



RUNet Backbone Update - Summer 2008

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1 October 2008

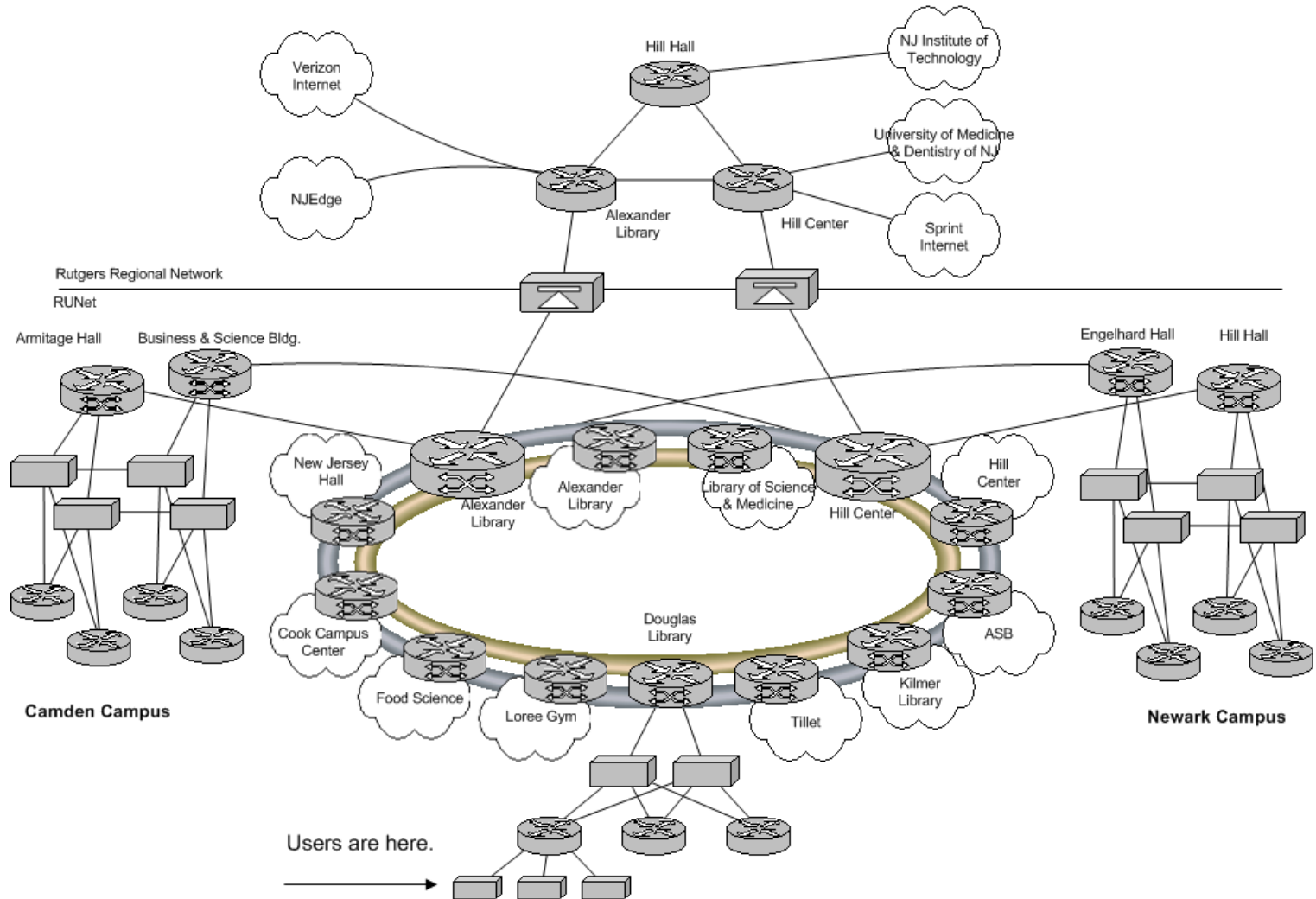
Today's discussion

- Review of Summer 2008 RUNet upgrades
- Available technology options
- Concepts for future RUNet development

Why is RUNet successful?

- Design standards and best practices
- Standard, modular solutions replicated many times
- Core – Distribution – Access
- Planned aggregation practices
- Designed-in fault management
- Automated monitoring and management
- Our staff!

