MBEYA UNIVERSITY OF SCIENCE AND TECHNOLOGY

INFORMATION SYSTEMS AND TECHNOLOGY DEPARTMENT

INTERNET TECHNOLOGY

COB 4111

3rd November 2020

Module Structure

- Lectures
- Labs
- Module Assessment Plan
  - Project Presentation (10%)
  - Test 1 and Test 2 (20%)
  - Quiz/Assignment (10%)

Project Presentation

- The project is conducted **individually.**
- The objective is to develop a **web based system that** Enable **users to access items (search, select, comment)** and store data. **Interactive web sites** often require data to be stored.
- Basic Languages: PHP, JavaScript, CSS, HTML and MySQL.
- Frameworks: Such as Bootstrap and Laravel
- All the techniques illustrated in the lectures must be properly applied (*not a simple, static HTML-based web site)*
- The project results will depend on a **running system and professional written report.**
- Any material taken from other sources must be **properly referenced, and it must be legal for you to include it** (**Wikipedia should not be included**)
- **First presentation 6th week, second presentation 10th week and last presentation 12th week.**

Module Content

- Introduction to Internet
- Internet Applications
- Web Programming Languages
- IoT
- Data Communication and Mobile networks
- Protocols (OSI vs TCP/IP, UDP vs TCP/IP)
- Security (encryption and cryptography)
- Cyber Security (Cyber Attacks/Threats vs Cyber Defenders)
- Big Data and Blockchains user case
- Internet Routing Protocols
- E-Commerce

Frameworks

- Advantages:

- ❑ Open Source
- ❑ Documentation and support
- ❑ Efficiency
- ❑ Security
- ❑ Integration

- Disadvantages:

- ❑ Limitations
- ❑ Performance
- ❑ Learning bias
- ❑ Slow learning curve
- ❑ Cost

Popular Frameworks

PHP:

- Yii
- CodeIgniter
- CakePHP
- Zend
- Symfony
- Laravel

Ruby:

- Rails
- Sinatra
- Padrino

Python:

- Django
- Web2py
- TurboGears
- Flask

JavaScript:

- AngularJS
- EmberJS
- BackboneJS
- KnockoutJS

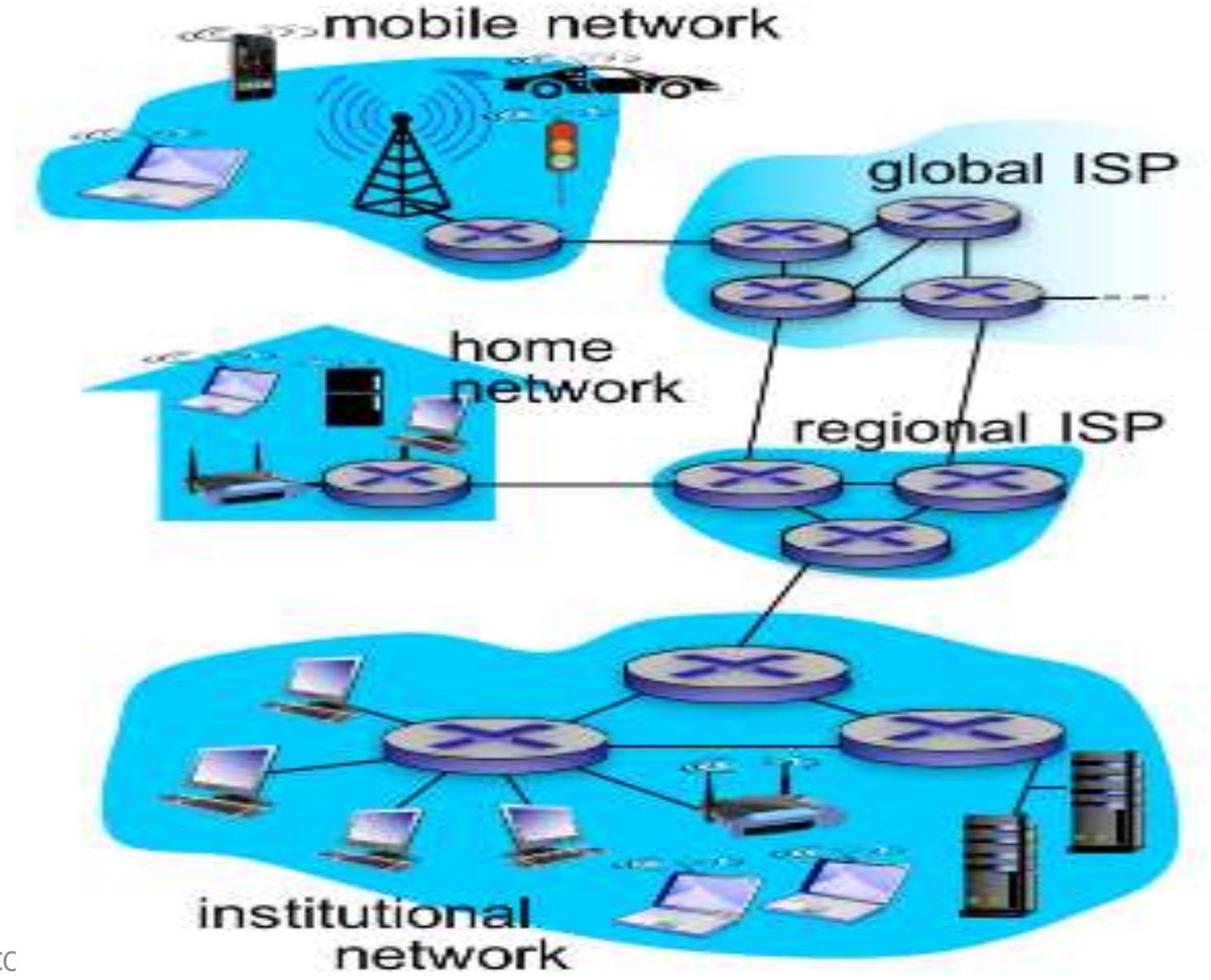
Design/CSS frameworks:

- Bootstrap
- Foundation

Internet

- The internet
  - A network of networks
  - No one owns the Internet – every one connected owns a slice of the internet
  - There is no central administration to the internet
- Internet networks
  - Linked networks that work much the same way -- they pass data around in packets, each of which carries the addresses of its sender and receiver
- The origin of Internet devised from the concept of **Advanced Research Project Agency Network (ARPANET).**
- **ARPANET** was developed by United States Department of Defense.

Computer Network by Kurose and Ross



Packet Switching and Internet

- The internet uses packet switching which is considered more efficiency as it:
  - Divides data into small blocks, called packets
  - Allows multiple users to share a network
  - Includes identification of the intended recipient in each packets
  - Devices throughout the network each have information about how to reach each possible destination.

History of the Internet

(1957) Advanced Research Projects Agency (ARPA) established by US Department of Defense

(1968-9) first packet-switching networks

(1972) Telnet

(1973) File Transfer Protocol (FTP); ARPANET goes international:

- *University College, London (UK)*
- *Royal Radar Establishment (Norway)*

(1974) design of TCP (Transmission Control Protocol)

(1977) email

(1982) TCP and IP (Internet Protocol) used for ARPANET

(1984) DNS (Domain Name Service) introduced

(1991) WWW released

Internet Applications -TCP IP LAYER

- Data transfer – Telnet & File Transfer Protocol - FTP
- Communication - E-Mail & Telephony
- Peer-To-Peer Computing

  -sharing of physical resources
- Web browser and Web server
- Internet Relay Chat – IRC & Instant Messaging - IM

Internet Standards

- Internet Architecture Board – IAB
- Internet Engineering Task Force – IETF
- Internet Engineering Steering Group – IESG
- Request for Comments – RFC – Publication

