Agenda

- What is Web ?
- Building Blocks of Web
- How Browser works ?

What is web ?

- The web or WWW (world wide web) is a huge network of connected computers.
- In 1989 the world wide web was invented by Sir Tim Berners-Lee.

- He was trying to find a new way for scientists to easily share the data from their experiments.
- He also made the world's first web browser and web server.

Reference – Business Insider

- Tim suggested three main technologies that meant all computers could understand each other (HTML, URL and HTTP). All of these remain in use today. We will learn about these 3 words in next slides.
- 1989 onwards web is developed, initial version was web 1.0, current version is 2.0 & future is of web 3.0.

Importance of web

- World is connected via web. (Services from financial, entertainment, govt. & education domains are available at finger tips).
- Accessible to *anyone, anywhere & anytime*
- Different people can get the right information in many times with ease.
- Problems solved the lack of time and the lack of money for people through the acceleration of the completion of routine work, especially government work, most of the work today can be implemented very easily and quickly through specialized websites such things as government sites.
- Make it easier for people to shop through e-shopping sites, where people can purchase anything they need from anywhere in the world through these sites.
- These sites are highly reliable and easy to make money with.
- It facilitated the individuals who wish to complete their educational journey by doing this through distance learning through communication with the university to which the student has joined.
- Some of them have been able to provide different types of entertainment for people. People can watch television channels, play entertaining and useful games, watch movies, read books, watch cartoons, watch videos & so on.
- Through some websites can start private businesses that generate a good income on individuals leading to financial independence.

- Reference :

BBC

Evolution of the Web

Web 1.0

1. Mostly read only pages (No content creation)
2. Online books, magazines, research papers

Web 2.0

1. Supports heavy content generation every second
2. Rich web apps like Maps, animations, streaming etc.
3. Web apps generators (No code / Low code tools)

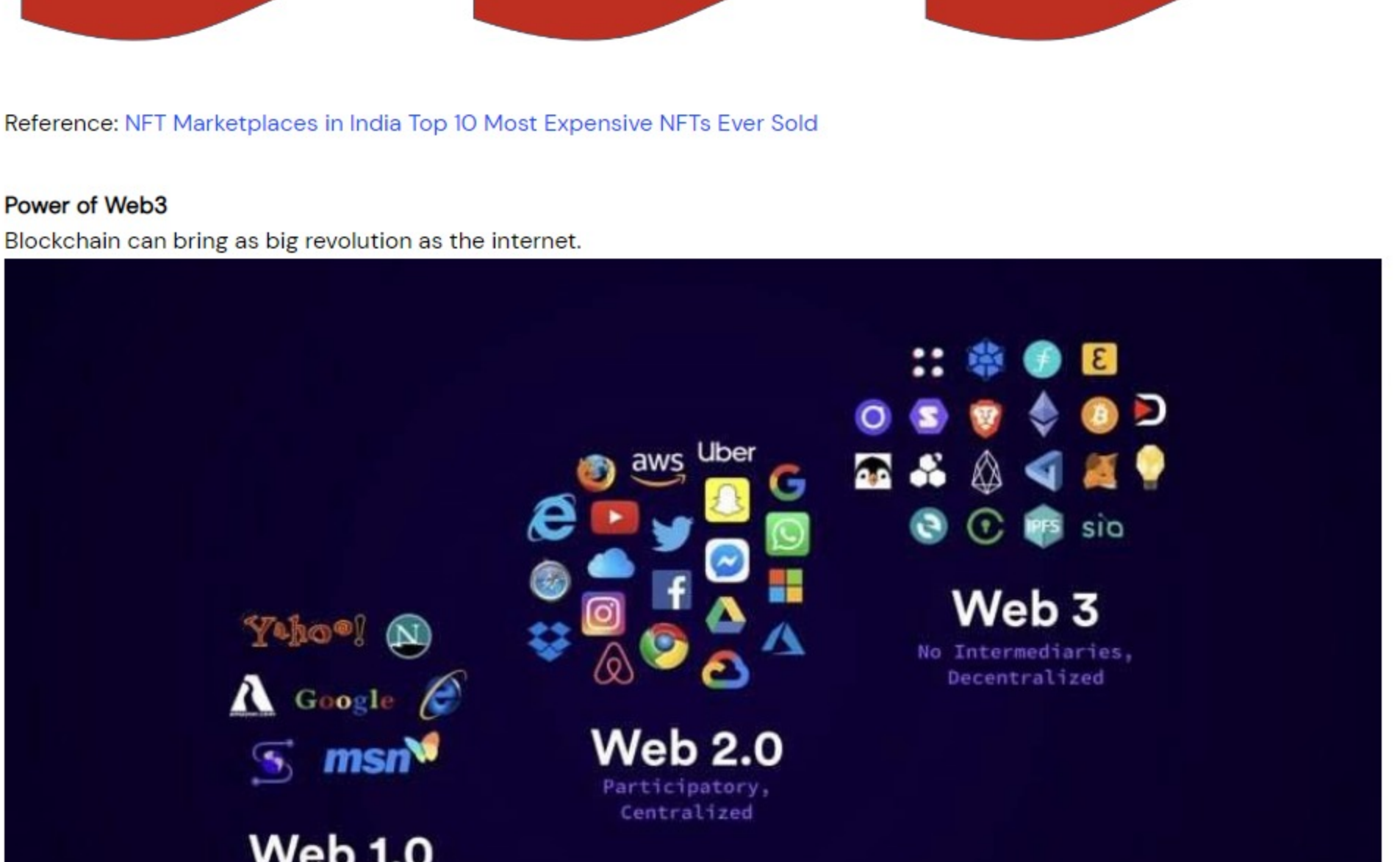
Web 3.0

1. Decentralization (No central authority to censor the content)
2. Permissionless participation in decentralised web apps.
3. AI & ML to serve better results
4. Connectivity and ubiquity - ie. IoT devices