Old RUNet: One last look

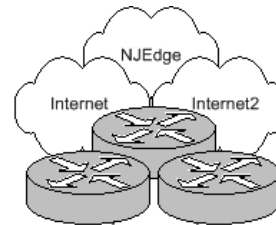


Dollars and sense

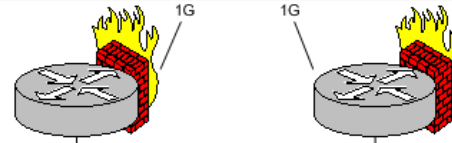
- Old core equipment nearing End-of-Life
 - Cisco GSR12008 unsupported in February 2012
 - Blades and processor cards were either already unsupported, or being unsupported this year
 - Estimated \$1.8M to replace processor cards
 - Platform limited to 2.5Gbps per slot; no path to 10Gbps or beyond
 - Smartnet costs for core and distribution layers combined exceeded \$190k
- New core cost \$600k “on the books”
 - \$1.5M list price for equipment and optics
 - Discounts, trade-in credits and Smartnet credits brought core down to \$560k
 - Additional \$50k (estimated) for supporting facilities and fiber work
 - New Smartnet costs for core and distribution layers will be under \$60k, after first year

RUNet Design Model

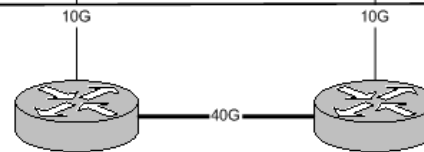
Rutgers Regional Network
 * Provides robust connectivity between RUNet and its external peers and service providers
 * Based on Juniper M10i routers and Cisco switches



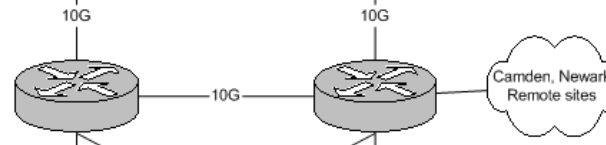
RUNet Services Layer
 * Provides robust connectivity between RUNet and Rutgers Regional Network
 * Provides connectivity and policy for RUNet-wide services
 * Cisco 6500 Sup2 switching engine with FSM blades



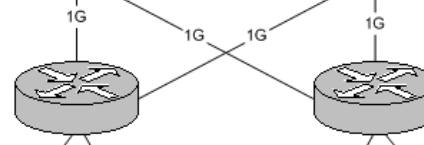
RUNet Core Layer
 * Central, 10Gbps aggregation for RUNet, providing 40Gbps East-West across RUNet
 * Policy-free core
 * Wire-speed, layer 3 switching
 * Based on Cisco 6500 Sup720 switching engine



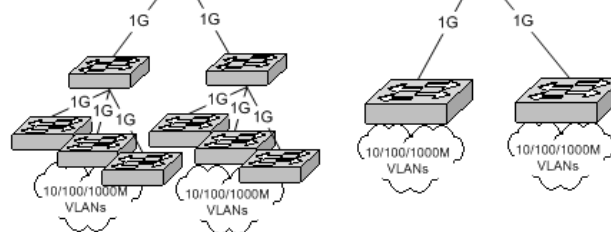
RUNet Distribution Layer
 * 1Gbps to 10Gbps access aggregation
 * Per-campus aggregation
 * WAN aggregation for remote RUNet locations
 * Policy enforcement for QoS and CoS applications
 * Layer 3 connections manage multicast distribution
 * Based on Cisco 6500 Sup720



