

# ITTI 2000

## Introduction to Telecommunications

Presentation by

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Chief, Office of Engineering and Technology

Federal Communications Commission

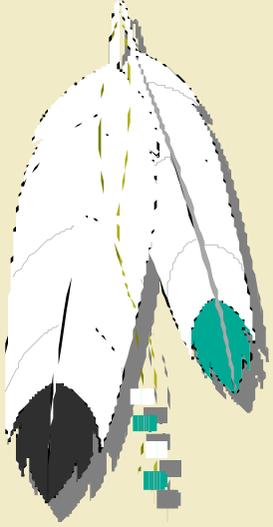
at

Indian Telecom Training Initiative 2000

St. Paul, MN

September 25, 2000

**INDIAN TELECOM TRAINING INITIATIVE 2000**

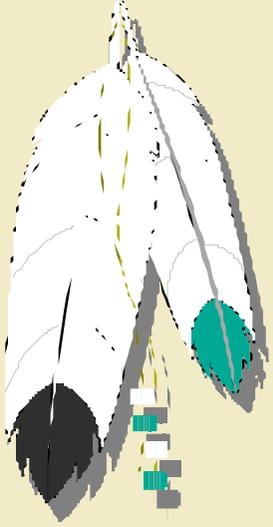


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## Introduction

- Purpose:

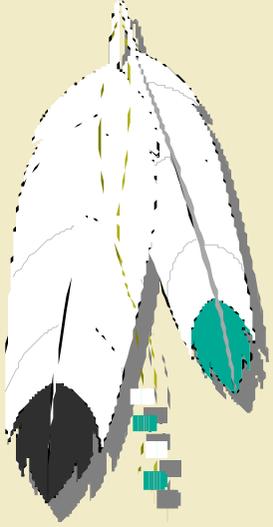
To provide attendees with a basic background in telecommunications terminology and trends



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## Introduction

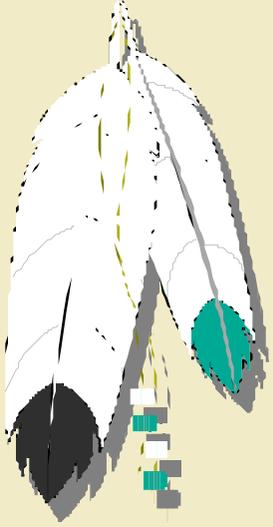
- Outline:
  - Introduction
  - Basic Concepts
  - Five Mega-Trends
  - The Challenge of the “Last Mile”
- Definition of Telecommunications



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## Introduction

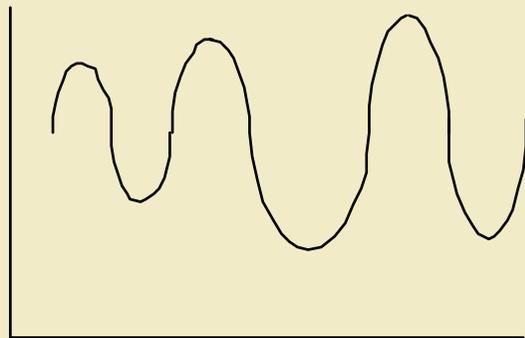
- Importance of Telecommunications
  - Safety of Life and Property
  - Economic Development
  - Education
  - Healthcare
  - Other



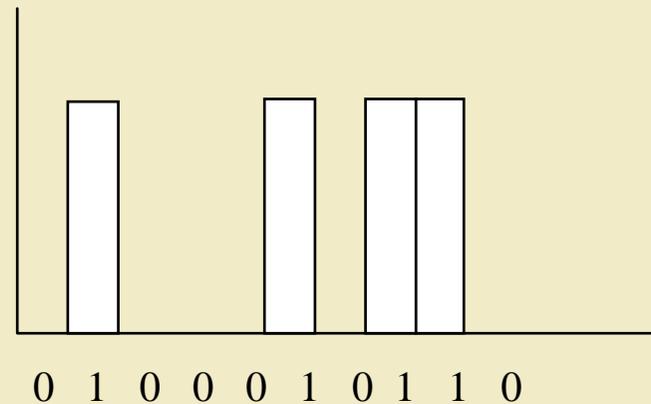
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## Basic Concepts

