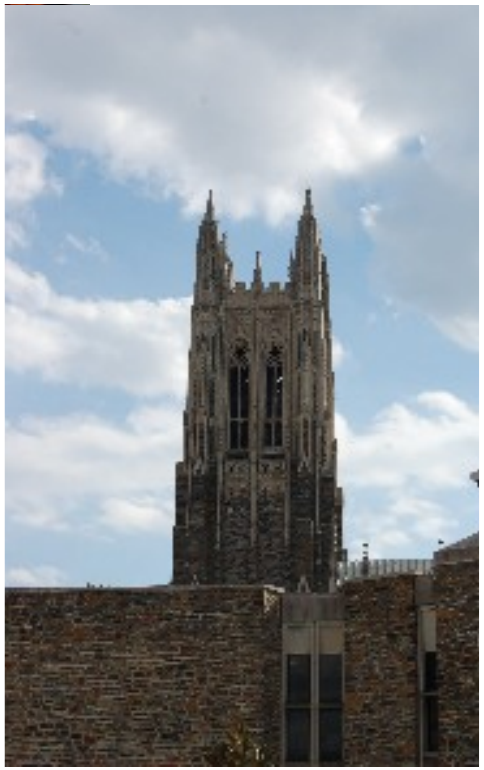
Duke University Update
Ivy+ Network & Telecom
May 1, 2007

