Internet and Security: A Closer Look

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- Key Ideas of the Internet

- Internet Security

- Mobile Security

Key Ideas of the Internet

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Where did the Internet come from?

- Government sponsored project in the 1960s
  - Cold war

- Defense department
  - What if parts of the phone network are destroyed?

(Old) Phone Network

- Phone connection
  - Dedicated circuit between two parties
    - "Circuit Switching"

  - If a segment of the circuit in the network is destroyed
    - The two parties cannot communicate

A More Resilient Communication Network

- How to design a communication network
  - that can survive
  - when parts of the network are destroyed?

Key Idea 1: Packet Switching

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- The message is composed from packets at the receiver

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- Lost packets are re-sent via other routes

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  - Detects out-of-order packets at the receiver
  - Detects duplicate packets at the receiver
  - Detects corrupted packets at the receiver

Different Types of Computers in a Network

- Consider 3 different types of computers: A, B, C
  - 3 different pairs of computer types
    - A-B, B-C, A-C
    - 3 different "protocols"

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- N types of computers
  - N(N-1)/2 different protocols
  - Lots of work

Key Idea 2: Interface Message Processors (IMPs)

- Computers don't directly connect to each other

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- N types of computers
  - N protocols, instead of $N(N-1)/2$

Multiple Networks

- APRANET, NSFNET, USENET, CSNET, UUNET, …

- Computers on one network couldn't talk to those on another network.

Key Idea 3: Internet Protocol

- Networks are connected to each other via Gateways
  - "inter" network => Internet

- Internet Protocol (IP) (1970s)
  - If a computer /network understands IP
    - It can communicate with another on a different network

More Familiar Networks

- Local Area Networks (LANs)
  - Ethernet
  - Wifi

- These networks are connected to the Internet via routers/ISP/gateways/…

Software/Hardware Complexity

- Designing "apps" could be complex
  - Involving many ideas

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  - Many layers/levels
  - Working at one level without knowing the details of the lower levels

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- Send email, search via google, …
  - Without knowing any details about Internet Protocol, Gateways, IP addresses….

- Easier to build "apps" quickly

Beyond Communication

- Phone system
  - 911 service
  - 411 service
  - 800 toll-free to businesses

Key Idea 5: Resource Sharing

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  - Allow sharing of resources
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Key Idea 5: Resource Sharing

- Internet is not just for communication
  - Allow sharing of resources
    - World Wide Web (1990s)
      - Sharing of scientific information/data/articles
      - "hyperlinks" that link related resources
      - URL: Uniform Resource Locator
    - Fast forward to now
      - Banking, shopping, entertainment, education, …
    - Future
      - ???
        - Up to our imagination
        - Whatever that can be digitized can be transmitted and shared

Government and Free Enterprise

- The US government decided not to restrict internet technology

- No one single authority controls the Internet
  - Each network/gateway is controlled by its owner (in some cases governments)
    - Lots of cooperation

- Free to innovate and commercialize

Summary of Key Ideas

1. Packet switching
2. Interface Message Processors
3. Internet Protocol
4. Abstraction Levels
5. Resource Sharing

More Outreach Efforts

- cs.fit.edu/~pkc/cs4hs

  - District-wide tic-tac-toe tournament
    - Organized by Edgewood in April/May
    - Your player against others

  - Summer Camps
    - July