Presidency University, Bengaluru

CSE 256
INTERNET TECHNOLOGIES

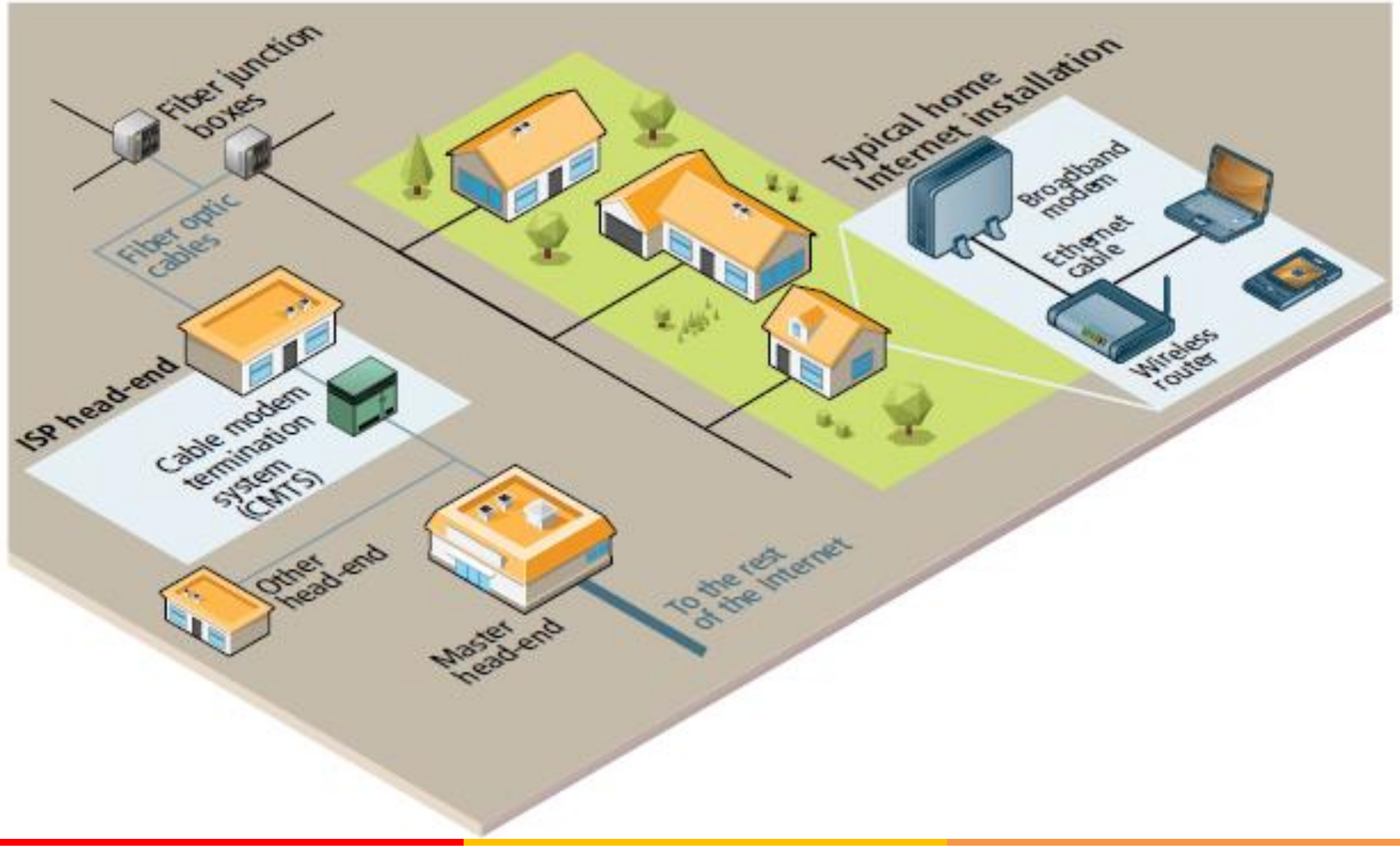
TUTORIAL SHEET-3

Where Is the Internet?

Let your imagination fly beyond the computer/mobile screen

The global network of networks is implemented via millions of miles of copper wires and fiber optic cables, as well as via hundreds of thousands or even millions of server computers and probably an equal number of routers, switches, and other networked devices, along with many thousands of air conditioning units and specially constructed server rooms and buildings.

Internet hardware from the home computer to the local Internet provider



Few known facts….. 1. modem

The **broadband modem** (also called a cable modem or DSL modem) is a **bridge** between the network hardware outside the house (typically controlled by a phone or cable company) and the network hardware inside the house.

These devices are often supplied by the ISP.

2. router

The wireless router is perhaps the most visible manifestation of the Internet in one's home, in that it is a device we typically need to purchase and install.

Routers are in fact one of the most important and ubiquitous hardware devices that make the Internet work.

At its simplest, a router is a hardware device that forwards data packets from one network to another network.

When the router receives a data packet, it examines the packet's destination address and then forwards it to another destination by deciding the best path to send the packets.

3. Fiber optic cable

Fiber optic cable (or simply optical fiber) is a glass-based wire that transmits light and has significantly greater bandwidth and speed in comparison to metal wires.

In some cities (or large buildings), you may have fiber optic cable going directly into individual buildings; in such a case the fiber junction box will reside in the building.

These fiber optic cables eventually make their way to an ISP's head-end, which is a facility that may contain a cable modem termination system (CMTS) or a digital subscriber line access multiplexer (DSLAM) in a DSL-based system.