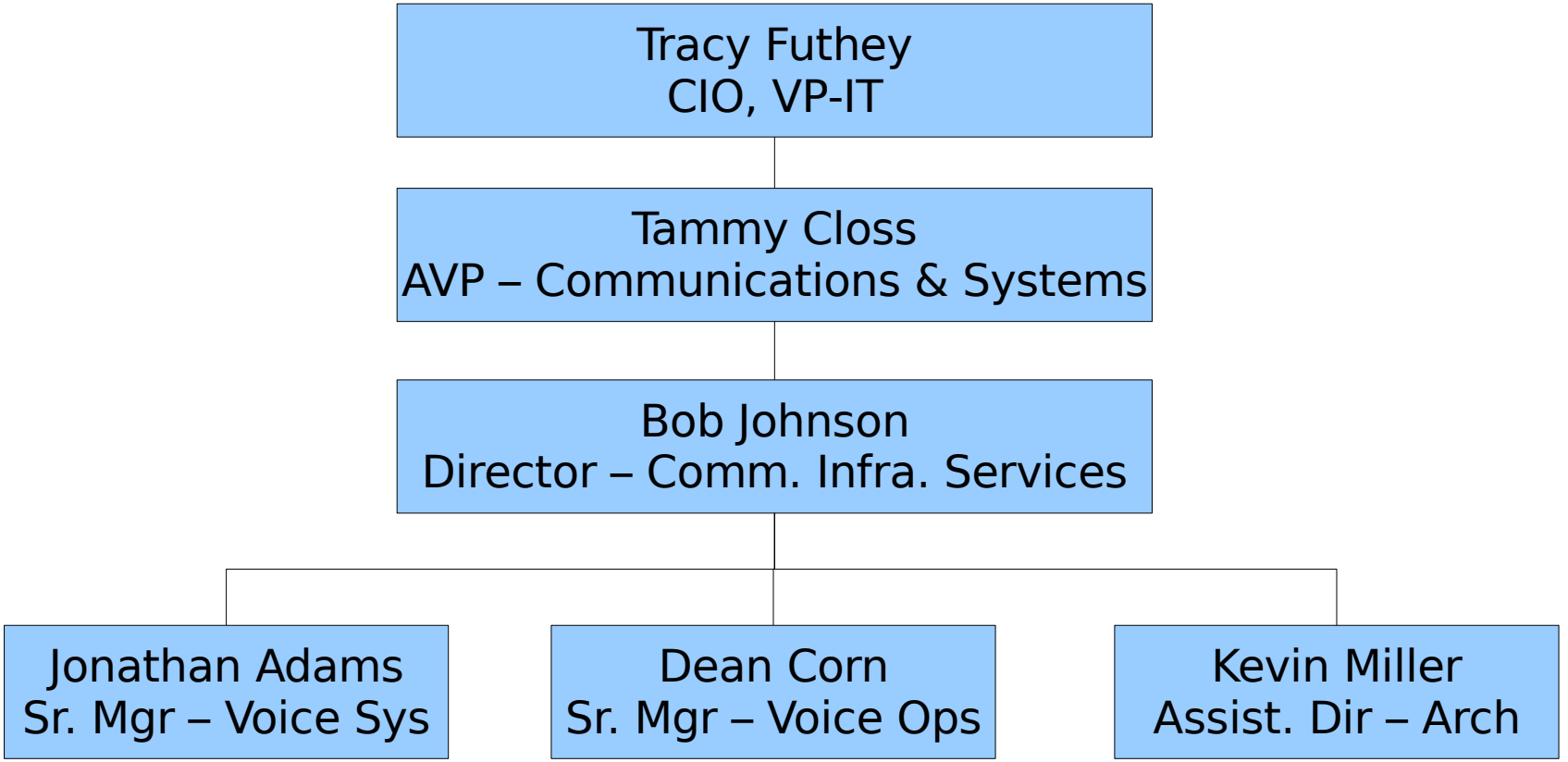






Organization

- Office of Information Technology – central IT



Duke
UNIVERSITY

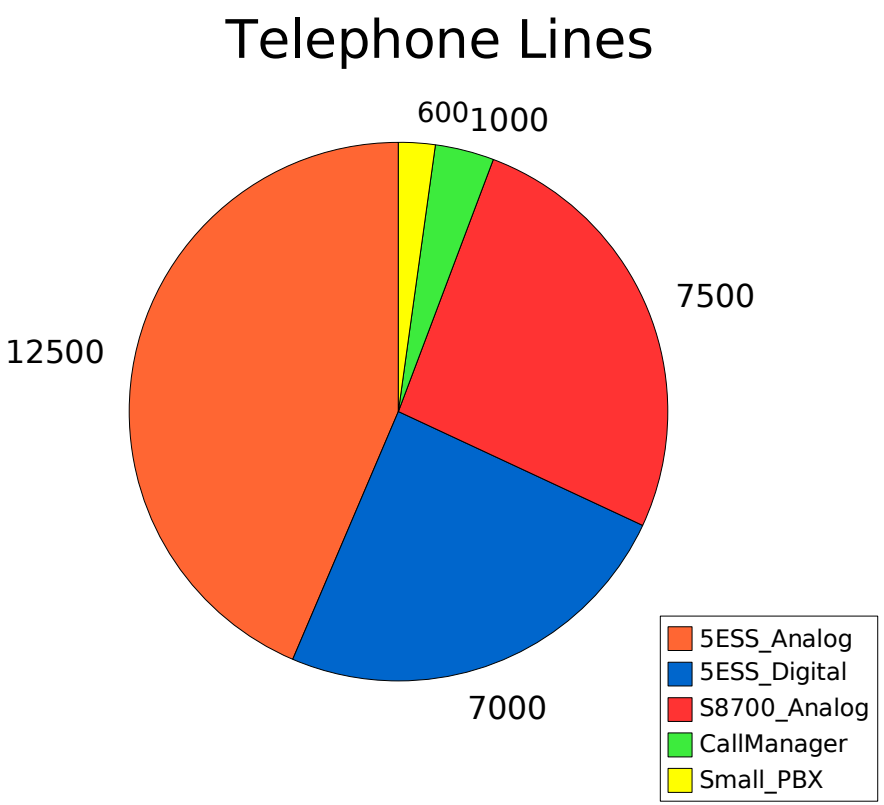
Demographics

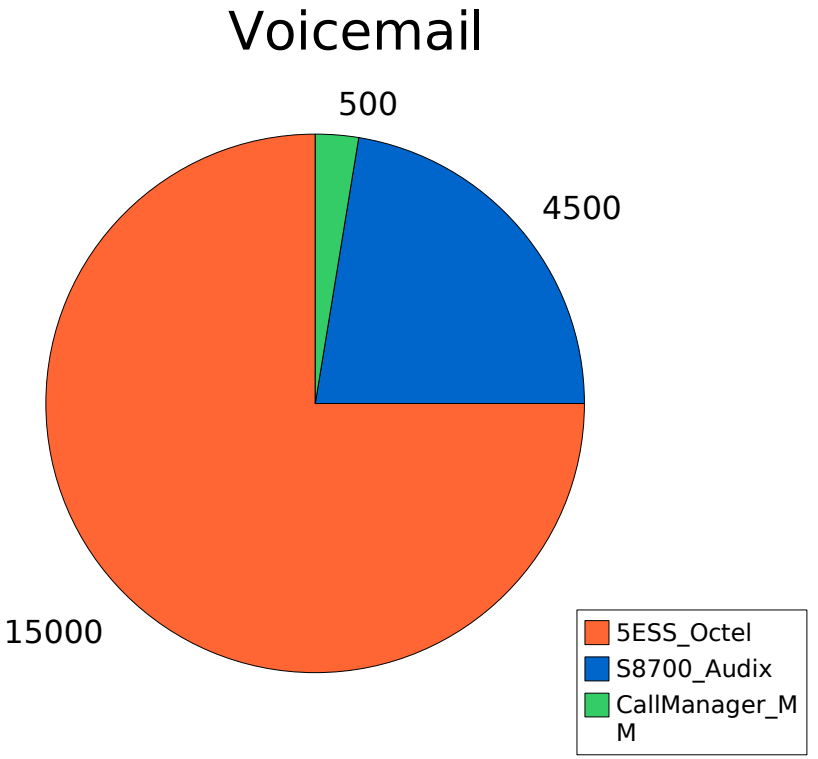
- 6,244 undergrad
- 6,844 graduates
- 2,518 faculty
- 29,489 staff
  - 7,901 University
  - Balance Duke Medicine
- 6.7M f^2 (University)
- $4.5B endowment

- 44K data ports
- 28K telephone lines
- 7 NXXs
- 20K voicemail boxes
- ~430 ACD agents
- 5K CATV drops
- 800 radios (800MHz)

Duke
UNIVERSITY

Voice Platform Breakdown





Duke
UNIVERSITY

Current Voice Projects

- Unity Voicemail
  - Complete platform replacement
  - Unified communications pilot – Summer 07
  - Beginning user cutover
- Complete PAETEC engagement
  - Completed discovery
- SS-7 to PRI conversion
  - Cost and flexibility
  - Ability to bypass 5ESS
- SIP Trunking
  - DR and price
  - Inbound pilot to address DID redundancy

Duke
UNIVERSITY

Voicemail Replacement





Duke
UNIVERSITY

VoIP

- Migration to Cisco VoIP
  - CM5.0
  - Greenfield, obsolete systems
  - Transitioned systems admin responsibility to Systems group

