Computer Fundamentals
"Software"

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Agenda

- What is Algorithm
- Software
- Machine Language
- Assembly Language
- High Level Languages
- Libraries/Packages/Frameworks
- Backend/Frontend

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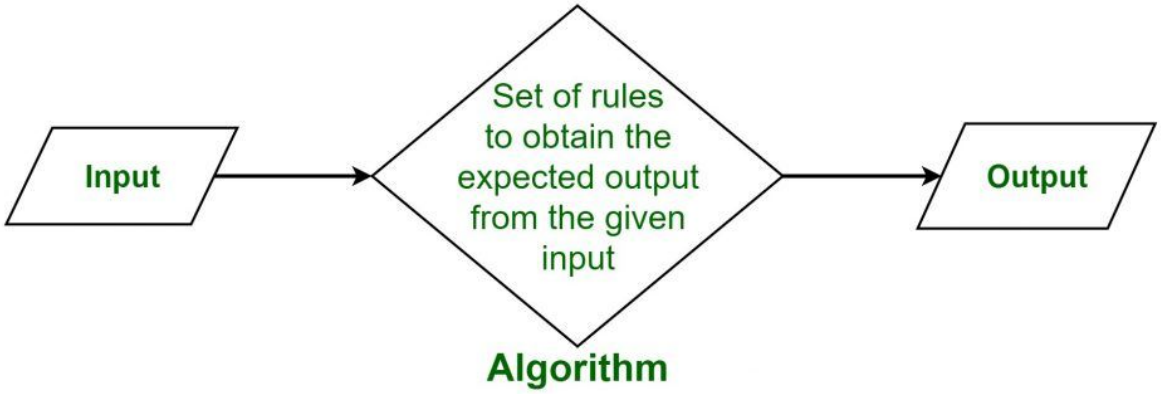
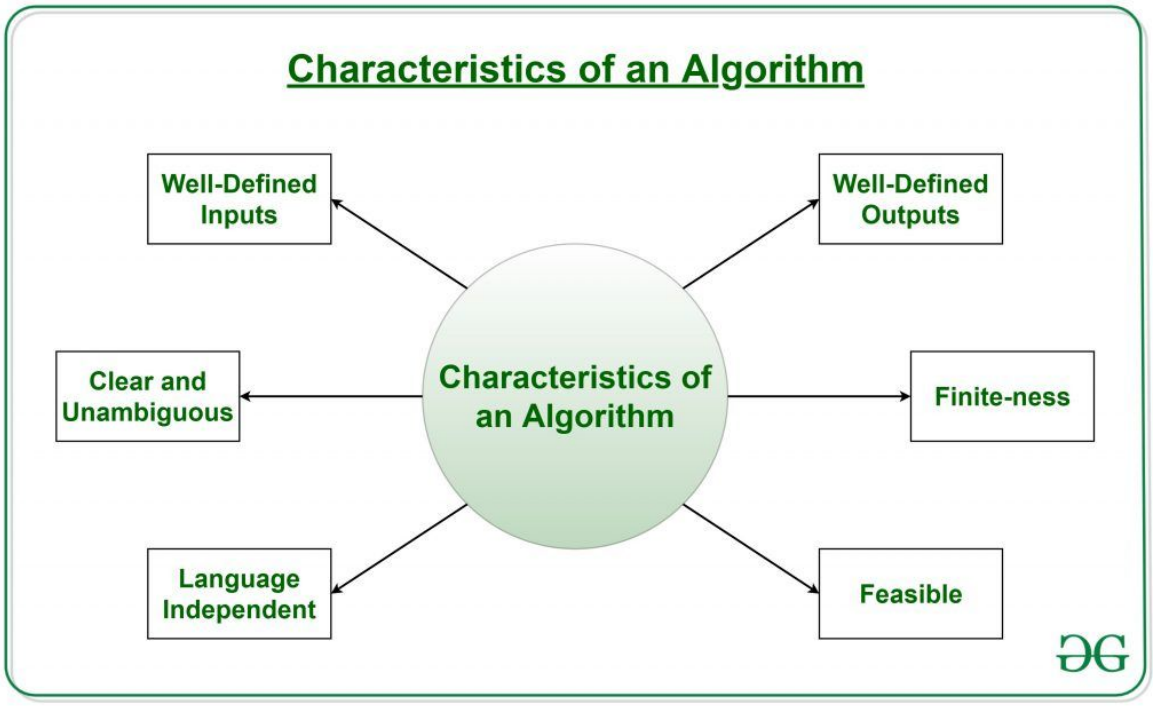
Kahoot!

What is Algorithm



What is Algorithm

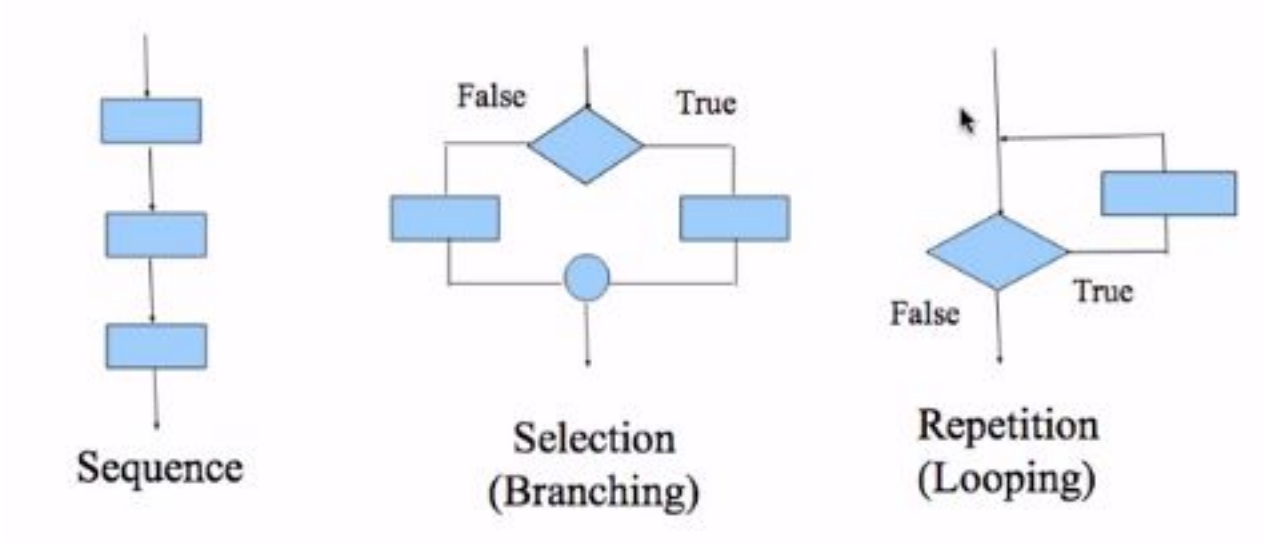


What is Algorithm

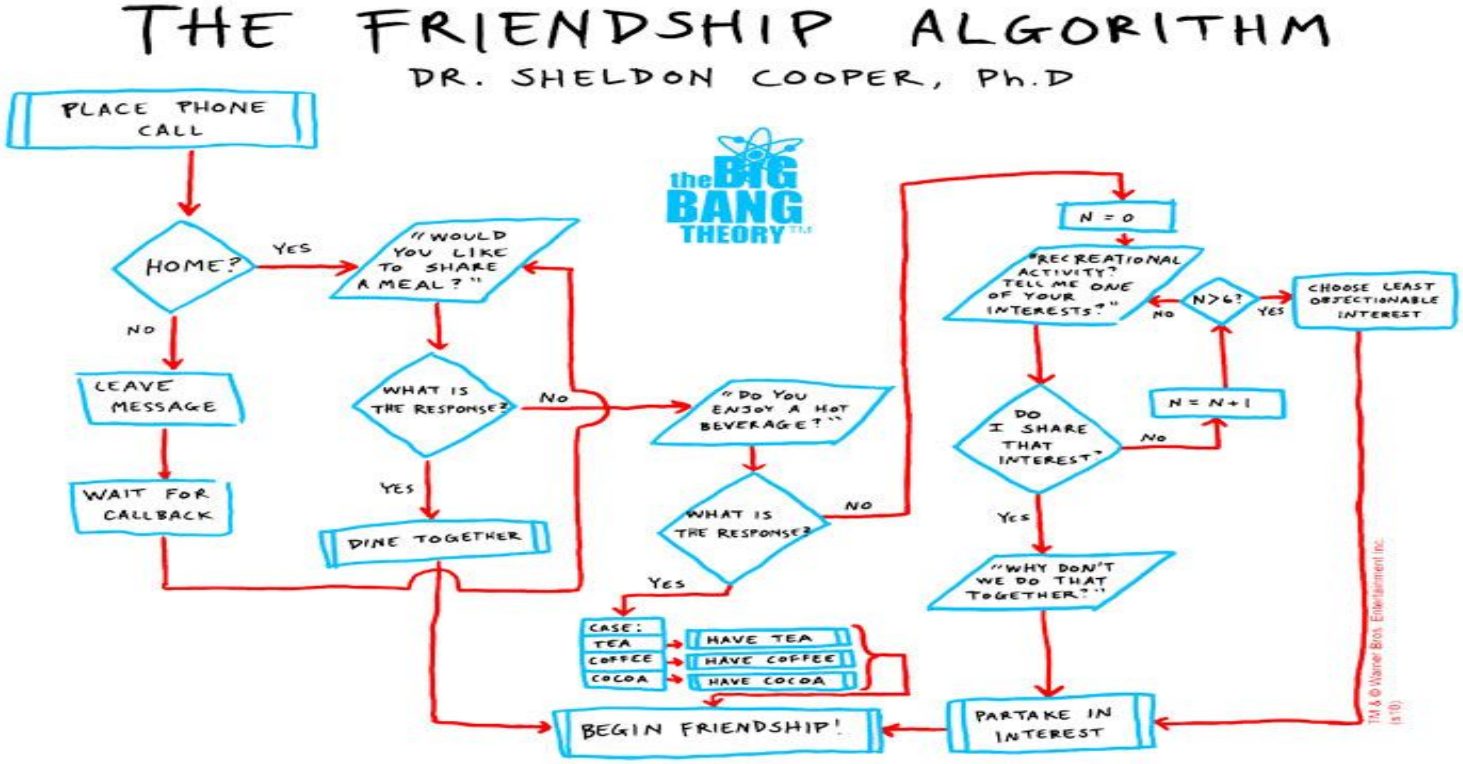
Tea Brewing Algorithm:

Put the teabag in a cup.
Fill the kettle with water.
Boil the water in the kettle.
Pour some of the boiled water into the cup.
Add milk to the cup.
Add sugar to the cup.
Stir the tea.
Drink the tea.

What is Algorithm



What is Algorithm



What is Algorithm

What is Algorithm

PSEUDOCODE

```
set total to zero

get list of numbers

loop through each number in the list
   add each number to total
end loop

if number more than zero
   print "it's positive" message
else
   print "it's zero or less" message
end if
```

What is algorithm?
What is pseudocode?

Students, write your response!