➢ www.faqs.org/rfcs

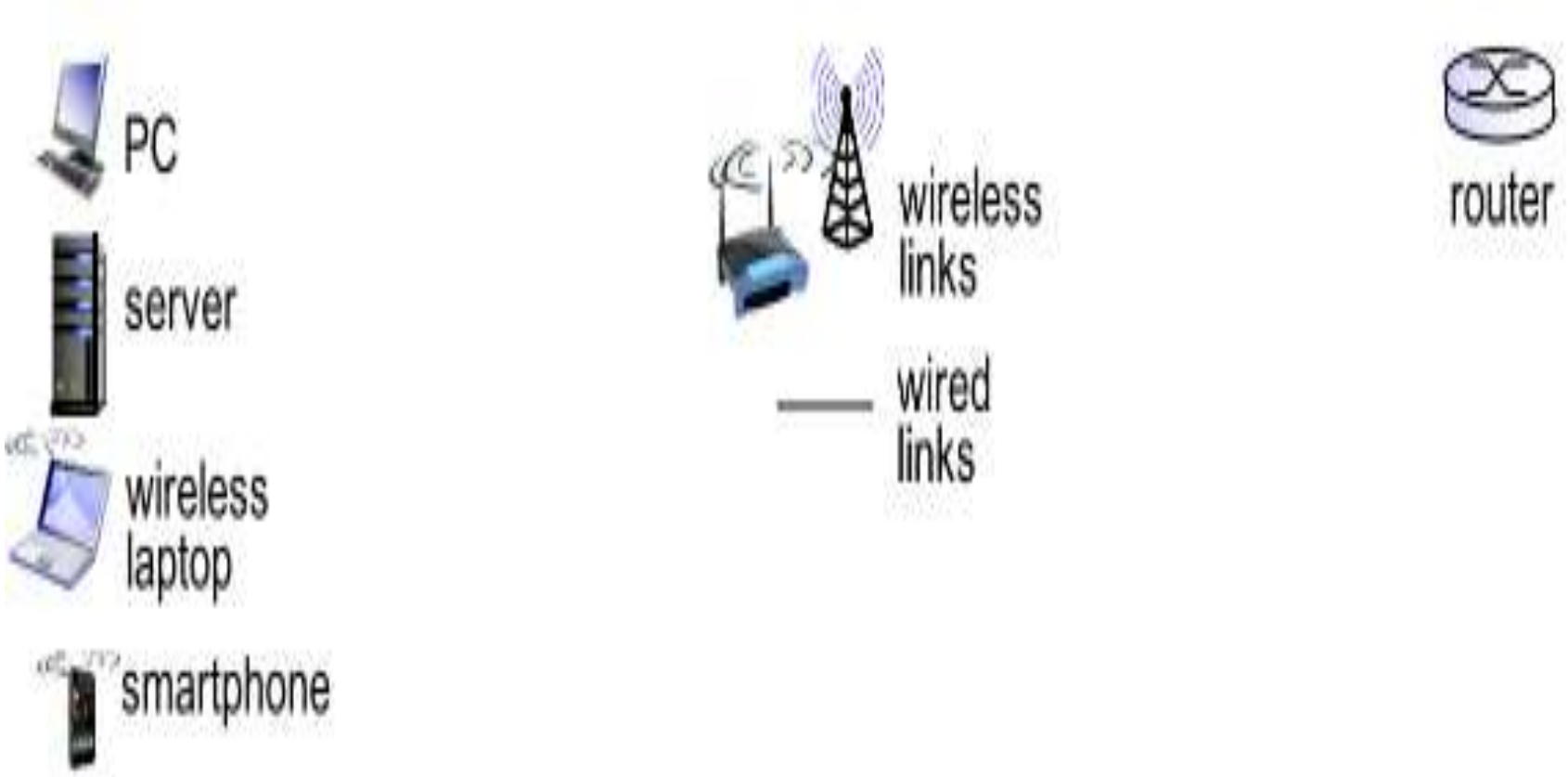
➢ www.ietf.org/rfc.html

➢ www.rfc.net

Internet Components

- Communication media – Guided and Unguided (links)
- A computer/ Host running an application
- Router – routing in and outside blocks
- Gateway – provides connections between different networks
- Network – a group of hosts, links, routers capable of sending data.

Internet Components by Kurose and Ross



Requirements for connecting to the Internet:

- **Modem:** A modem is a peripheral device that allows a computer to connect and communicate with other computers. Modem stands for *Modulator Demodulator.*
- **Web Browser:** A browser is a software program that is necessary in order to view web pages on the web. Ex: Internet Explorer, Netscape Navigator, Mozilla Firefox, Microsoft outlook express etc.
- **Telephone line:** A telephone line is required to transfer data from one computer to another.
- **Subscription with Internet service provider (ISP):** ISP's are companies that provide access to the internet. We need subscription with any ISP to get an Internet connection. Some of the ISPs in Tanzania are TTCL, SimbaNet, Zanlink, Benson Online (BOL), Africa ONLINE, SPICENET, TIGO, VODACOM etc.
- **A computer**