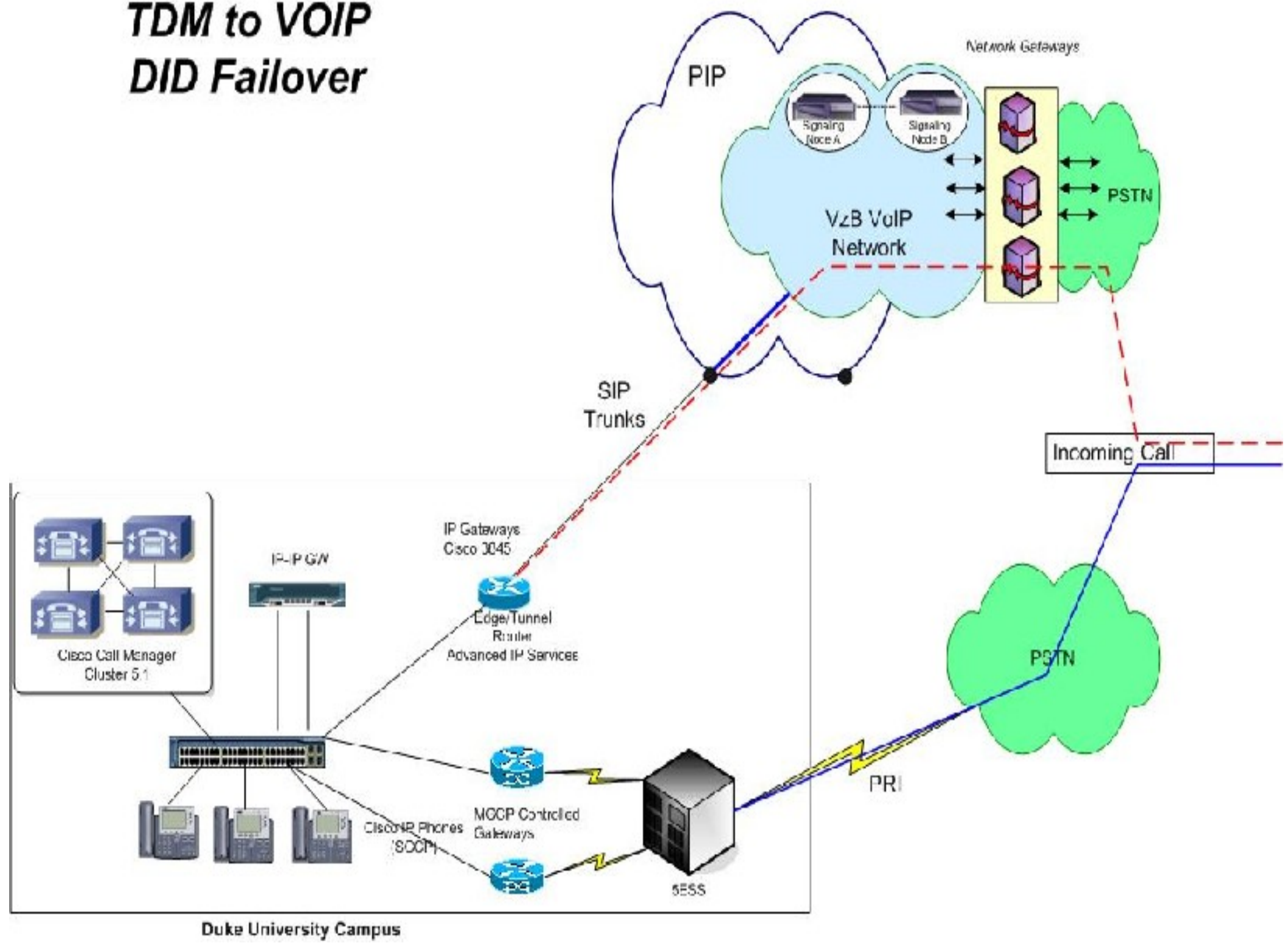
Duke
UNIVERSITY

Fax Service

- Pilot of X-Medius Fax Server
  - Integrated to Avaya S-8700 w/ T.38
  - email, web gateways (inbound & outbound)
- Enterprise service: efax.duke.edu
  - Centrally managed infrastructure
  - Distributed/site AuthZ
  - Shibboleth-enabled web login
- Cost effective price point
  - 16 ports @ $1600/port; 65:1 user ratio
- Valuable with VoIP: supersedes need for analog gateways