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What is Algorithm

ALGORITHM
VERSUS
PSEUDOCODE

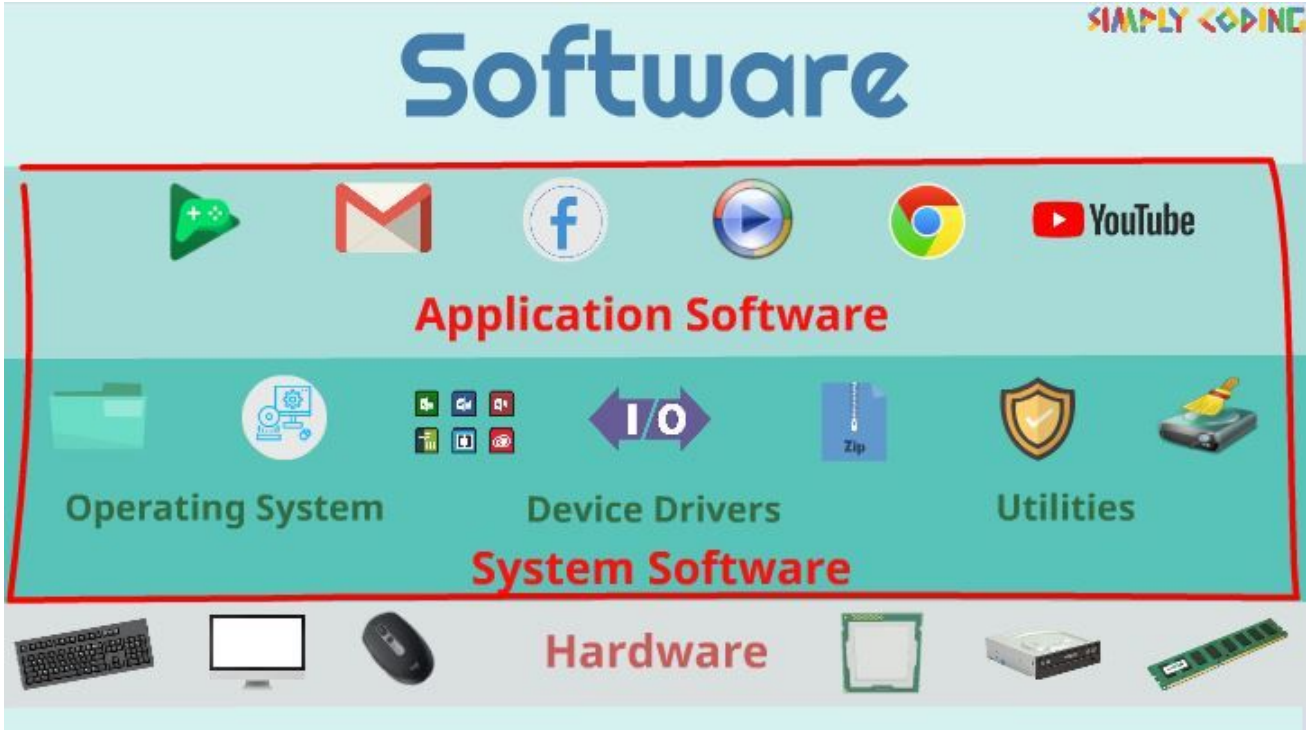
ALGORITHM	PSEUDOCODE
An unambiguous specification of how to solve a problem	An informal high-level description of the operating principle of a computer program or other algorithm
Helps to simplify and understand the problem	A method of developing an algorithm

Software

What is software?

- unlike hardware it can't be physically touched
- it's the missing link between the computer hardware and the data which it is processing
- has to be "loaded" into the computer's RAM before it can be "run"
- a set of pre-written instructions which the computer executes in order to perform a particular task
- typically written using programming languages such as C, C++, BASIC, Java etc.

Software



Have you heard of any of Programming Languages?

Students choose an option

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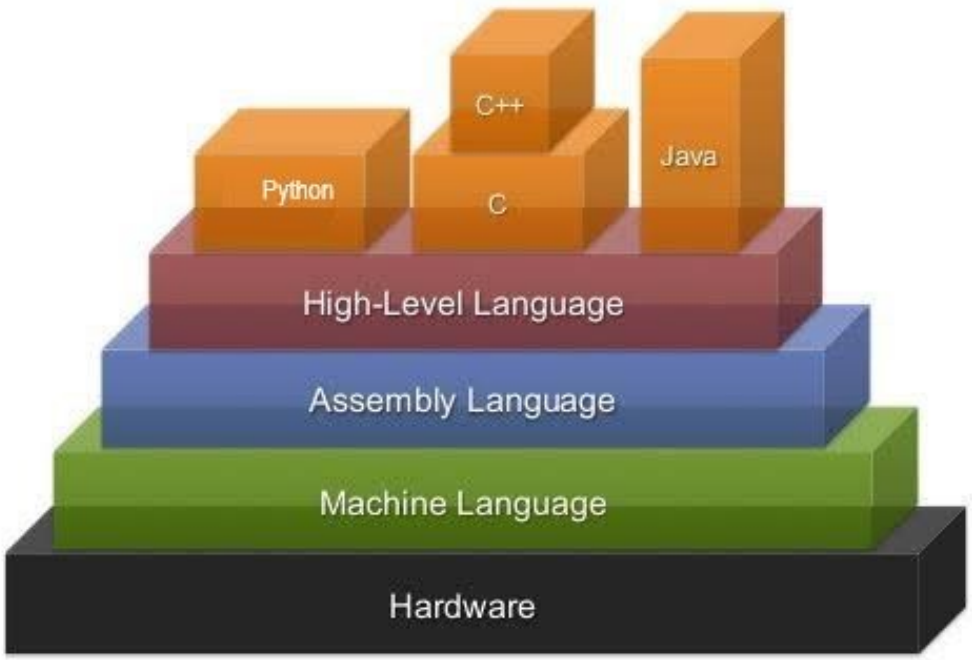
Software



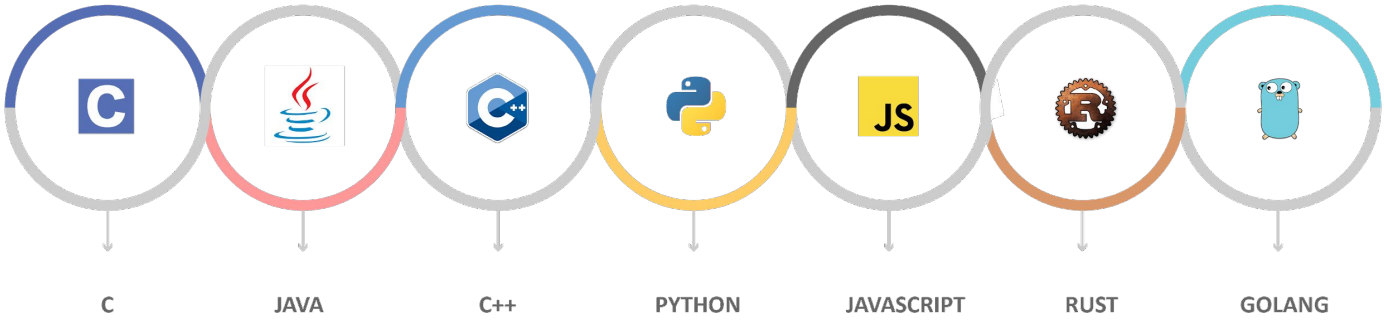
Software

Low Level Languages:

- Assembly Language
- Machine Language

Software

High Level Languages:



Software

High Level Language	Low Level Language
These are Interpreted	Direct memory management
They have open classes and message-style methods which are known as Dynamic constructs	Hardware has extremely little abstraction which is actually close to having none.
Poor performance	Much fast than high level
Codes are Concise	Statements correspond directly to clock cycles
Flexible syntax and easy to read	Superb performance but hard to write
Is object oriented and functional	Few support and hard to learn
Large community	

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What does highlevel/ lowlevel mean?

Students, write your response!

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Machine Language

Example of machine-language

Here's what a program-fragment looks like:

10100001 10111100 10010011 00000100
00001000 00000011 00000101 11000000
10010011 00000100 00001000 10100011
11000000 10010100 00000100 00001000

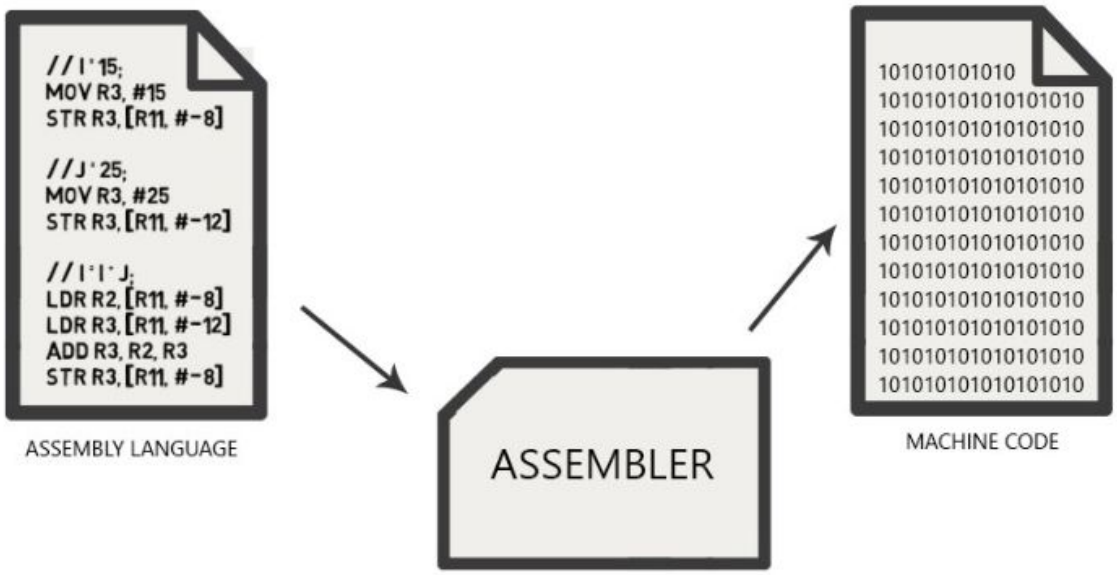
It means: z = x + y;

Assembly Language

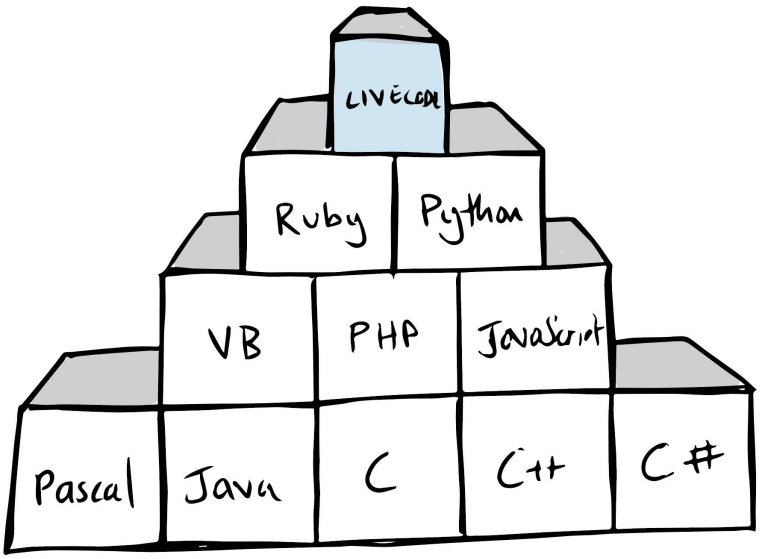
- Assembly is converted to machine code

```
mov     %esp,%ebp
sub     $0x28,%esp
mov     0x804d300,%eax
add     $0x1,%eax
mov     %eax,0x804d300
mov     0x804d300,%eax
cmp     0x8(%ebp),%eax
```

Assembly Language



High Level Languages

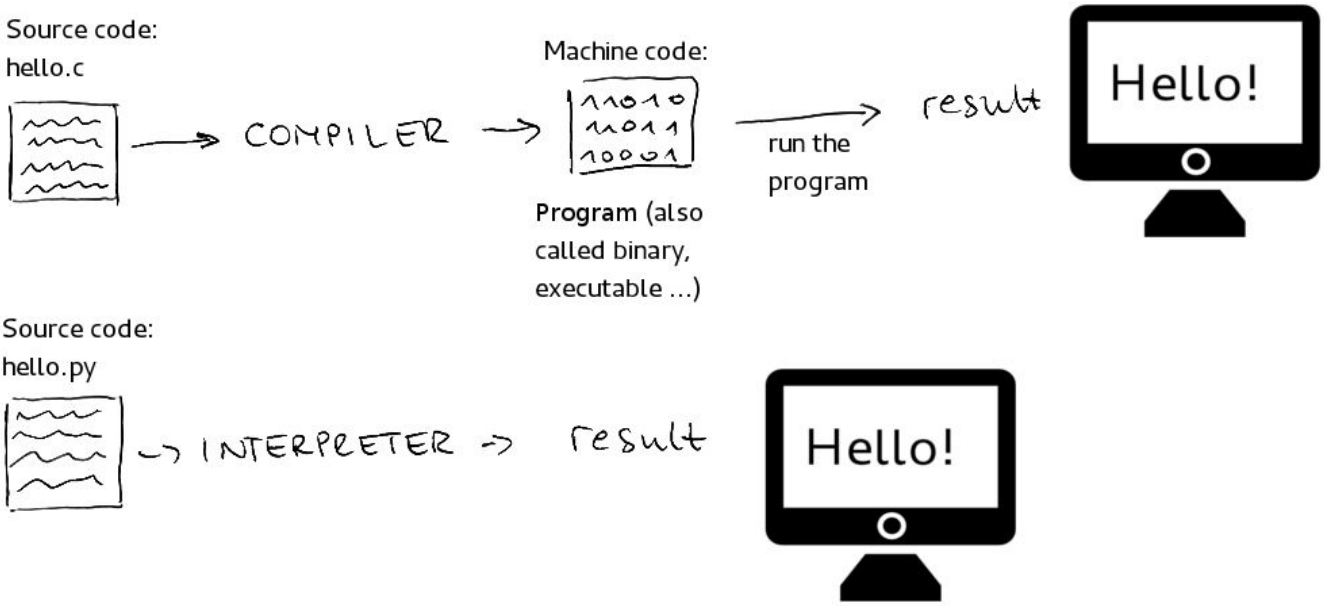


High Level Languages

Source Code:

Source code is a human-readable text written in a specific programming language.

