Projects in Electrical & Computer Engineering 2007-2008

EEnet Design

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Sponsor: CGA ECE Section

Presentation Outline

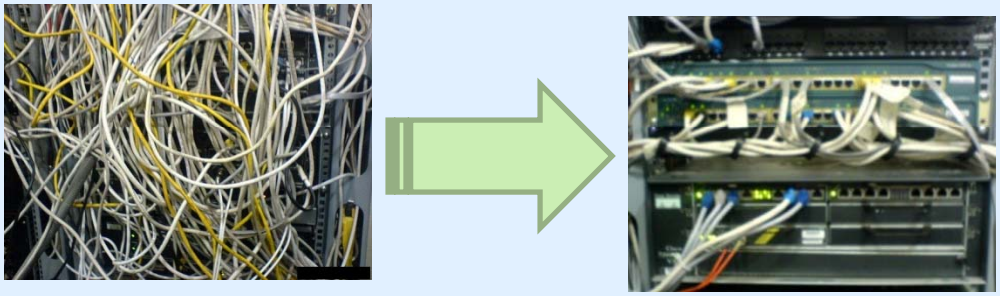
- Introduction to EEnet
- Background of ECE Section Network
- Objectives of EEnet
- System Design
- Results
- Functional Expansion

Introduction

- **What**
  - Document existing EE Section network
  - Design new Network using best practice methods
  - Implement design while maintaining functionality
- **Why**
  - Initially network was undocumented, unorganized, and not user friendly
  - Used for classes in the EE Section
- **Impact**
- **Relevance**

Introduction

- **What**
- **Why**
- **Impact**
  - Faster / more Reliable
  - Easier to use
    - Better designed for current uses
    - Expanded applications
  - Allow for a single Administrator
- **Relevance**
  - Importance to teach future operators how to use and the principles behind networking



Background

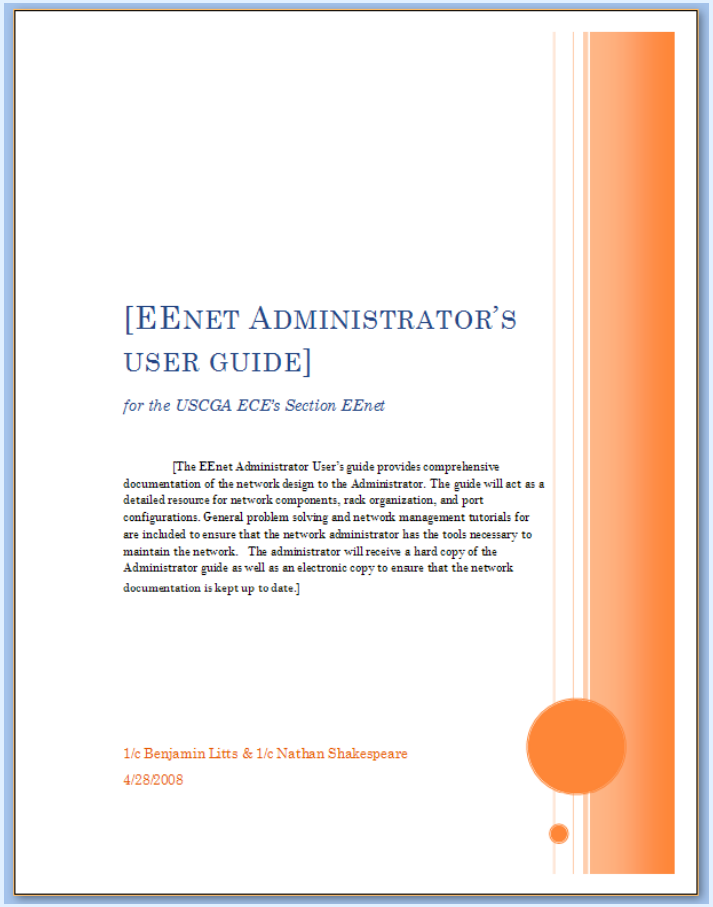
- **History**
  - Used in EE Section Classes
    - Computer Communications and Networks
    - PECE (EE senior design course)
    - IECE (non-engineering cadets)
    - Selected Topics
      - Information Assurance
      - Network Programming
  - EE Section Support Team LORAN data server
- **What accomplished in previous years**
  - Ad-hoc component additions
  - M204 remodeling to support Datacenter use
  - Cisco Donation

