"Network performance, guaranteed lifecycle support and cost-effective extendibility were the critical criteria for our network. Amer's Spine & Leaf design and education-friendly proposals finished in 1st place on each requirement."

– Robert G. Paxman, Academic System Administrator

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B.Y.U. Network Refresh / Upgrade of E.O.L. Network _ 10 gigabit to 40 gigabit CORE

Case Study

System Highlights:

- **Upgrade from 10 gigabit to a 40 gigabit CORE : extendible to 160 Gbps**
- **Phase 1 & 2 Spine & Leaf supports 1,500 ports: extensible to 9,600 ports**
- **48% procurement cost savings, 60% TCO savings over 6-year lifecycle**

Brigham Young University of Provo, Utah required a network technology upgradein their research department.

BYU'S need for 20-gigabit CORE and "end-of-life" urgency equaled opportunity for an Amer Networks 40-gigabit upgrade*at 50% less cost than competing proposals.*

Education technology planners and administrators must continually balance investment verses performance -weighing user demand against severe resource constriction. Each dollar invested in infrastructure means a dollar less for classroom technology, instructor training or curricula investment. This balancing act is made more challenging by the continuous increase in on-line/digital demands in 21st century education. Your network requirements of todaymay be only 50% of network needs 18 months from now.

Extend your Institution's Budget

All Amer switching systems are 100% interoperable with Cisco, H.P. and other legacy systems. Please contact us for a free, "no commitment" trial of our full-district 10 Gigabit network upgrade.

In 2012, Brigham Young University's Chemistry faculty faced the challenge described above. Network throughput demands had doubled in 2 years, and were projected to increase exponentially. A nationally recognized education leader since 1875, BYU's 34,000 students receive the very best of education and resources available anywhere in the nation.BYU executive leadership is determined to maintain this standard.

Robert Paxman, Academic Systems Administrator, was charged with upgrading the network infrastructure within the researchdepartment of the University. The legacy Cisco 4500-based network had been designated end-of-life and, therefore not supportable over the 6-year planning window. The broad requirements were

- a network "refresh" to a minimum 20-gigabit backbone;
- 20 gigabit uplink to the data center;
- 10 gigabit connectivity to IDF closets, supporting approx. 2,000 ports.

A key executiveconsideration was extendibility, eliminating "dead-end investment" and fixing operational costs. "No budget surprises" was the prime executive directive.

I.T. standards and procurement practices required a minimum of three (3) vendor "proof-of-concept" and accompanying fixed cost quotations. Mr. Paxman was unaware of Amer Networks, but was immediately intrigued by the distributed "Spine and Leaf" architecture Amer submitted. Amer implemented a 60-day on-site verification system. During this process, Amer demonstrated three critical enhancements that exceeded BYU base requirements:

1. **Core network capacity at 40 Gbps, extensible to 160 Gbps with only simple component addition, (requiring no system decommissioning, re-configuration or re-deployment);**

2. **Spine & Leaf architecture enables critical performance increases:**
    i. Higher available bandwidth
    ii. Built in redundancy
    iii. Shorter paths between destination (lower latency), enabling near wire speed data transfer between nodes.

3. **Spine & Leaf opens lowest-cost, least-overhead network expansion pathway for6-8 year network planning process.**

Phase 1 of the network refresh was completed in August, 2013, enabling 48 x 10Gbps links, extendable to a maximum 4,600 ports. Phase 2 was competed in January, 2014. Current network topography supports:

- 4 x 40 gigabit CORE network data transmission connections
- 48 x 10 gigabit "Spine and Leaf" connections supporting 1,440 ports and more than 3,000 users