Internet Protocols- An OS abstraction

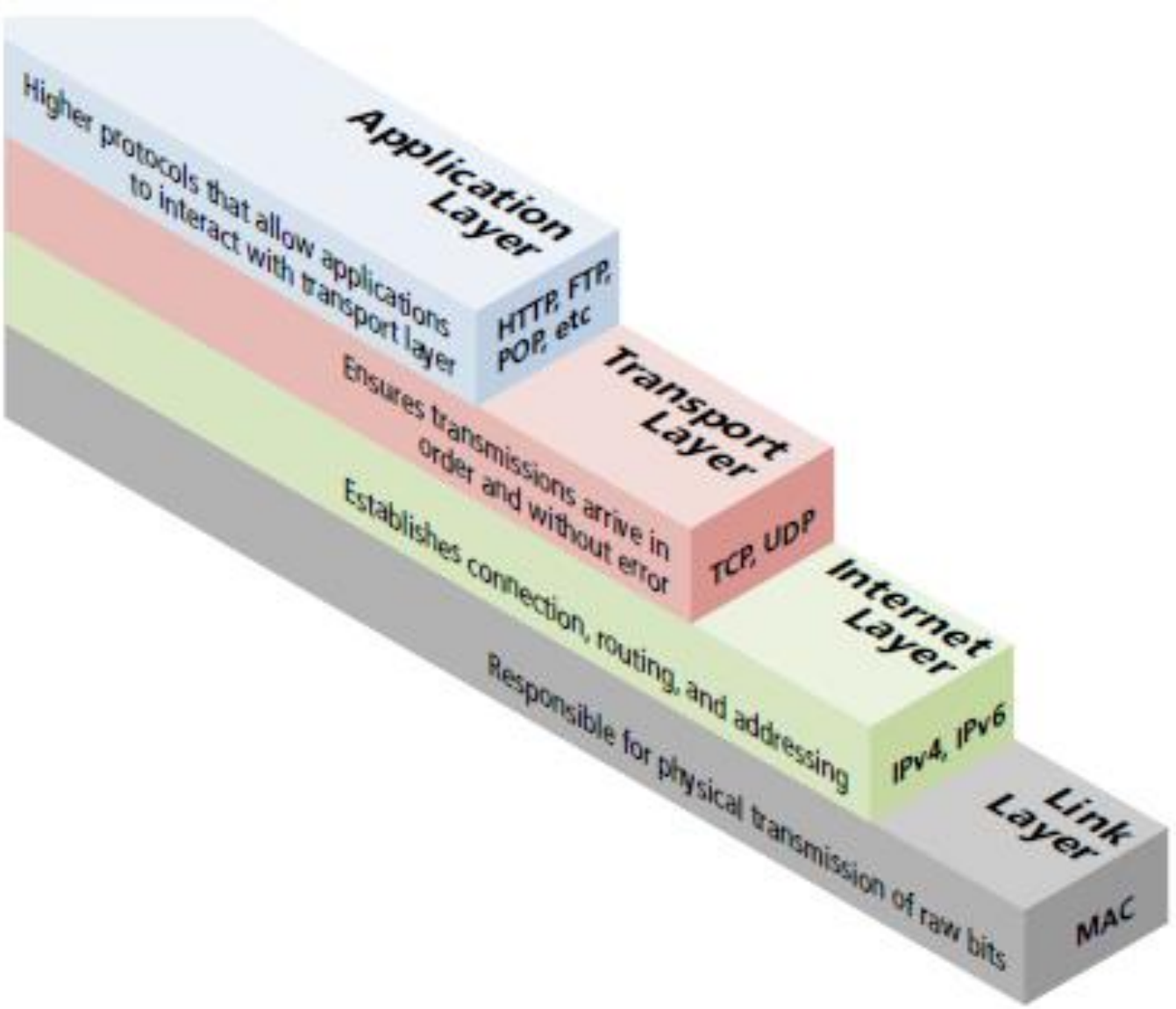
The Internet exists today because of a suite of interrelated communications protocols.

A protocol is a set of rules that partners in communication use when they communicate.

We have already mentioned one of these essential Internet protocols, namely TCP/IP.

These protocols have been implemented in every operating system

Layered architecture- A quick revision



link layer

The link layer is the lowest layer, responsible for both the physical transmission across media (wires, wireless) and establishing logical links.

It handles issues like packet creation, transmission, reception, error detection, collisions, line sharing

The MAC (media access control) addresses:- unique 48- or 64-bit identifiers assigned to network hardware and which are used at the physical networking level

The Internet layer

The Internet layer (sometimes also called the IP Layer) routes packets between communication partners across networks.

The Internet layer provides “best effort” communication.

It sends out the message to the destination, but expects no reply, and provides no guarantee the message will arrive intact, or at all.

The Internet uses the Internet Protocol (IP) addresses to identify destinations on the Internet.

Every device connected to the Internet has an IP address, which is a numeric code that is meant to uniquely identify it.

The transport layer

The transport layer ensures transmissions arrive in order and without error.

The data is broken into packets formatted according to the Transmission Control Protocol (TCP).

Each data packet has a header that includes a sequence number, so the receiver can put the original message back in order, no matter when they arrive.

Each packet is acknowledged back to the sender so in the event of a lost packet, the transmitter will realize a packet has been lost since no ACK arrived for that packet.

That packet is retransmitted, and although out of order, is reordered at the destination

Application layer

Application layer protocols implement process-to-process communication and are at a higher level of abstraction in comparison to the low-level packet and IP address protocols in the layers below it.

There are many application layer protocols. A few that are useful to web developers include:

- HTTP. The Hypertext Transfer Protocol is used for web communication.
- SSH. The Secure Shell Protocol allows remote command-line connections to servers.
- FTP. The File Transfer Protocol is used for transferring files between computers.
- POP/IMAP/SMTP. Email-related protocols for transferring and storing email.
- DNS. The Domain Name System protocol used for resolving domain names to IP addresses.