Objectives

- **Existing Network Analysis**
  - Get the tools needed
  - Determine what exactly is in place now
  - Determine what we can adopt for the EEnet
- **Phase 1: Backbone**
  - Design EEnet backbone overview
  - Add detail and create full EEnet design
  - Offer network design to Academy IS for .edu network
  - Implement in phases
- **Phase 2: Services**
- **Documentation**
- **Functional Expansion**

Objectives

- **Existing Network Analysis**
- **Phase 1: Backbone**
- **Phase 2: Services**
  - Network Monitoring
  - Wireless
  - Comprehensive Guides
    - User
    - Administrator
- **Documentation**
  - Thoroughly examine existing network
  - Use good labeling practices
- **Functional Expansion**



[EENET ADMINISTRATOR'S USER GUIDE]

for the USCGA ECE's Section EEnet

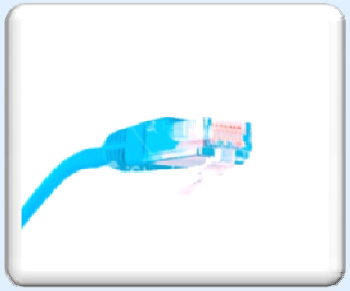
[The EEnet Administrator User's guide provides comprehensive documentation of the network design to the Administrator. The guide will act as a detailed resource for network components, rack organization, and port configurations. General problem solving and network management tutorials for are included to ensure that the network administrator has the tools necessary to maintain the network. The administrator will receive a hard copy of the Administrator guide as well as an electronic copy to ensure that the network documentation is kept up to date.]

1/c Benjamin Litts & 1/c Nathan Shakespeare

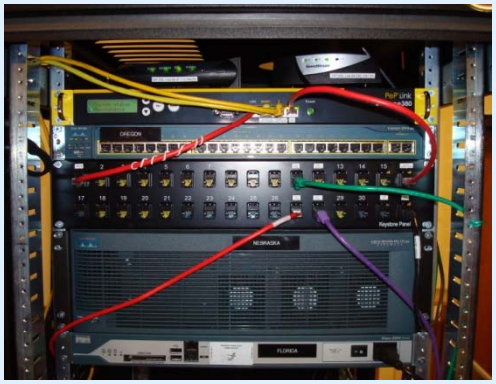
4/28/2008

System Design

- **Speed**
  - Gigabit Ethernet links
    - Fiber
    - Cat5
  - Load-balancing
    - Provides increased reliability, speed
    - 2 x DSL
    - 1 x Connection to CGA .edu connection
      - Internet bandwidth
      - Outlook Web Access on EEnet
      - Citrix Metaframe .edu Access
- **Usability**
  - Unified network
  - Remote management
  - VPN
- **Simple Management**

