Network Programming

By

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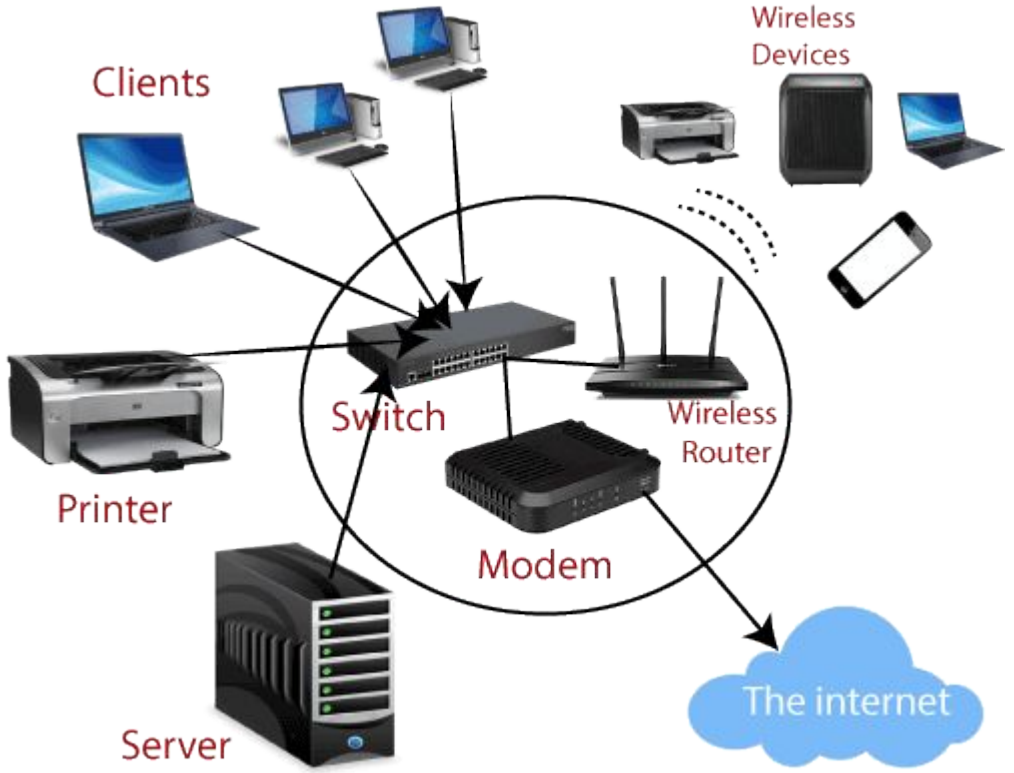
EMBA,BE

Computer Network



Computer Networks

- A computer network is a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data, and applications.
- A computer network is a set of devices connected through links. A node can be computer, printer, or any other device capable of sending or receiving the data. The links connecting the nodes are known as communication channels.