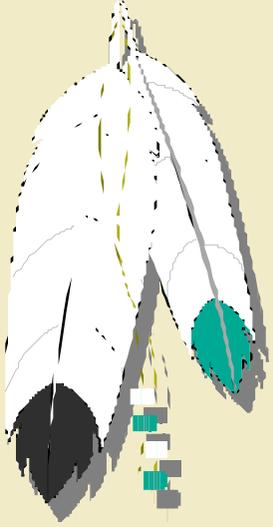
- Types of Signals



Analog



Digital

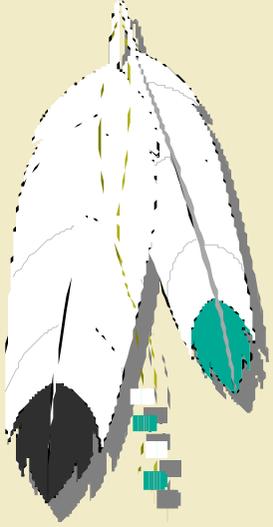


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## Basic Concepts

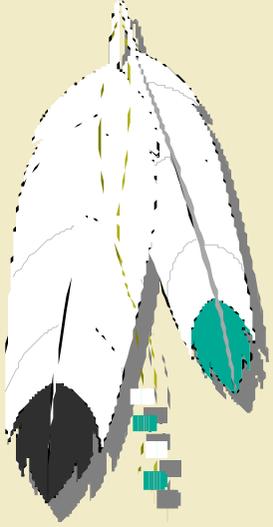
- Notion of Bandwidth
  - In simple terms, bandwidth is just a measure of how fast information can be transmitted
  - The larger the bandwidth, the more information that can be transmitted in a given amount of time

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## Basic Concepts

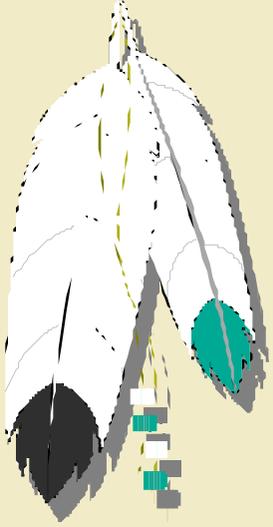
- Characteristics of Different Signals
  - Voice: analog with information rate “constant” and relatively narrowband
  - Data: digital with information rate bursty with variations from very narrowband to broadband



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## Five Mega-Trends

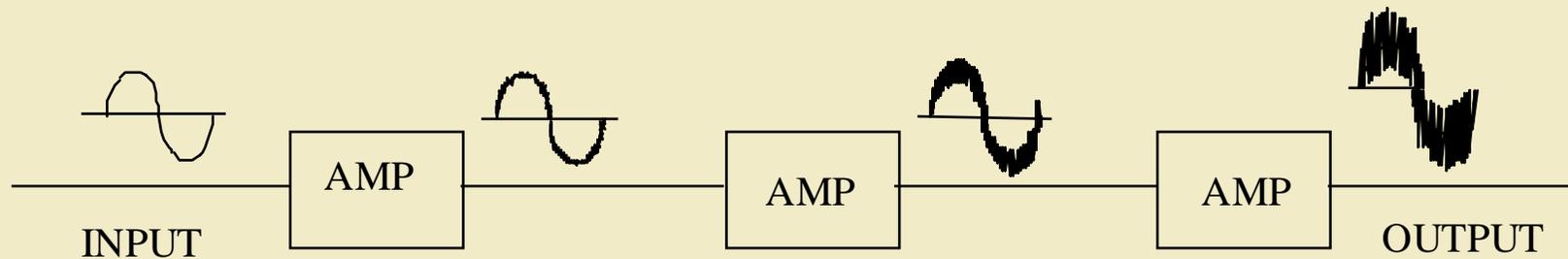
- Analog versus Digital -- Why Digital?
- Circuit Switching versus Packet Switching -- Why Packet Switching?
- Narrowband versus Broadband -- Why Broadband?
- High Latency versus Low Latency -- Why Low Latency?
- Wired versus Wireless -- Why Wireless?