Reference: NFT Marketplaces in India Top 10 Most Expensive NFTs Ever Sold

Power of Web3

Blockchain can bring as big revolution as the internet.



Learn how a small country with limited resources & population is 50+ Lakhs transformed lives of refugees using blockchain technology better than US and Canada – Ethereum Smart Contracts

Building Blocks of Web

There are 4 Building Blocks of the Web

- Content
- Client & Server
- Protocol
- Identifications

Content

It means anything from these we see on the Internet

Images	Videos	Texts	Audio

Client & Server

Client request the data & server sends the required info to the client.

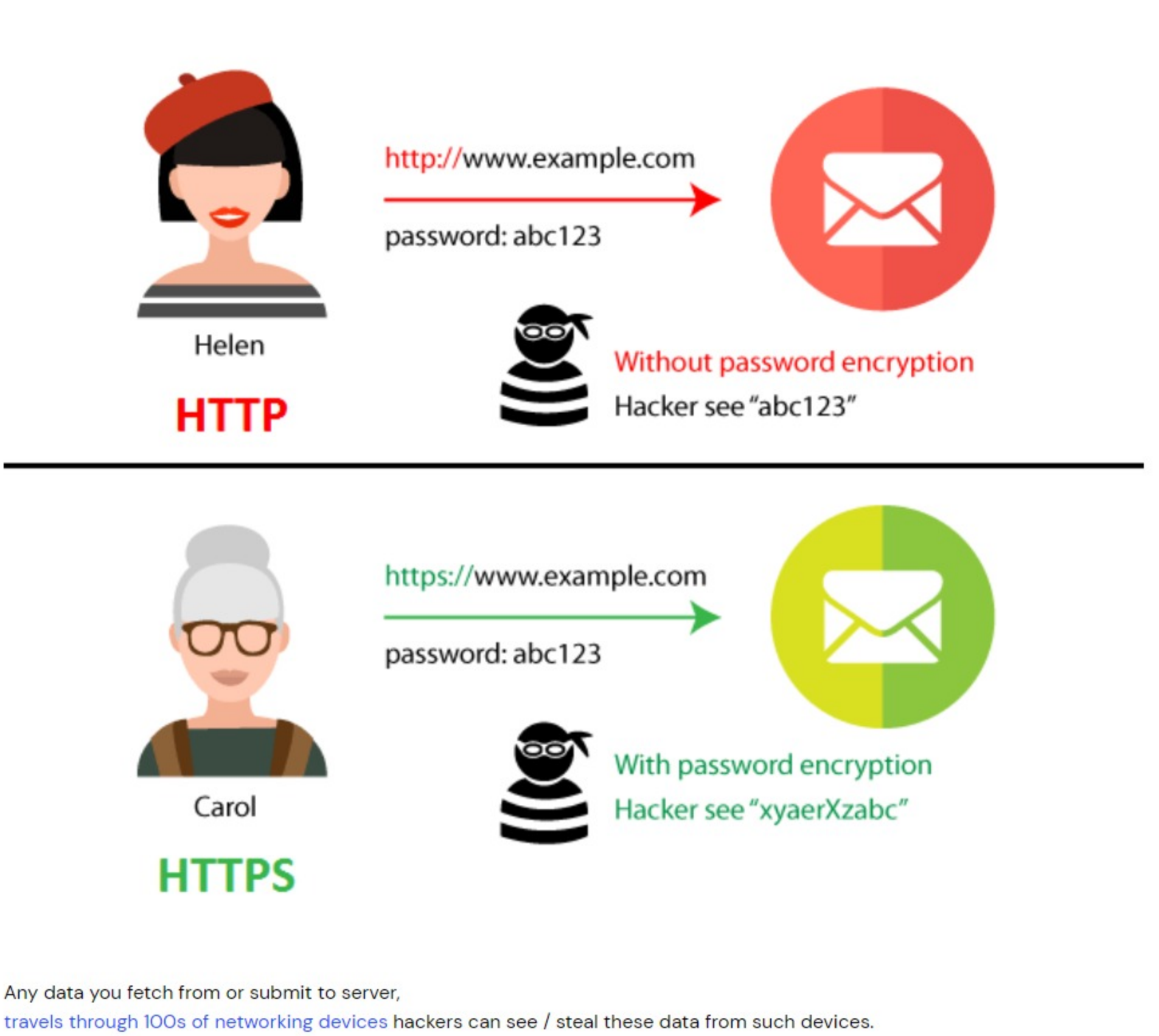
Once you open facebook.com machine from where web page is served to you is server.

Apart from this, any device through which we request information from server, is a client.

