



# Application Performance in Higher Education The Evolution of Traffic Management



**Greg Dalzell**  
**SMBU / NAI Marketing**

# The Evolving Computing Environment

2000

- Less than half of students have their own personal computer
- Access provided in dorms, libraries, study halls
- Bandwidth requirements to support browsing, email, course applications
- Computing activity primarily on-campus

2008

- Majority of students now have own personal computer (est. >80%)
- Both wired and wireless access provided throughout the campus
- Increasing sophistication of applications and resulting high-bandwidth requirements
- Computing activity defined as “wherever, whenever”; distance learning is an integral component of scholastic experience

2000

2008

# The Changing Online Environment

## *... And the Challenges of Application Control ...*

### P2P File Sharing

- Copyright Infringement
- Blocking vs. Control
- Subscriber Identification

### Distance Learning

- Prioritization / QoS
- Access Control
- Billing / Content Management

### Research and Collaboration

- Access Control
- Prioritization / QoS

### Voice over IP Video over IP Gaming

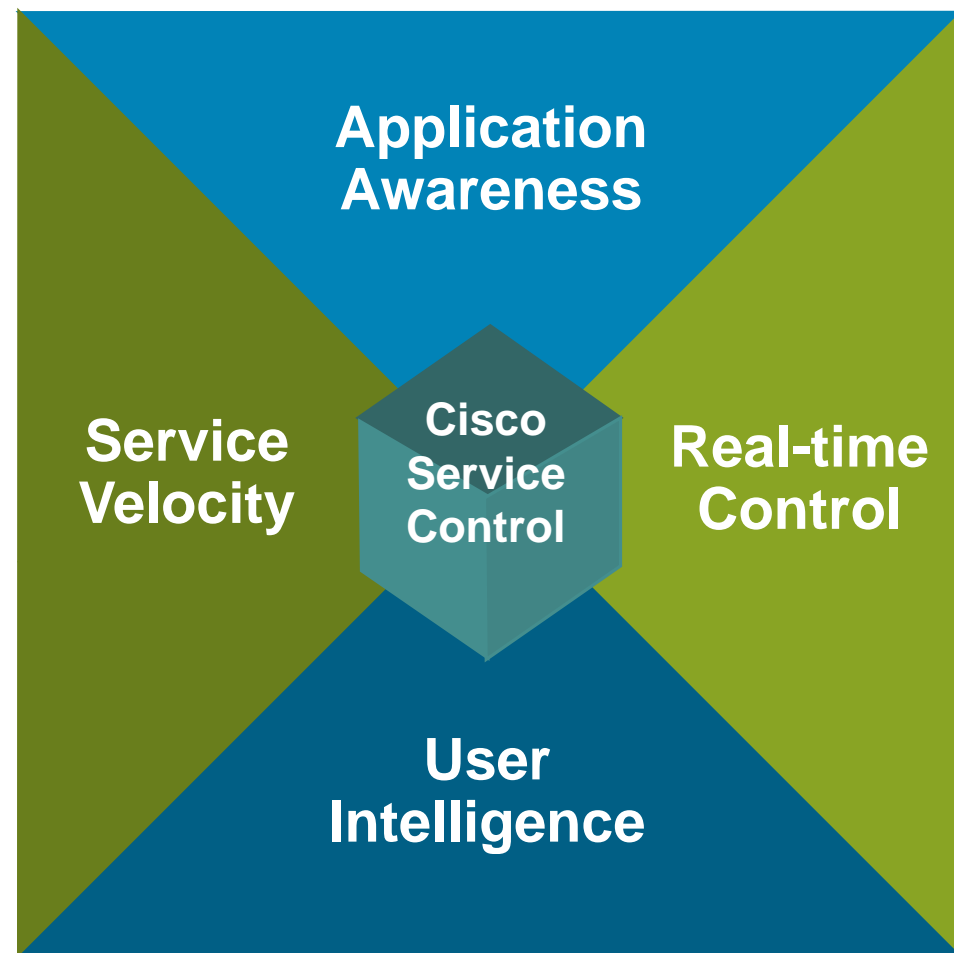
- Subscriber Identification
- Time-based Access
- Access Control
- Billing / Charging
- Prioritization / QoS
- Latency Control

