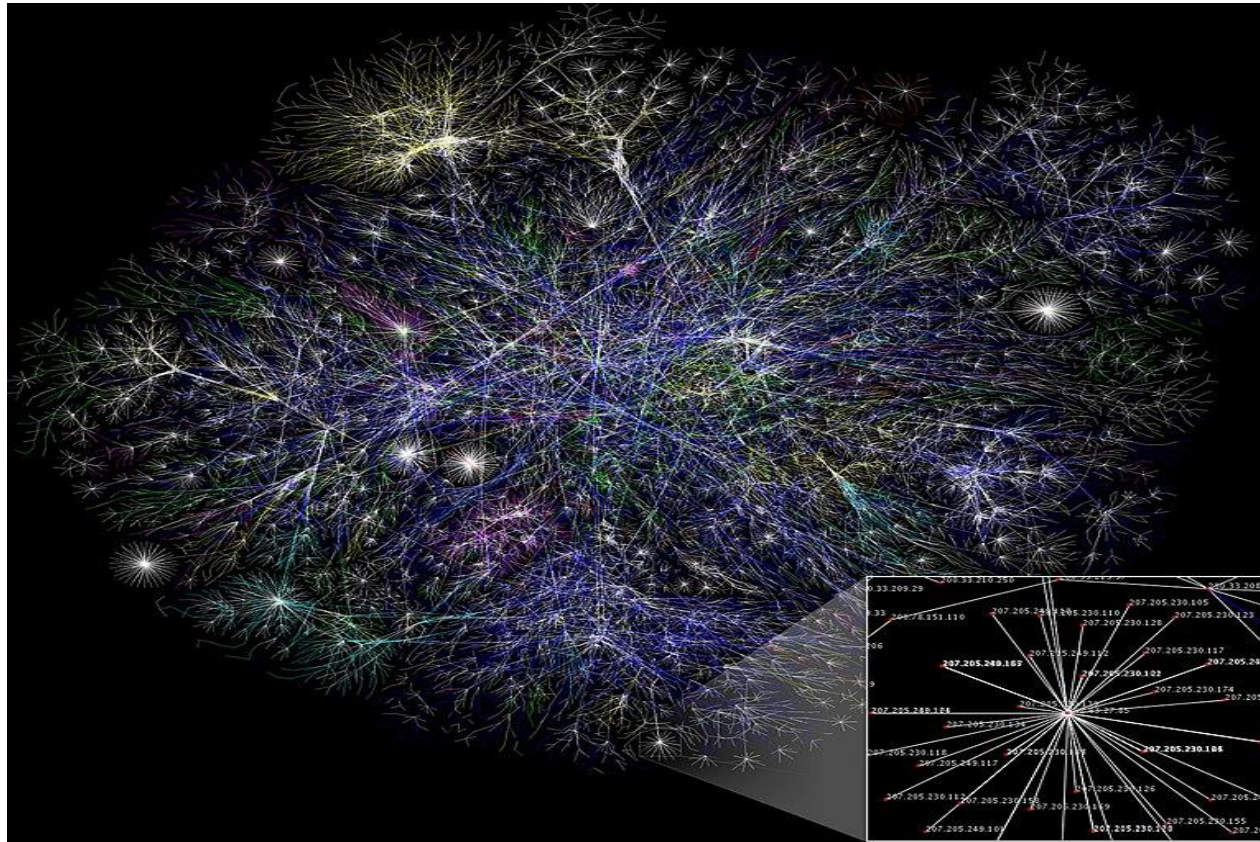


Computer Networks and Network Security

David Paul

What is a computer network?