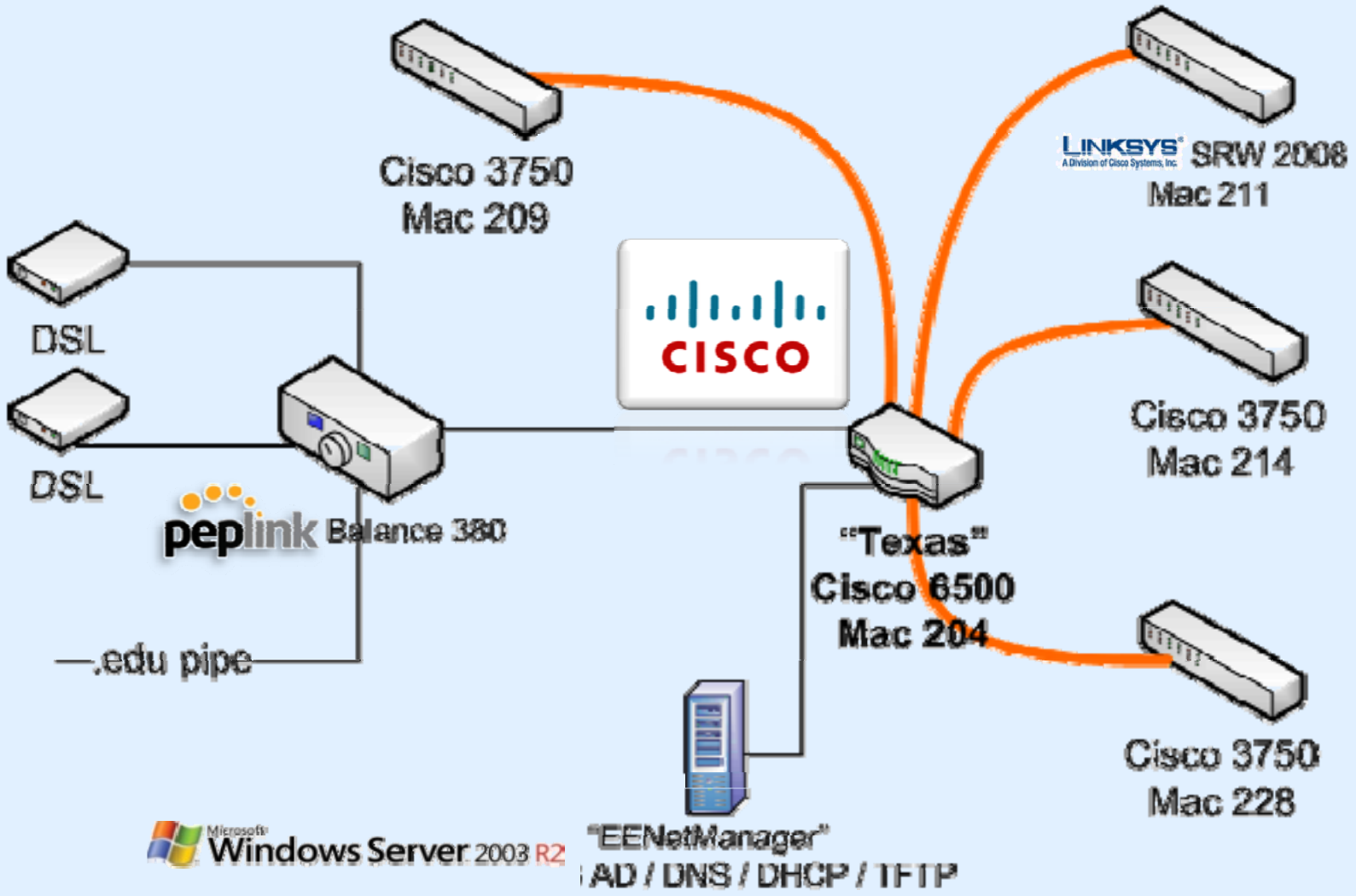


System Design

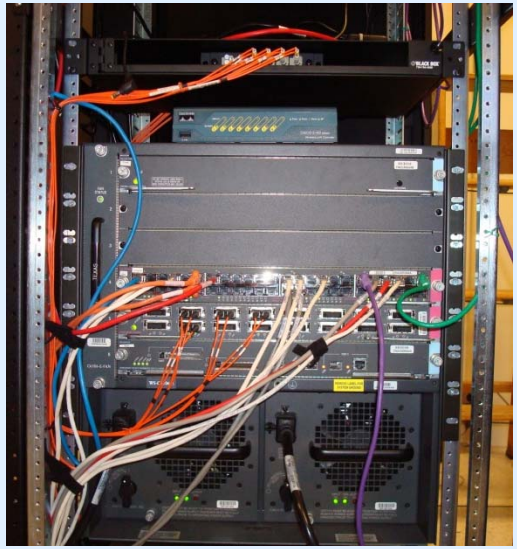


- **Speed**
- **Usability**
- **Simple Management**
  - Centralized critical components
  - Utilize best practice methods
  - Detailed network diagram and explanation
  - Comprehensive EEnet Guides
    - User
    - Administrator
      - Monitoring tools
      - Authentication for wireless and outside access
      - Component Configuration Walkthrough

