Internet

* global network of networks
* from internetwork
* inter– outside the boundary
* network – interconnection of devices
* categorized by:
* nodes – actual devices
* interconnection technology –
* wired - ex. coaxial ,fiber, UTP
* wireless- ex. infrared
* protocols
* device drivers
* linked together based on IP
* supports communications using TCP/IP
* IPv6 -64 bit
* IPv4-32 bit
* uses or makes accessible high level services
* Initially intended for scientific and military use.
* 1969 – beginning of the internet
* DARPA (Defense Advanced Research Project Agency)
* IoT- Internet of things
* 1972 – email was developed (first killer application)

Circuit Switch Connection

* Establish circuit and maintain it to communicate
* Not scalable

Store and Forward

* Send messages to the next hub until destination is reached

Wide Area Information Services (WAIS)

* Connected to servers from different locations to get data from each server periodically and index these data

Gopher Protocol

* Distributing, searching and retrieving documents over the internet
* Hierarchy is involved with the index having sub-indexes

Usenet

* Similar to an online discussion group

World Wide Web (WWW)

* Established in 1989
* Created by Tim Berners-Lee
* Worked with CERN
* HTTP, HTML, URL
* Web server and web client
* Information system that allows documents to be connected to other documents
* An arrangement of web servers that boost particularly designed records
* Two most popular browsers people use is the Google Chrome and the Mozilla Firefox
* There are a few applications called Web programs that make it simple to get to the World Wide Web
* All significant Web locales have balanced their substance outline and improvement way to deal with oblige the quickly expanding division of the populace getting to the Web from little screen telephones rather than extensive screen desktop and smart phones

Web Server

* Hosts web resources
* Listens for requests

Web Client

* Example is web browser
* Gives requests to web servers
* Follows HTTP to communicate with the server

Semantic Web

* Next step in the evolution of the web
* Makes use of artificial intelligence to understand the question given by user

Hypertext Transfer Protocol (HTTP)

* Application layer communications protocol used to access resources
* Developed by W3C (World Wide Web Consortium) and IETF (internet Engineering Task Force)
* Standard way of communicating through applications
* Version 0.9 came out in 1991
* HTTP 1.0 (RFC 1945, May 1996) – first standardized
* HTTP 1.1 (RFC 2068 Jan 1997, RFC 2616 Jun 1999), RFC 7230 – 7235 (Jun 2014)
* HTTP 2 (RFC 7540 May 2015) – patterned after SPDY of Google

HTTP Fundamentals

* Runs on top of TCP/IP, using port 80 as default or 443 for HTTPS
* HTTPS is encrypted and needs digital or self-signed certification
* IANA – allocates certain ports to certain applications
* Socket - IP Address and Port number
* SSL/TLS – takes HTTP traffic and transmits it in an encrypted form
* Based on client-server architecture
* Clients a.k.a. user agent
* Web browsers, web crawlers/spiders, other end user tools and applications
* Any application that communicates with HTTP protocol
* Server
* Origin server – resources are actually there
* Proxy server – checks authentication; forwards requests and gives back requests
* Gateway, tunnel (blind relay between two points; forwards communication without knowing what it does) – can be used for authentication
* Uses request-response protocol
* Client sends an HTTP request message to server (pull protocol)
* Server volunteers new information via notifications (push protocol)
* Checks server at regular intervals (polling)
* Server processes the request and replies with HTTP response message
* In HTTP 2, server can push resources to client without client requesting
* Stateless communication
* Do not keep information about clients in between requests
* Other functionalities
* Cache control – storage for easy and fast access
* Content media type (MIME: Multipurpose Internet Mail Extension) specification
* Language and character set specification
* Content/ transfer coding
* Content negotiation – talk to tell what the recipient can handle
* Client-server protocol negotiation – asking server if it can handle higher version and if yes, the server will upgrade
* Persistent connections – telling the server to not close the connection for further requests
* In HTTP 1.0, connection is terminated after a resource has been retrieved from responding to a request
* Request pipelining – sending requests one after another
* In HTTP 1.0, only one resource can be transferred per connection
* Authentication/ authorization

HTTP Resource Accessing

* HTTP resources are identified using URIs (Uniform Resource Identifier), which tells what the resource is, or more, specifically HTTP URL (Uniform Resource Locator), which tells where the resource is
* Scheme (http or https)
* Authority
* User information/ information credentials
* Host-domain name (resolved to an IP address using DNS) of the server where the resource resides, or will be created
* Port number – default is 80
* Path to resource (resolved relative to the document root) – may refer to a static or dynamic resource
* Query – typically provided as key = value pairs, with ampersand separators between key/ value pairs, and may be URL-encoded
* Fragment identifier – “bookmark”