High Level Languages



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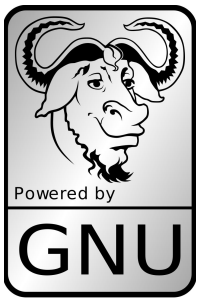
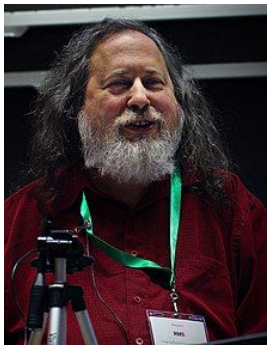
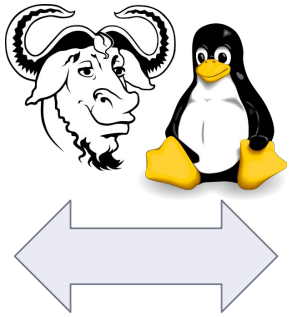
High Level Languages

Free Software vs. Open Source Software

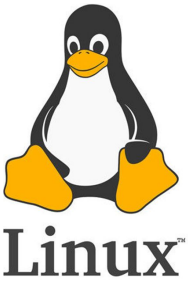




Richard Stallman



Linus Torvalds



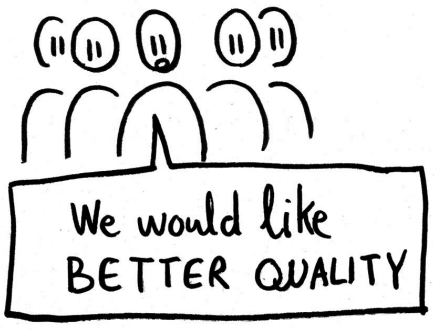
FREE SOFTWARE FOUNDATION

High Level Languages

Free software activists

ethical approach

Open source boosters

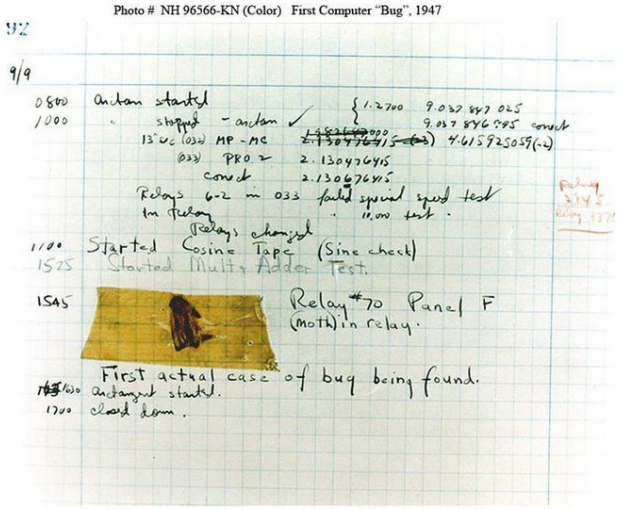


technical approach

High Level Languages

Bug:

- Story: named after a moth
- Two types: syntax and logic errors
  - prnt("I could forgotten something.")



High Level Languages

print("Clarusway Rocks")

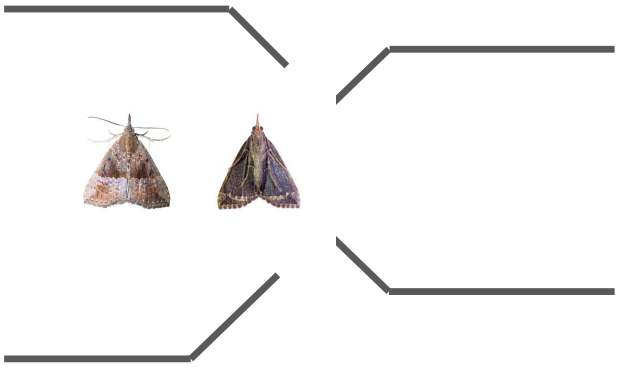
Find bugs and write the correct ones to right hand side:

Instructions

print(5, 7;

prnt(1, 2);

print("hello world);



Students, draw anywhere on this slide!

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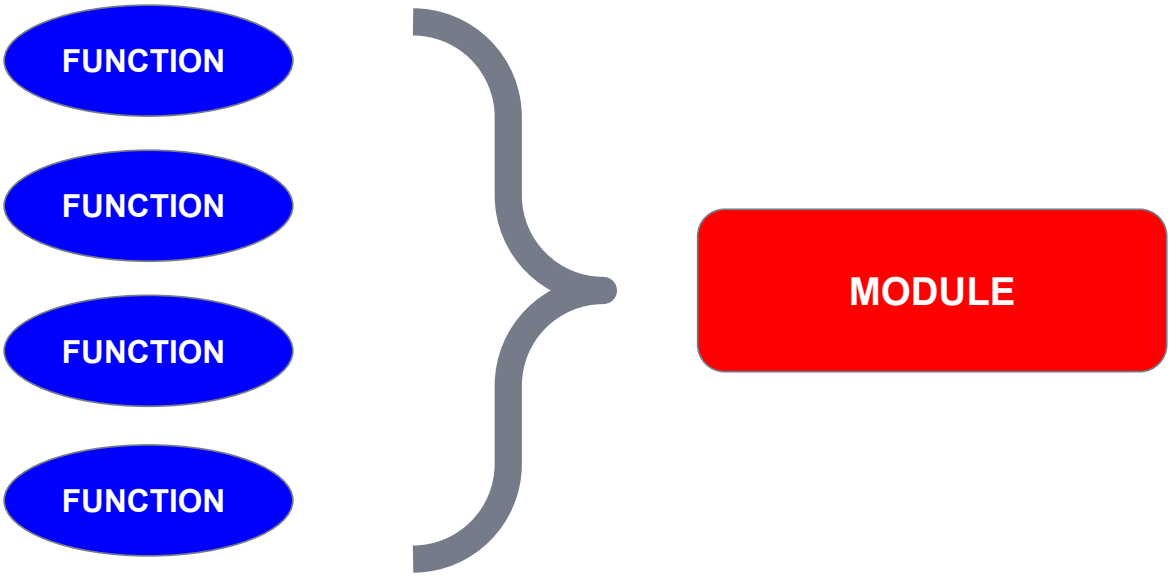
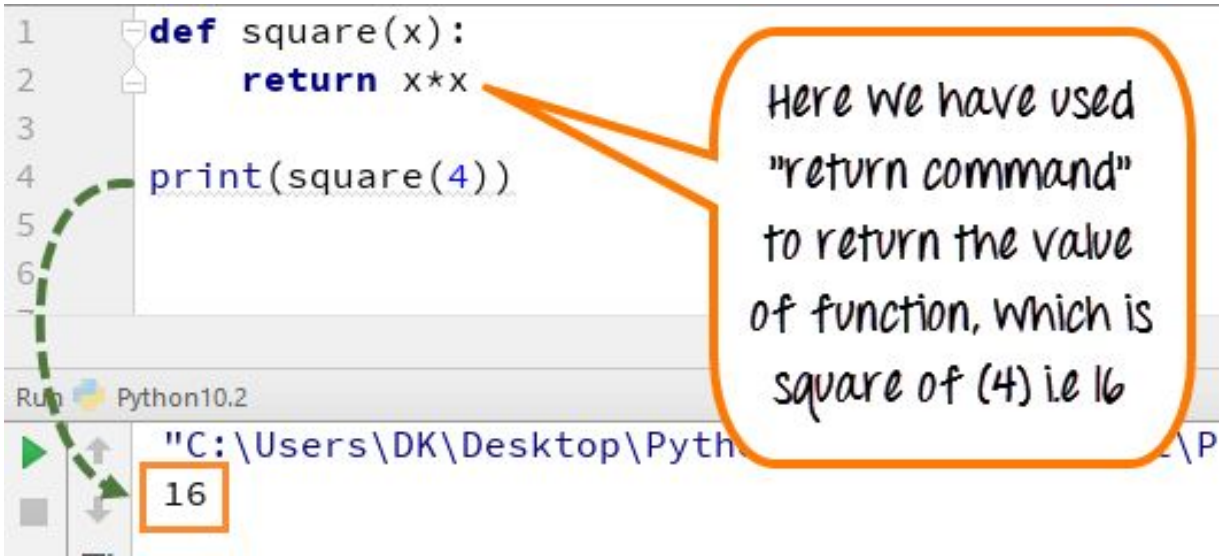
Libraries/Packages/Frameworks

Library:
A software library generally consists of pre-written code, classes, procedures, scripts, configuration data and more. Typically, a developer might manually add a software library to a program to achieve more functionality or to automate a process without writing code for it.