# Cisco's Higher Education Solution

**Consists of hardware, software, and services that enable education institutions to control costs and profitably create and manage services deployed, by:**

- Providing **complete visibility** into application and subscriber traffic patterns
- Providing sophisticated **traffic management** capability to “condition” the network for the desired operational characteristics
- Providing **tiered access** to protocols and services by student / faculty / or other username

# The Elements of Application Performance and Prioritization



- Able to perform stateful deep packet inspection
- Allows IT professionals to profile traffic on the network
- Critical for identifying malicious and other (e.g., P2P) costly traffic

- Ability to proactively control application streams by traffic type, time of day, source/destination IP addresses, behavior of individual students, etc.
- Required to ensure that resources are utilized in a manner that supports overall educational requirements

- Recognizes individuals on the network, their network “demographics,” and usage patterns
- Allows the institution to develop individual access characteristics to meet the needs of different groups within the institution

- Able to quickly respond to the emergence of new protocols and applications, and to rapidly associate different individuals with different online access experiences
- Allows the institution to quickly respond to the emergence of problem traffic

# Cisco's Traffic Control Solution for Higher Education: Hardware Components

## Traffic management solution offering:

- Deep-packet-inspection with stateful application recognition
  - Identification of over 1000 application protocols
  - Behavioral classification for new and emerging protocols
- Dynamic policy control on per-application, per-user bases
- Performance and scalability to meet the needs of small to medium-sized institutions
  - 200 Mbps (aggregate bidirectional) to 4 Gbps (aggregate bidirectional) throughput
  - Support for 10K–80K users



Application Performance Assurance Engine (200Mbps)



Service Control Engine (2–30 Gbps)