Types of Internet Connections

- **Dial-up**: slowest type of Internet connection uses Phone line and you can not use both internet and Landline at the same time. Speed up to **56 Kbps**
- **ISDN -** Integrated Services Digital Network, allows users to send data, voice and video content over digital telephone lines or standard telephone wires. Speed up to **128 Kbps**
- **LEASED CONNECTION** Leased connection is also known as direct Internet access or Level Three connection. It is the secure, dedicated and most expensive, level of Internet connection.
- **DSL**: Digital Subscriber Line- service uses a **broadband connection** and its faster than Dial-up. Both internet and phone line can be used at the same time and no need for landline. Speed between **128Kbps** to **8 Mbps**

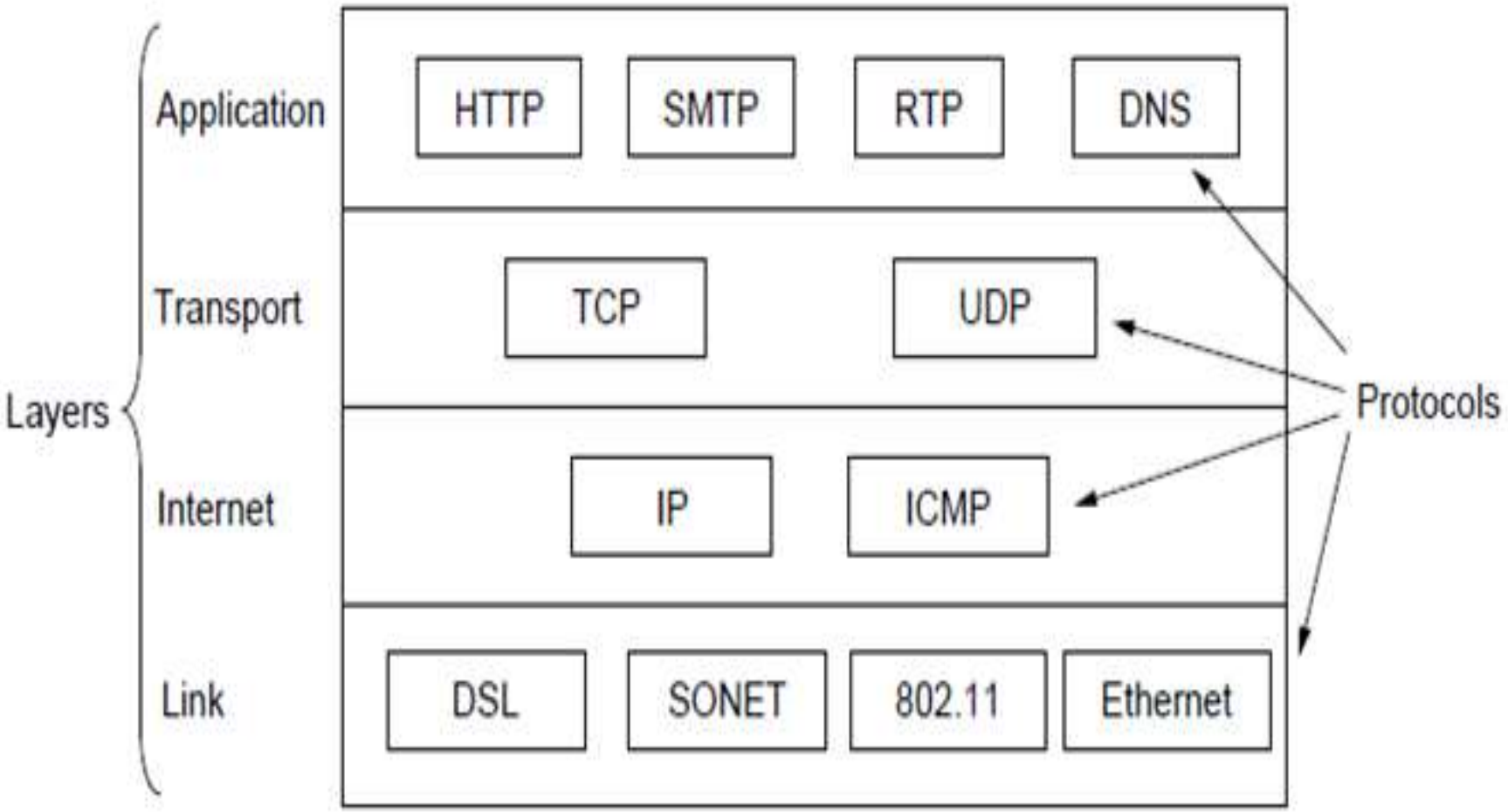
Types of Internet Connections Cont.