Duke
UNIVERSITY

TDM to VOIP
DID Failover

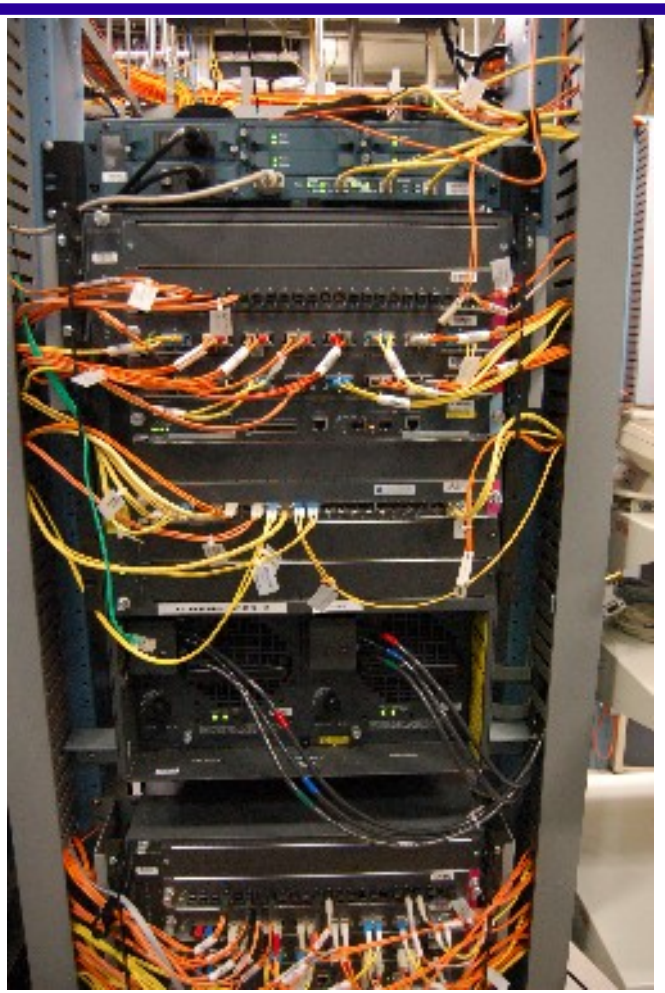


Core Network Upgrade

	2006	2007
Border	2: 6509-720-3BXL	2: 6509-720-3BXL
Core	2: 6509-Sup2	5: 6509-720-3BXL
Speed	1Gbps	20Gbps
Protocols	IPv4, AppleTalk, IPX	MPLS, IPv4
HSRP/GLBP	Minimal	Complete
9K MTU	None	Complete
Distribution	100Mbps – 1Gbps	1Gbps – 10Gbps
Private Nets	VLAN	VRF
Geography	One building	Diverse locations