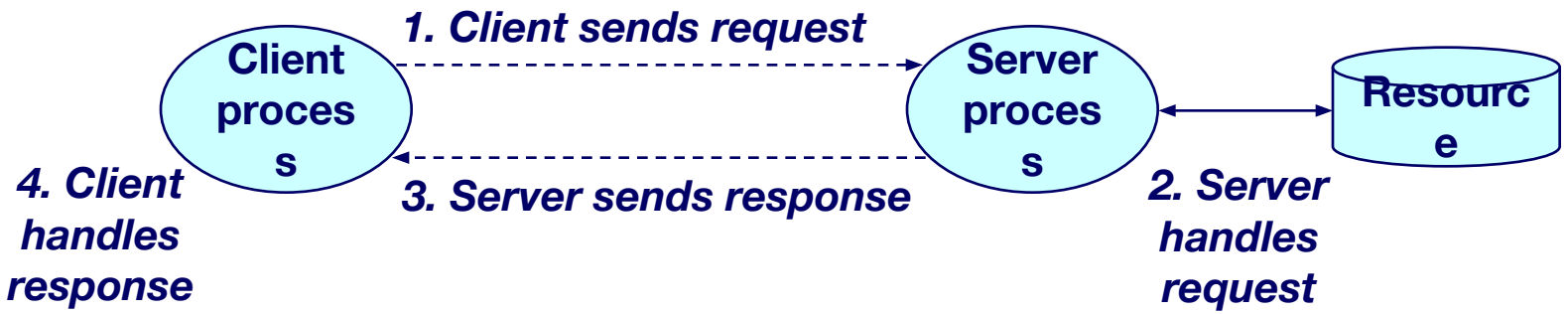
Applications of Networks

- **Resource Sharing**
  - Hardware (computing resources, disks, printers)
  - Software (application software)
- **Information Sharing**
  - Easy accessibility from anywhere (files, databases)
  - Search Capability (WWW)
- **Communication**
  - Email
  - Message broadcast
- **Remote computing**
- **Distributed processing (GRID Computing)**

Client-Server Transactions

Every network application is based on client-server model:

- ***Server*** **process and one or more** ***client*** **processes**
- **Server manages some** ***resource*****.**
- **Server provides** ***service*** **by manipulating resource for clients.**

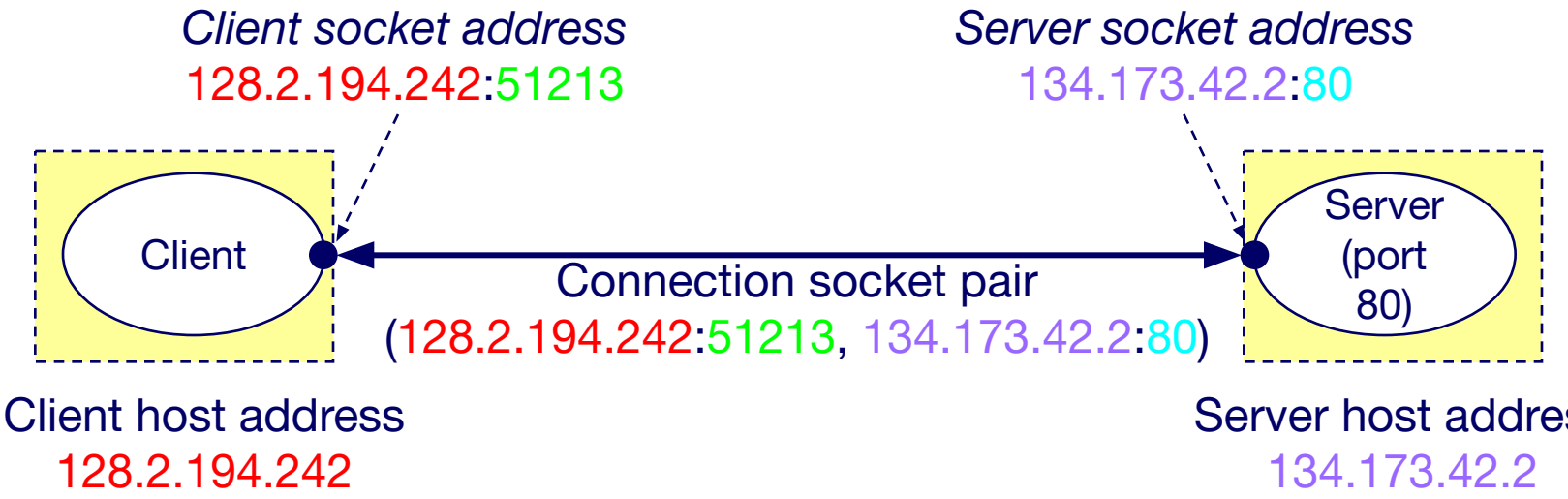


Note: clients and servers are processes running on hosts (can be the same or different hosts).