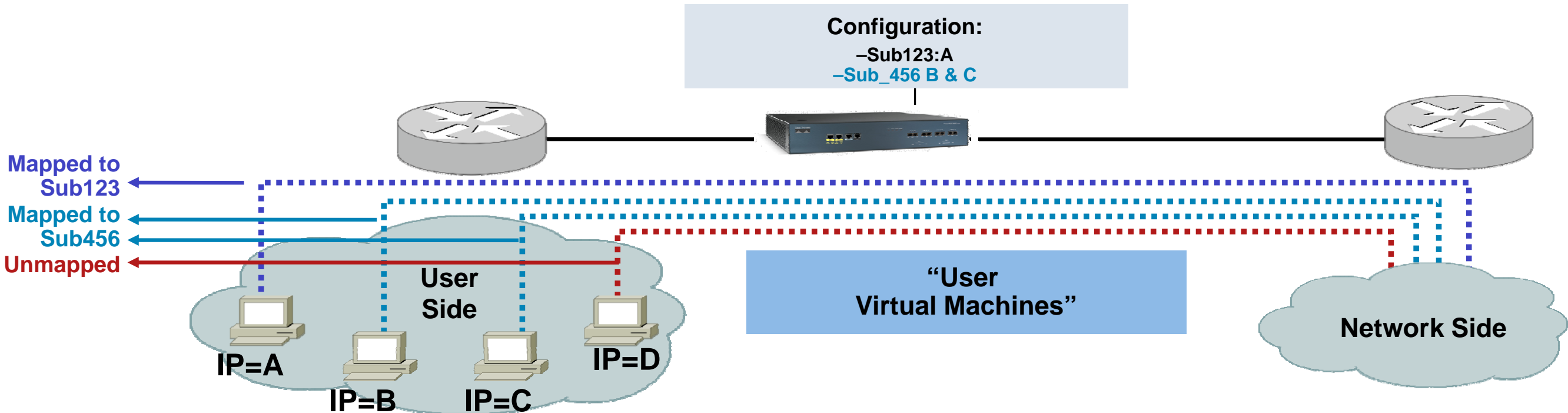
# The Hardware Options

	CAM-APA-100	SCE-1010	SCE-2020
Suggested List Price	\$20,000	\$45,000	\$65,000
Interfaces	2-MFE	2-GBE (fiber SX/LX)	4-GBE (fiber SX/LX)
Max. Flows	10K concurrent unidirectional application flows	1M concurrent unidirectional application flows	1M concurrent unidirectional application flows
Maximum Users	10,000	40,000	80,000
Network Configuration	<ul style="list-style-type: none"> <li>Receive-only</li> <li>Inline</li> </ul>	<ul style="list-style-type: none"> <li>Receive-only</li> <li>Inline</li> </ul>	<ul style="list-style-type: none"> <li>Receive-only</li> <li>Inline</li> <li>Cascade</li> </ul>
Solution Components	<ul style="list-style-type: none"> <li>CAM-APA-100</li> <li>APA-SW-3.0 (OS)</li> <li>APA-CX5-VO or APA-CX5-CC (mgmt. and reporting)</li> </ul>	<ul style="list-style-type: none"> <li>SCE-1010 (appliance)</li> <li>Additional server for reporting and mgmt (customer-supplied)</li> <li>SCA BB (mgmt.)</li> <li>Database and reporter (\$10K)</li> </ul>	<ul style="list-style-type: none"> <li>SCE-2020 (appliance)</li> <li>Additional server for reporting and mgmt. (customer-supplied)</li> <li>SCA BB (mgmt.)</li> <li>Database and reporter (\$10K)</li> </ul>

# Sample Use Cases

Category	Sample Problem	The Approach	Suggested Alternatives
Usage Analysis	Increasing number of calls to the Help Desk complaining of poor performance of Blackboard or WebCT (or dropped courses)	<p>Analysis of the applications and protocols on the network over time to determine if specific applications are introducing latency / jitter</p> <p>Analysis of traffic patterns per student to identify which users, if any, are the source of the issue</p>	<p>Identify school P2P policies required</p> <p>Determine required control policies</p> <p>Evaluate quota-based or time-of-day policies to ensure critical applications are protected</p> <p>Public flogging/expelling of offending users?</p>
Traffic Optimization	Increasing number of calls to the Help Desk complaining of poor performance of Blackboard or WebCT (or dropped courses)	<p>Determine target P2P traffic as dictated by school policy</p> <p>Review peak usage times and individual P2P users (by name)</p> <p>Determine peak traffic times for other high-use protocols to evaluate time-of-day control policies</p>	<p>Provide distance learning applications with highest traffic priority</p> <p>Confine overall P2P traffic during the day, open access during on-peak hours (7 pm–6 am)</p> <p>Identify the offending students; ransack their dorm rooms while they're at the bar; confiscate beer, computer, stereo, iPod?</p>
Service Security	Spam is being generated on the school network by spam email trojans	Analysis of email sessions per user to identify suspicious email activity	Identify spammers, block email traffic until the offending user can be reached, assist in "clean-up" activities on the user's system
Tiering and Access Control	Requirement for evaluation of revenue-generating IT services	Review of usage patterns, specifically focusing on video, voice, gaming, overall Internet use	Investigate pay-for-use services such as "accelerated gaming," "prioritized voice," quota-based Internet use

# User Control Contexts



Mode	Description	Use Case
Subscriberless	Traffic not assigned to a user-context Aggregated traffic control	Global P2P control Global application/user analysis
Anonymous Mode	Automatic spawning of user-context by IP addresses Policy defined by subnet (123.5.1.6@grp1)	User prioritization (research, faculty, distance learning) Spam-control
Subscriber-Aware	Differentiated policy applied individually to each user Dynamic integration with authentication system	Quotas and billing services (e.g., gaming)

# Value Proposition: Summary

**The Cisco Higher Education solution provides the necessary level of control for existing and evolving higher education environments**

- Control over P2P downloads limits illegal distribution of music and data files
- User awareness ensures “tiered access rights” to individual students and faculty members
- Protects critical applications: research, administration, distance learning
- Creates incremental revenue streams through deployment of new services (e.g., gaming)

# Learn More

## Please Visit the Traffic Management Demonstration



### Here in the Booth

- Talk to product experts from Cisco**
- Discuss your requirements**
- Ask questions**