Protocol

Protocols are rules, they are followed by the server and the client to communicate with each other securely.

There are a lot of protocols but in full stack web development, we deal with https (Hypertext Transfer Protocol Secure) & http (earlier used)



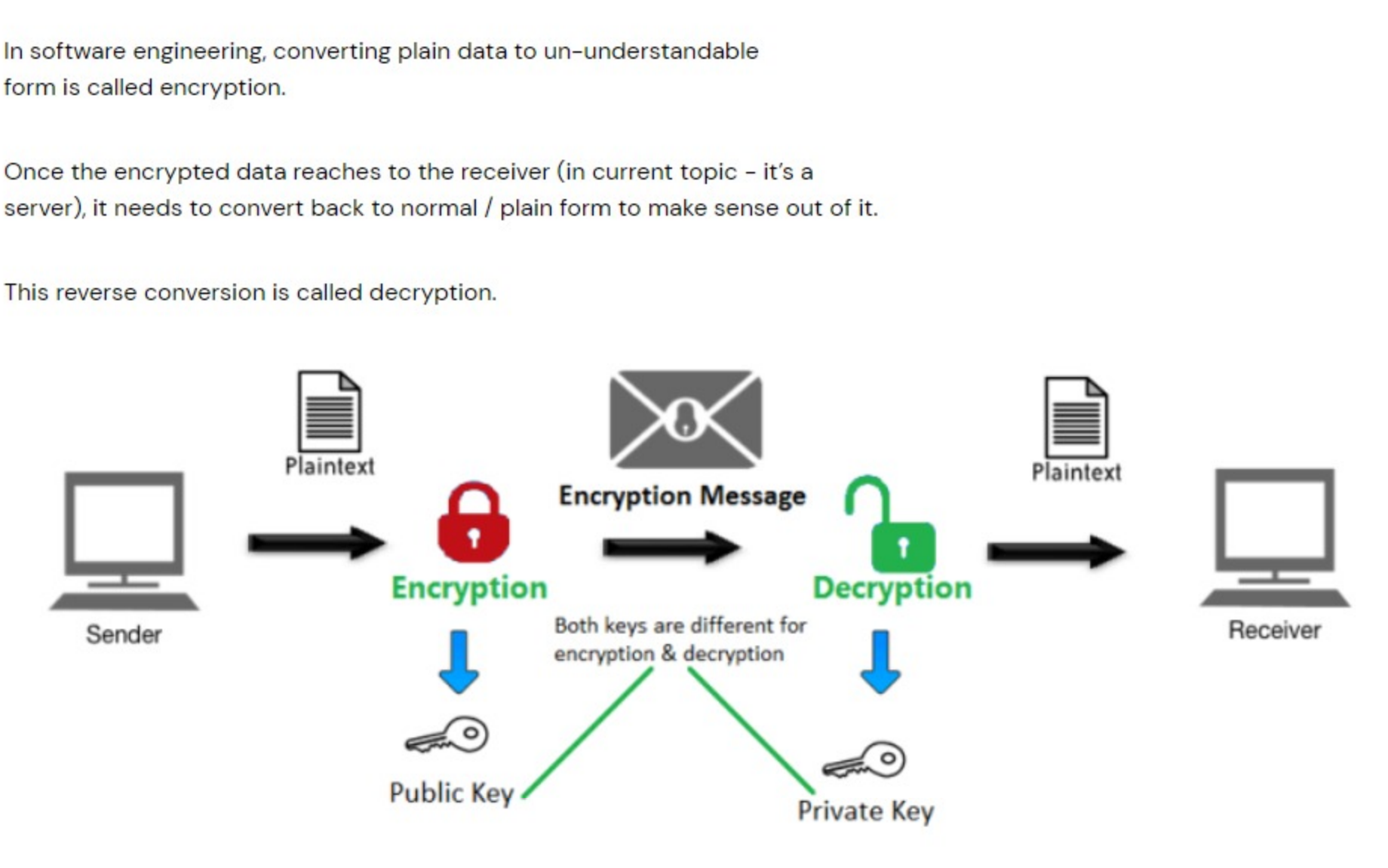
Any data you fetch from or submit to server, travels through 100s of networking devices hackers can see / steal these data from such devices.

So we need to convert the data to some format so that only client and server can understand – no other device or human.