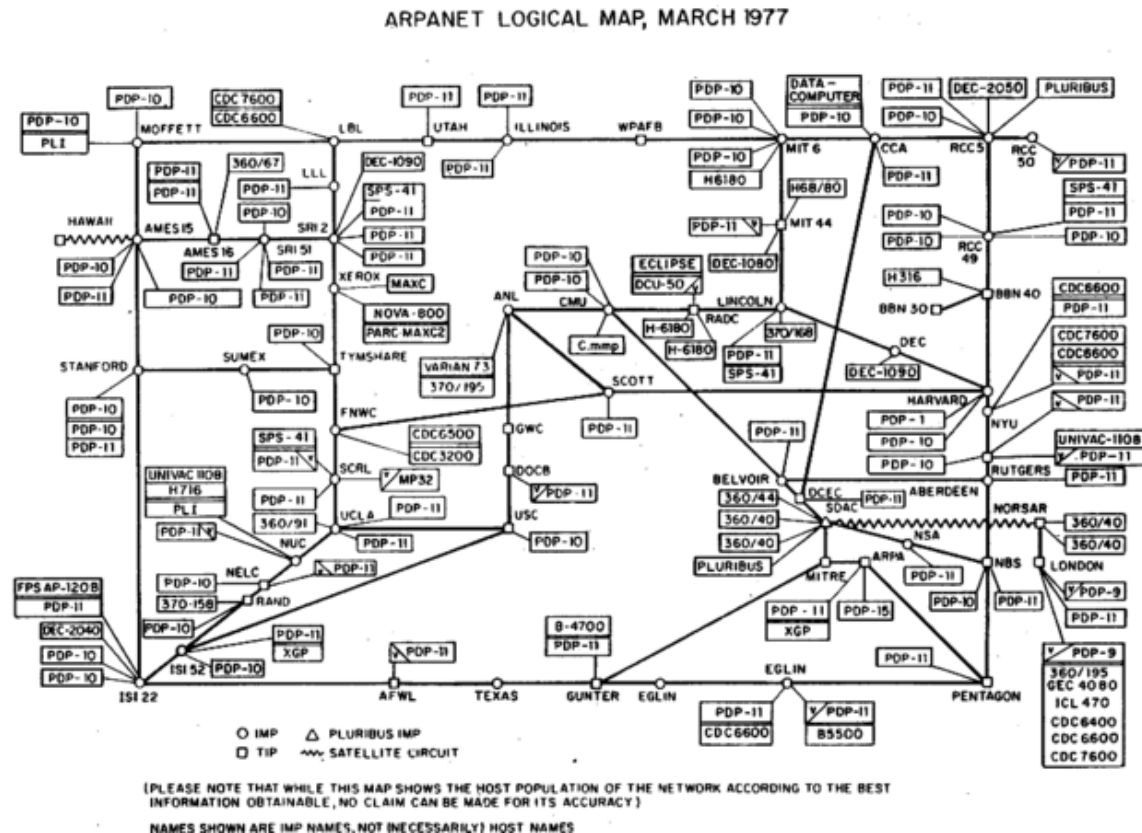


Partial map of the Internet in 2005 by The Opte Project (CC BY 2.5 - no changes made)

The role of computer networks

- Global Communication
- Business and Commerce
- Healthcare
- Entertainment
- Social Interaction
- Transportation and Smart Cities
- Remote Work
- Security and Surveillance
- Scientific Research

History of computer networks



ARPANET logical map, 1977 by ARPANET (Public domain)

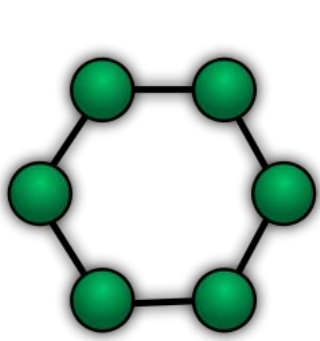
Components of a computer network

- Nodes
 - Computers
 - Servers
 - etc.
- Links
 - Physical
 - Wireless
- Transmission
 - Wires
 - Fiber optics
 - Radio waves
 - etc.