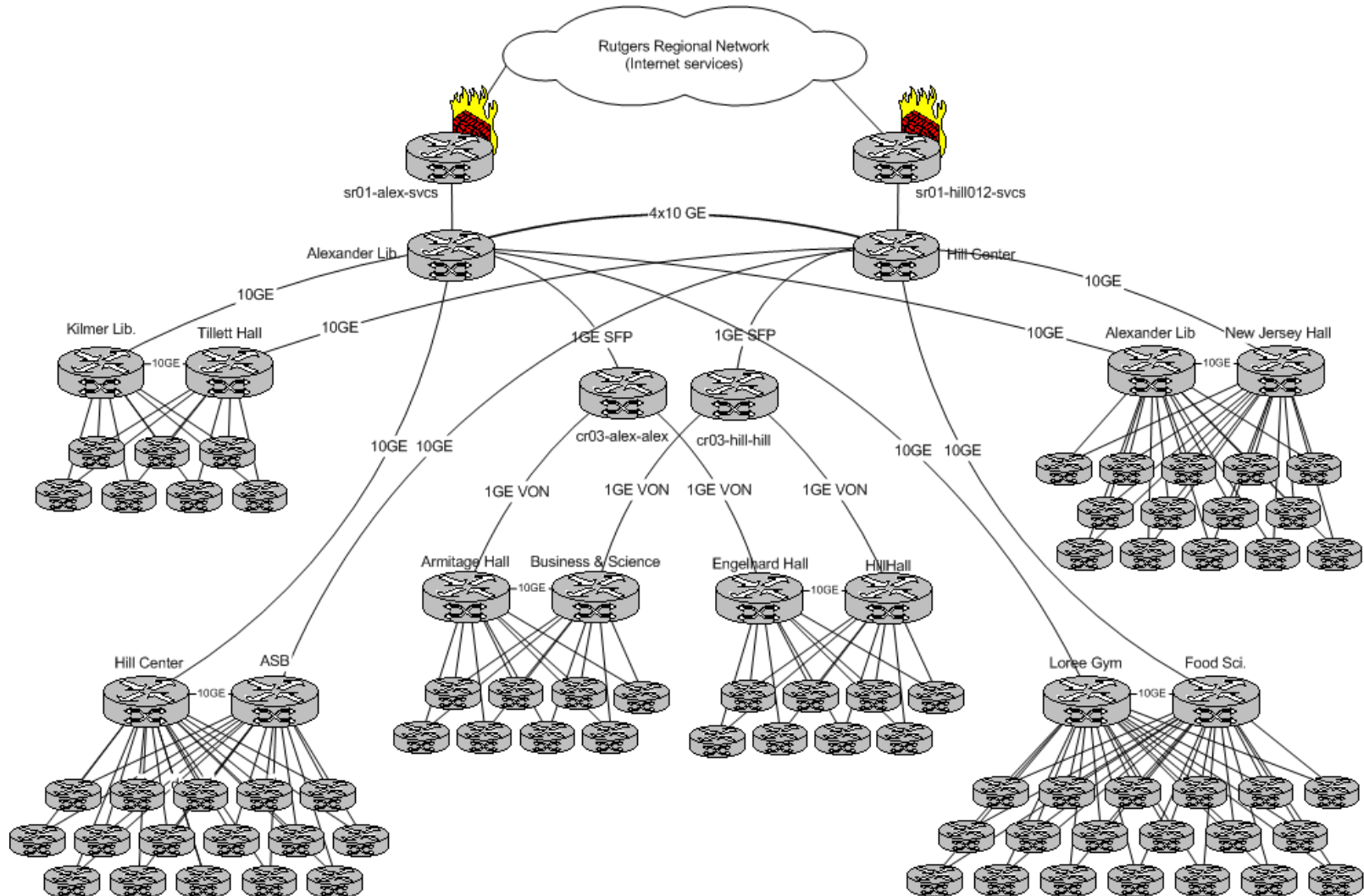
RUNet Access Layer
 * 1Gbps aggregation for 10/100/1000Base-T VLANs
 * "Intelligent Edge" policy for Layer 3, QoS, CoS
 * User-managed ingress and egress policy
 * Based mostly on 6500 Sup2 switching engine
 * Migration to Sup32/Sup720 planned through 2010



RUNet Access Switching layer
 * Port backing and VLAN services for RUNet locations
 * 10/100/1000Base-T aggregation to 1000Base-FX
 * Provides some CoS policy for Voice & Video applications
 * Based largely on Catalyst 4000-series devices, migrating to Catalyst 4500



The New RUNet



Migration: Did *you* notice?

- New core received, built and tested in June-July timeframe
- Campus access routers “hot cut” from old network to new network late July through early August
- RUNet converted to new core in 6 weeks, thanks to aggressive downtime schedule and thorough planning
- Transition uncovered and corrected a number of point-anomalies in the RUNet implementation
- Core transition in New Brunswick Piscataway completed 8/13, with the migration of the E-complex devices

Still work to be done

- Planning to deploy new equipment to align Newark and Camden campuses with the new model
- E-complex devices need to upgrades to address potential bottlenecks
 - Risk: a single Gigabit-connected host can soak the RUNet uplink to RRN
- Access routers need upgrades to support planned service and policy enhancements
- Access switching layer needs updates to keep up with current application demands

Futures

- IPv6 (coming soon)
 - Rutgers received a /46 allocation, and is working towards native RUNet support
 - Contact noc @ rutgers.edu for more information.
- Switch Interface Management Tool (coming soon)
- Enhanced router Access List controls through NetDB?
- MPLS-VPN?
- Internet connectivity enhancements?

Questions?

- For any follow-up questions about this presentation, please contact the NOC at 5-7541, or by email at [noc @ rutgers.edu](mailto:noc@rutgers.edu)