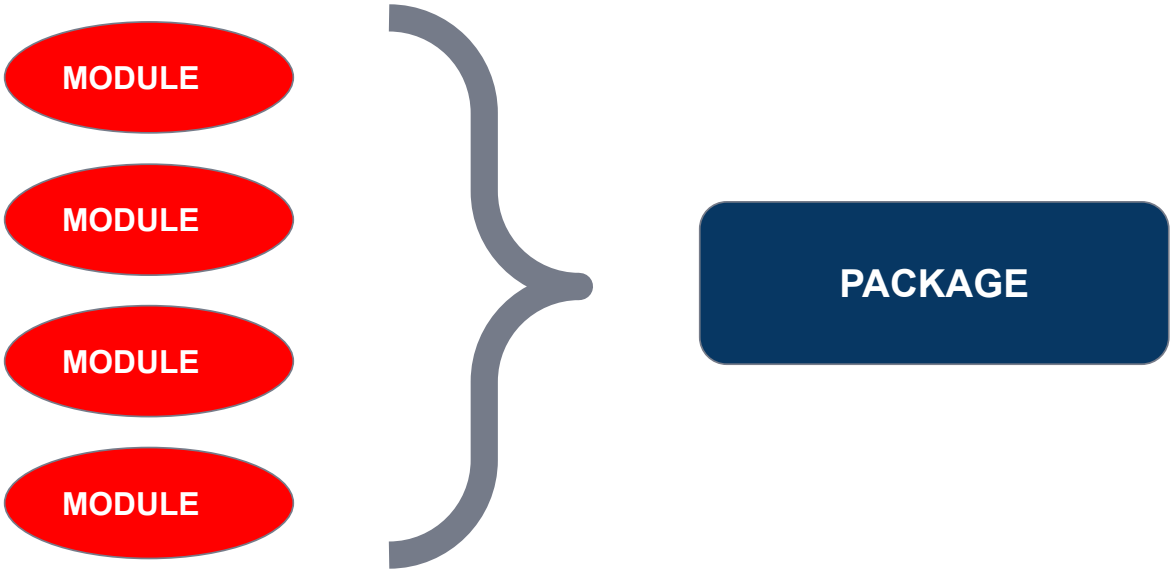
Libraries/Packages/Frameworks



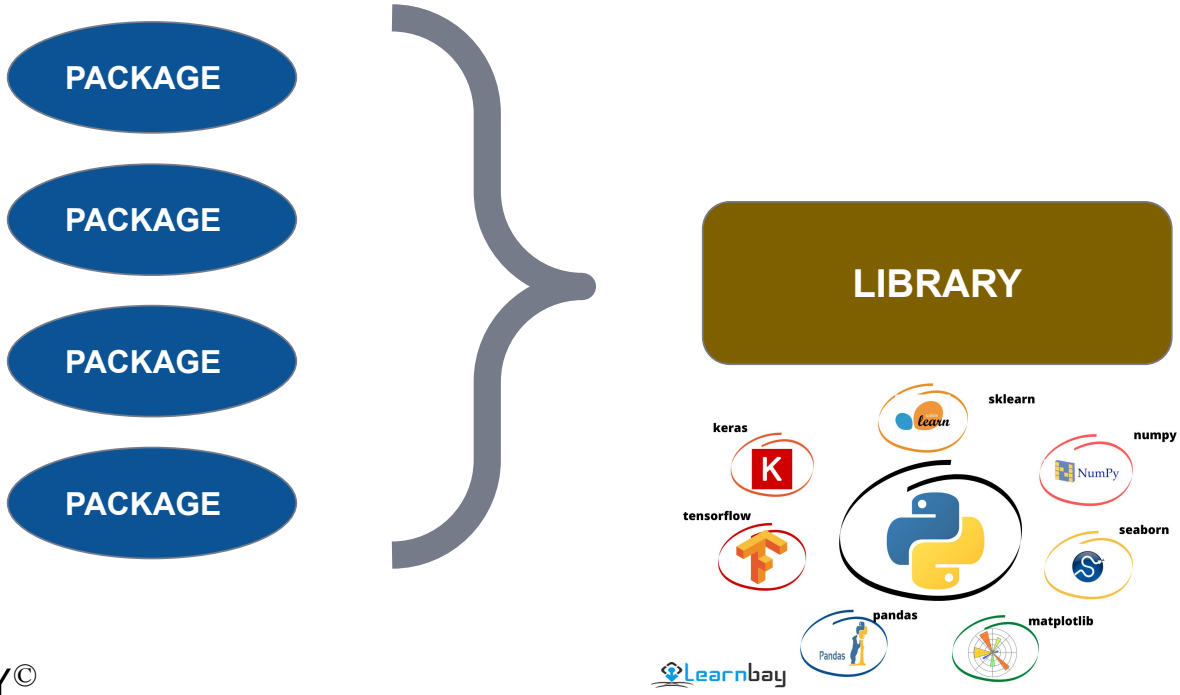
Libraries/Packages/Frameworks



Libraries/Packages/Frameworks



Libraries/Packages/Frameworks



Libraries/Packages/Frameworks

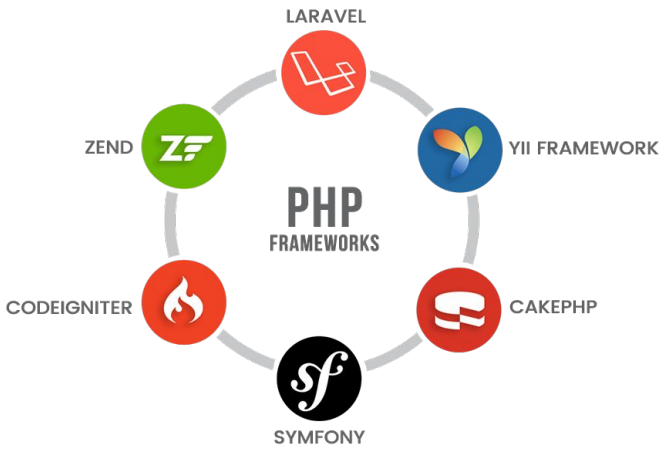
Framework:

Frameworks are software that is developed and used by developers to build applications.

Libraries/Packages/Frameworks

Framework:

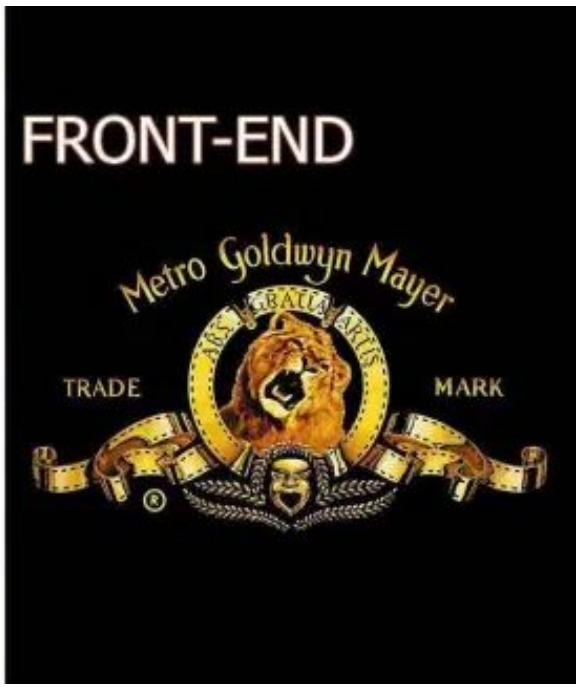
- Web Application Framework
- Mobile Development Frameworks
- DataScience Frameworks



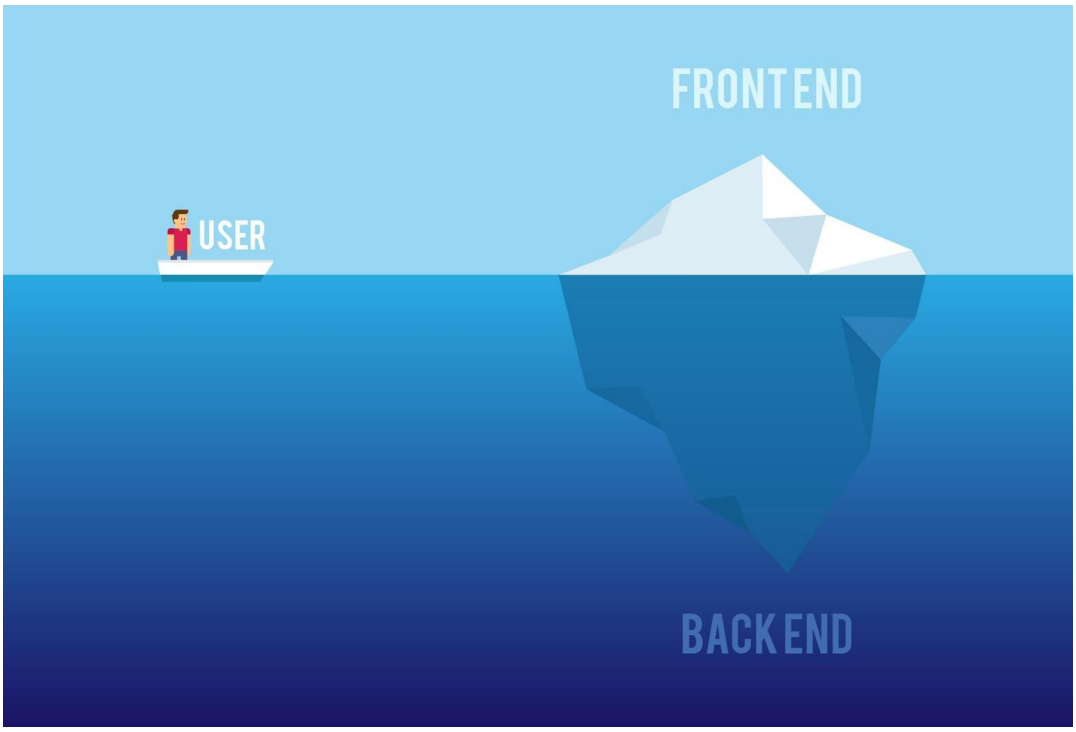
Libraries/Packages/Frameworks

Web Framework

Backend/Frontend



Backend/Frontend



Backend/Frontend

FRONTEND VERSUS BACKEND

Frontend	Backend
Frontend refers to the client-side of the application.	Backend refers to the server-side of the application.
It is the part of the website users can see and interact with.	It constitutes everything that happens behind the scenes.
It typically includes everything that attributes to the visual aspects of websites.	It generally includes a web server that communicates with a database to serve requests that the frontend presents.
It forms the basis of what users can touch and experience on their web browsers.	It is the brain of the website that is never visible to the end users.
The essentials of frontend web development include HTML, CSS, and JavaScript.	The essentials of backend development include Ruby, Python, Java, .Net, etc.

In one minute, write the most important thing from Software's topic.

Students, write your response!

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Computer Fundamentals

"Internet"

Agenda

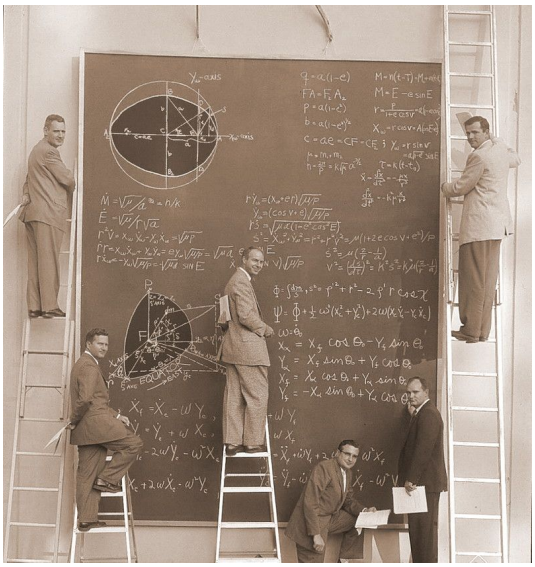
- Internet
- TCP/IP Protocol
- DNS
- LAN/WAN

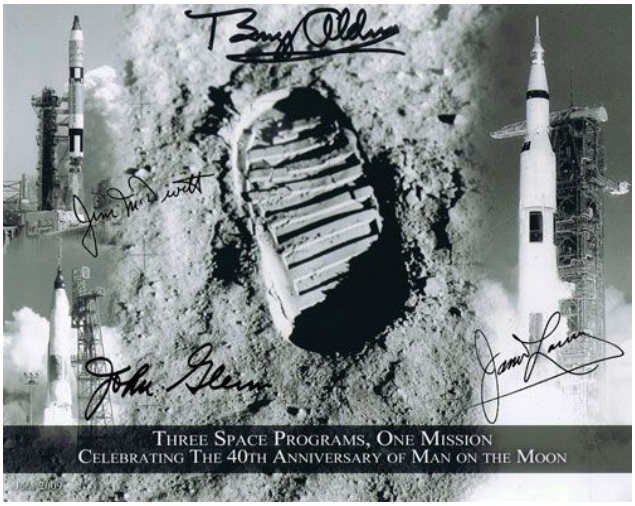
Kahoot!