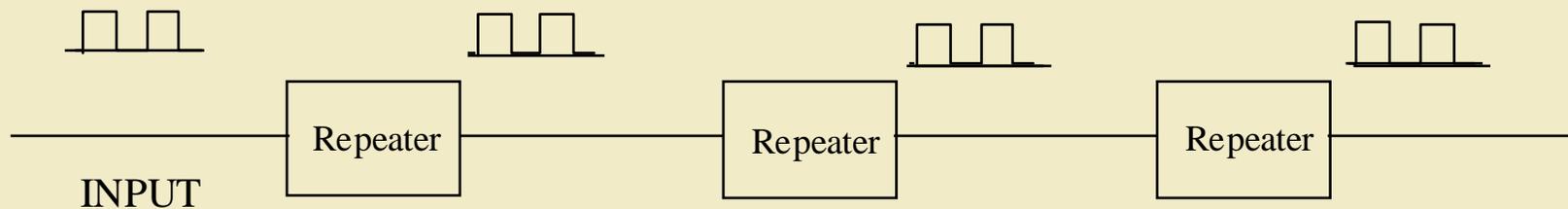
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## Five Mega-Trends

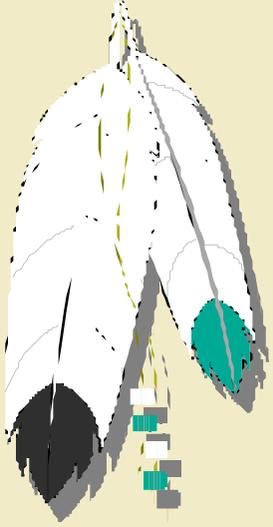
- Analog versus Digital -- Why Digital?



