

MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
SLOAN SCHOOL OF MANAGEMENT

15.565 **Integrating eSystems:**

Technology, Strategy, and Organizational Factors

15.578 **Global Information Systems:**

Communications & Connectivity Among Information Systems

Spring 2002

Lecture 12

*TECHNICAL CASE STUDY - MITnet*

Guest Lecturer: Chris Murphy  
MIT Information Systems

# MITnet Overview

- Approximately 80,000 hosts
- Approximately 2.5 terabytes of data passed on and off campus daily
  - export an average of 170Mbps
  - import 125Mbps
  - perform over 300,000 email deliveries daily
  - Users send over 120,000 email messages daily
  - 3 million web server hits daily, 52 gigabytes of data
- TCP/IP and Appletalk based

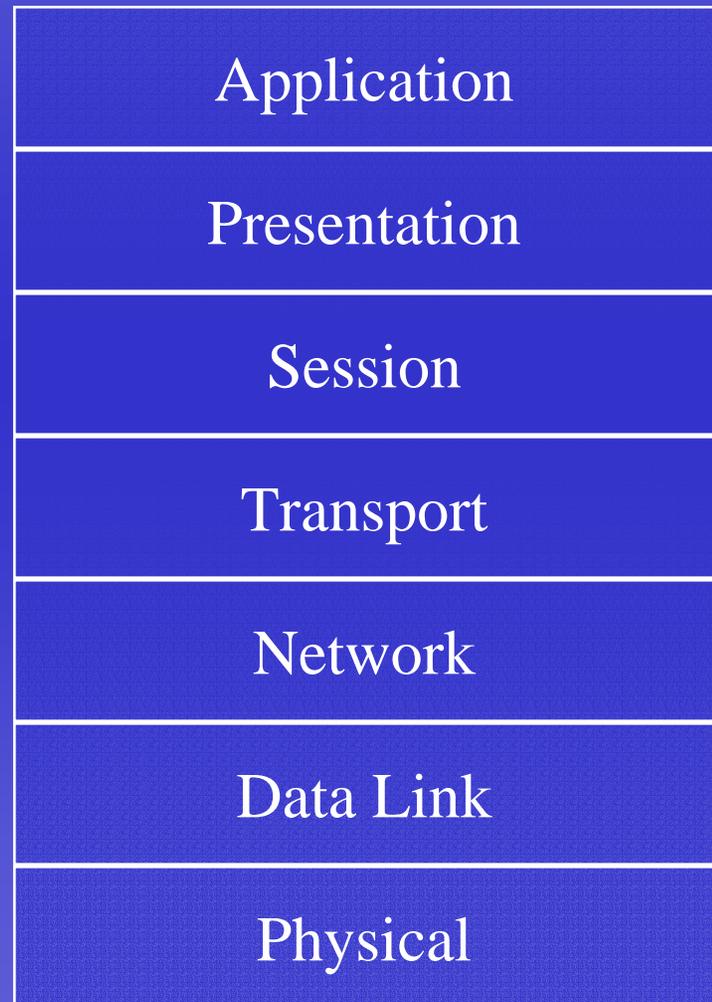
# Protocols

- Protocols define how entities communicate
  - **Ethernet** - low level communication between hosts
  - **TCP/IP** - higher level host-to-host communication
  - **IMAP** - Internet Message Access Protocol
  - **SMTP** - Simple Mail Transfer Protocol

# Protocols (cont.)

- HTTP - HyperText Transfer Protocol
- SNMP - Simple Network Management Protocol
- PPP - Point-to-Point Protocol
  - PAP - Password Authentication Protocol
  - CHAP - Challenge Handshake Authentication Protocol
  - IPCP - Internet Protocol Control Protocol

# The ISO Reference Model



# The ISO Model and Protocols

- Ethernet
  - Covers both Physical (wiring) and Data Link layers
- IP - Internet Protocol
  - A Network layer protocol
- TCP - Transmission Control Protocol
  - A Transport layer protocol

# Network Technology

- Backbone Network
  - Used to interconnect other networks
  - Covers the scale from buildings to nations
- Repeater
  - Works with a specific media (i.e. Ethernet)
  - Works at Layers 1 and slightly in 2
  - Passes all traffic

# Network Technology (cont.)

- Bridge
  - Usually works with a specific media
  - Works at layer 2
  - Used to segment traffic (only traffic that needs to cross the bridge is allowed to do so)
  - Switches can be thought of as multiport bridges

# Network Technology (cont.)

- Router
  - Can support multiple media types
  - Works at layer 3
  - Used to forward packets from one network to another based on routing tables
  - Communication servers, used to support dialup users, are based on routers