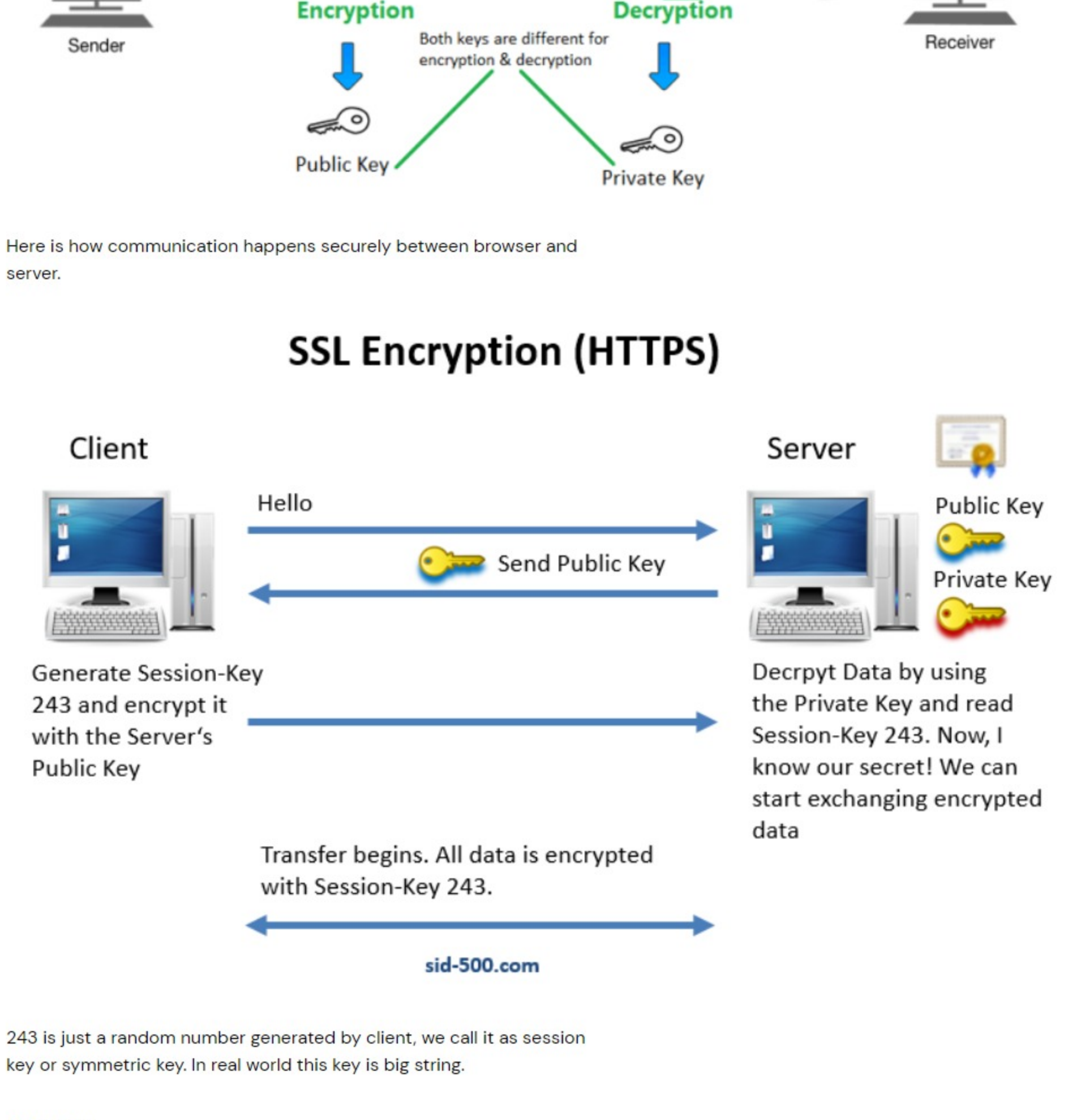
In software engineering, converting plain data to un-understandable form is called encryption.

Once the encrypted data reaches to the receiver (in current topic – it's a server), it needs to convert back to normal / plain form to make sense out of it.

This reverse conversion is called decryption.



Here is how communication happens securely between browser and server.