### On the Web

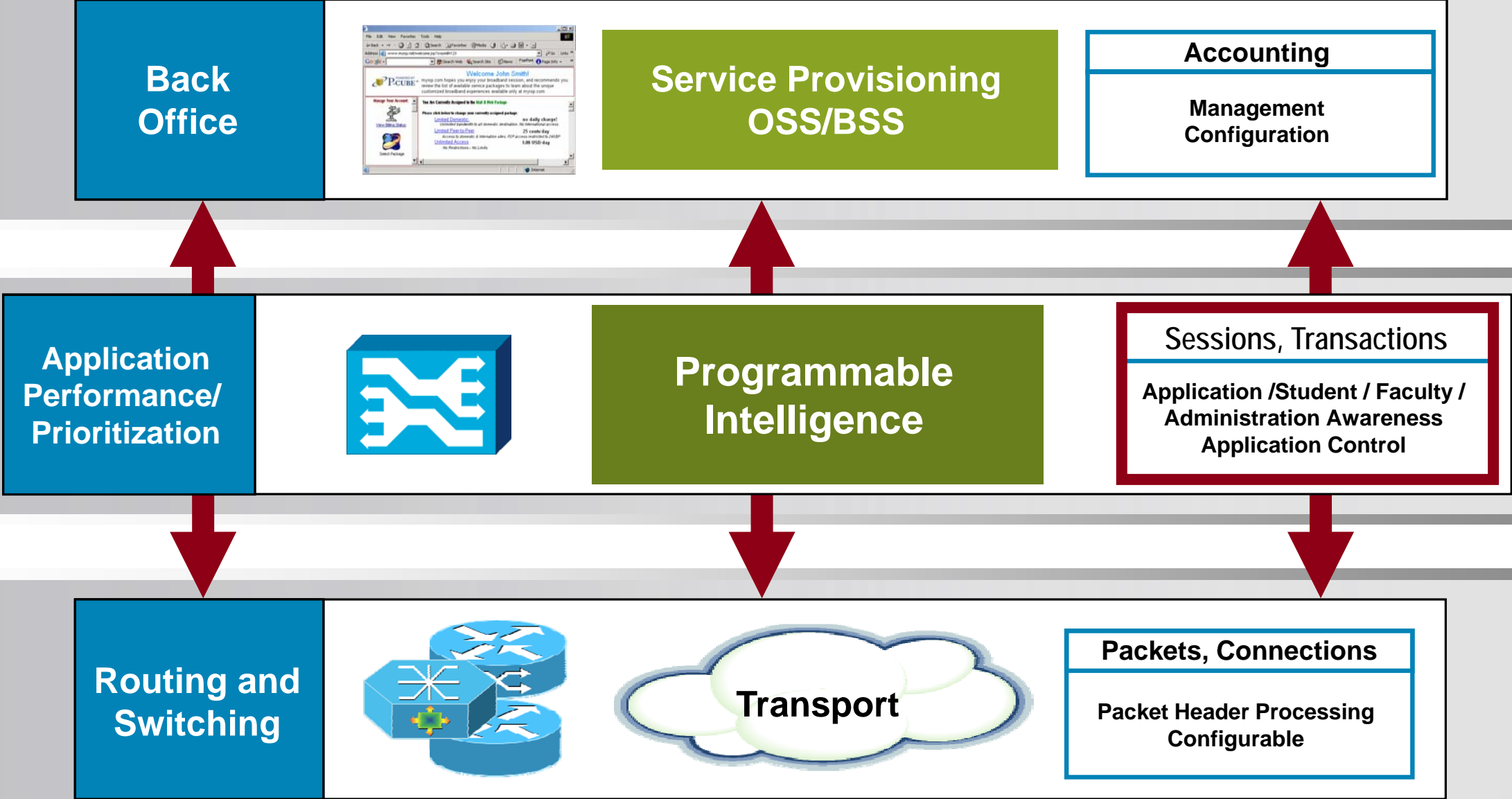
- [www.cisco.com/en/US/products/ps9799/index.html](http://www.cisco.com/en/US/products/ps9799/index.html)**
- Download reference materials**
- White papers**
- Case studies**
- Videos**