Analog Amplification: Noise Accumulates

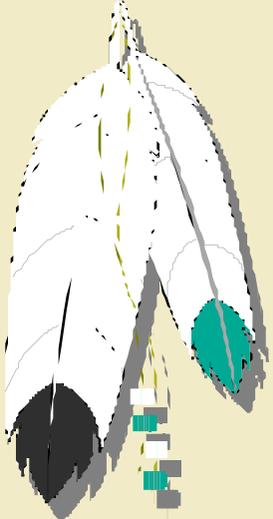


Digital Regeneration: "Perfect" Signal is Regenerated



## Five Mega-Trends

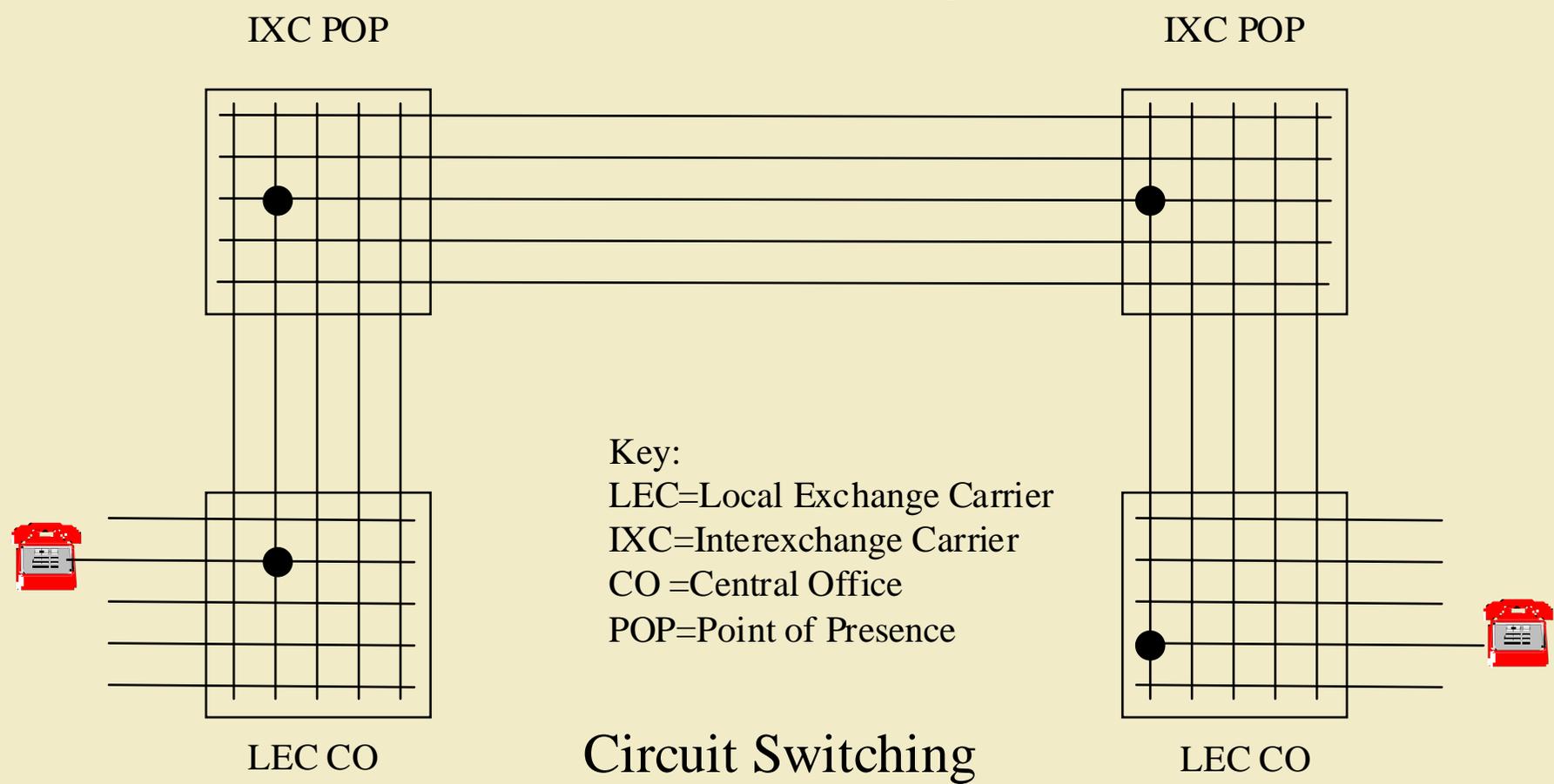
- Analog versus Digital -- Why Digital?
  - Advantages of the Digital Mode
    - Signal regeneration
    - Ease of multiplexing -- that is, ease of carrying combinations of voice, data, image and video signals
    - Other

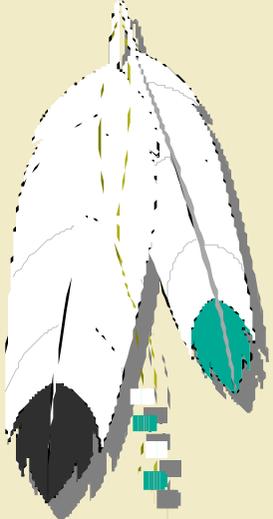


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## Five Mega-Trends

- Circuit Switching versus Packet Switching -  
- Why Packet Switching?