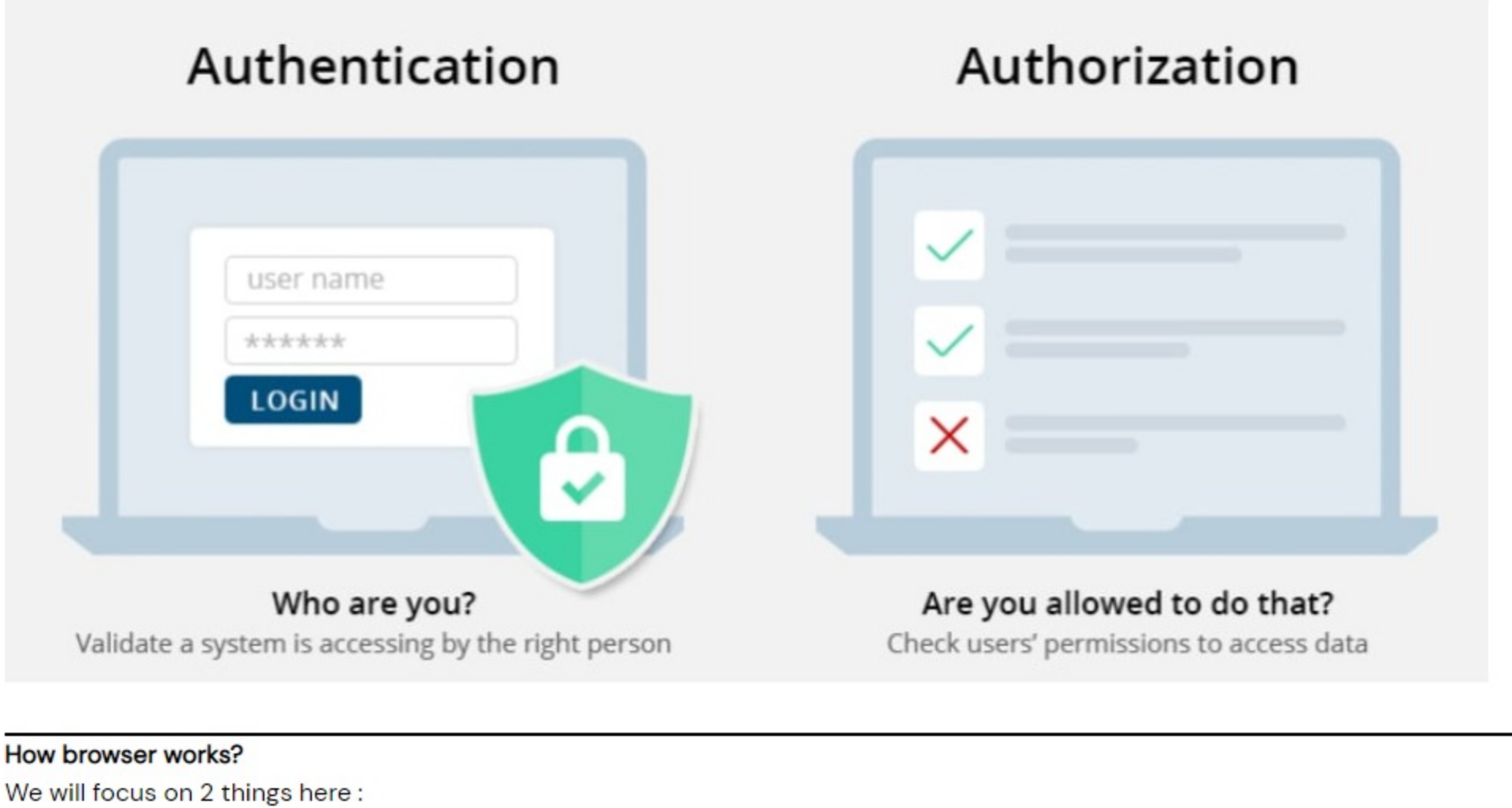
243 is just a random number generated by client, we call it as session key or symmetric key. In real world this key is big string.

Reference
IBM
SSL

Identifications

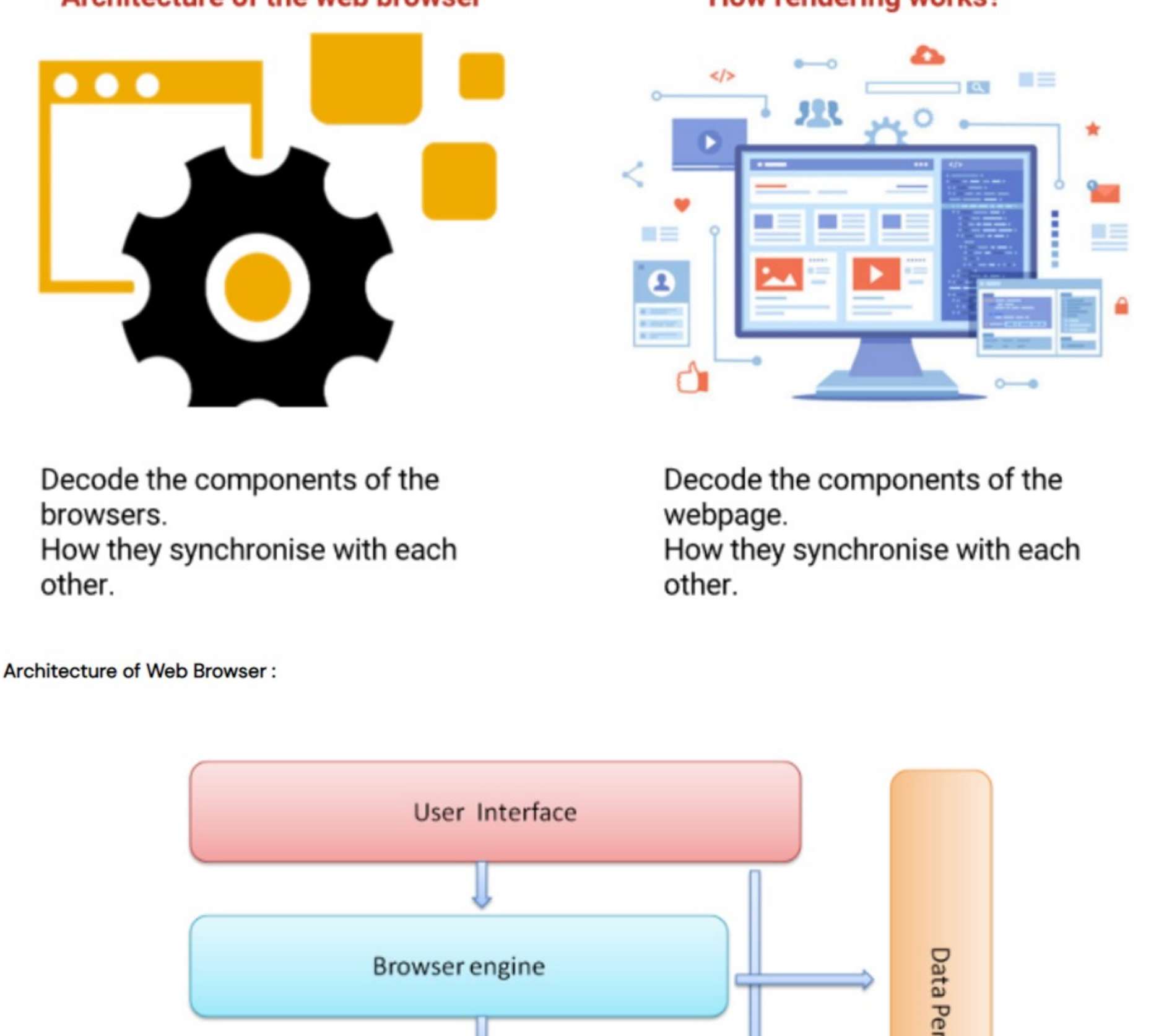
It means verify the client very well before giving the precious data. Value of our data on banking sites, social media is not less than millions of dollars. Hence it is a very strong need that every request must be verified.

