Remote Access Techniques and Issues

Bill Klein
Networking and Telecommunications Services
10/25/2006
klein@ku.edu
Introduction

• Presenter bio
• The Information Services "triad"
  – Information repositories
    • Libraries (physical)
    • Databases (electronic)
  – Information manipulation and presentation
    • Personal computers
    • Servers
    • Applications
  – Information access and transport
    • Networks
Networks

• The "internet" operates on many scales
  – Local Area Network (LAN) technologies
  – Metropolitan Area Network (MAN) technologies
  – Wide Area Network (WAN) technologies
• These technologies are used to build real networks
  – Internet Service Providers (ISPs)
  – Enterprise/corporate networks
  – "Consortium" networks
  – Small office/home networks
Expectations

• Anywhere, anytime access to information and services
  – While traveling (hotels, airports, coffee shops)
  – From home

• How can your home computer be connected to the internet?
  – Wired
  – Wireless
Wires to Your Home

- Electrical connection
- Phone line (twisted pair copper)
- Cable TV (coaxial cable)
- Fiber optic
  - Not yet, but maybe someday ...

- Ethernet is the defacto standard for connecting computers to the internet
  - Speeds up to 1000M bps
  - Distance limitations make its use from home (over existing wiring) impossible (LAN vs. MAN)
    - twisted pair copper: 300 feet
    - coaxial cable: 1000 feet
Can We Use These Wires to Connect to the Internet?

• Electrical connection - No
  – Some experimentation has been done
    • No viable commercial services, yet ...

• Phone line - Yes
  – Dialup modem
  – Digital Subscriber Line (DSL) service*

• Cable TV - Yes
  – Cable modem service*
  • * where available!
Using the Phone Line: Dialup Modem

- **Modulator / Demodulator**
- Converts computer data to "sounds" (in an electrical form) just like your telephone does for the human voice
- Designed to use the "standard" Public Switched Telephone Network (PSTN) just like any normal call would be made
  - No modifications to the PSTN required
Dialup Modem continued

• The earliest (and now the oldest) remote access technology

• The modem uses "all" of your phone line
  – No incoming or outgoing human voice calls while the modem is in use, and vice versa

• The performance is limited by the "capacity" provided by the PSTN for a voice call
  – The best modems today can operate at speeds up to 56K bps. This is slow by today's standards.
  – The use of modems is fading fast.
Dialup Modem Environment

Home

"Plain Old Telephone Service" (POTS) Line

twisted pair copper wire

Local Telco Central Office

Telephone Switch

Internet Service Provider (ISP)

Internet

KU Network

terminal server

864-XXXX

Internet

PSTN
Using the Phone Line: Digital Subscriber Line

- The telephone companies wanted to find a way to offer new data oriented services (and generate revenue) over their existing installed base of telephone wires
- A technological "challenge" at the time
  - The "quality" of the wires is marginal at best for this purpose (one pair of twisted copper wires)
  - New signal processing technologies allow us to "squeeze" more data through the wires
• The solution: Frequency Division Multiplexing (FDM) and some fancy digital signal processing
  – One frequency is used to carry a standard voice call
  – A different frequency is used to carry computer data
  – Both frequencies can be carried simultaneously over the same wires
    • Standard incoming and outgoing voice calls can be made while your computer is connected to the internet
  – Performance is still limited by the nature of the wires and signal processing used, but speeds up to 3M bps are currently possible (at a premium price)
    • I just saw an ad on television where 6M bps performance is claimed
DSL Environment

Diagram:
- Home
  - DSL modem
- Local Telco Central Office
  - DSLAM
  - Telephone Switch
  - ISP
- Internet
- PSTN
- KU Network

Connections:
- POTS Connection
- Internet Data Connection
- twisted pair copper wire
Using Cable

• Your standard cable TV "wire" uses FDM to carry many TV channels simultaneously
  – The "wire" is a coaxial cable, which by its design can carry 100s of individual TV channels (not all are used in practice) simultaneously
  – One (or more) of these unused TV channels can be used to transport computer data
  – Current service offerings can provide up to 10M bps (at a premium price)
Cable Environment

- Home
  - Cable modem
  - coaxial cable

- Cable Company
  - Head End
  - Video Sources
  - ISP
  - fiber optic cable

- Internet

- PSTN

- KU Network

- Internet Data Connection
- TV Connection
- POTS Connection
Wireless

• Many different technologies
  – AM/FM
  – Cellular phone
  – Satellite
  – Microwave
  – Laser
  – WiFi (IEEE 802.11)
    • aka wireless LAN
    • the most common technology used (today) for connecting computers to the internet wirelessly
• Distance and speed limited
  – Depends on "environment"
    • physical mass reduces signal strength
      – up to several hundred feet
      – 54M bps possible
        » actual speeds are typically 2M to 6M bps

• Other issues
  – Interference from other signals
    • uses unlicensed radio frequency spectrum
  – Security
    • your data is transmitted "through the air" and can be easily intercepted by someone in range
      – use encryption
WiFi Environment

- Out of "Range"
- In "Range"
- Marginally in "Range"
- "War Driver"
- Eavesdropping Neighbor
- Wireless "Hot Spot"
Watch Out For ...

- **Vendor performance claims**
  - They rarely lie per se, but they don't always divulge the full picture readily (read the fine print carefully)
  - Advertised performance is only possible under "ideal" conditions
  - Asymmetric speeds
    - assumes that you will download more information from the internet to your computer than the other way around
    - max performance from the ISP to you, less performance in the other direction

- **Performance on the internet in general**
  - There are NO performance guarantees!

- **Security**
  - *You should assume the worst unless you take specific steps*
  - Protecting you computer
    - firewalls
    - anti-virus
  - Protecting your data during network transit
    - If the data you are transmitting/accessing is confidential, then you must use encryption
      - Secure Socket Layer (SSL)
      - Virtual Private Network (VPN) technology/service
Questions