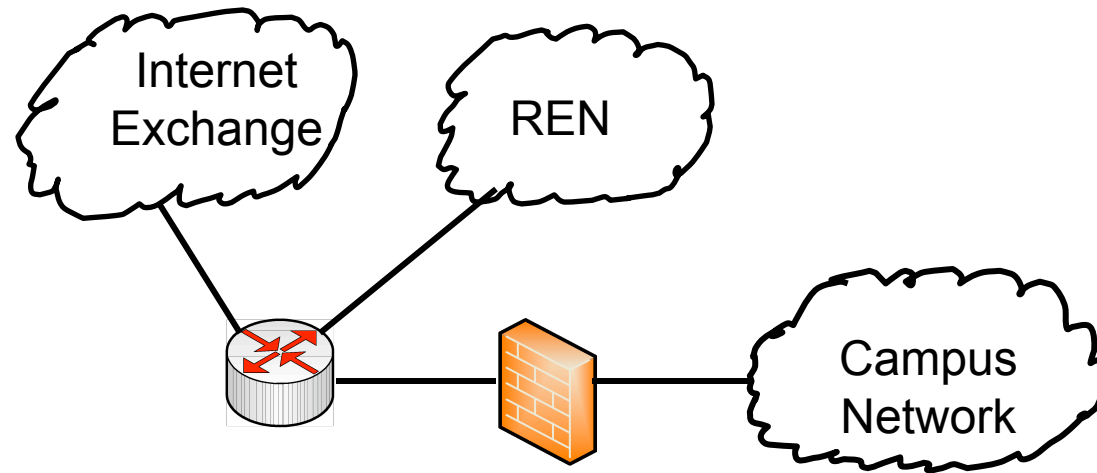
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Separate border from core

- Allows you to provision tools centrally
  - Firewalls
  - Traffic shaping devices
  - Intrusion Detection
  - Intrusion Prevention
  - Network Address Translation
  - Etc.

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Border Router

- Connects to outside world
- RENs and peering are the reason you need them

Access Layer

- Provides service to end users
- Each of these networks should be an IP subnet
  - Plan for no more than 250 Computers at maximum
  - Should be one of these for every reasonable sized building
- Always buy switches that are managed – no unmanaged switches!