Duke
UNIVERSITY

Core: 2006 & 2007





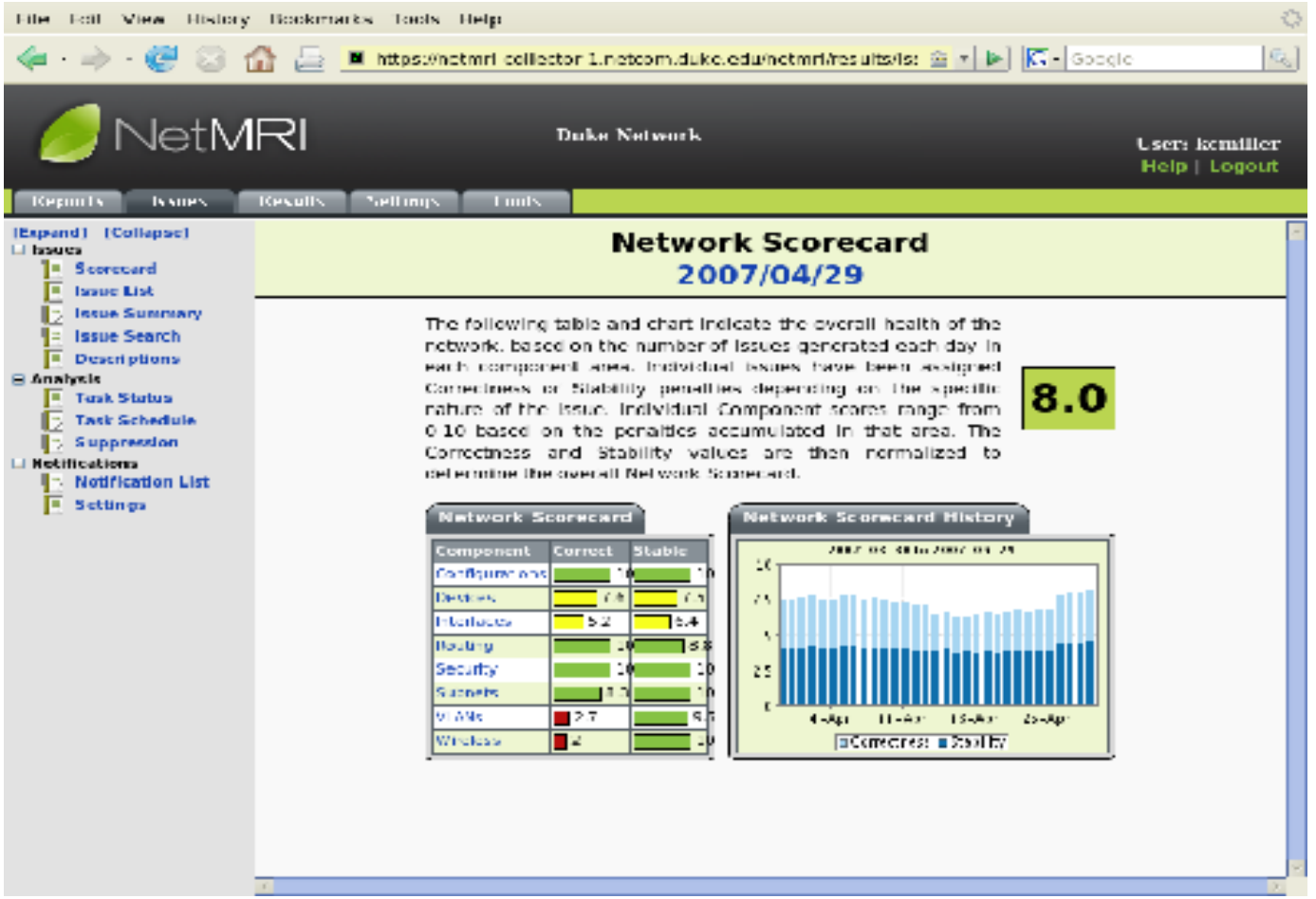
Duke
UNIVERSITY

Edge Network Refresh

- Cisco 3750 with PoE (75% of campus)
- Few telecom rooms with UPS
- 10/100 standard, 20% 10/100/1000
- Edge port configuration
  - BPDU Guard
  - DHCP Snooping (residence halls)
  - Accept 32 MACs per port