Internet

- **Network of networks!**

Internet

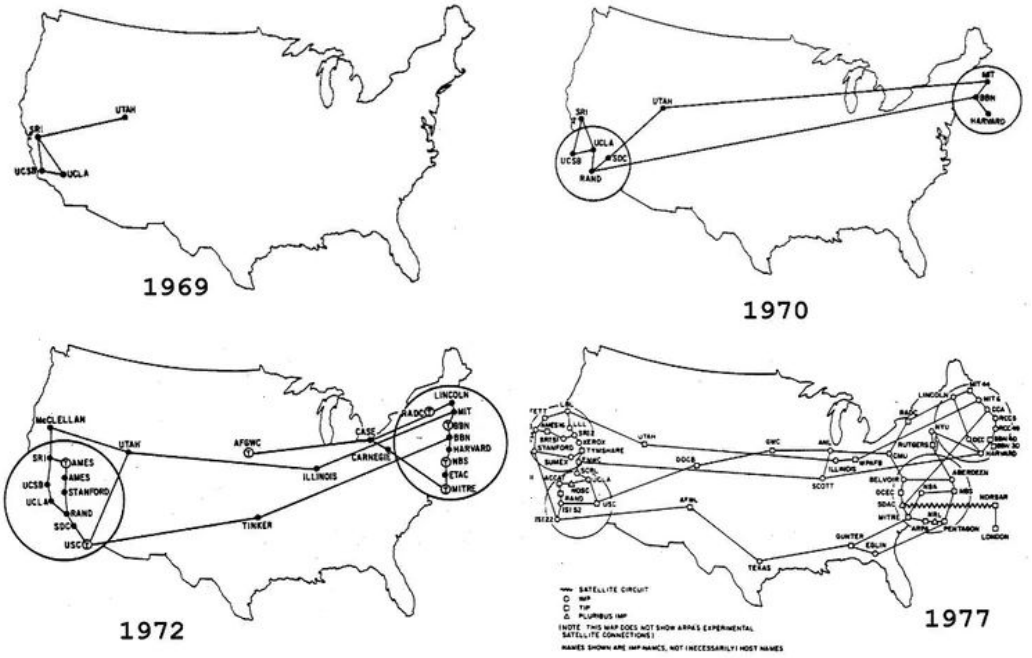




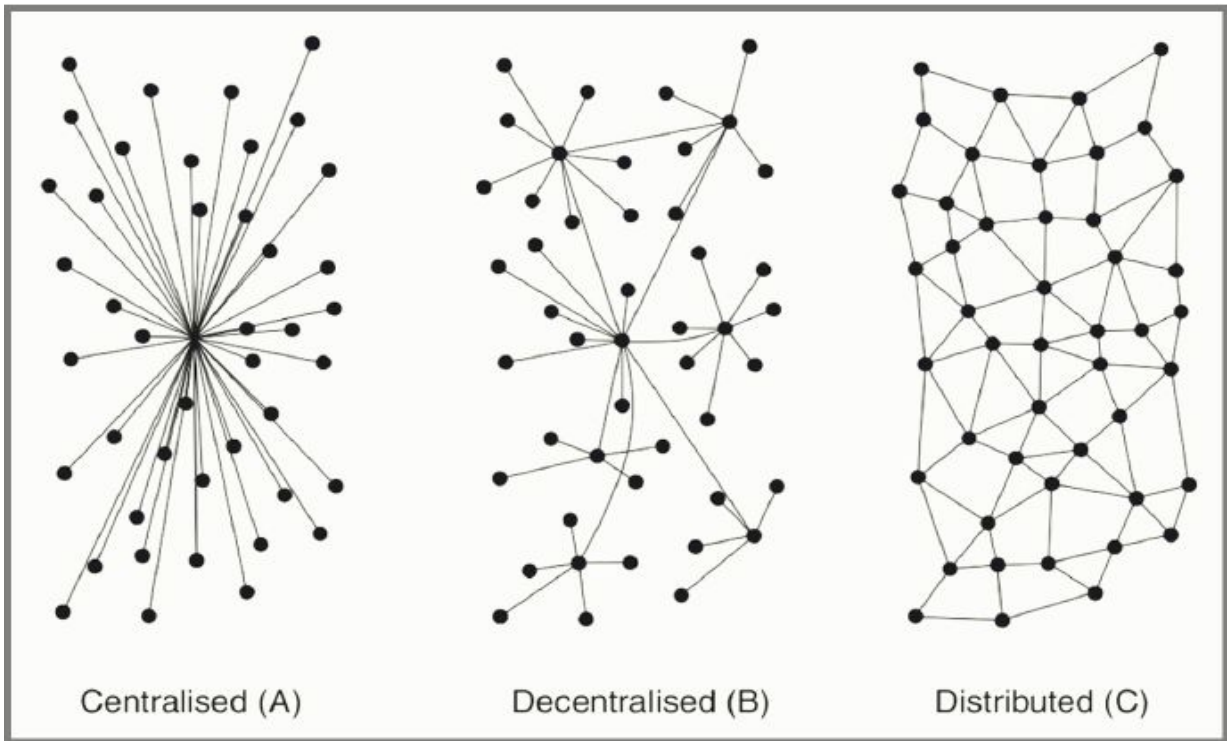
Common Sense

Internet

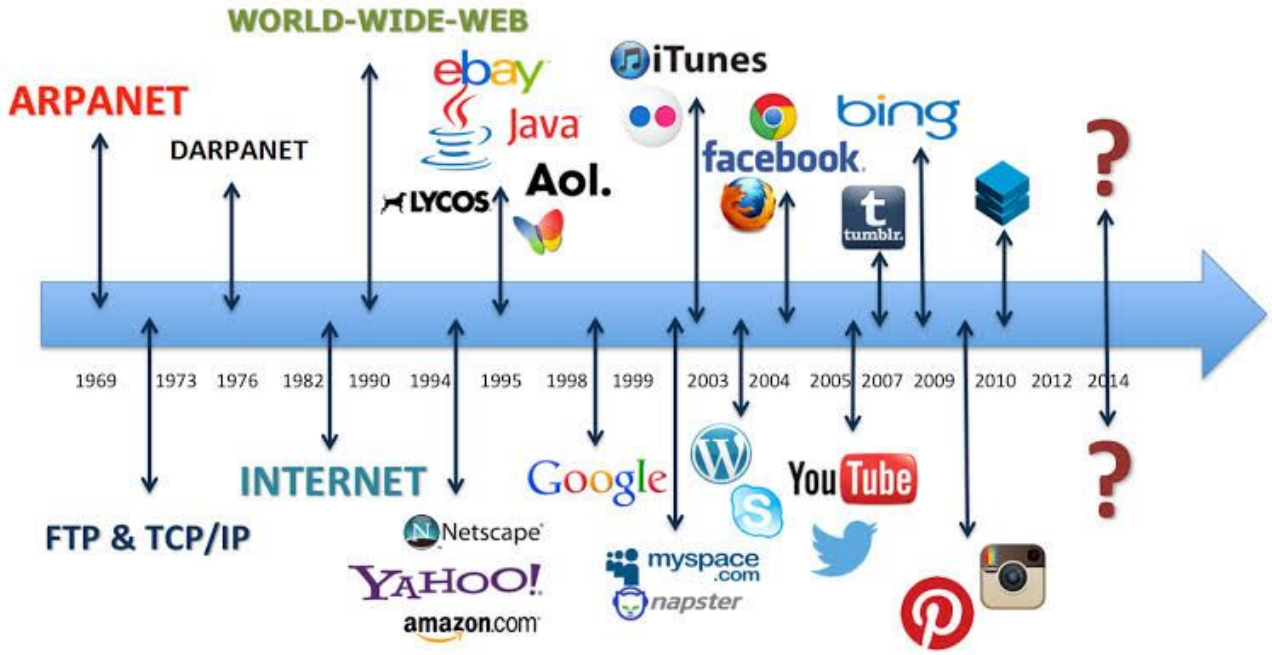
- **ARPANET (The Advanced Research Projects Agency Network)**



Internet

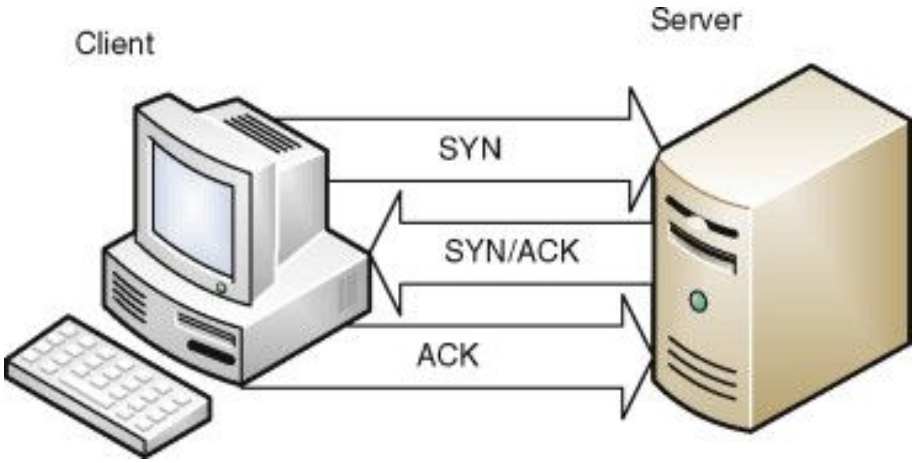


Internet



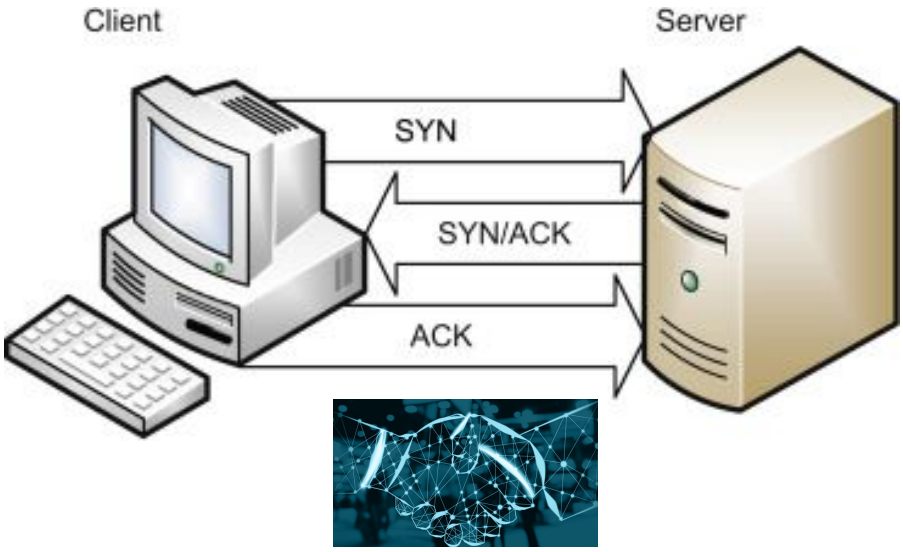
TCP/IP Protocol

- IP: Internet Protocol
- TCP: Transmission Control Protocol
- Rules for sending information between computers
- Followed by both clients and servers



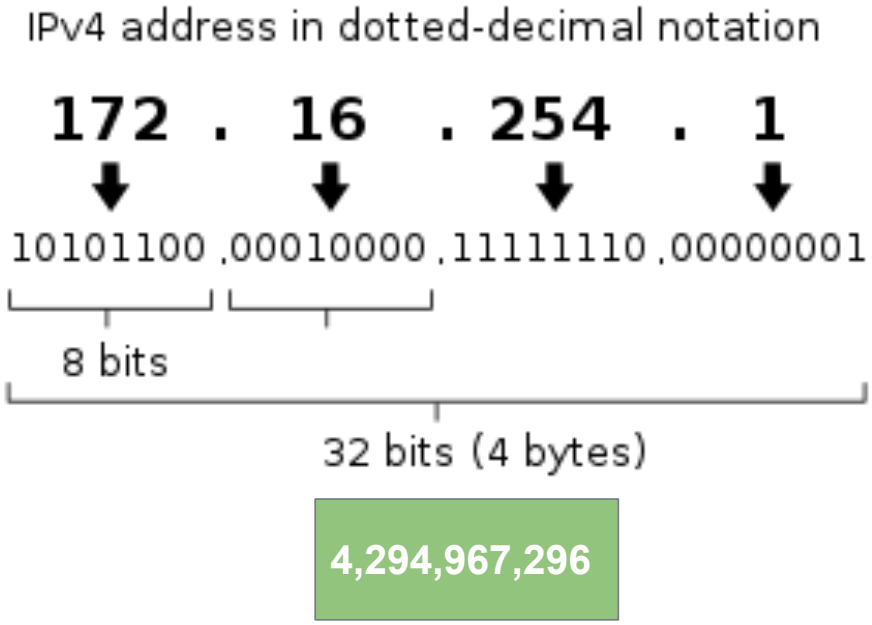
TCP/IP Protocol

- Before connection, server and client should shake their hands three times!
  - Three hand shake:

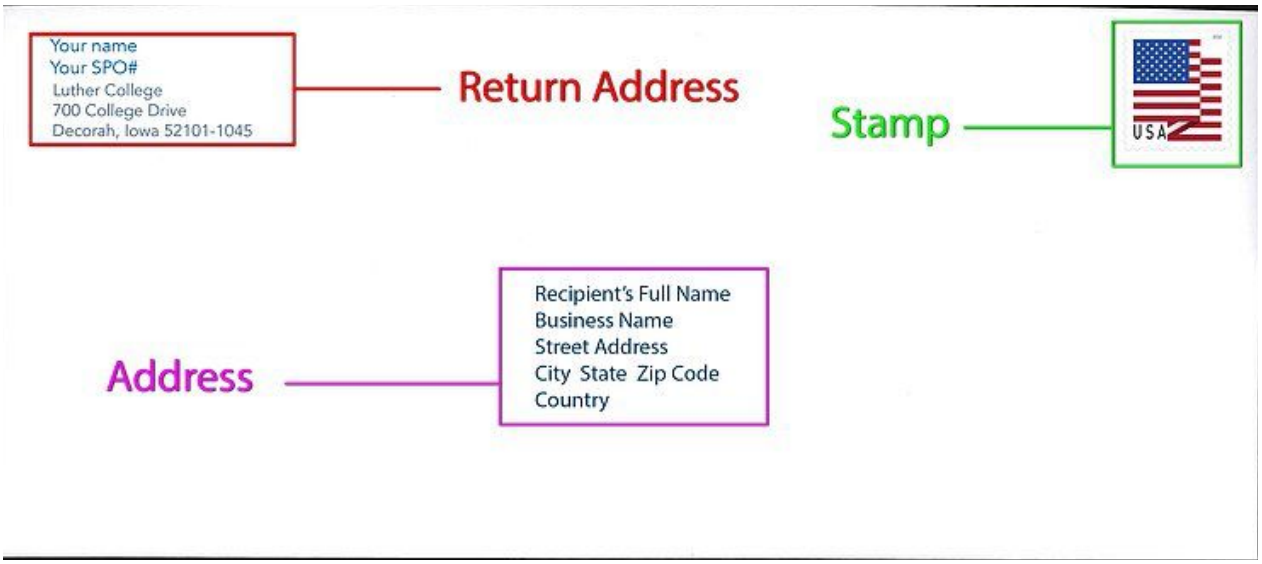


TCP/IP Protocol

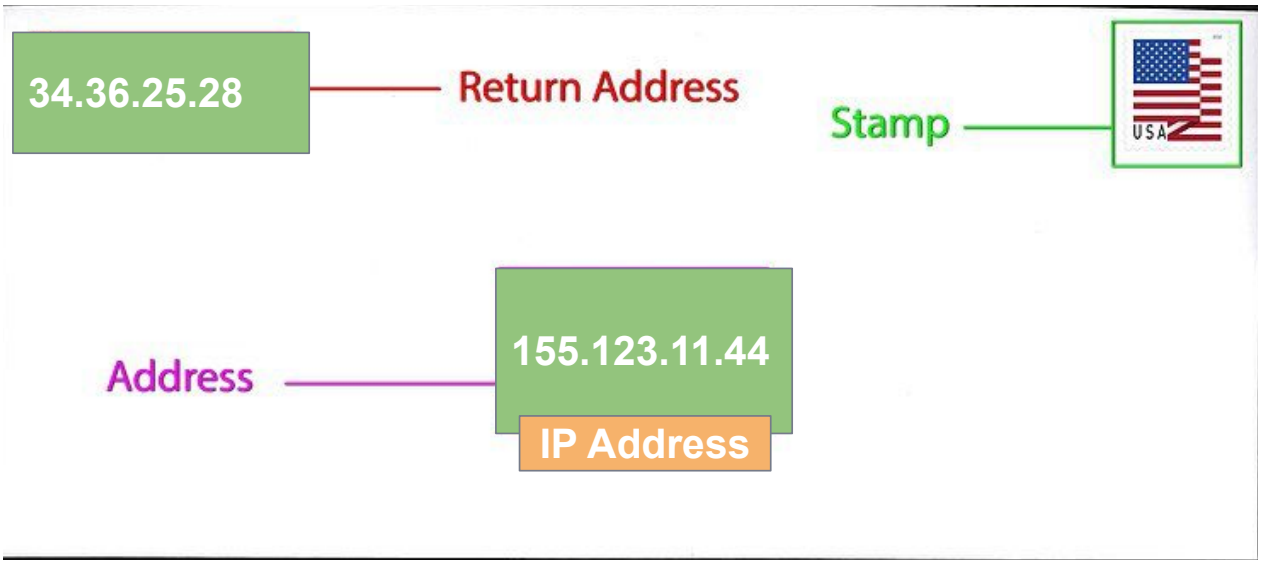
- **IP Number:**



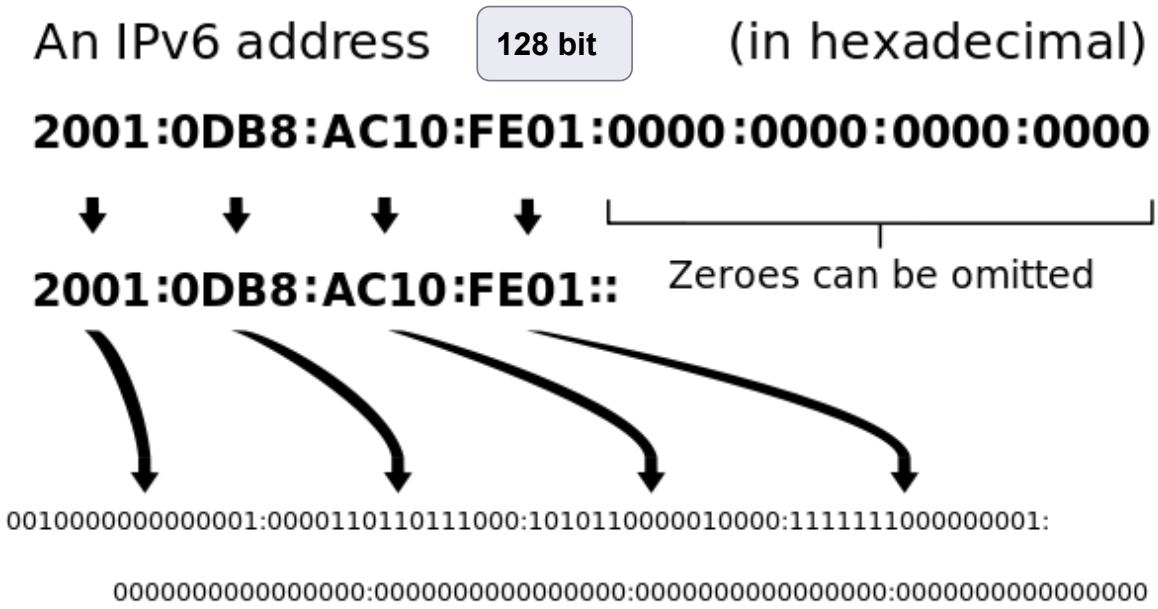
TCP/IP Protocol



TCP/IP Protocol



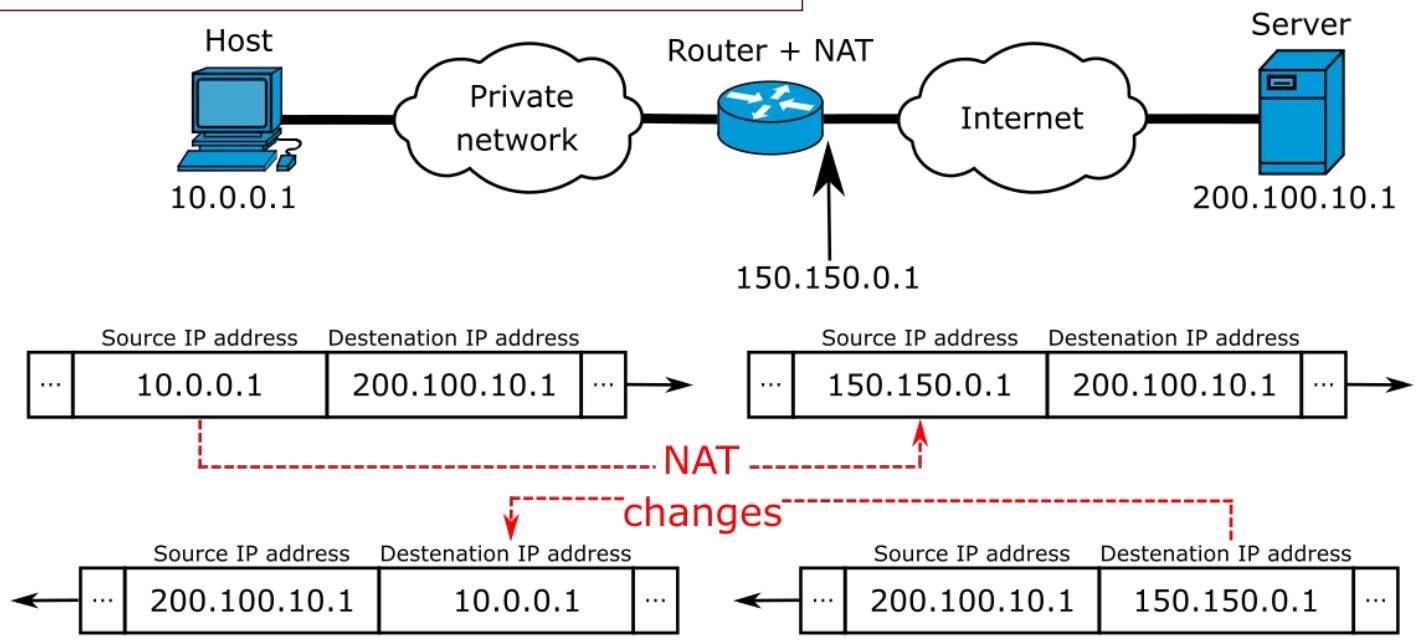
TCP/IP Protocol



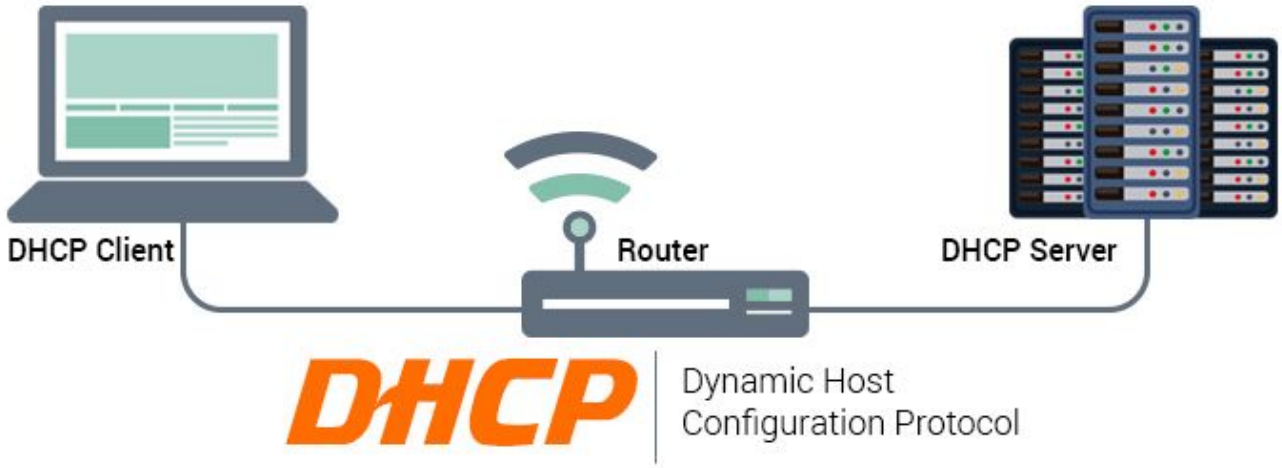
TCP/IP Protocol

TCP/IP Protocol