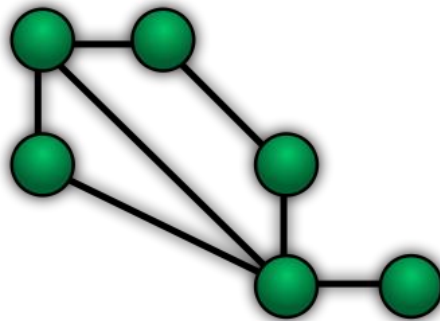


Fibre optic cable rack by Lars Kienle
(Unsplash)

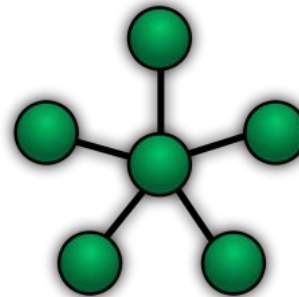
Network topologies



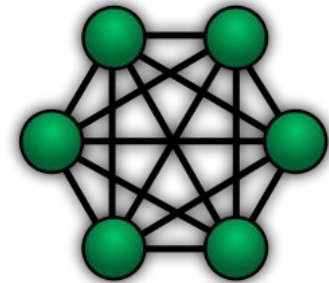
Ring



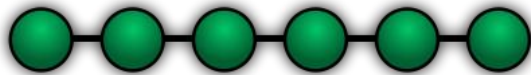
Mesh



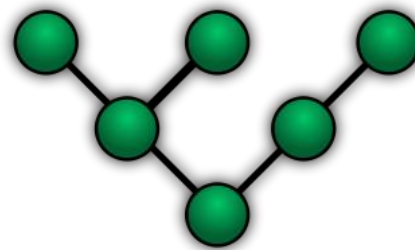
Star



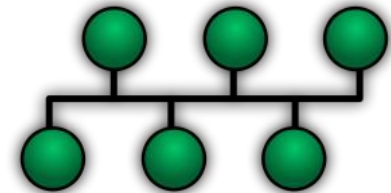
Fully Connected



Line



Tree



Bus

Network topologies by Maksim (Public domain)