Internet Connections

Clients and servers communicate by sending streams of bytes over *connections*

Connections are point-to-point, full-duplex (2-way communication), and reliable

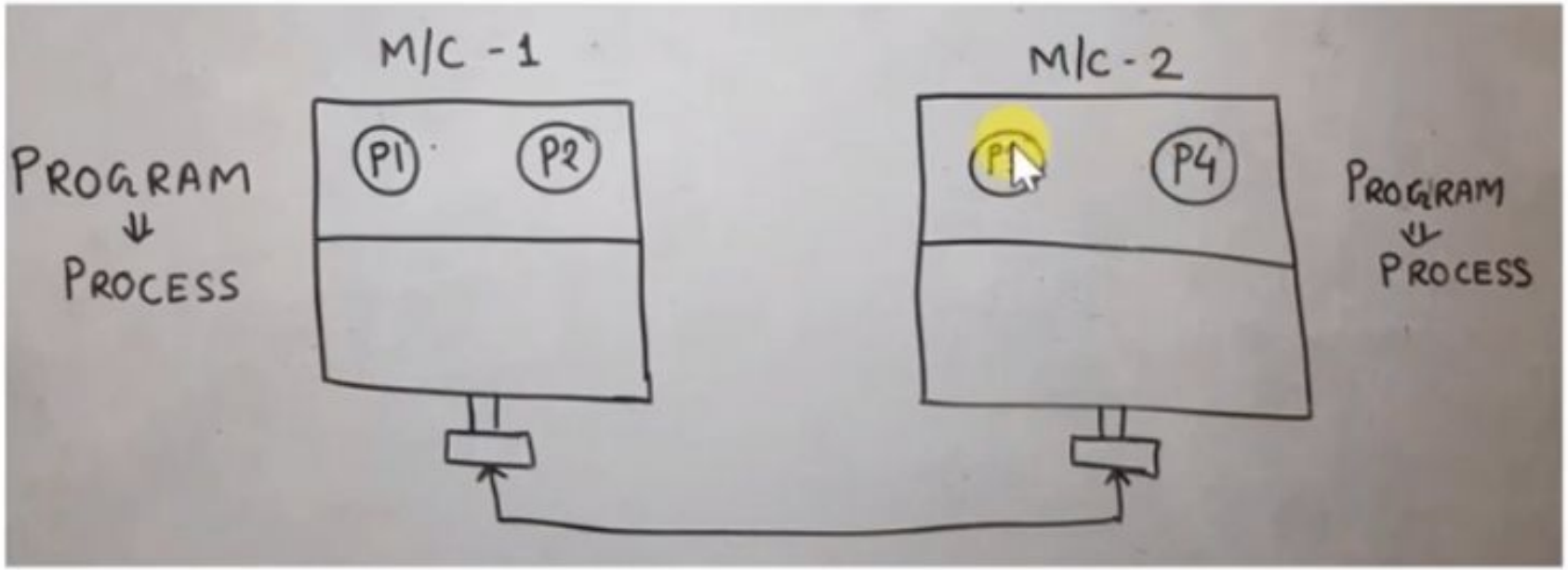


Note: 51213 is an ephemeral port allocated by the kernel

Note: 80 is a well-known port associated with Web servers

What is Network Programming

- **Developing a program by which one device can communicate with another device.**



- **A fundamental entity in a computer network is a process.**
- **A process is a program in execution by the computers operating system.**

Computer network programming involves writing computer programs that enable processes to communicate with each other across a computer network.

Network Programming

- The term network programming refers to writing programs that execute across multiple devices in which the device are all connected to each other using network
- Network Programming involves writing programs that communicate with other programs across a computer network.
- As we know that computer Network means a group of computers connect with each other via some medium and transfer data between them as and when require.
- In **network programming** we can make such a program in which the machines connected in network and will send and receive data from other machine in the network by programming.

