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# Cyber security Techniques- What Is The Internet?

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# What is the Internet?

An Introduction to how the Internet works

Created For:



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# Points of Discussion

How did it all start?

What was its original purpose?

Packets, Protocols & Networks

Applications & the Internet

Secure Connectivity

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# In The Beginning

Advance Research Project Agency (ARPA) - 1958

ARPANET - 1969

Packet Radio Network (PRNET) - 1976

Satellite Network (SATNET) - 1977

The Internet was born

# The World Wide Web

Not designed to be Widely Available

Information was difficult to find

Little to No Security

Hypertext Markup Language (HTML) - 1990

Web Browser Software - 1993

Mid 90's – CompuServe, AOL & Prodigy

Internet Access & e-Mail to the Masses

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# Underneath The Hood

What's a Packet?

Data Fragments

Size: 1,000 to 3,000 characters

Packets sent independently – (IP)

What are Packet Routing Networks?

Internet comprised of Routers

Move packets from source to destination

Many hops along the way

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# Packet – Closer View

## Structure of a packet

| | |
|---|---|
| **Header** | ■ Internet protocol<br>■ Size of the header and payload<br>■ Source and destination IP address<br>■ 16 bit identification number<br>■ 96 bits |
| **Payload** | ■ Content or data of the packet<br>■ 896 bits |
| **Trailer** | ■ Signature of the packet<br>■ Error checking<br>■ 32 bits |

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# Underneath The Hood

Where did Internet Routing Originate?

ARPANET – 1960s

Internet Service Providers (ISP)

Do Packets Arrive in Order?

Faster Routes

TCP to reconstruct

Packet Loss & Missing Packets

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# TCP/IP

Two Standards for IP Address

IPv4 – 192.168.1.1

4 Billion Addresses ($2^{32}$)

IPv6 – 2cca: 1532:3345:6:296:b122:b122:21ab

Supports $2^{128}$ Addresses

8+ Billion Current Devices – 3% over IPv6

How are 8+ Billion Devices Supported on IPv4?

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# How Does DHCP Work?

Dynamic Host Configuration Protocol

Single External IP Address

Port Assignments

Leased Connection

NAT – Public vs. Private

Gateway

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# How Do Routers Work?

Outbound Links

Network Prefix & Host Identifiers

192.42.*.*

College Campus, Business, ISP

New Routers

Query Neighbors

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# How Does DNS Work?

Dynamic Name Systems

Resolve IP Address based on Domain Name

Query Local DNS

Query ISP DNS

Query Root Servers

Resolve Top-Level Domains (.com)

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# Internet Network Layers
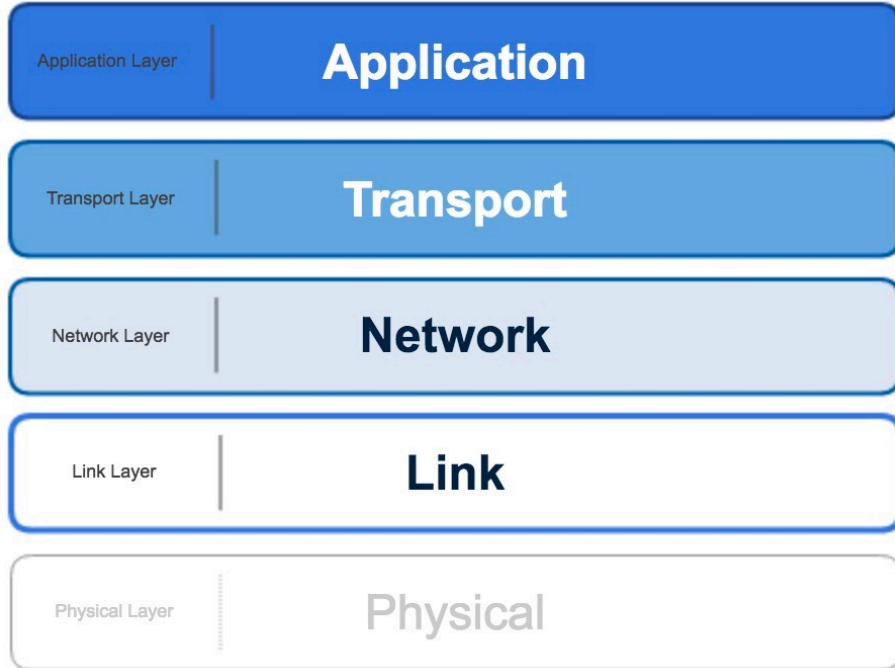
| | |
|---|---|
| **Application Layer** \| **Application** | HTTP, IMAP, FTP, etc. |
| **Transport Layer** \| **Transport** | TCP – Assemble & Retransmit |
| **Network Layer** \| **Network** | Routing Packets to Destination |
| **Link Layer** \| **Link** | Transmitting data bits |
| **Physical Layer** \| **Physical** | Physical hardware components |

# Client vs. Server

Client Applications

Browser, email, smart phone apps

Server Applications

Communicate with Client

Mass Storage

Centralized Information

# Internet Security SSL/TLS

Secure Socket Layer

Netscape - 1994

Transport Layer Security

Resides Between Transport & Application Layers

Encryption & Authentication

https (SSL-Enabled)

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# Authentication & Encryption

Asymmetric Encryption & SSL Certificates

Public & Private Keys

Decrypt & Sign Documents – Private Key

Encrypt & Verify Signed Documents – Public Key

SSL Certificate

Public Key Assigned to Web Server

Issued by Cert. Authority

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# How is Trust Determined?

Client Requests an SSL Encrypted Connection

Is Certificate Issued to the Server?

Is it signed by Trusted Certificate Authority?

Is it Active or Expired?

Client Sends Secret Key

Client & Server Symmetrically Encrypt Messages

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