Introduction to Modern Application Development
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Module - 05
Lecture – 07
Protocols

The central message for this module, Module number 5 is going to be centered around Protocols.

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Essentially, we first outline what protocols really are, and then we will talk in some detail about what is possibly the most important protocol, which is the transmission control protocol operating over IP networks.

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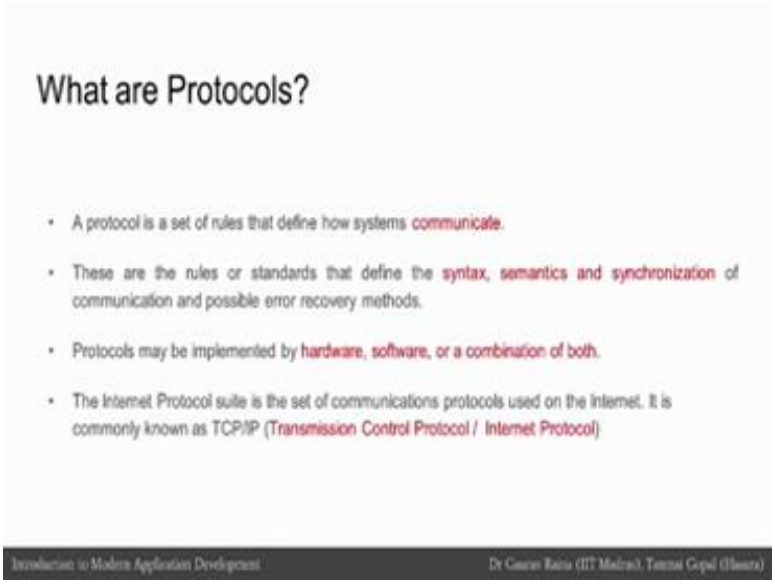

Now, a protocol is actually just simply a set of rules that define how a system is communicated. So that is the one line statement definition of what a protocol really is. These are essentially the rules or standards that define the syntax, the semantics and synchronization of communication and also possible error recovery methods.

Protocols may be implemented by hardware, or by software, or by a combination of both. The internet protocol suite is the set of communication protocols used on the internet. It is commonly known as TCPIP, TCP stands for Transmission Control Protocol and IP as mentioned earlier is just the Internet Protocol.

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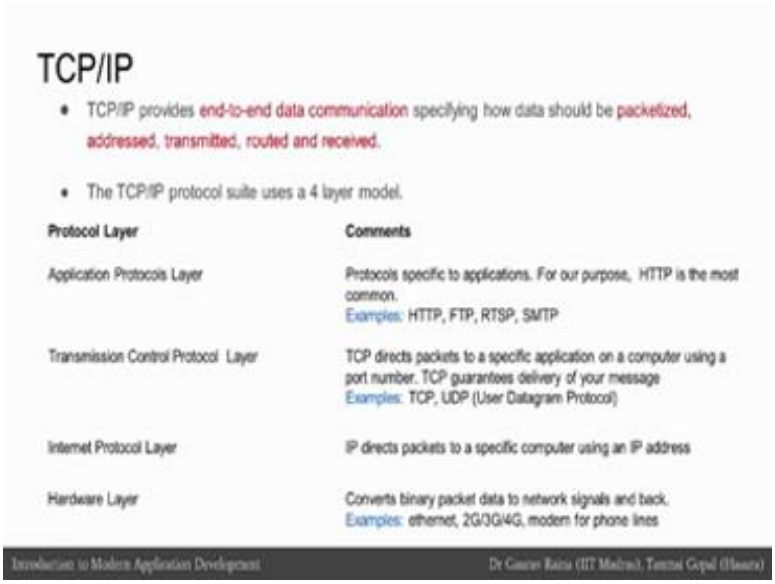

Now, TCPIP provides end-to-end data communication specifying how data should be packetized, addressed, transmitted, rooted and received. That one sentence itself should make it very clear to you that TCP is extremely important for data communication over IP networks. The TCPIP protocol suite uses a 4 layer model. At the protocol layer you got the application protocols layer, and these are protocols that are specific to certain applications. For example, for our purposes HTTP which we described earlier is the most common. Other examples are FTP, RTSP, SMTP and so on so forth.

At the TCP layer, TCP essentially direct package to a specific application on the computer using a port number. It is important to note that TCP actually guarantees that every of your message. Other examples of a transfer protocols apart from TCP is UDP, which is User Datagram Protocol. At the IP layer, IP directs packets to its specific computer using an IP address. And at the hardware layer this converts binary packet data to network signals and back. For example, you got Ethernet or 3G or 2G or 4G or modem for phone lines etcetera.

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Now, getting on to protocol layering; to ease design, protocols are structured using a layering scheme as a basis. Instead of using a single universal protocol to handle all transmission tasks, a set of cooperating protocols fitting the layering scheme are used.

Each level of the stack performs a particular function and communicates with the levels above and below it. All HTTP information is put inside a TCP packet. All TCP information is put inside an IP packet. And all IP information is converted to appropriate signals that get sent down the wire.

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Now giving the importance of TCPIP we would like to talk about it in little bit in more detail. The message essentially starts at the top of the protocol stack on your computer and works its way downward. If the message to be sent is long, each stack layer that the message passes through may break the message up into smaller chunks of data. On the internet, these chunks of data are known as Packets.

The packets go through the Application layer and continue to the TCP layer. Each packet is assigned a port number. Now ports will be explained later, but for now it would suffice to say that many programs may be using the TCPIP stack and sending messages. But we need to know which program on the destination computer needs to receive the message because it will be listening on a specific port.

After going through the TCP layer, the packets proceed to the IP layer and this is where each packet receives its destination address, for example 5.6.7.8. Now that our message packets have a port number and an IP address, they are ready to be sent over the internet. The hardware layer takes care of turning our packets into the alphabetic text of our message into electronic signals and then transmitting them.

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On the other end of the phone line your ISP, your internet service provider actually has a direct connection to the internet. The ISPs router examines the destination address in each packet and determines where to send it. Now more often than not, the packets next

stop is usually another router. And we talk about routers and internet infrastructure later on.

Eventually, the packet reach computer 5.6.7.8. Here the packets start at the bottom of the destination computers TCPIP stack and then work upwards. As the packets go upwards through the stack, all routing data that the sending computers stack added - such as IP address and port number, is striped from the packets. And when the data reaches the top of the stack the packets have been re-assembled into their original form, “Hello computer 5.6.7.8!”.

In this module we introduced you to the idea of protocols, and we play it a little bit more attention to the most important protocol out there which is the TCP protocol and we explain that in a little bit more detail.