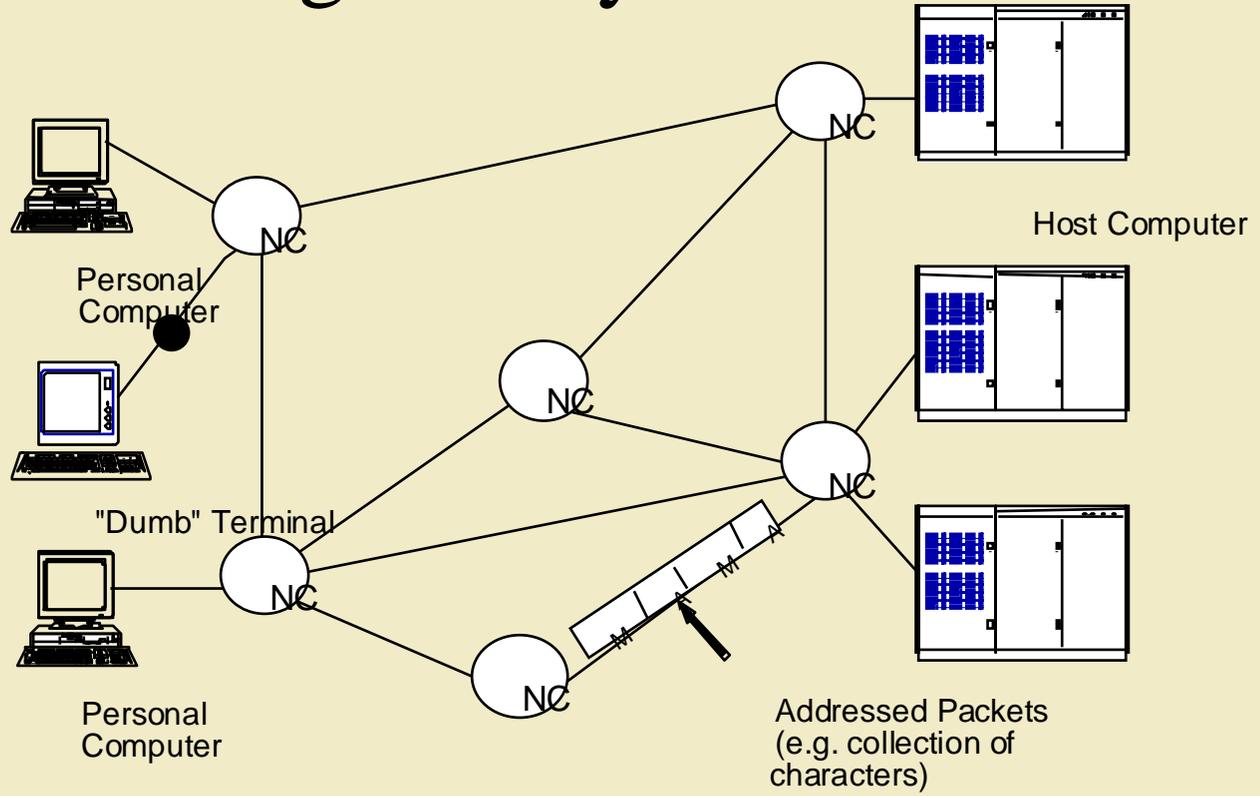




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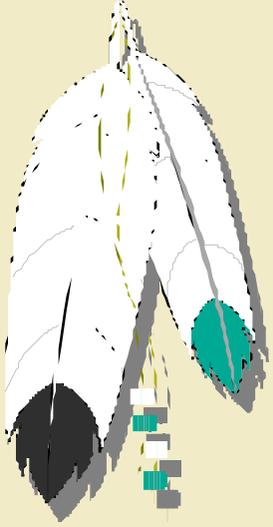
## Five Mega-Trends

- Circuit Switching versus Packet Switching -- Why Packet Switching?



NC = Network Computer  
Functions: Error Control, Routing, Flow Control

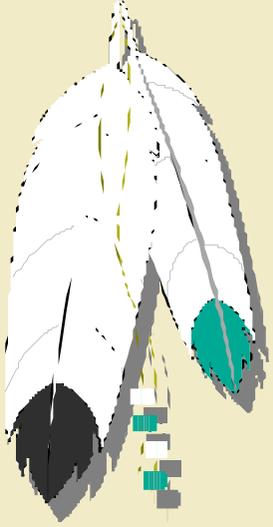
### Packet Switching



## Five Mega-Trends

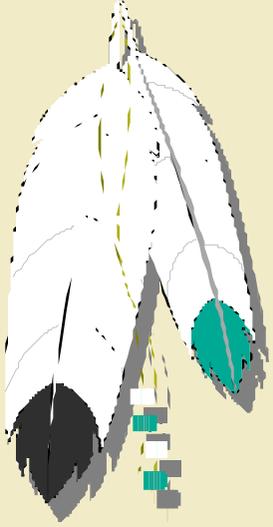
- Circuit Switching versus Packet Switching
  - Why Packet Switching?
    - Advantages of Packet Switching
      - Efficient utilization of network when traffic is bursty (e.g., for data)
      - User does not consume network resources when no information is being sent
      - “Bandwidth on demand”
      - Other