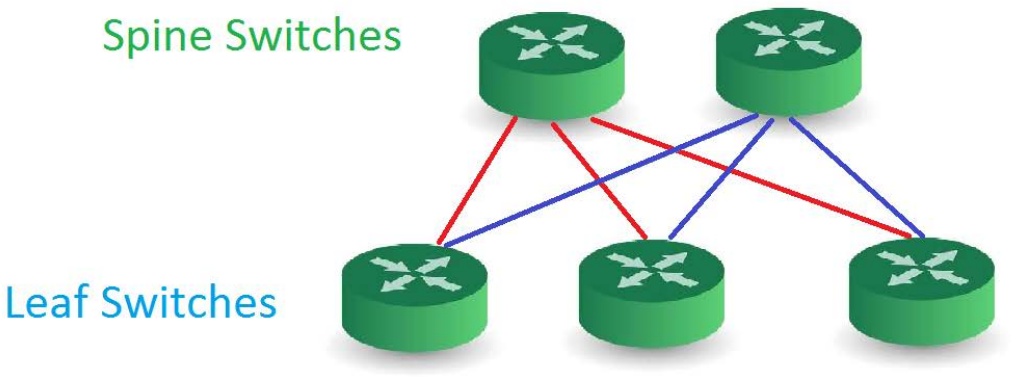

Figure 1: Spine and Leaf Architecture

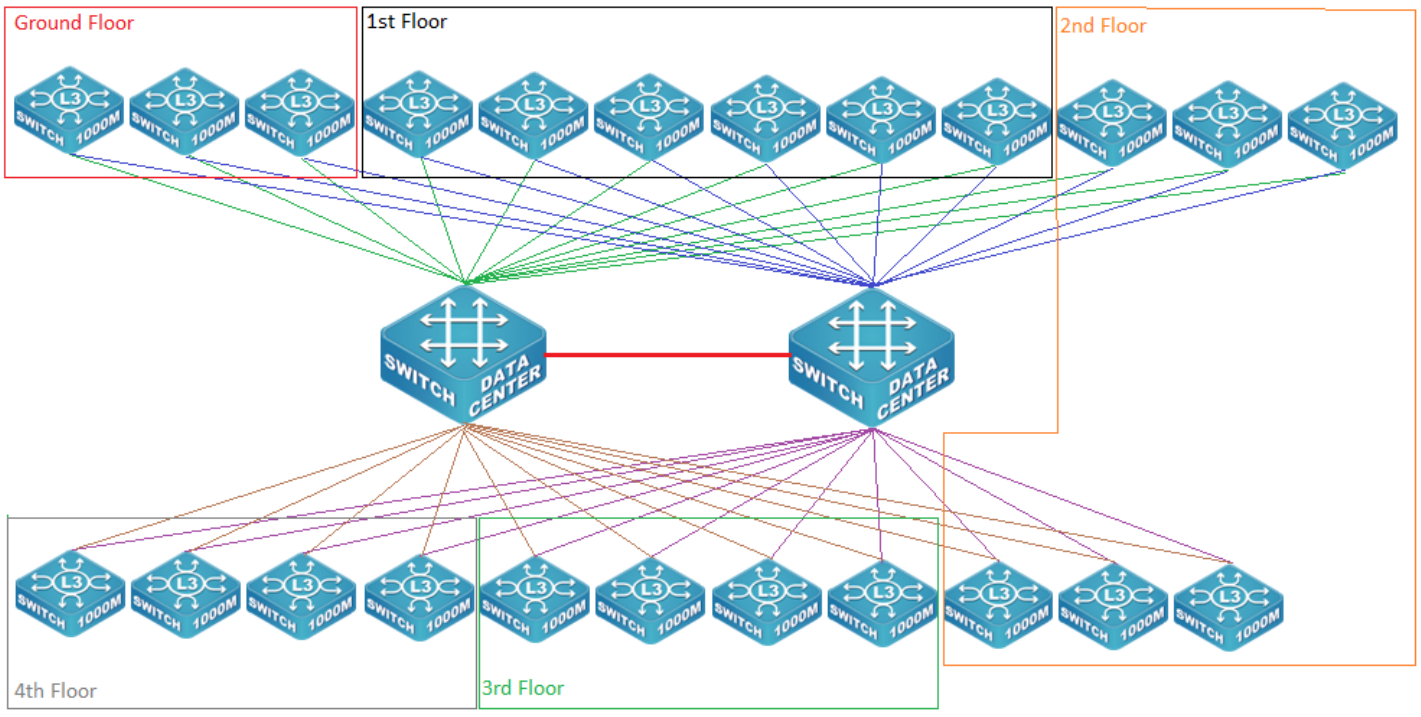

Figure 2: Layout of Spine and Leaf

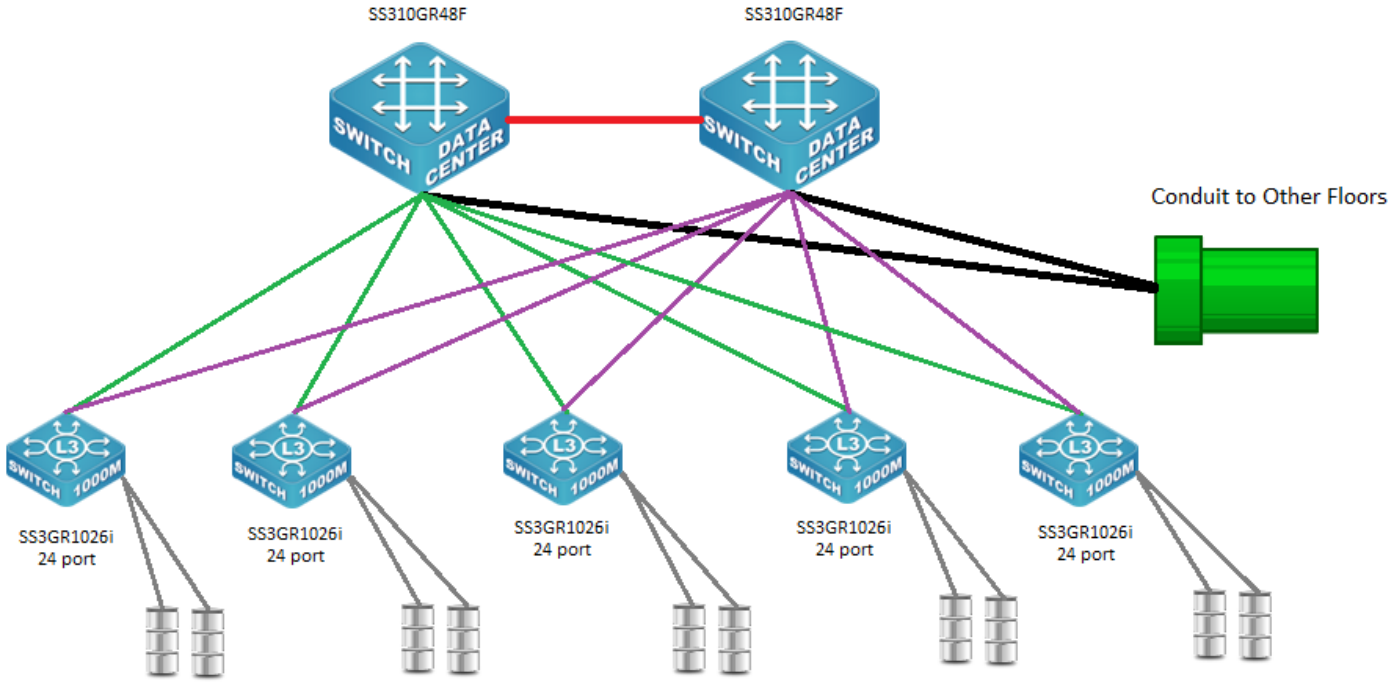

Diagram 3: Alternate Ground Floor Configuration

Phase 1 of the BYU network was implemented using:

- **2 x SS310GR48F:** 48 SFP+ Port Managed Layer 3 10G Stackable Switch with 4 QSFP Ports and Redundant Power Supplies
- **12 x SS3GR1050i:** 44 port + 4 Gigabit Combo+SFP/GT+ ports+2 10G ext. slot, ASIC-based hardware line speed IPv6 Switch

Likesystem proposals were offered between $160,000 - $175,000 on competitor bids. Purchasing from Amer, BYU's **total hardware cost** including switching systems, redundant power supplies, media convertor/connectors and all infrastructure cabling was **approximately $82,000**. Implementation was completed by internal BYU staff & current Amer Reseller and Network Engineer Consultant: Wasatch Area Networking of Spanish Forks, Utah. Phase 2 of the system was implemented to include 18 additional SS3GR1050i systems.

Key Decision Criteria Identified:

1. Superior performance-to-invest valuation.
2. Network Architectural Flexibility and Extendibility.
3. Procurement Cost savings of 47% -50%; TCO over 6-year projected lifecycle at +60%.
4. Committed product line and component support for a minimum of 8 years.

For more information or a complementary network traffic analysis and planning study, please contact:

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