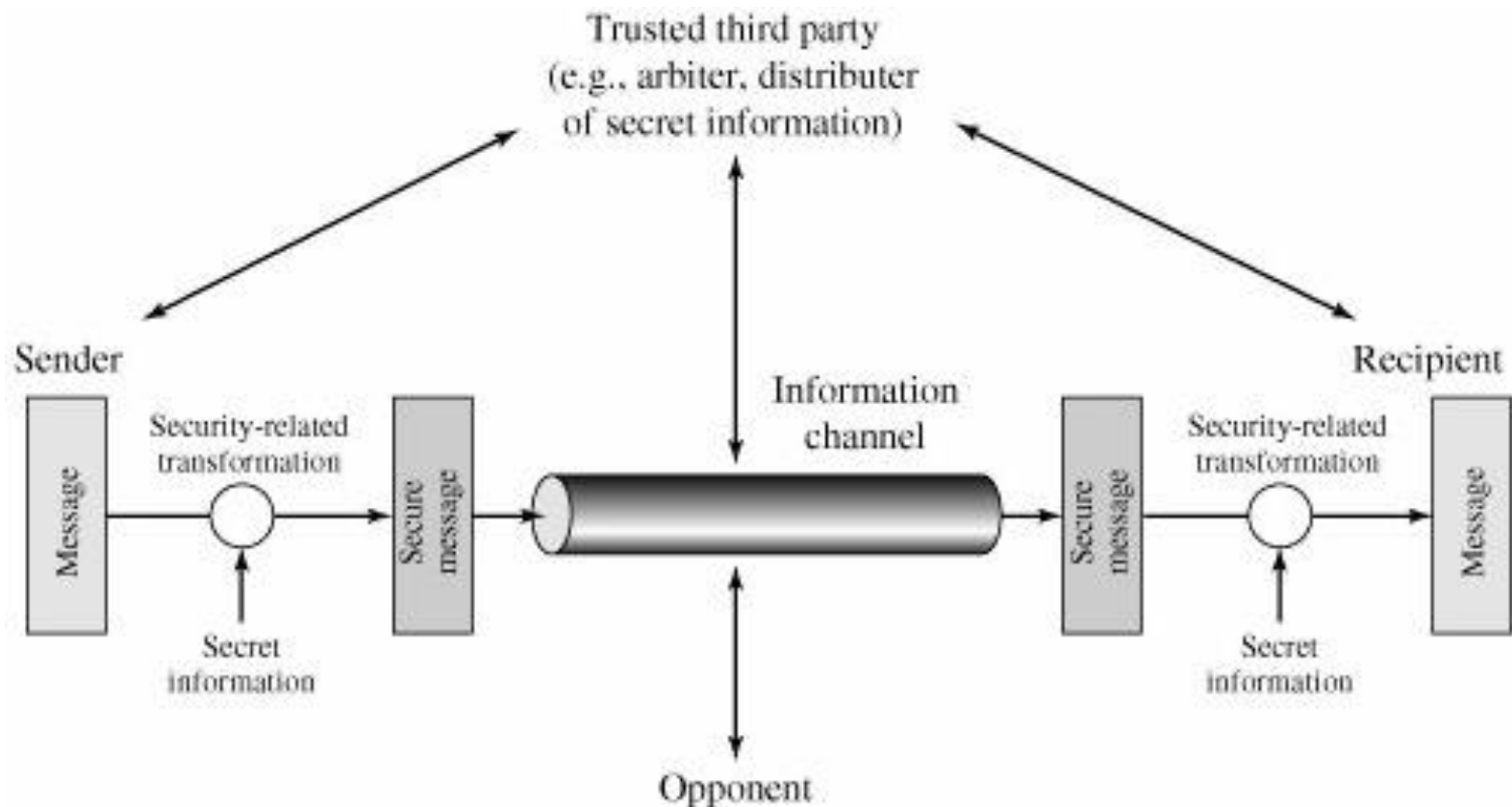
Network protocols



- A set of rules and conventions for communicating over a network
 - TCP/IP
 - HTTP
 - SMTP
 - FTP

Network cable by Gavin Allanwood
(Unsplash)

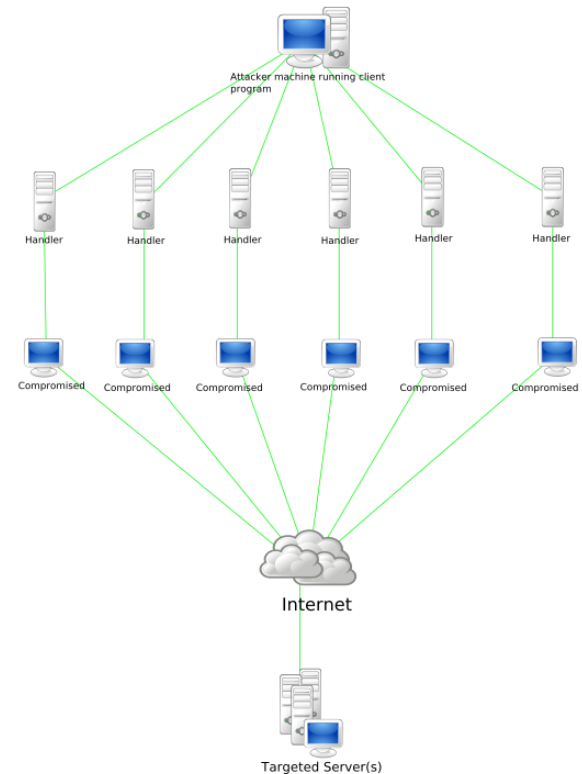
Introduction to network security



Network Security Model (Copyright Stallings, W. Network Security Essentials: Applications and Standards, Pearson, 5th ed., 2013. ISBN 9780273793366)

Network security threats

- Malware
- Hacking
- Phishing
- Distributed Denial of Service (DDoS)