- **Cable**: Cable service connects to the Internet **via cable TV.** It uses a broadband connection and can be faster than both dial-up and DSL service. Speed between **512 Kbps** to **20 Mbps**
- **Wireless.** Wireless, or Wi-Fi, as the name suggests, does not use telephone lines or cables to connect to the internet. Instead, it uses radio frequency. Speed between **5 Mbps** to **20 Mbps.**
- **Satellite- VSAT-** Very Small Aperture Terminal: A satellite connection uses broadband but does not require cable or phone lines as it connects to the Internet **through satellites orbiting the Earth**. Also Satellite internet is slower than DSL or cable. Speed between **512 Kbps** to **2 Mbps.**
- **3G and 4G**: 3G and 4G service is most commonly used with mobile phones, and it connects **wirelessly** through your ISP's network. Speed between **2 Mbps** to **100 Mbps.**

Types of Internet Connections Cont.

- **Fiber optic Internet** is an Internet connection that transfers data fully or partially via fiber optic cables. “Fiber” refers to the thin glass wires inside the larger protective cable
- Fiber also refers to the thin glass wires inside the larger protective cable. “Optic” refers to the way the type of data transferred – light signals. Speed up to **1 Gbps.**

Communication Protocols



IPv4 vs IPv6

- IPv4 has 32-bits quantity
- IPv4 is a 4 Blocks/Bytes of decimal numbers
- Example 25.23.128.129
- IPv4 addresses are divided into “classes”
- IPv4 uses 0.0.0.0 as an unspecified address, and class-type address (127.0.0.1) for loopback

- IPv6 has *128-bits* quantity
- IPv6 is a8 Blocks/Bytes of hexadecimal numbers
- Example - 5f05:2000:80ad:5800:0058:0800:2023:1d71
- IPv6 uses subnetting to adjust network sizes
- IPv6 uses :: and ::1 as unspecified and loopback address respectively.

Web or Internet?

- They are not the same things.
- The Internet is a collection of computers or networking devices connected together.
  - They have communication between each other.
  - Decentralized design that there is no centralized body controls how the Internet functions.
- The Web is a collection of documents that are interconnected by hyper-links.
  - These documents are accessed by web browsers and provided by web servers.

The World Wide Web (WWW)

- The WWW/web is a collection of host machines which deliver documents, graphics and multi-media to users via the Internet.
- It enables the display, searching, and viewing of files which prior to it, was complicated and time consuming.

A Web

- A web is one of the Internet's most popular services providing access to over 8 billion web pages .
- WebPages are documents created in a programming language called HTML
  - that can contain text, graphics, audio, video, and other objects, as well as "hyperlinks" that permit users to jump easily from one page to another.

Internet Terminology

- Client
  - Any computer on the network that requests services from another computer on the network.
- Server
  - Any computer that receives requests from client computers, processes and sends the output.
- Web Page
  - Any page that is hosted on the Internet.
- Web Development
  - The process of creating, modifying web pages.
  - Hypertext
  - HTTP
  - URL
  - HTML / XML

Intranets and Extranets

- **Intranet**

  An internal corporate network built using Internet and World Wide Web standards and products that allows employees of an organization to gain access to corporate information

- **Extranet**

  A network based on Web technologies that links selected resources of the intranet of a company with its customers, suppliers, or other business partners outside the intranet network

Web Browser (Web Client)

- It is a program that retrieves information from the Web.
  - Microsoft Internet Explorer

    Most commonly used browsers
  - Netscape, Mosaic, Mozilla

    Many different computing platforms
  - Opera

    The fastest browser on Earth
  - GOOGLE CHROME

    Another most commonly used browsers

How does the Web work?

- The web information is stored in the Web pages.
  - In HTML format
- The web pages are stored in the computers called Web servers.
  - In the Web server file system.
- The computer reading the pages is called web clients with specific web browser.
  - Most commonly Internet Explorer or Netscape.
- The web server waits for the request from the web clients over the Internet.
  - Internet Information Server (IIS) or Apache.

Reference

- Data Communications and Computer Networks **for Computer Scientists and Engineers BY** Michael Duck and Richard Read SECOND EDITION
- Computer Networks and Internets by Douglas E. Comer. Fifth edtion
- **Data and Computer Communications BY William Stallings**