Information Systems Infrastructure

APPA-Institute for Facilities Management

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Learning Objectives

Become familiar with the physical layer components of information system infrastructures that provide audio, video, and data communications in a unified platform.

Discuss the impact of data center design and layout on energy management.

Become familiar with key new technologies for facilities management and understand how they impact facilities management.

Discuss the changing relationship between IT Support and the Facilities Department.

Components of Campus Telecommunications Infrastructure

- Private Branch Exchange (PBX)
- Outside Cable Plant
- Inside Cable Plant
- Local Area Network
- Wide Area Network
- Engineering
- Emergency Response
Open Systems Interconnection

- Application Layer
- Presentation Layer
- Session Layer
- Transport Layer
- Network Layer
- Data Link Layer
- Physical Layer

Physical Layer

**Circuits:**

- Physical: the complete path of an electric current including the source of the energy
- Virtual: ???????

Physical Layer Elements

- Telecommunications Media
- Topology
- Transmission Rate
- Transmission Mode
- Channels and Multiplexing
Telecommunications Media

- **Bounded Media**: signals are confined to the medium; they never leave it.
- **Unbounded Media**: signals are not confined to the medium; they are free to propagate through the atmosphere, the ocean, and outer space.

Types of Unbounded Media

Wireless Networking

Wireless network access point. Note the access point is wired.
Types of Bounded Media

- Twisted Pair
- Coaxial Cable
- Fiber-Optic Cable

Test your knowledge

Why is the type of media so important?

Topology

- Point to Point
- Complete
- Star
- Bus
- Ring
- Tree
- Irregular
Which topology is chosen for its ability to recover from a cable cut?

Ring or Mesh

Transmission Rate

The capacity of a communication channel, measured as the difference between the highest and lowest frequencies carried by the channel. The greater the bandwidth, the greater the amount of information that can be simultaneously transmitted over the channel.

Bandwidth = Tx Rate

<table>
<thead>
<tr>
<th>Modem Type</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>56K Modem</td>
<td>4.525 sec</td>
</tr>
<tr>
<td>ISDN Phone</td>
<td>1.980 sec</td>
</tr>
<tr>
<td>384 DSL</td>
<td>660 sec</td>
</tr>
<tr>
<td>T-1</td>
<td>169 sec</td>
</tr>
<tr>
<td>Cable Modem</td>
<td>84 sec</td>
</tr>
<tr>
<td>10M Ethernet</td>
<td>25 sec</td>
</tr>
<tr>
<td>100M Ethernet</td>
<td>2.5 sec</td>
</tr>
<tr>
<td>1G Ethernet</td>
<td>.2 sec</td>
</tr>
</tbody>
</table>
Which network connection would allow you to watch a movie in real time?

10M Ethernet or Greater

In Building Wiring

- Supports:
  - LAN
  - Phone
  - Cable TV
  - Facilities Controls
- Structured Cabling System
  - Category 5
  - Category 6

Local Area Network (LAN)

- Data transferred in Frames
- Peer to Peer Networking
- Low level protocols IEEE 802.3:
  - Ethernet 802.3
  - Token Ring 802.5
  - Token Bus 802.4
- Transport level
  - Novell IPX/SPX
  - TCP/IP
BICSI

Building Industry Consulting Services International

- Promotes the economical and efficient design and implementation of telecommunications distribution systems in commercial and multi-family buildings
- International non-profit professional association
- Founded in 1974
- Approximately 20,000 members in >85 countries!

TDM Manual

Topics include:
- LAN Overview
- Cabling Standards
- LAN Design
- Ethernet, Token-Ring, FDDI, ATM
- Internetworking
- Wide Area Networks
- and much more...

Contact BICSI

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VoIP (voice over IP)

- Uses existing data network

Issues
- Quality of Service
- Security of Physical Network
- Power over Ethernet

VoIP Telephone

New voice over IP telephone

Software PBX

Software PBX to support a voice over IP phone system. Note the 25 pair (grey) legacy telephone cable interfacing to SoftPBX
Emergency Notification

Methods
- Electronic Signage
- Voice Annunciation
- Sirens and Horns
- Email and Text Messaging

Issues
- Activation-Who, What, When?
- Communications Plans
- Failures

Emergency Notification Popup message on Desktop computer

Emergency Notification

Classroom multi-media workstations make good points of emergency communications. Telephones can be used for voice annunciation and computers for text alerts.
IT Systems for Facilities

- Energy Management Systems and Software
- Work-order management systems
- Content Management systems
  - Blueprints and as built drawings
- Mobile Devices
  - Inventory collection
  - Remote access and control

Facilities Management Systems

- CAFM - Computer Aided Facilities Management
- CIFM - Computer Integrated Facilities Management
- IWMS - Integrated Workplace Management System
- TIFM - Total Infrastructure and Facilities Management

Key Features

- Work Order Tracking
- Room Inventory
- CAD/Design Content Management
- Telecommunications/Cable Management
- Fleet Management
- Materials Management
Work Order Tracking and Queuing

In addition to a facilities work order tracking system, email mail boxes serve as a queue for tracking work requests, orders and assignments.

Work Order Tracking

Work order tickets being entered into ticket tracking system. System also tracks labor and materials applied to the order.

Energy and Facility Management

- Provides computer control of facilities equipment
- Allows remote monitoring anywhere-anytime even from home
- Logs and tracks energy demand, heat load, etc.
Building Automation

Energy and Utility Management

HVAC interconnection to building automation and control system
Sensors and Interfaces

Content Management
There’s an App for that!

Content Management
2,178,039 gross square feet (2005)
Closing Remarks

* Networks can be complex to understand, we can simplify them by breaking them down into layers
* Voice, video, and data are all now represented as bits on converged single infrastructure networks
* New technologies are entering the facilities workspace everyday
* Technologies are enabling institutions to manage resources and cut costs

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