Absolute URL

* Scheme and domain name are always required

Relative URL

* Scheme, user info, and domain name can be omitted

HTTP Request Message

* Request Line (CRLF – terminated line consisting of three spaced-separated items)
* Request Method
* GET
* HEAD
* POST
* PUT
* DELETE
* CONNECT
* OPTIONS
* TRACE
* Request URI – location of the requested resource
* HTTP protocol version
* Request Header Fields – information about the request and the client
* Accept-Charset
* Accept-Encoding
* Accept-Language
* Authorization
* Expect
* From
* Host
* If-Match
* If-none-match
* Range
* If-range
* If-modified-since
* If-unmodified-since
* Max-forwards
* Proxy-authorization
* Referer
* TE
* User-agent
* Message headers
* HTTP 1.1 requires at least the host request header to be provided
* Empty line (CRLF)
* Message body a.k.a. payload – optional

HTTP Response Message

* Request and response have the same structure
* Response Header Fields
* Accept-Ranges - you can give specific bytes
* Age - how long the response from fetching in the origin server or in the cache
* ETag
* Location-for redirection
* Proxy Certificate -
* Retry-After – when maintenance of a web server; timeouts
* - indicate currently not available
* -503 Service no Available
* Server – displays what server .
* -Example Apache, Amazon s3 , sffe
* Vary – changing header values
* www-Authentication -
* Status line (CRLF)
* HTTP protocol version
* Status code – 3-digit code that designates the status
* Reason phrase – descriptive meaning of the status code
* 1xx (informational ), 2xx (success), 3xx (redirection), 4xx (client error), 5xx (server error)
* Message headers (general, response and / or entity headers)
* Empty line
* Message body – optional

HTTP Request Methods

* Standard
* GET
* Transfer a current selected representation of the resource identified by the request URI
* Most commonly used method
* Must be supported by all compliant general-purpose servers
* HEAD
* Same as GET but the entity is not sent
* Used to retrieve metadata about the entity
* Must also be supported by all
* POST
* Performing resource-specific processing of entities enclosed in the message body
* Has a payload
* PUT
* Store the enclosed entity in the message body under a specified URI
* By default, the method is not allowed
* When allowed, authentication must be provided
* DELETE
* Remove the resource associated with the specified URI
* Like PUT, the method is not allowed by default
* OPTIONS
* Request information on what can be done with the resource specified
* TRACE
* Perform or request a loopback of the requested message (echo back)
* Typically used for testing/diagnosis of the request/response chain
* CONNECT
* Establishment of an encryption tunnel to communicate with https
* Extension Methods
* WebDAV (Web Distributed Authoring and Versioning)
* PROPFIND
* PROPPATCH
* MKCOL – make collection (new folder)
* COPY
* MOVE
* LOCK – lock resources
* UNLOCK – unlock resources
* Safe Methods
* Doesn’t change the resources
* GET, HEAD, OPTIONS, TRACE
* Idempotent Methods
* Repeated request result to the same response
* GET, HEAD, OPTIONS, TRACE, PUT, DELETE
* Cacheable Methods
* Requests that generate cache