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Minimize Number of Network Devices in the Path
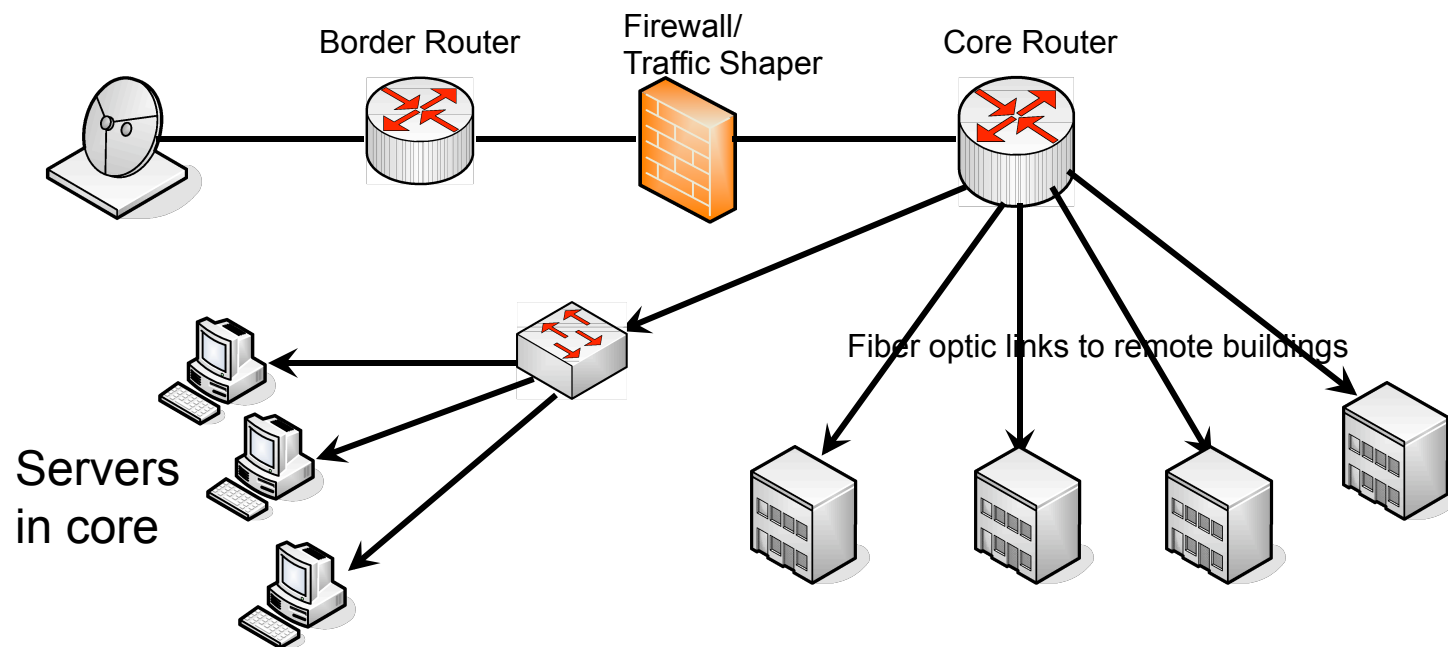
- Build star networks
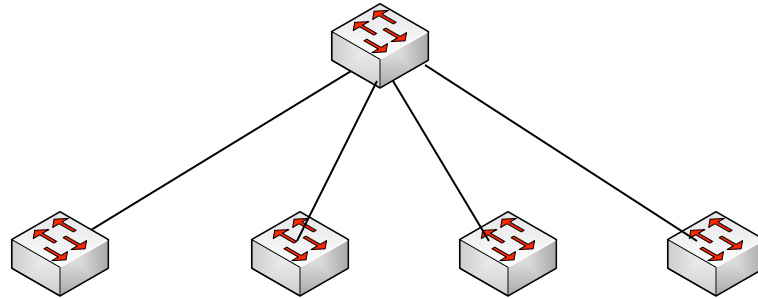
- Not daisy chained networks
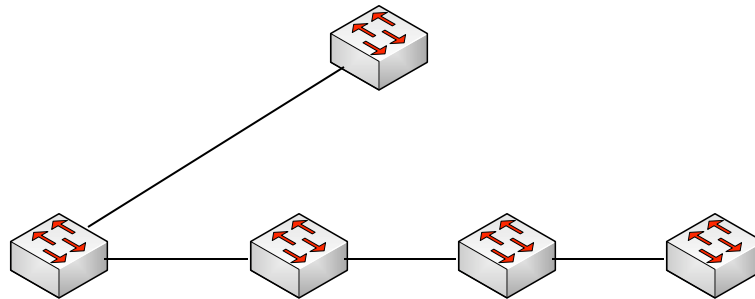
Where to put Servers?

- Servers should be on a high speed interface off of your core router
- Servers should be at your core location where there is good power and air conditioning

Border Router

Firewall/
Traffic Shaper

Core Router

Fiber optic links to remote buildings

Servers
in core

Use open standards

- Avoid using proprietary solutions when possible
  - Keeps your purchasing options open
  - Avoids having to change later
  - Open standards are better understood by more people

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Notes on IP Addressing

- Get your own public IP address space
    - Get your v6 block when you get your v4 one
    - Make subnets large enough for growth
- Use DHCP to assign addresses to individual PCs
    - Use static addressing only for network equipment, printers, and servers

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DHCP

- Dynamic Host Configuration Protocol
  - Used to assign IP address and provide basic IP configuration to a host.

- Simplifies your life <u>greatly</u>
  - Faster
  - Fewer mistakes
  - Easier renumbering

- Should be provisioned centrally
  - Requires relaying across layer 3 networks

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Central DHCP

- In order to centralize your DHCP service, you need a DHCP relay on each subnet
    - Most routers provide this feature
        - Also possible on Linux routers using ISC DHCPD as relay
    - The central server knows which subnet queries are coming from, and assigns addresses from the right pool
- As you grow, add another server and run as a failover pair

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DNS

- DNS reliability is essential to your network
  - No DNS == No services
- Server location
  - On different subnets, off of different routers
  - Air conditioned, dual power supplies, etc.
- Separate duties
  - Authoritative and recursive on different machines

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DNS Authoritative vs. Recursive

Server Function	Information	Target audience
Authoritative	Your domains	The Internet
Recursive	All other domains	Your users

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Questions?

- Thank you.

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