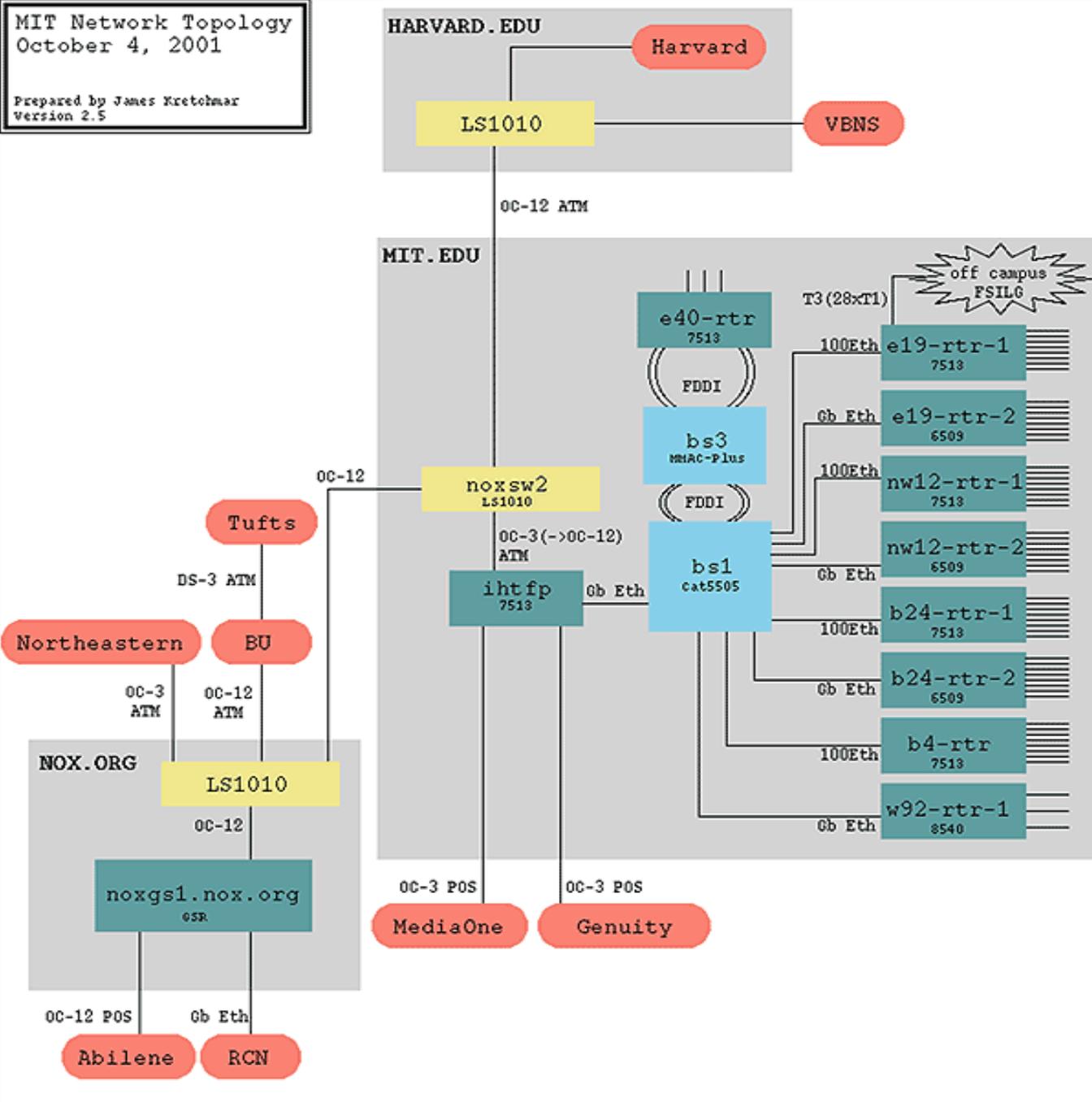
# Network Technology (cont.)

- Some other network devices
  - Media Converters
    - used to convert between physical connections
    - not part of the Ethernet specification
      - How lucky do you feel?
  - Firewalls
    - Used to provide some control over data flows for security purposes
    - Actually covers a multitude of devices

# Network Technology (cont.)

- Other devices (cont.)
  - Wireless LAN Access Points (APs)
    - dominate standard is the IEEE 802.11 family
      - 802.11 – 2Mbps, 2.4Ghz
      - 802.11a – 54Mbps, 5Ghz
      - 802.11b – 11Mbps, 2.4Ghz
      - 802.11g – 54Mbps, 2.4Ghz
    - MIT has coverage in most classrooms, libraries, and many common spaces