Network Programming

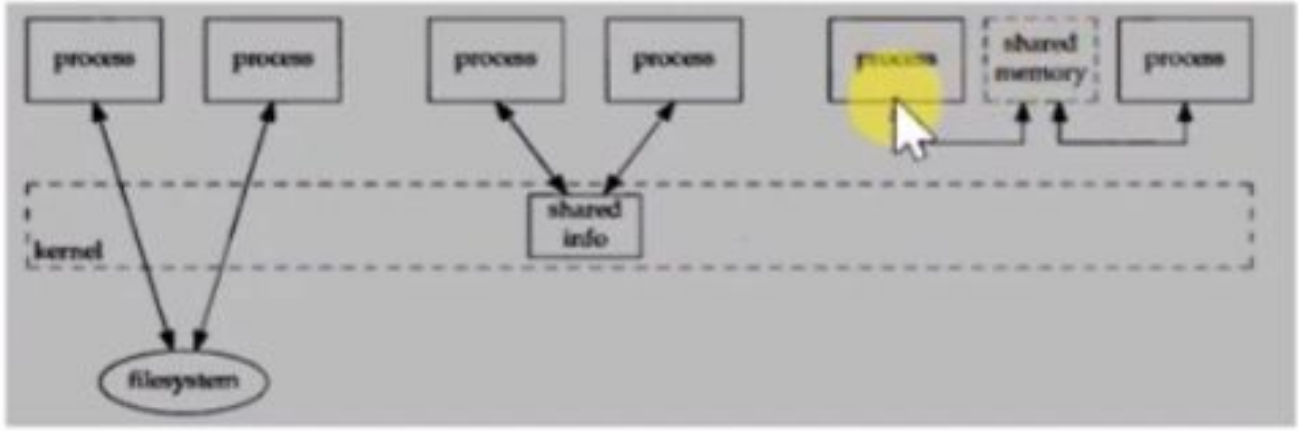
- The first and simple logic to send or receive any kind of data or message is **we must have the address of receiver or sender.** So when the computer needs to communicate with another computer, it's required the other computer's address.
- Network programming can be done using various other APIs. Most current network programming, however, is done either using sockets directly, or using various other layers on top of sockets (e.g., quite a lot is done over HTTP, which is normally implemented with TCP over sockets). TCP/IP and UDP/IP (as well as a number of other IP-based protocols) are done primarily via the sockets interface.

Network Programming

- Network programming is about writing computer programs that talk to eachother over a computer network. The world is full of such type of programs: for example, the web browser you are using to read this website is a piece of software that connects to a remote computer where the data is stored and grabs the text content to display on your screen.
- The browser and the web server can do their networking job thanks to the operating systems they run on, where all the necessary network protocols have been implemented. The operating system's parts that provide network functionality are called **sockets**.

Inter process Communication

Two processes are communicating with each other – running on a single machine.



A pipe is an inter-process communication mechanism using message passing. Shared information resides within the kernel.

Example of Network Programming

- Client Server Application
  - Web Client : Mozilla Firefox, Google Chrome, Safari, Internet Explorer, Microsoft Edge, Opera, Lynx, Gnome etc.
  - Web Server : Apache Tomcat, IIS , Oracle iPlanet, Tornado, HTTP File Server etc.
  - Chat Application
  - Email
  - Echo Server

- Developing Protocols
  - Daytime Protocol
  - FTP
  - ECHO

Course focus on

- Network
- Internet Address
- URL and URL Connection
- HTTP
- Socket Programming
- IP Multicasting
- RMI

Prerequisite of This Course

- Knowledge of Computer Network
  - Client server system,
  - Protocol and its types
  - IP Addressing
  - OSI and functions of different layers
  - TCP/IP
  - TCP,UDP
- Knowledge of Programming Language
  - C
  - C++
  - Java

Syllabus

Unit 1: Introduction [3 Hrs.]

Unit 2: Internet Addresses [4 Hrs.]

Unit 3: URLs and URIs [5 Hrs.]

Unit 4: HTTP [2 Hrs.]

Unit 5: URLConnections [5 Hrs.]

Unit 6: Socket for Clients [5 Hrs.]

Unit 7: Socket for Servers [5 Hrs.]

Unit 8: Secure Socket [4 Hrs.]

Unit 9: Nonblocking I/O [3 Hrs.]

Unit 10: UDP [5 Hrs.]

Unit 11: IP Multicast [2 Hrs.]

Unit 12: Remote Method Invocation (RMI) [2 Hrs.]

Laboratory Work

- Laboratory work should be done covering all the topics listed above and a small project work should be carried out using the concept learnt in this course using C,C++, Java programming Language.

Thank You !!!