# Q&A



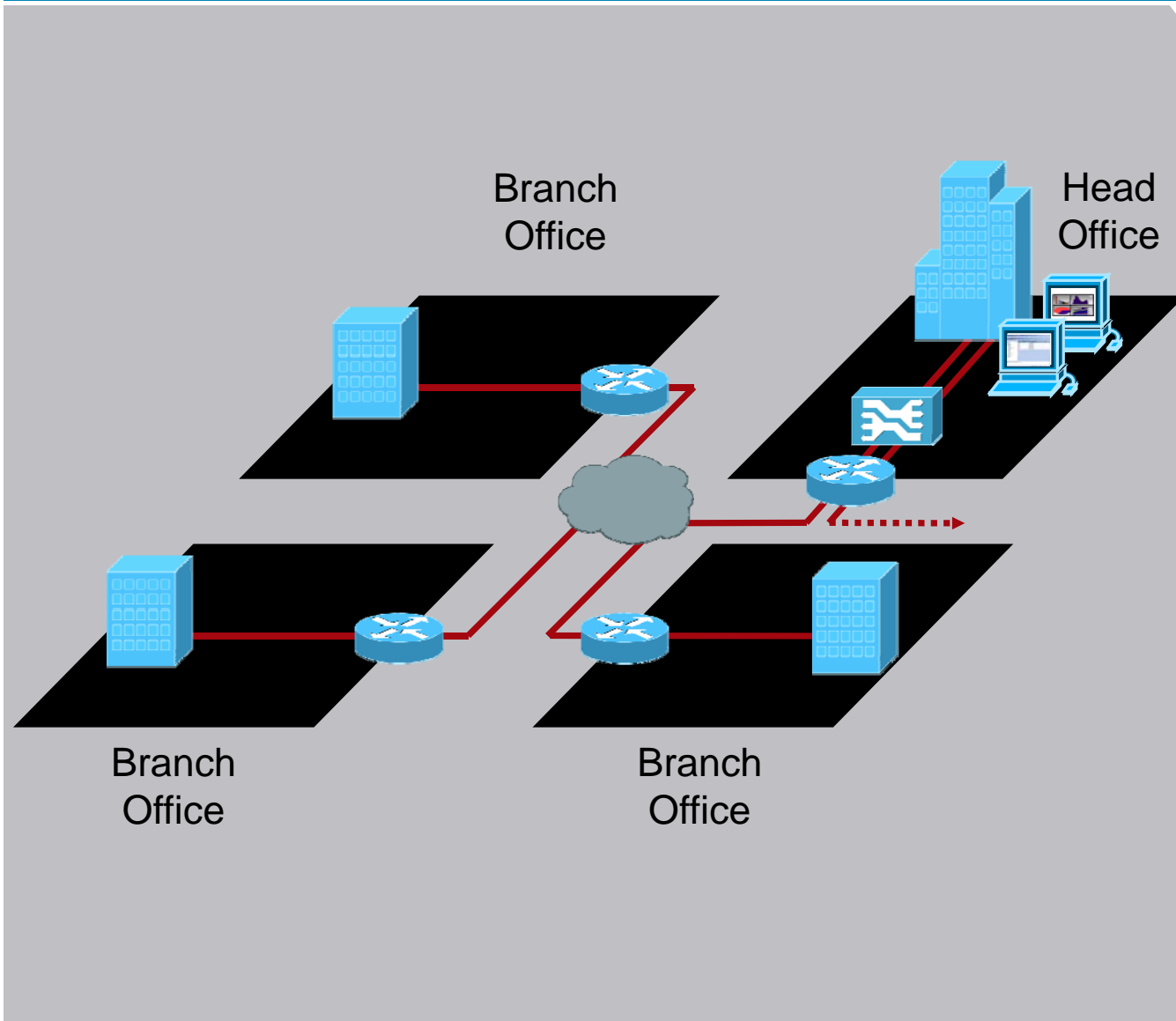
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# Infrastructure for Advanced Higher Education Services



# Applications / Network Insertion

## ◀ Insertion – Main Site Internet Link ▶



- Environment
  - Universities with on-campus housing or significant overall Internet use
- Topology
  - APA Engine deployed on Main Site Internet link
- Deployment Rationale
  - Classification of, and control over, traffic on the basis of server location, direction of traffic, etc.
  - Identification and control of unwanted traffic, including P2P, instant messaging, Flash video
  - Prioritization of application traffic for administration, faculty, research
  - Prioritization of distance learning traffic



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