System Design



First Semester Results



- Existing network fully mapped
- EEnet needs identified
  - Diagram of network
  - Components purchased
- New Management computer
  - Active Directory (authentication)
  - DHCP (ip address issuing)
  - DNS (internal domain name resolution)
  - TFTP (hardware configuration server)
- Fiber optics in place and operational
- Organization
  - All wires labeled and documented
  - Complete, up-to-date network diagram

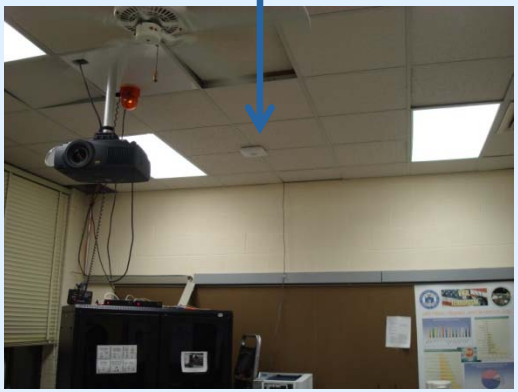
Second Semester Results

- Networks combined
  - No longer separate networks
- Load-balancing Implemented
  - EE DSL connection
    - six public IP addresses
    - project support

  - Section Support Team DSL connection
    - redundant connection
    - access for Loran support applications
  - CGA IS connection
    - Direct link for Outlook Web Access, Citrix Metaframe
    - Fast, synchronous access
- Wireless
- Network Performance Monitoring Software

Second Semester Results

- Networks combined
- Load-balancing Implemented
- Wireless
  - Three a/b/g access points (54 Mbps per client)
  - One a/b/g/n access point (355 Mbps per client)



File Edit View History Bookmarks Tools Help

http://10.10.1.15/Orion/SummaryView.aspx?viewid=1&netobject=

Customize Links | Free Hotmail | Windows Marketplace | Windows Media | Windows

Network Summary Home | Events | Events | Events | Events | Events

Orion

VIEWS: Home Top 10 Events Alerts Syslog Traps Overview Reports Admin Help ADMIN (LOG OUT) SOLARWINDS

Network Summary Home

Tuesday, April 29, 2008 11:57:42 AM

All Nodes
GROUPED BY VENDOR

HELP EDIT

- Cisco
- net-snmp
- Unknown
- Windows

Active Alerts
ALL TRIGGERED ALERTS

HELP

TIME OF ALERT	NETWORK DEVICE	CURRENT VALUE	MESSAGE
Status			
4/28/2008 1:25:52 PM	Cisco 3750 Networks Lab	Down	Cisco 3750 Networks Lab is Down

