Application Layer

OSI	TCP/IP
Application	Application
Presentation	
Session	

Layer 7/5 provides the interface between apps used to communicate

Most widely known Layer 7 protocols:
(1) HTTP
(2) FTP
(3) TFTP
(4) IMAP, POP3
(5) DNS

DHCP
↓
DORA
(1) Discovery
(2) Offer
(3) Request
(4) Acknowledgement

Presentation / Session Layer

3 Presentation Layer Functions

(1) Formatting data at source into a compatiable format for receipt

(2) Compressing data in a way that can be decompressed by the destination device

(3) Encrypting data for transmission / Decrypting data upon receipt

Session Layer functions

(1) Creates and maintains dialogs between source and destination apps

(2) Handles the info exchange to initiate dialogs, keep them active and to restart sessions

TCP/IP Layer 5 Protocols

Name System	Host Config	Web
DNS - Domain Name System	DHCP - Dynamic Host Configuration Protocol	HTTP - Hypertext Transfer Protocol
TCP, UDP Client 53	UDP Client 68 Server 67	TCP 80, 8080
Translates domain names into ip addresses	Dynamically assigns IP addresses for end devices	For exchanging text, graphic images, sound, video and other multimedia files

Peer-to-Peer

Client-Server Model - in application layer

Client : device requesting info
Server : device responding to request

- Layer 7 protocols describe the format of the requests/responses between clients and servers

Peer-to-Peer Networks : 2 or more end devices are connected via a network, can share resources without having a dedicated server

A peer (connected end device) can function both as a server and a client.

* The roles are set on a per request basis

Common P2P networks: (1) BitTorrent
(2) Direct Connect
(3) eDonkey
(4) Freenet

Web and Email Protocols

Hypertext Transfer Protocol (HTTP) and Hypertext Markup Language (HTML)

When web address (URL) is typed into a web browser, it establishes a connection to the web service running on the server using HTTP protocol.

URL = Uniform Resource Locator

Step 1

Interpretation of 3 parts of the URL:

(1) http (protocol or scheme)
(2) www.cisco.com (server name)
(3) index.html (specific requested file)

Step 2

(1) Browser checks a namer server
(2) Convert www.cisco.com to numeric IP address using DNS
(3) Initiates an HTTP request to a server by sending a GET request and then asks for the index.html file.

Step 3

In response, the server sends HTML code for the web page to the browser.

Step 4

The browser deciphers HTML code and formats the page for the browser window.

HTTP and HTTPS

HTTP : not secure
HTTPS : secure

HTTP : a request / response protocol
specifies the message types

3 common message types : (1) GET
(2) POST
(3) PUT

(1) GET - a client request for data

client —GET→ web server
to request HTML pages

(2) client —POST→ web server
uploads data files

(3) client —PUT→ web server
uploads resources (images)

Email Protocols

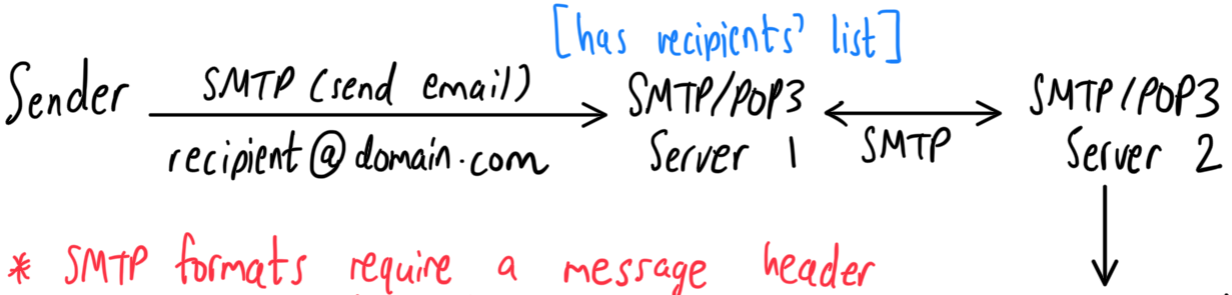
Email : a store-and-forward method of sending, storing and receiving electronic messages across a network

* Messages are stored in databases on mail servers

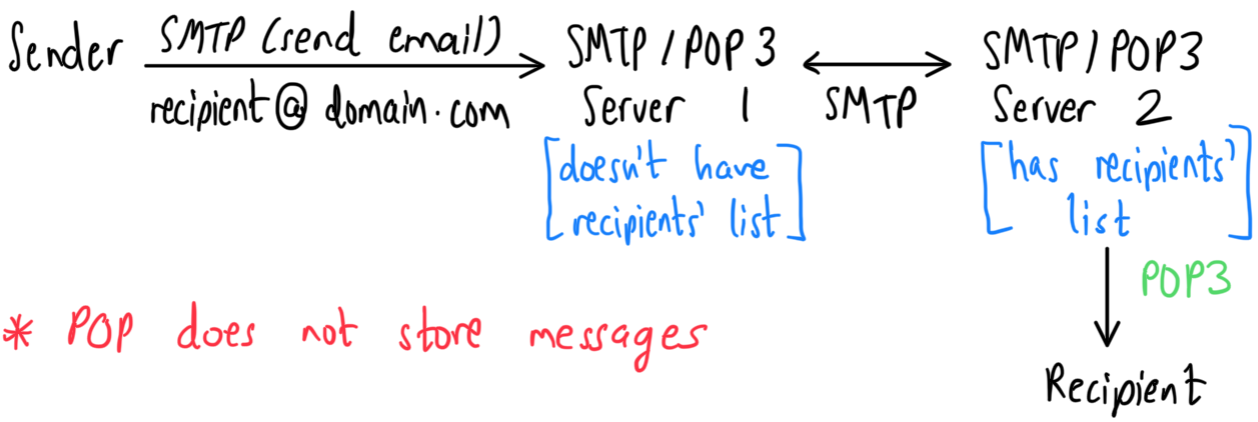
Clients —(to send/receive emails)→ Servers

Protocols : Simple Mail Transfer Protocol (SMTP)
Post Offic Protocol version-3 (POP3)
Internet Message Authentication Protocol (IMAP)

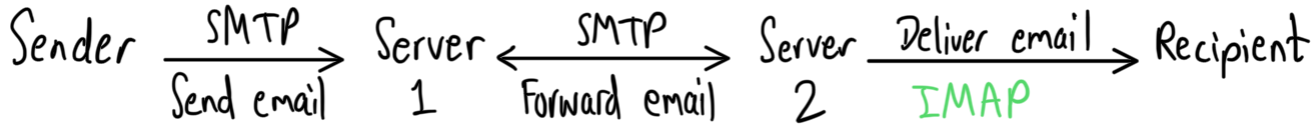
SMTP - to send mail
POP3, IMAP - for clients to receive mail



* SMTP formats require a message header (recipient / sender address) and a message body.



* POP does not store messages



IP Addressing Services

Domain Name System (DNS)

Numeric IP $\xleftrightarrow{\text{DNS}}$ Simple name

Fully-qualified domain names (FQDNs): http://www.cisco.com

Message Format: A - end-device IPv4 address
NS - authorative name server
AAAA - end-device IPv6 address (quad-A)
MX - mail exchange record

Message Section: Question
Answer
Authority
Additional

- .com : business /industry
- .org : non-profit
- .au : Australia

DNS Hierarchy

Root level Domain
Top-level Domain
Second level Domain
Authorative