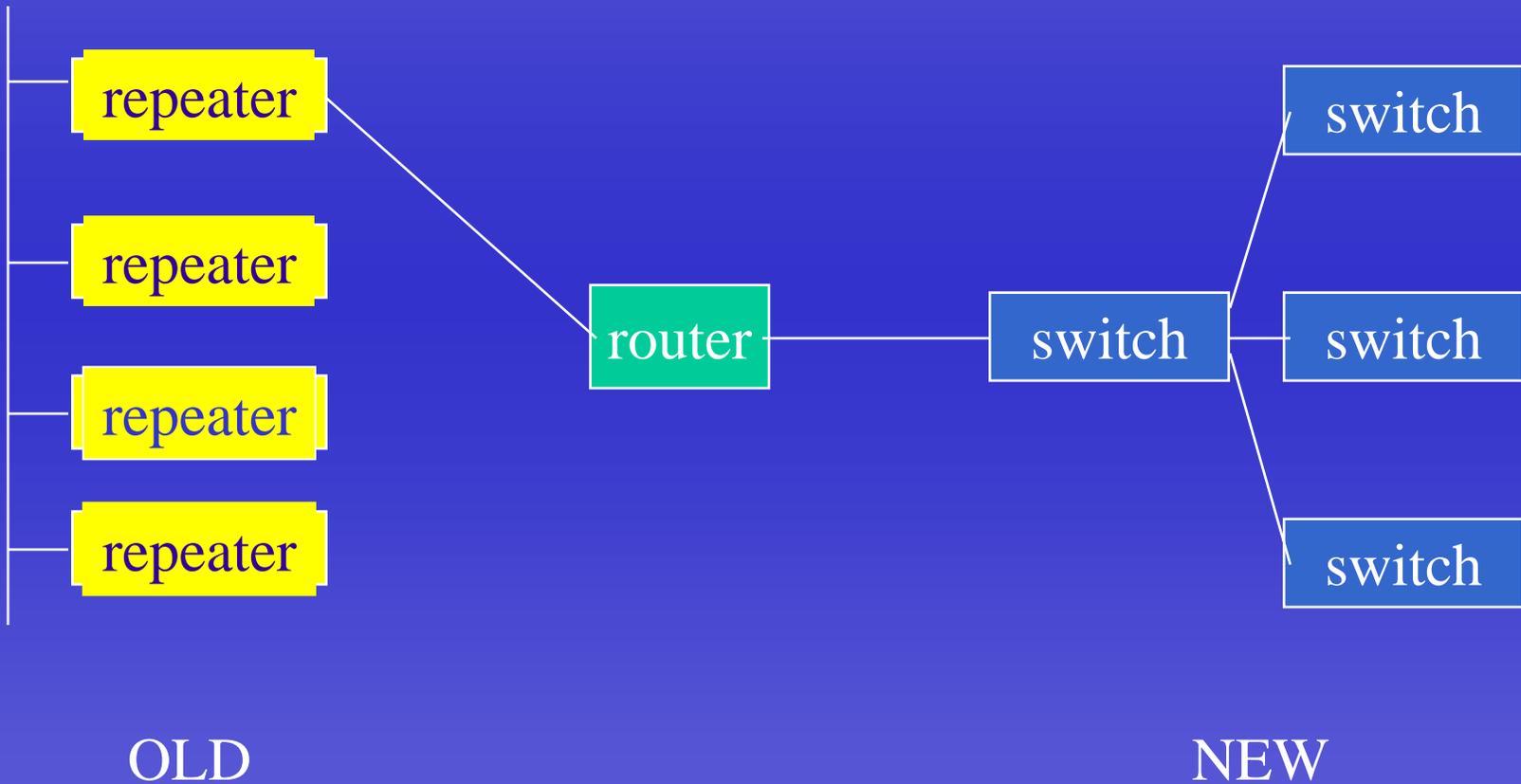
MIT Network Topology  
 October 4, 2001  
 Prepared by James Kretzmar  
 Version 2.5



# MITnet - Campus Backbone

- Core switch with 100Mbps or 1Gbps links
  - 1 legacy FDDI router
- 8 routers
  - Ethernet connectivity to buildings
  - A variety of links to the Internet and off-campus sites
  - co-located with central server sites and MIT's fiber plant

# MITnet - Building Backbones



# MITnet - Wide Area Connections

- MIT Off-campus sites
  - ILGs - multiplexed T1 lines
  - Remote offices
    - laser links
    - leased lines (T1, 56kbps)

# MITnet - Internet Connections

- Links to the following networks
  - Genuity - our default service
  - vBNS - MCI high speed backbone, shared with Harvard
  - Northern Crossroads (NOX)
    - Abilene (Internet 2), RCN, other New England universities
  - ESNNet - Energy Science Network

# MITnet - Remote Access

- MIT provided
  - “56k” modem based PPP service
  - Legacy terminal service to Athena
- Other ISPs
  - Traditional modem-based services
  - AT&T, RCN cable modem service
  - DSL?

# MITnet Design Philosophy

- Simplicity
  - Keep topology and technology standardized as much as possible

# Security

- The MIT approach to security
  - secure higher-layer connections between hosts
  - secure the hosts themselves
  - assume the network is compromised
  - firewalls not used in our security plans
  - Network Security team handles security incidents, as well as preemptive work