Event Summary
TODAY

HELP EDIT

27	Node Rebooted	
4	Interface Changed	
2	Interface Disappeared	
2	Interface Reappeared	
32	Alert Triggered	

Search Nodes

HELP EDIT

Find | Search By: Node Name | SEARCH

Examples: Cisco*, 10.15.*.*, Windows, Server-*, *.SolarWinds.Net

Network Map

HELP

McALLISTER HALL 2nd FLOOR

Nodes with Problems
THE FOLLOWING PROBLEMS SHOULD BE INVESTIGATED

HELP EDIT

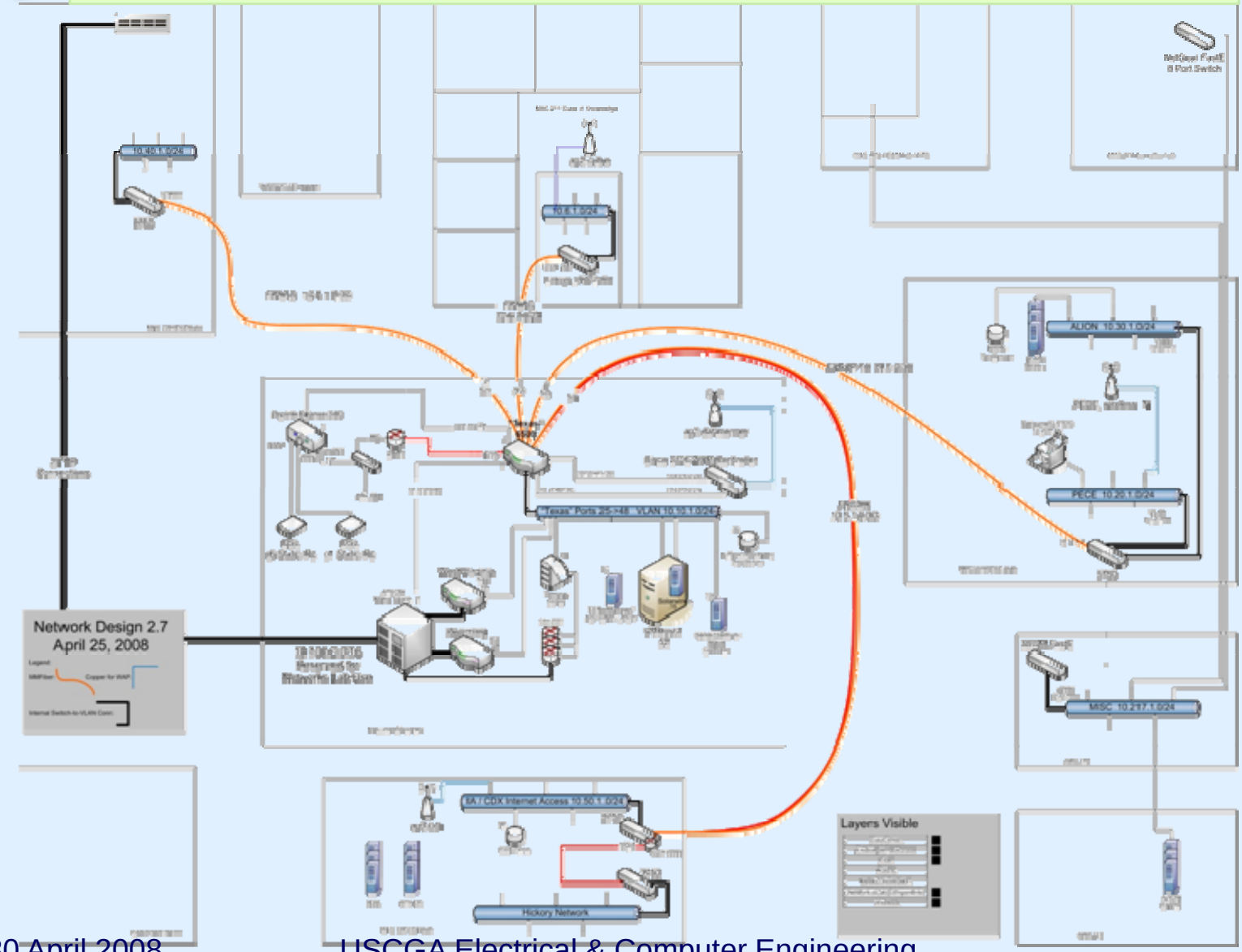
CURRENT RESPONSE TIME | PERCENT LOSS

Done

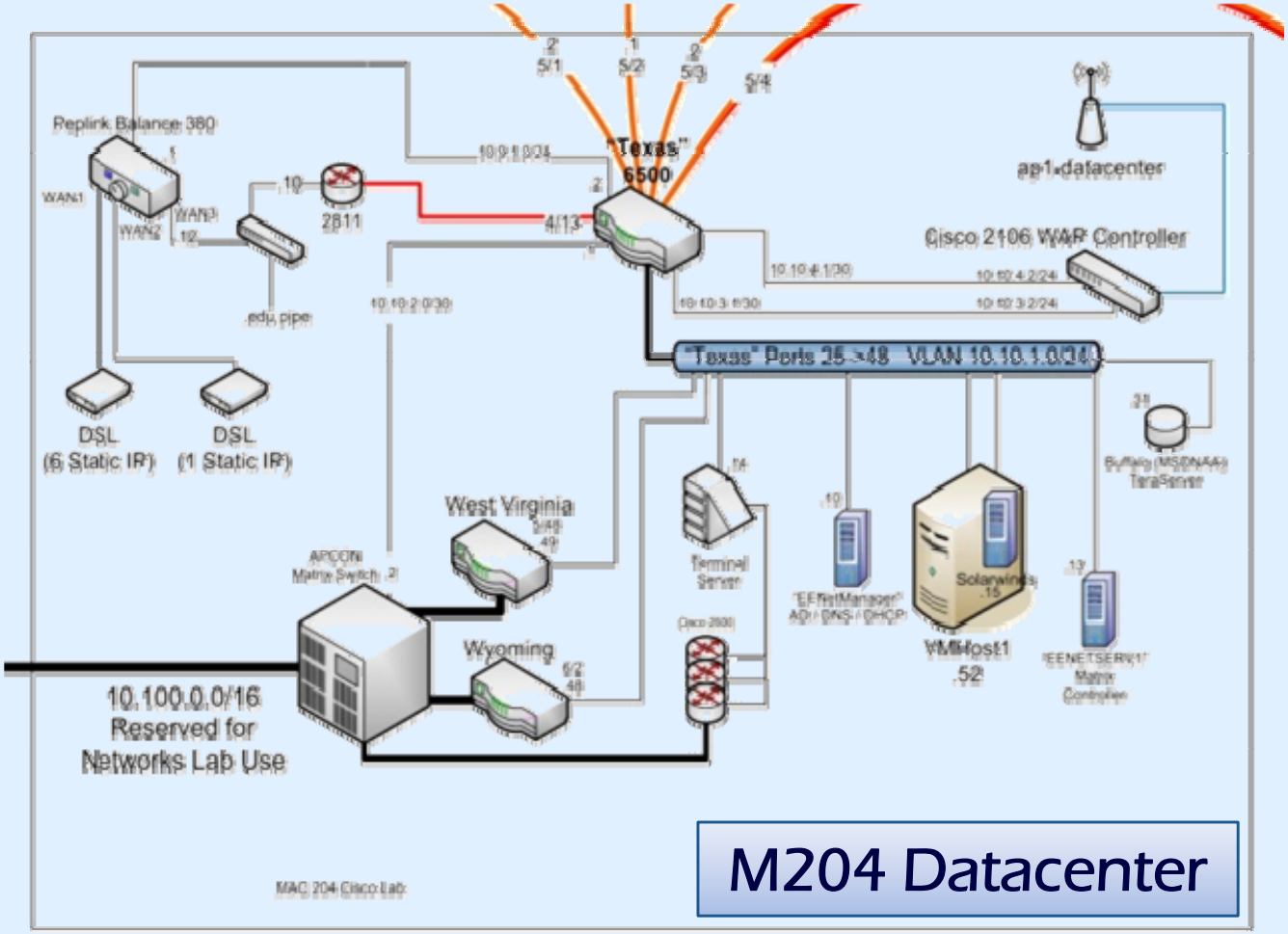
Second Semester Results

- Networks combined
- Load-balancing Implemented
- Wireless
- Network Performance Monitoring Software
  - Web-based GUI
  - Node status
  - Performance monitoring
    - Utilization
    - Availability
    - Packet loss (important for future VoIP projects)

Detailed Network Diagram



Detailed Network Diagram



Functional Expansion

- Media Distribution
  - Media types
    - Streaming media
    - Websites
    - Slide views
  - Features
    - Scheduled programming
    - Centralized management via simple GUI
- Traffic Monitoring / Logging
- Network Storage
- VoIP
- Simple VPN access

Conclusion

- Phase 1 Results
  - Existing Network Analysis
  - Fiber implementation
- Phase 2 Results
  - WAN Load Balancing
  - Network performance monitoring software
  - CDX Support
  - Wireless throughout 2nd Deck McAllister Hall
  - EEnet Guides

Questions?