- **NAT : Network Address Translation**

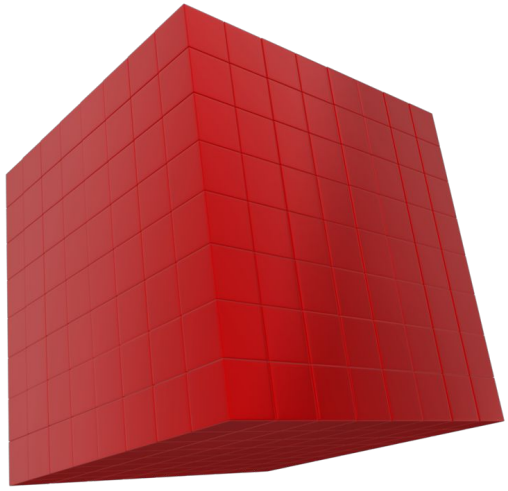


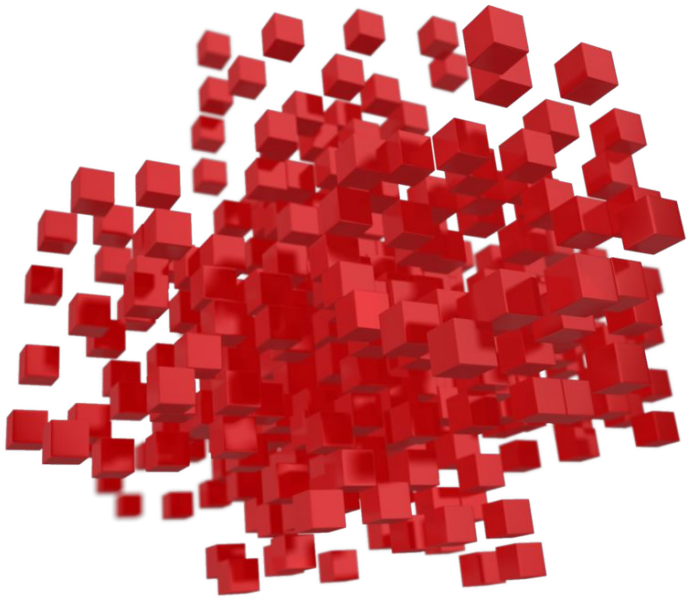
TCP/IP Protocol



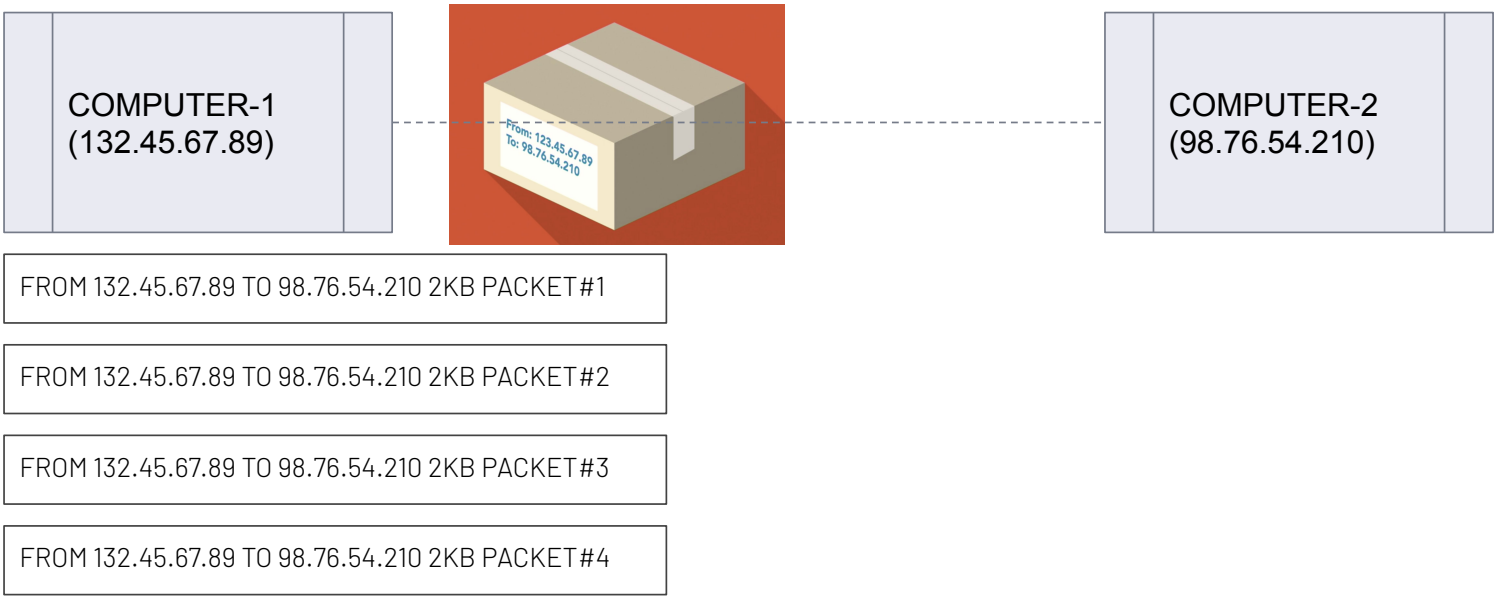
TCP/IP Protocol

- **Packages**





TCP/IP Protocol



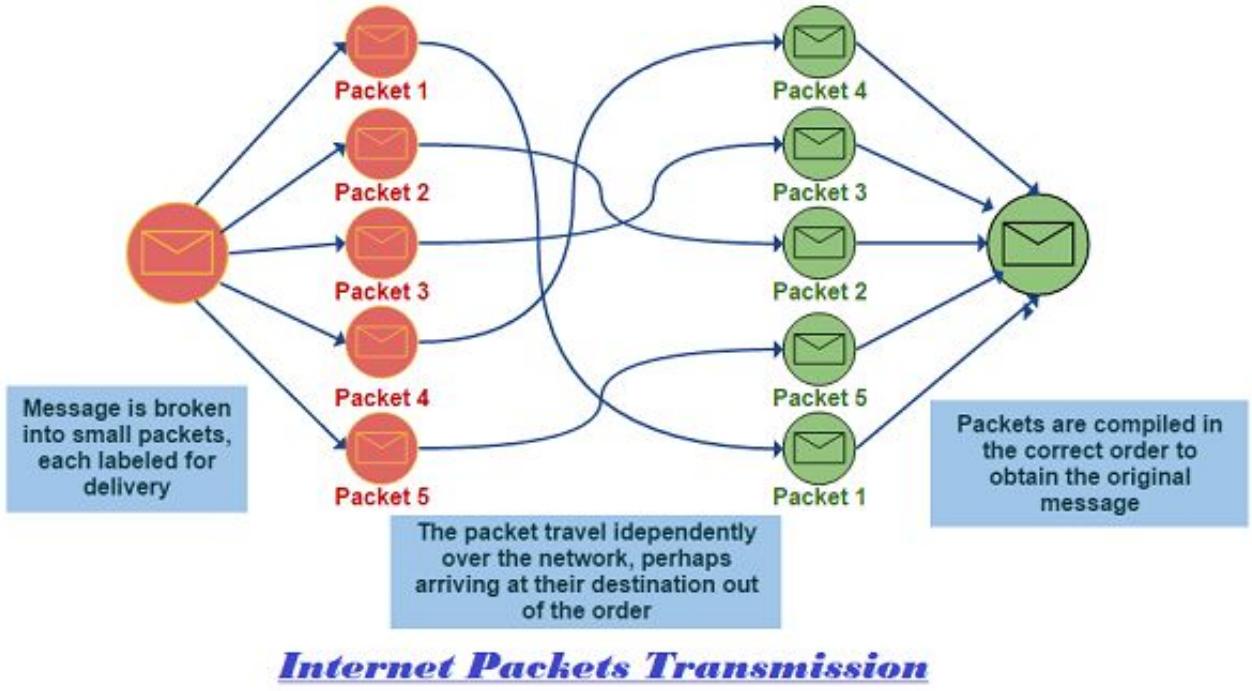
FROM 132.45.67.89 TO 98.76.54.210 2KB PACKET#1