In the world of internet, this process is divided in 2 – Authentication & Authorisation.



How browser works?

We will focus on 2 things here :



Architecture of Web Browser :

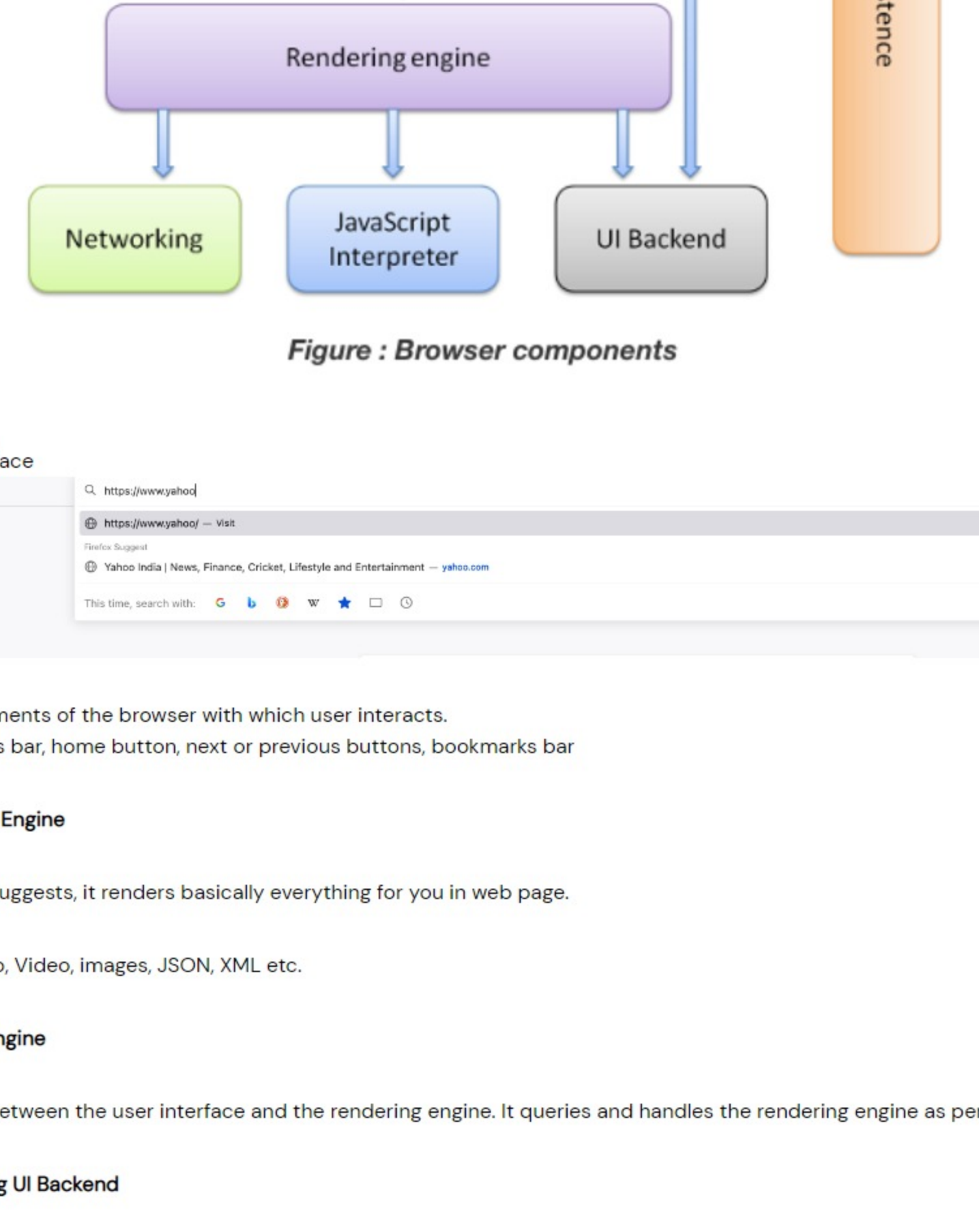
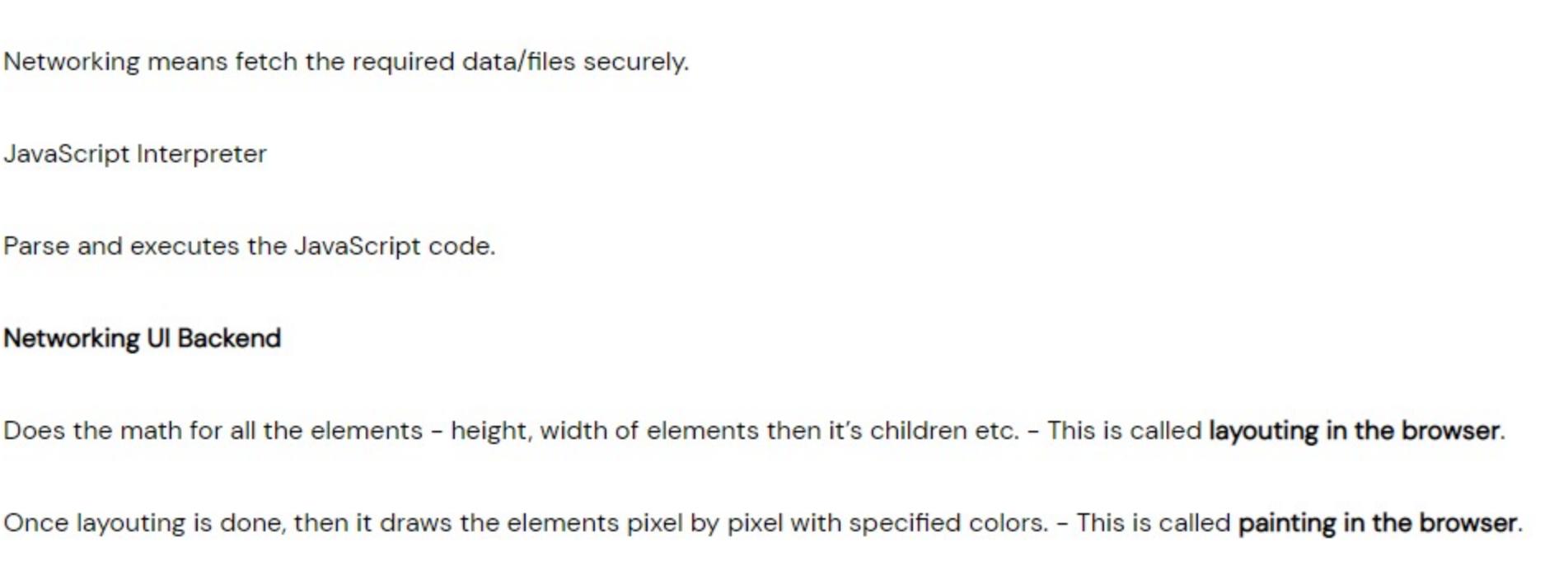