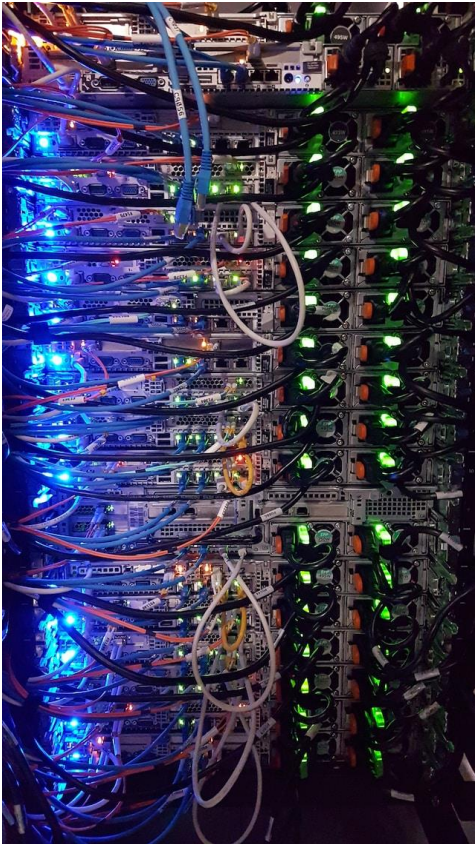


Botnet DDoS attack by Everaldo Coelho
and YellowIcon (LGPL)

Security Measures and Best Practices

- Security policies and procedures
- Encryption
- Authentication
- Access control

Network Security Tools



Data centre by Massimo Botturi
(Unsplash)

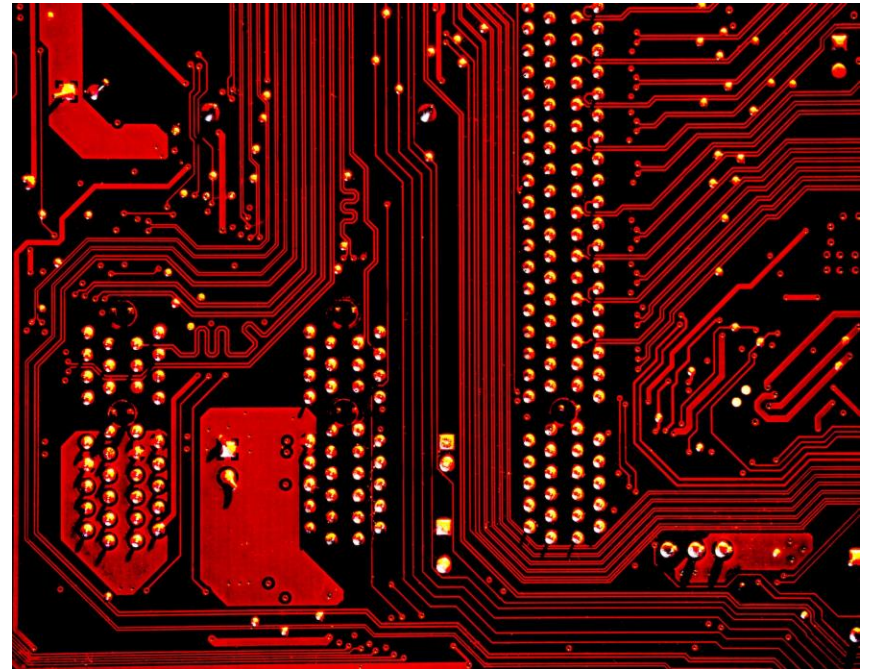
- Firewalls
- Antivirus
- Intrusion Detection Systems (IDSs)
- Virtual Private Networks (VPNs)
- Patch management

Network Security in Practice

- Strong passwords
- Avoid phishing
- Update devices/software
- Be cautious
- Use secure Wi-Fi

Future Trends in Network Security

- Artificial Intelligence (AI) and Machine Learning (ML)
- Zero Trust
- Edge Computing
- Quantum Computing



Motherboard by Michael Dziedzic
(Unsplash)

Summary

- Computer networks
- Networks components
- Network topologies
- Network threats
- Security measures
- Network security tools
- Future of network security