FROM 132.45.67.89 TO 98.76.54.210 2KB PACKET#2

FROM 132.45.67.89 TO 98.76.54.210 2KB PACKET#3

FROM 132.45.67.89 TO 98.76.54.210 2KB PACKET#4

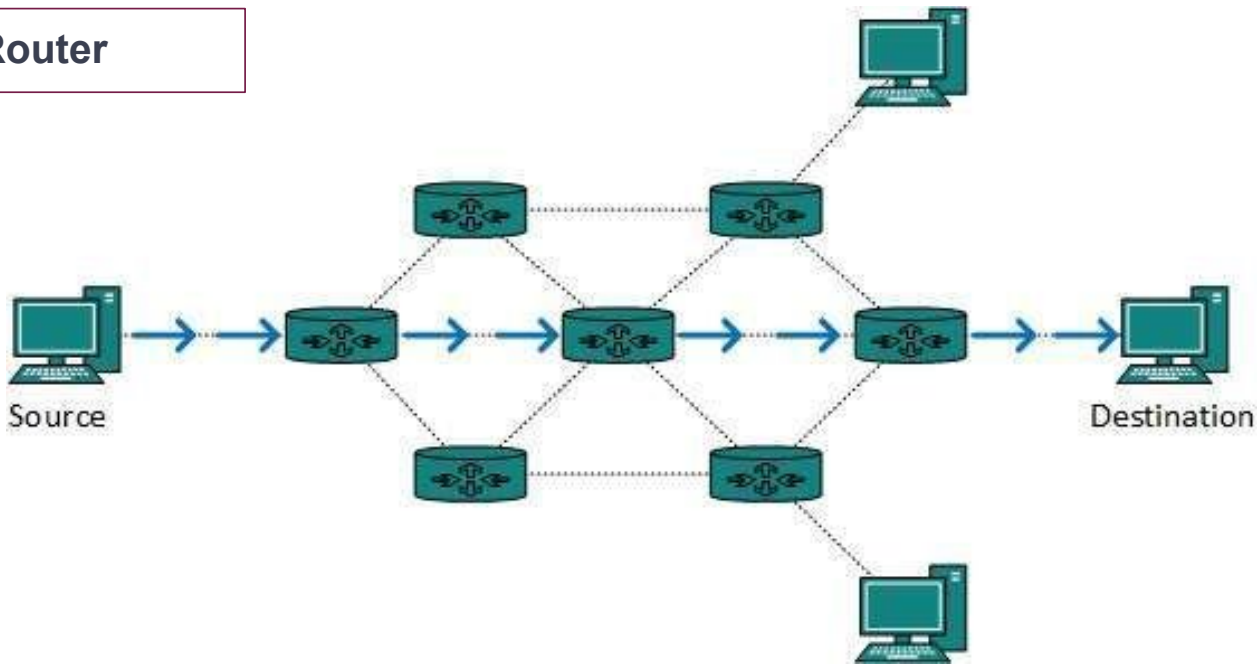
TCP/IP Protocol



Internet Packets Transmission

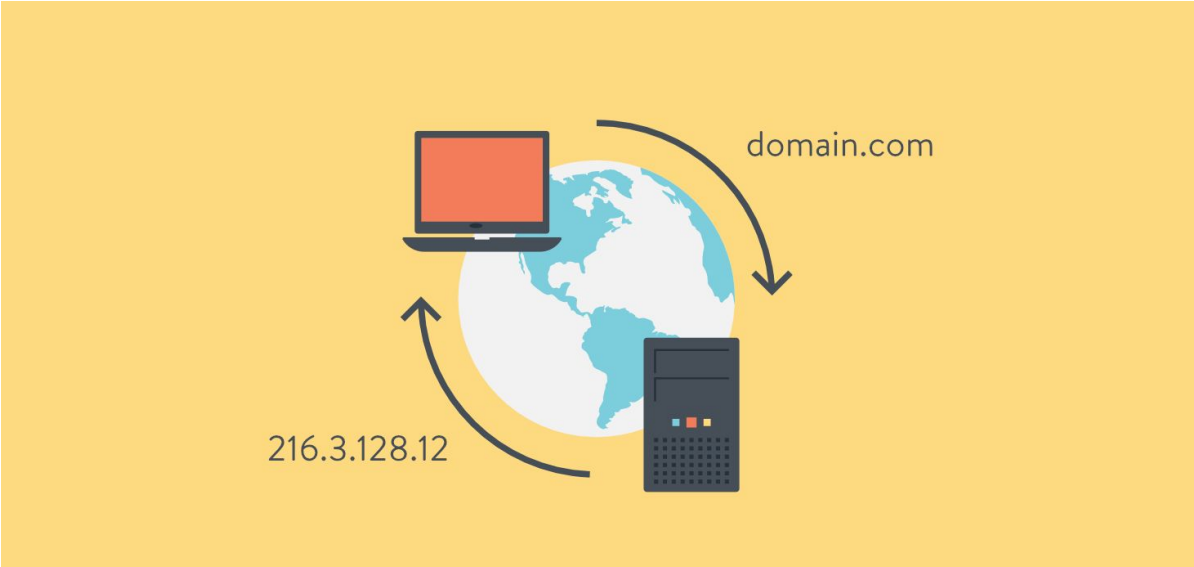
TCP/IP Protocol

- **Router**



DNS

- **Domain Name Server**



DNS

- **URL: Uniform Resource Locator**

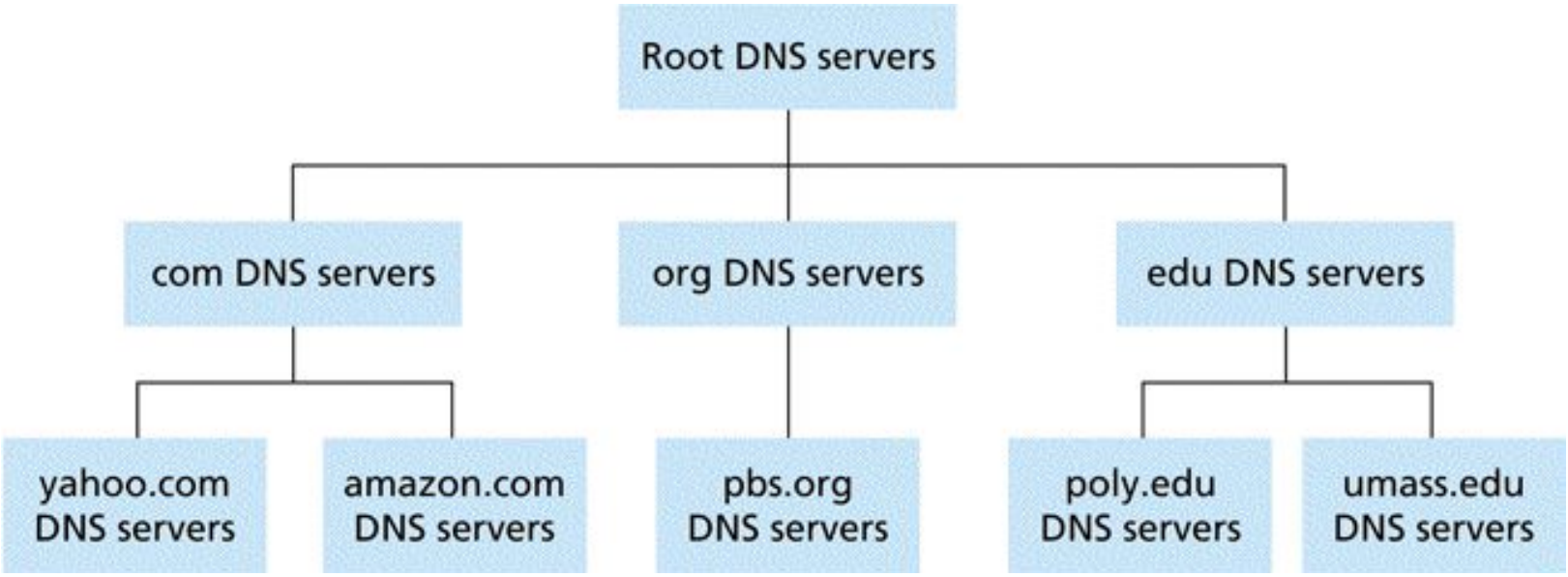
https://www.example.com

Protocol (scheme) — **Sub-domain** — **Domain name** — **Top level domain (TLD)**

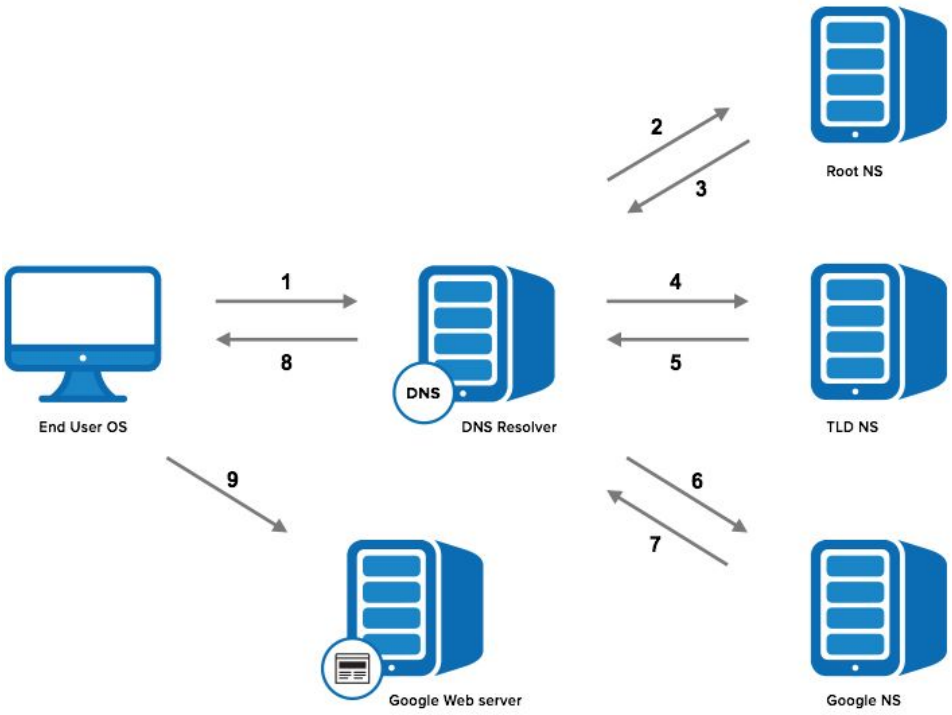
DNS

- **Root DNS**

DNS

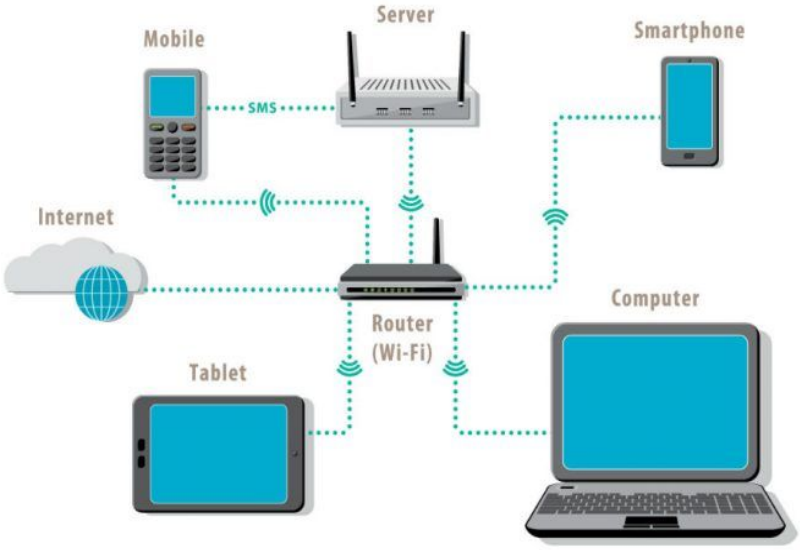


DNS



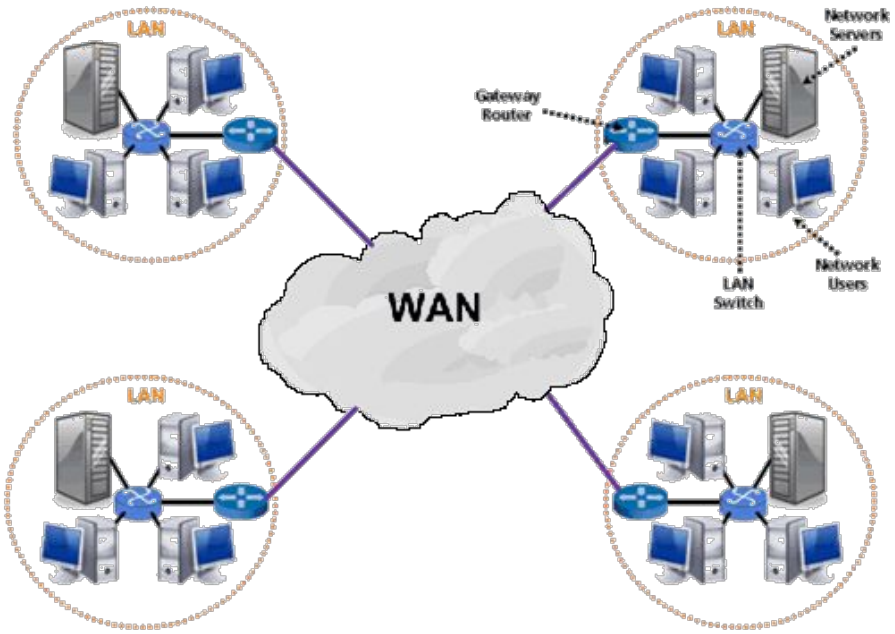
LAN/WAN

- **LAN: Local Area Network**



LAN/WAN

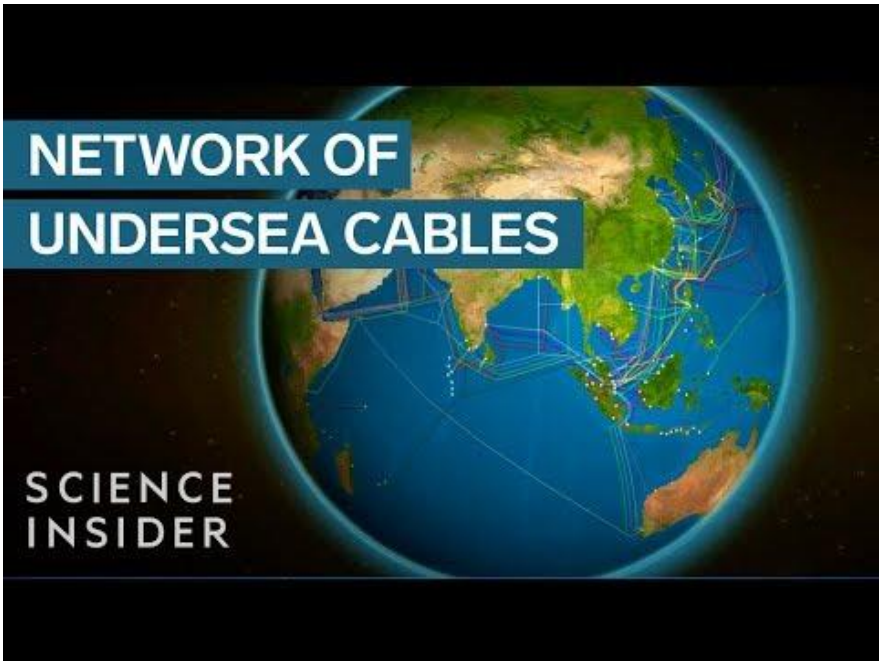
- **WAN: Wide Area Network**



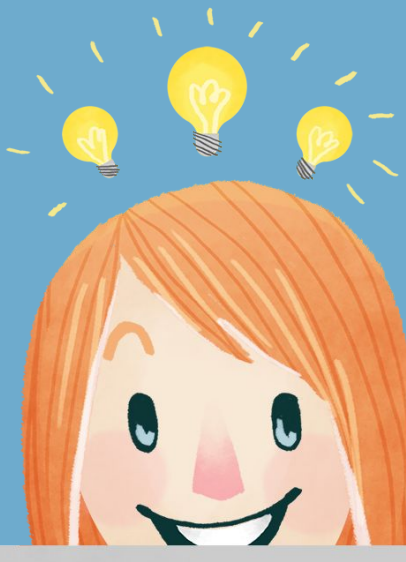
Let's Practice

```
clarus-linux@professor: ~
clarus-linux@professor:~$ traceroute clarusway.com
traceroute to clarusway.com (54.164.151.235), 64 hops max
  1   192.168.1.1  2,418ms  110,443ms  1,356ms
  2   212.57.0.115  7,721ms  9,578ms  10,913ms
  3   10.36.253.221  9,185ms  *  *
  4   10.58.19.21  12,654ms  *  *
  5   10.58.19.30  12,150ms  *  *
  6   10.40.141.12  8,843ms  *  *
  7   10.36.6.2  11,598ms  *  *
  8   195.22.206.0  140,022ms  *  *
  9   195.22.206.63  132,805ms  *  *
 10   54.239.111.232  144,067ms  *  *
 11   52.93.114.45  136,734ms  *  *
 12   52.93.28.110  143,479ms  *  *
 13   *  *  *
 14   * ^C
clarus-linux@professor:~$
```

LAN/WAN



Please write what is
- Internet
- IP address
- TCP/IP
- DNS



Pear Deck
Students, write your response!
Pear Deck Interactive Slide
Do not remove this bar

Circle how you are feeling:

Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar

THANKS!

Any questions?

You can find me at:

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- jamil@clarusway.com
- @Tomy
- tomy@clarusway.com