Figure : Browser components

User Interface



Visual elements of the browser with which user interacts.
ie. Address bar, home button, next or previous buttons, bookmarks bar

Rendering Engine

As name suggests, it renders basically everything for you in web page.

Text, Audio, Video, images, JSON, XML etc.

Browser engine

A bridge between the user interface and the rendering engine. It queries and handles the rendering engine as per the inputs received from the user interface.

Networking UI Backend

A web page is mixture of images, videos, css files, javascript files. All such contents exists on some servers.

Networking means fetch the required data/files securely.

JavaScript Interpreter

Parse and executes the JavaScript code.

Networking UI Backend

Does the math for all the elements – height, width of elements then it's children etc. – This is called **layouting in the browser**.

Once layouting is done, then it draws the elements pixel by pixel with specified colors. – This is called **painting in the browser**.

Data Persistence

A browser stores various types of data locally.

i.e Cookies. (just delete it from a website you are signed in & you will be signed out) Image / CSS / JavaScript files etc. This speedup the page rendering.

How rendering works?

This is one of most interesting process each browser performs when it receives the html content from server.

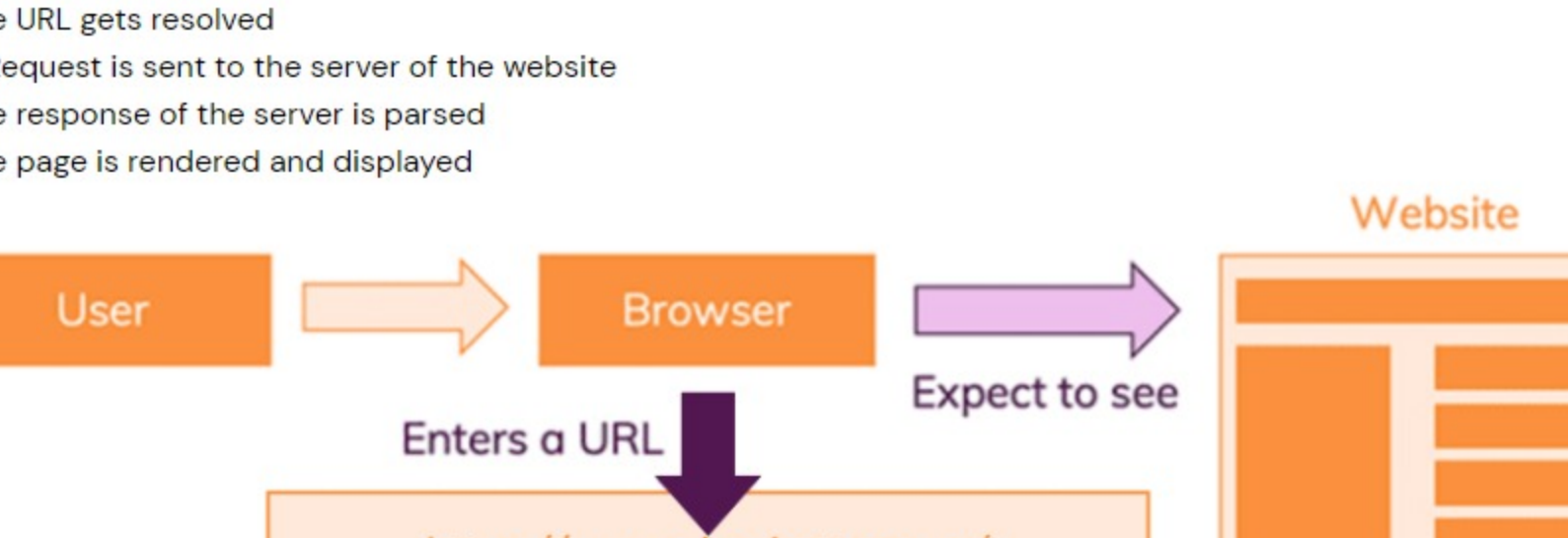


Figure : Rendering engine basic flow

Reference

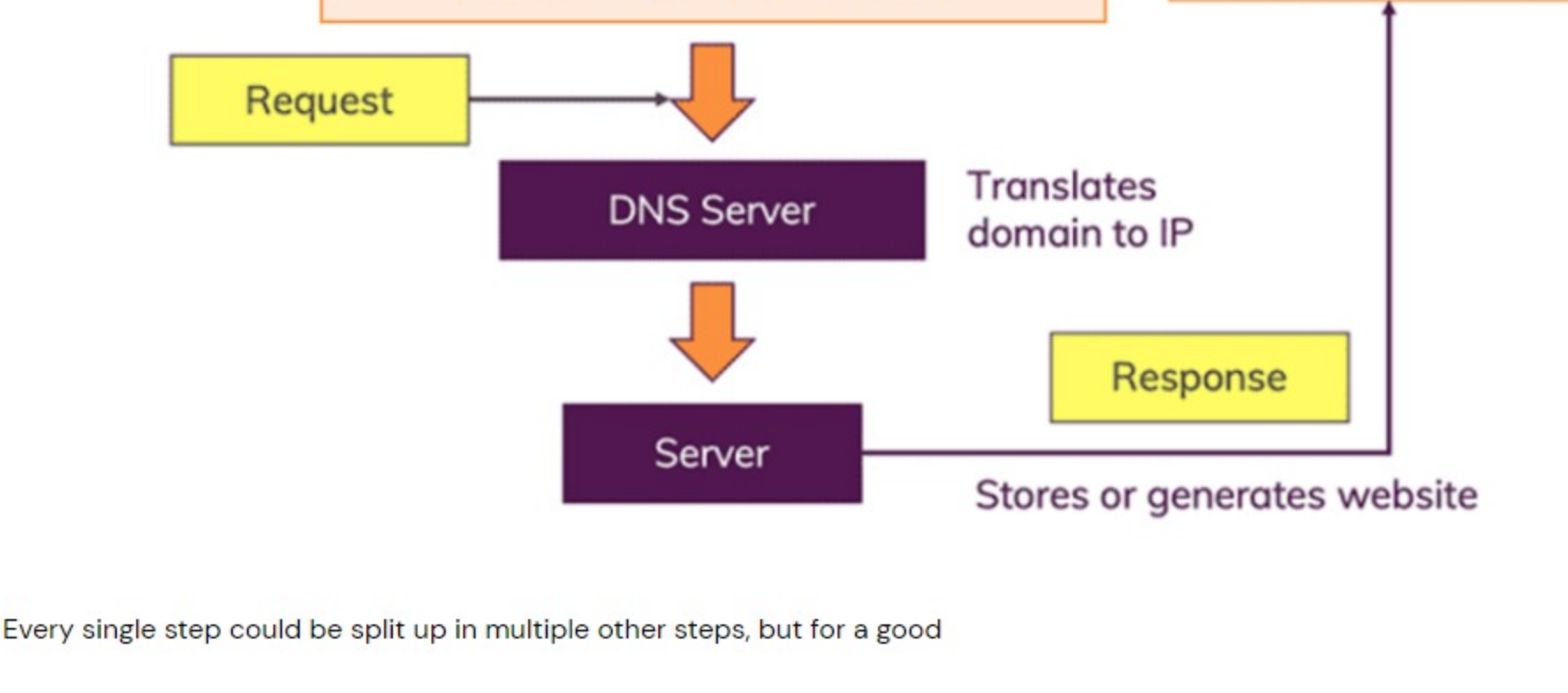
- Udacity
- Browser Stack

Let's start with the most obvious way of using the internet :

You visit a website like almabetter.com

The moment you enter this address in your browser and you hit ENTER, a lot of different things happen:

- The URL gets resolved
- A Request is sent to the server of the website
- The response of the server is parsed
- The page is rendered and displayed



Every single step could be split up in multiple other steps, but for a good overview of how it all works, that's something we can ignore here.