Duke
UNIVERSITY

Edge Management



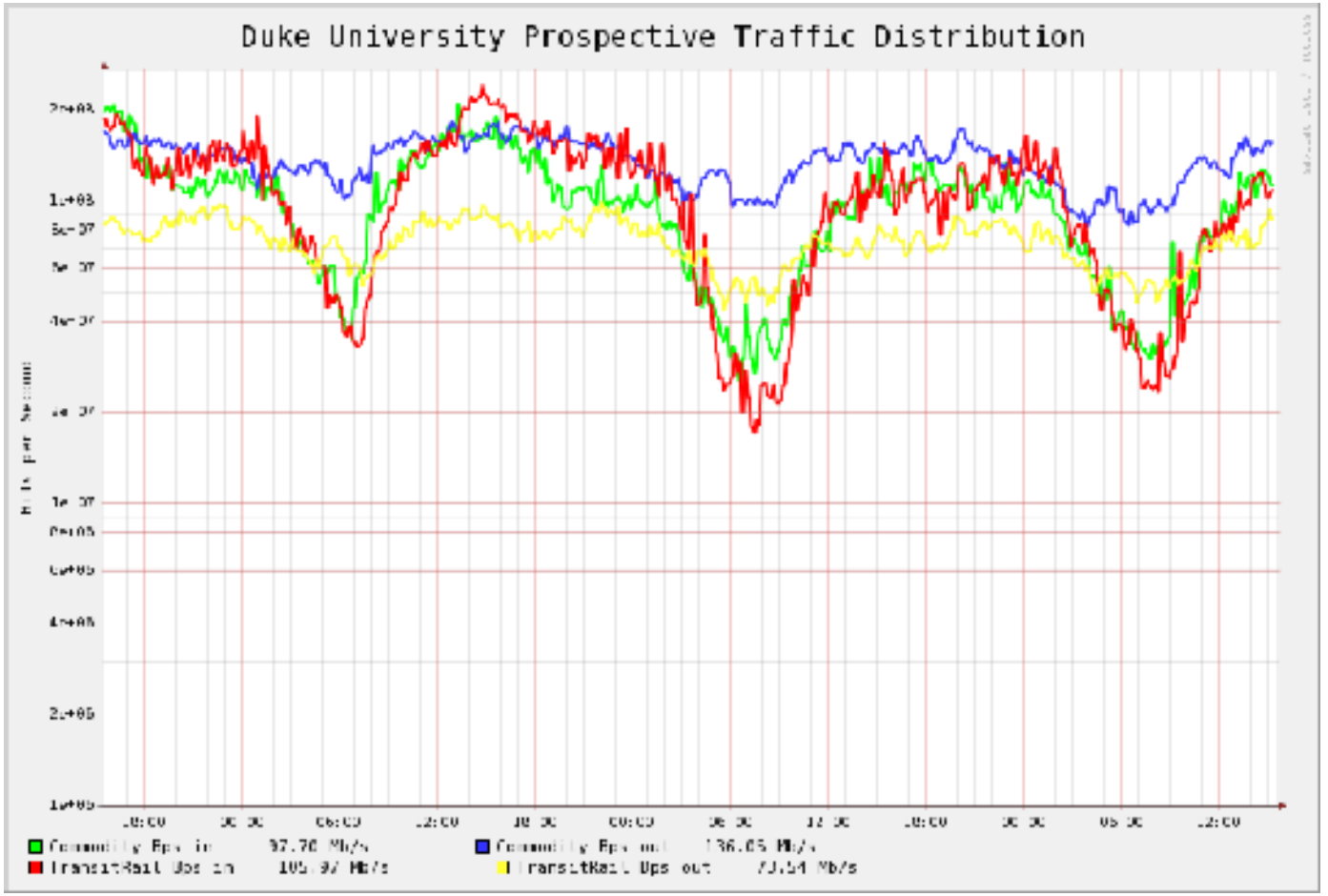
Duke
UNIVERSITY

Upstream IP Connectivity Changes

	2006	2007
Connections	NCREN	NCREN Time Warner Telecom National TransitRail
Commodity	450Mbps	1Gbps (300, 500, 200)
I2 Abilene	Direct, 2.4Gbps	Via SoX, 1Gbps
NLR PacketNet	10Gbps (L2)	10Gbps (L2)
Routing	Default route	BGP

Duke
UNIVERSITY

Upstream Analyses: Netflow + BGP



Duke
UNIVERSITY

Wireless Network

	2006	2007
Technology	Standalone	Lightweight
Models	Orinoco AP1000 Cisco 12xx	Cisco 1242 predominantly
Protocols	802.11b/g	802.11a/b/g
Security	NetReg	NetReg
Access points	~600	~1500
Coverage†	35% 2.3M f^2	55% 3.7M f^2
Residence hall	Common areas only	Common areas only
Management	Ad Hoc	Cisco WCS
Outdoor	Bleed-through only	8 Cisco Mesh – Most popular

† All figures are University only; not inclusive of Duke Medicine

Duke
UNIVERSITY

Wireless Controllers



Duke
UNIVERSITY

Emergency Notification

- Paging system
  - Local paging transmitters
  - Paging terminals: Glenayre GL-3000
  - Paging database, oncall, web: Amcom
  - Wide area: USA Mobility
- Piloting Amcom E-Notify, rolling forward
  - Multi-modal: call out, SMS, email
  - Can escalate, require positive response
  - Not expected to be used for broadcast messages

Duke
UNIVERSITY

Home Broadband Service

	2006		2007	
	Service	MRC	Service	MRC
Time Warner	5M x 384K	$40	5M x 768K	$40
	768K x 768K	$65	discontinued	
	2M x 1M	$85	2M x 1M	$70
	4M x 2M	$180	4M x 2M	$170
DSL – Verizon	768K x 128K	$48	768K x 128K	$36
	1.5M x 128K	$53	1.5M x 128K	$46
	1.5M x 384K	$65	1.5M x 384K	$56

Duke
UNIVERSITY

Other Efforts

- DWDM Optical Ring
  - Cisco 15454
- Load Balancing
  - NetScaler RS9950
- DNS & DHCP
  - 90% migrated to CMU-NetReg
  - Growing DHCP service
- IPTV
  - Need to replace current 750MHz, 71 channel system
- Video over Fiber
  - Experimenting with metro HD transmission to satellite facilities
- SSL-VPN deployment

Duke
UNIVERSITY

Current Data/Video Projects

- New data center build-out (5K f^2)
- Metro optical ring expansion (DWDM)
- IPTV
  - Open standards?
  - HD?

Duke
UNIVERSITY

and finally...

- Organizational convergence (voice/video/data)
- Tiered organizational approach to support
  - 1/operations, 2/systems, 3/architecture
- Creation of customer consultative analyst function
  - Emphasis on healthcare and convergence

Duke
UNIVERSITY