HTTP Message Headers

* General Header Fields(client & server)
* Cache-control – used for controlling cache and telling whether a resource needs to be cached or not
* Connection – Control whether connection is persistent or not and allows the sender to specify options that are desired for that particular connection
* Date – represents the date and time at which the request was generated
* Pragma – from older version, generic directive, indicates that something is cacheable
* Used to include implementation specific directives that might apply to any recipient along the request/response chain.
* Trailer – indicates that a header is present at the end of the data to supply metadata that might be dynamically generated while the message body is sent.
* Transfer-encoding – indicates what type of transformation has been applied to the message body to safely transfer it between the sender and the recipient.
* Upgrade – used for protocol negotiation \*
* Allows the client to upgrade or change to a different protocol on the same connection.
* Via – indicate where the request passed through
* Used for tracking message forwards, avoiding request loops, and identifying the protocol capabilities of senders along the request/response chain.
* Warning – carry additional information about the status or transformation of a message error in the message \*
* Request Header Fields (client)
* Accept – specifying acceptable file type; server responds with negotiation, accept if other type can be delivered.
* Accept-Charset – indicates which character sets are acceptable for the response
* Accept-Encoding –restricts the content-codings that are acceptable in the response.
* Accept-Language – restricts the set of natural languages that are preferred as a response to the request.
* Authorization
* Ensure protection from unauthorized access
* When proper credentials are entered, another request will be sent with authorization
* Without authorization, www-authenticate challenge will be sent and a pop-up authorization will appear
* Proxy Authorization – allows the client to identify itself (or its user) to a proxy which requires authentication
* Consists of credentials containing the authentication information of the user agent for the proxy and/or realm of the resource being requested.
* Expect – for two-face connection
* Indicates that particular server behaviors are required by the client.
* If any of the expectations cannot be met the server must respond with a 417 (Expectation Failed).
* From – contains contact credentials of sender – an internet e-mail address
* May be used for logging purposes and as a means for identifying the source of invalid or unwanted requests.
* Host – required in HTTP 1.1
* Specifies the internet host and port number of the resource being requested. This enables the origin server to distinguish among resources while servicing requests for multiple host names on a single IP address
* If-Match – comparing the file in the cache and server to check if file is unmodified to avoid state entity.
* If-None-Match – requests the server to perform the requested method only if one of the given value in a tag matches the given entity tags represented by the Etag
* Used to update caches or to prevent to upload a new resource when one is already existing
* If-Range – “is what I have a portion of what you have”
* Can be used with a conditional GET to request only the portion of the entity that is missing
* Allows the client to “short circuit” the second request
* If-Unmodified-Since – used with a method to make it conditional
* Expects the entity to be transmitted only if it has not been modified after the given date
* Ranges – Specifying portions of the resource the client wants to receive
* Max-Forwards – for tracing and limiting a trace.
* Limit the number of proxies or gateways that can forward the request to the next inbound server
* Contains a decimal integer indicating the remaining number of times a request message may be forwarded
* Referer – specify the address (URI) where the request was originated; to check where traffic is coming from
* TE – trailer encoding
* Specifies the transfer encodings the user agent is willing to accepts
* User-Agent – contains additional information about the clients, identity
* Response Header Fields (server)
* Accept-Ranges – allows partial resources
* Age – how long ago the response has been generated
* ETag (entity tag)
* Location – for redirection. If present, the server will fetch the latest resource from location
* Proxy-Authenticate
* Retry-After – amount of time the client has to wait before trying again
* Server – information about the server
* Vary – for content negotiation
* Entity Header Fields
* Allow – methods that can be called
* Content-Encoding – when server changed form of entity
* Content-Language – language characteristics; for accessibility purposes
* Content-Length – size of payload
* Content-Location – when content is from somewhere else; actual location of the resource
* Content-MD5 (deprecated header)
* Content-Range – when doing range request
* Content-Type – MIME type
* Expires – for controlling cache access; cache-control; (e.g. max-age = ??)
* Last-Modified – possible reference value to check if resource is fresh

HTTP Status Codes

* Server Responses
* Informational (1xx)
* 100 – continue
* 101 – switching protocol
* Success (2xx)
* 200 – OK
* 201 – Created
* 202 – Accepted; request is accepted but not yet generated
* 203 – Non-Authoritative Information; some are not from the origin server.
* 204 – No Content; not returning anything but success
* 205 – Reset Content; client can reset forms and data entries
* 206 – Partial Content; in other words, this is not the whole resource.
* Redirection (3xx)
* 300 – Multiple Choices; when resource is available in different forms
* 301 – moved Permanently; resource is no longer here and location must be changed
* 302 – Found; when a new resource is generated and can be found somewhere
* 303 – See Other; same as 302
* 304 – Not Modified; cache and server resource are the same
* 305 – Use Proxy; access through proxy
* 306 – n/a (unused status code)
* 307 – Temporary Redirect; like 301 but location must not be changed
* Client Error (4xx)
* 400 – Bad Request; malformed request
* 401 – Unauthorized; accessing protected resource
* 402 – Payment Required; for online payments
* 403 – Forbidden; resource must not be accessed
* 404 – Not Found; resource might be there but the client made a mistake in typing
* 405 – Method Not Allowed
* 406 – not Acceptable; server won’t do it
* 407 – Proxy Authentication Required
* 408 – Request Time-out; request taking too long to process the request
* 409 – Conflict; request can’t be done because state of resources can be compromised
* 410 – Gone; no forwarding address, no longer there, purposely removed
* 411 – Length Required; specify content length
* 412 – Precondition Failed; condition has failed
* 413 – Request Entity Too Large; payload is too big
* 414 – Request-URI Too Large; URI is too long
* 415 – Unsupported Media Type
* 416 – Request Range not Satisfiable
* 417 – Expectation Failed; server cannot honor request
* 426 – Upgraded Required (recently introduced status code)
* Server Error (5xx)
* 500 – Internal Server error; server’s fault, misconfiguration
* 501 – Not Implemented; method can’t be handled
* 502 – Bad Gateway; gateway machine is having problem
* 503 – Service Unavailable; when server is under maintenance
* 504 – Gateway Timeout
* 505 – HTTP Version not Found

If ever need ng definition sa mga header field terms, pwede dito :D :)

HTTP 1.1 RFC 2616 : Header Field Definitions

<https://www.w3.org/Protocols/rfc2616/rfc2616-sec14.html>

<https://developer.mozilla.org/en-US/docs/Web/HTTP/Headers>

https://tools.ietf.org/html/rfc7230#section-6.7