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## Five Mega-Trends

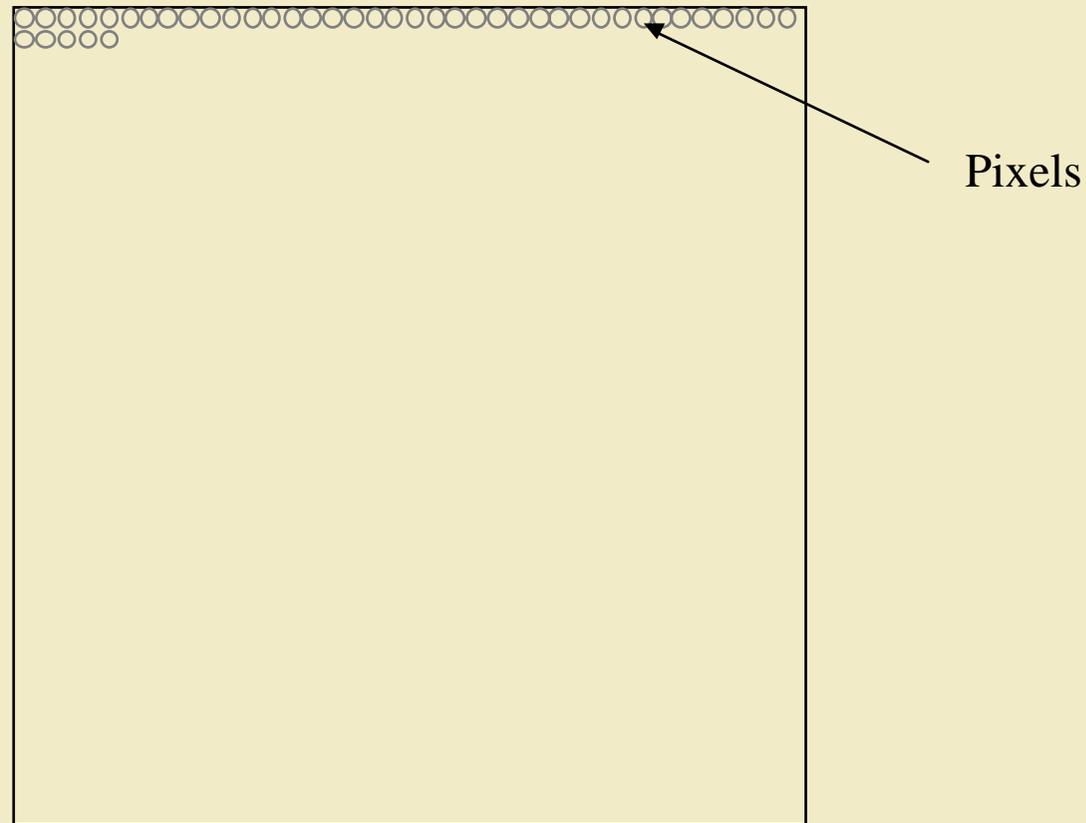
- Narrowband versus Broadband -- Why Broadband?
  - In the digital world, bandwidth is measured in bits per second
  - Analogous measures: vehicles per hour or gallons per minute



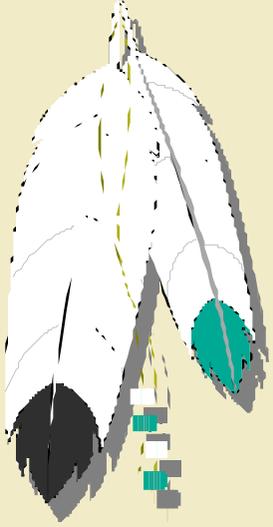
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## Five Mega-Trends

- Narrowband versus Broadband -- Why Broadband?



