Internet (1969)

- A global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide.
- It is a *network of networks* that consists of millions of private, public, academic, business, and government networks, of local to global scope, that are linked by a broad array of electronic, wireless and optical networking technologies.
- global information system that is logically linked together by globally unique address together by a globally unique address space based on the Internet Protocol.
- Able to support communications using time TCP/IP
- Inter – Crossing Boundaries
  Network – Connection

Vinton Cerf

- Father of the internet

Pocketswitch

- circuit switch – calling somebody
- store and forward networks
- go through intermediate machines

LAN- Local Area Network

1. Nodes – usually computer, routes
   IOT- Internet of things
2. Interconnection Technology – used to connect nodes
   - Wired – physical connection
   - Wireless – no physical connection: Wifi, Satellite, Infrared, Bluetooth
3. Protocols – World Wide Web- an information system on the internet that allows documents to be connected to other documents by hypertext links.

World Wide Web

- A global information medium which users can read and write via computers connected to the Internet. The term is often mistakenly used as a synonym for the Internet itself, but the Web is a service that operates over the Internet, as e-mail does.
- In September 1994, Berners-Lee founded the World Wide Web Consortium (W3C) at the Massachusetts Institute of Technology with support from the Defense Advanced Research Projects Agency(DARPA) and the European Commission. It comprised various companies that were willing to create standards and recommendations to improve the quality of the Web.

Tim-Berners Lee

- Father of the web

HTTP (hypermedia)

- Application layer used primarily to retrieve hypertext (on hypermedia) documents and resources on the World Wide Web
- Jointly developed by the W3C and the IETF
- an application layer communication protocol used to access resources (hypertext/hypermedia) on the WWW

Protocol

- Set of rules need to be followed.

Fundamentals

- HTTP typically runs on top of TCP/IP, using TCP port 80 by default (TCP port 443 for HTTPS).
- HTTP resources are identified using URIs (specifically, HTTP URLs)
    - Scheme (*http:* or *https:*)
    - (optional) authentication information
    - Host and (optional) port number
    - Path (resolved to the document root on the server) to the resource
    - (optional) scheme-specific parameters
    - (optional) URL-encoded query
    - (optional) bookmark (or fragment identifier)

http://jo:secret@myserver.com:8080/products/price.jsp;sessionid=123456?cat=school&man=xyz#summary

scheme username password host port path scheme specific parameters start of query URL query fragment

- HTTP is based on client-server architecture
- Clients, aka user agents (UA):
    - Web browsers, web crawlers, email clients, other end user tools and applications
- Servers:
    - Origin servers, proxy servers, gateways, tunnels
- HTTP uses a request-response standard protocol
    - The client sends an HTTP request message to the server
    - The server processes the request and replies with an HTTP response message
- HTTP is a stateless communications protocol
    - Servers do not keep information about clients in between requests
    - Web applications effect session tracking using mechanism such as cookies on URL-encoded session information to keep track of related client requests
- HTTP provides support for other functionalities such as cache control, content media type (MIME) specification, language and character set specification, content/transfer coding, client-server protocol negotiations, persistent connections, request pipelining, etc.

Version History

- HTTP 0.9(1991)
- HTTP1.0(RFC 1945, May 1996)
- HTTP1.1(RFC 2063 JAN 1997, RFC 2616 JUN 1999), RFC 7230-7235(JUN 2014)
- HTTP2(RFC 7540 MAY 2015)

HTTP Response Message

- Status line
  - HTTP protocol version
  - Status code
  - Reason phrase
- Response headers
- Empty line
- Message body

HTTP Request Methods

- GET
  - Most commonly used HTTP method
  - Used to request from the server the retrieval of the source identified by the request URI; the retrieved resource is returned in the message body as an entity.
  - Can be combined with conditional and/or range request headers to effect conditional and/or partial resource retrieval
  - Must be supported by all general-purpose servers.
- HEAD
  - Identical to GET, except the message body is not included in the response
- POST
  - Request that the origin server accept the entity enclosed in the request as a new subordinate of the resource identified by the Request-URI in the Request-Line.
- OPTIONS
  - Request for information about the communication options available on the request/response chain identified by the Request-URI. This method allows the client to determine the options and/or requirements associated with a resource, or the capabilities of a server, without implying a resource action or initiating resource retrieval.
- TRACE
  - Request the server to “echo” back to the client the received request
  - Typically used for testing/diagnostics of the request chain
- PUT
  - Request the server to store the enclosed entity in the message under the specified request URI
- DELETE
  - Request the server to delete the resource identified by the request URI
- CONNECT
  - Reserved for use of tunneling proxy servers

Idempotent Methods

- The methods GET, HEAD, PUT and DELETE share this property.

HTTP Message Headers

- General Header Fields
  - Cache-control
  - Connection
  - Date
  - Pragma
  - Trailer
  - Transfer-encoding
  - Upgrade
  - Via
  - Warning

- Request Header Fields
  - Accept
  - Accept-charset
  - Accept-encoding
  - Accept-Language
  - Authorization
  - Expect
  - From
  - Host
  - If-Match
  - If-Modified-Since
  - If-None-Match
  - If-Range
  - If-Unmodified-Since
  - Max-forward
  - Proxy-Authorization
  - Range
  - Referrer
  - User-Agent

- Response Header Fields
  - Accept-Range
  - Age
  - E-Tag
  - Location
  - Proxy-Authenticate
  - Retry-After
  - Server
  - Vary
  - WWW-Authenticate
- Entity Header Fields
  - Allow
  - Content-encoding
  - Content-language
  - Content-length
  - Content-location
  - Content-MD5
  - Content-range
  - Content-type
  - Expires
  - Last Modified

HTTP Status Codes

- Informational (1xx)
  - 100 Continue
  - 101 Switching Protocols

- Success (2xx)
  - 200 OK
  - 202 Accepted
  - 203 Non-Authoritative Information
  - 204 No Content
  - 205 Reset Content
  - 206 Partial Content

- Redirection (3xx)
  - 300 Multiple Choices
  - 301 Moved Permanently
  - 302 Found
  - 303 See Other
  - 304 Not Modified
  - 305 Use Proxy
  - 307 Temporary Redirect

- Client Error (4xx)
  - 400 Bad Request
  - 401 Unauthorized
  - 402 Payment Required
  - 403 Forbidden
  - 404 Not Found
  - 405 Method not Allowed
  - 406 Not Acceptable
  - 407 Proxy Authentication Required
  - 408 Request Timeout
  - 409 Conflict
  - 410 Gone
  - 411 Length Required
  - 412 Precondition Failed
  - 413 Request Entity Too Large
  - 414 Request-URI Too Long
  - 415 Unsupported Media Type
  - 416 Request Range Not Satisfiable
  - 417 Expectation Failed

- Server Error (5xx)
  - 500 Internal Server Error
  - 501 Not Implemented
  - 502 Bad Gateway
  - 503 Service Unavailable
  - 504 Gateway Timeout
  - 505 HTTP Version Not Supported

o Content-length
o Content-location
o Content-MD5
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o 501 Not Implemented
o 502 Bad Gateway
o 503 Service Unavailable
o 504 Gateway Timeout
o 505 HTTP Version Not Supported