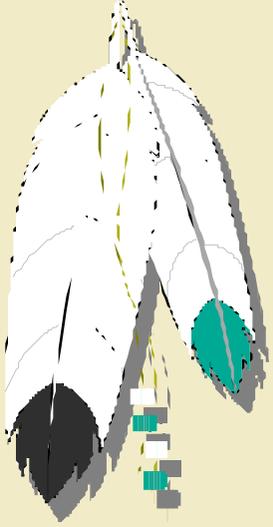
Computer Monitor



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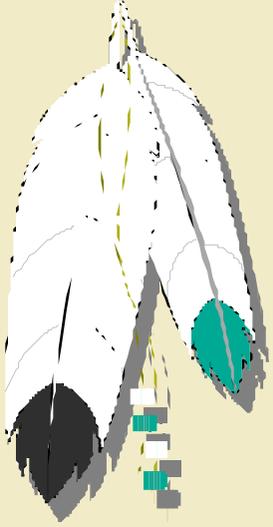
## Five Mega-Trends

- High Latency versus Low Latency
  - Why Low Latency?
    - In simple terms, latency just refers to delay
    - Latency is the amount of time it takes information (e.g., a packet) to travel from source to destination
    - In combination, latency and bandwidth define the speed and capacity of a network
    - Low latency is critical in voice communications and certain real-time data communications applications



## Five Mega-Trends

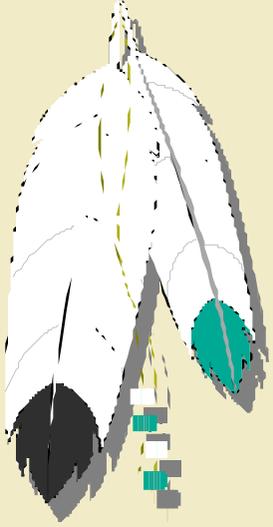
- Wired versus Wireless -- Why Wireless?
  - Increased mobility of the workforce and society more generally
    - Tradeoff of throughput for mobility
  - Potentially lower costs for certain fixed applications
  - More fungible investment
  - Other



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## Five Mega-Trends

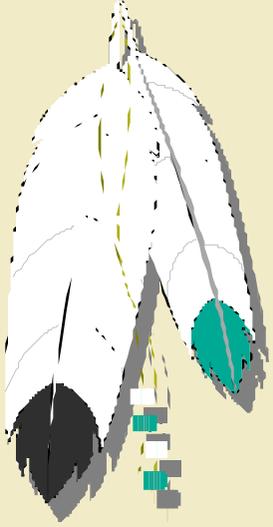
- Networks of the Future
  - Trends/Goals from a Technological Perspective:
    - All applications -- voice, data, image, video, multimedia -- conveyed on an all digital, packet-switched, broadband, low latency network or “platform”
    - A “network of networks”
    - Communicate “anytime, anywhere, in any mode”



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## The Challenge of the “Last Mile”

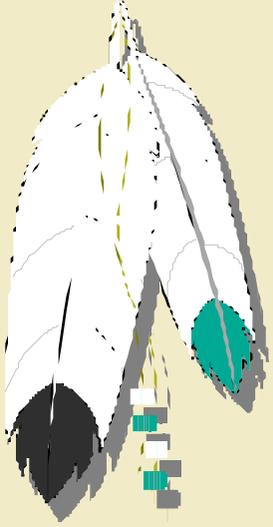
- Parts of the Network
  - Backbone -- “Multi-Lane Interstate Highway”
  - Middle Mile -- “Divided Highway”
  - Last Mile -- “Local Road”
  - Last 100 Feet -- “Driveway”
- The Challenge of the Last Mile



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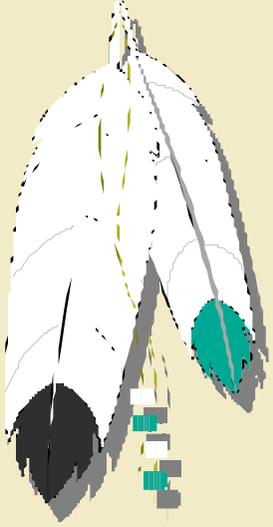
## The Challenges of the “Last Mile”

- “Last Mile” Alternatives for Broadband
  - Digital Subscriber Line (DSL) Systems
  - Cable Modems
  - Satellite (Direct to the Subscriber)
  - Fixed Wireless Access Systems (e.g., LMDS)
  - Third Generation Cellular



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## Summary and Conclusions



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## Contact Information

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