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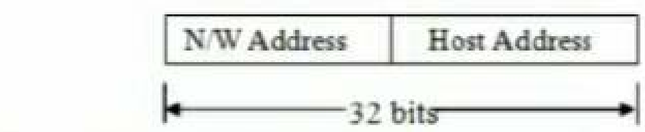
IP Address

Outline

- Internet Addressing
- DNS
- Proxy Server
- Networking classes and interfaces
- InetAddress class
  - Factory Methods
  - Instance Methods
- URL class
- URLConnection class
- Client-Server Socket Communication
- References

- An IP address is a 32-bit number that uniquely identifies a host on a TCP/IP network.
- IP addresses are normally represented in the form of "dot-decimal notation" where each byte is written in the decimal form, and they are separated by the period

  Example:192.168.123.132
- An IP address has two parts. The first part of an IP address is used as a network address, the last part as a host address.



Example 192.168.123.132

192.168.123.0	Network address.
0.0.0.132	Host address.

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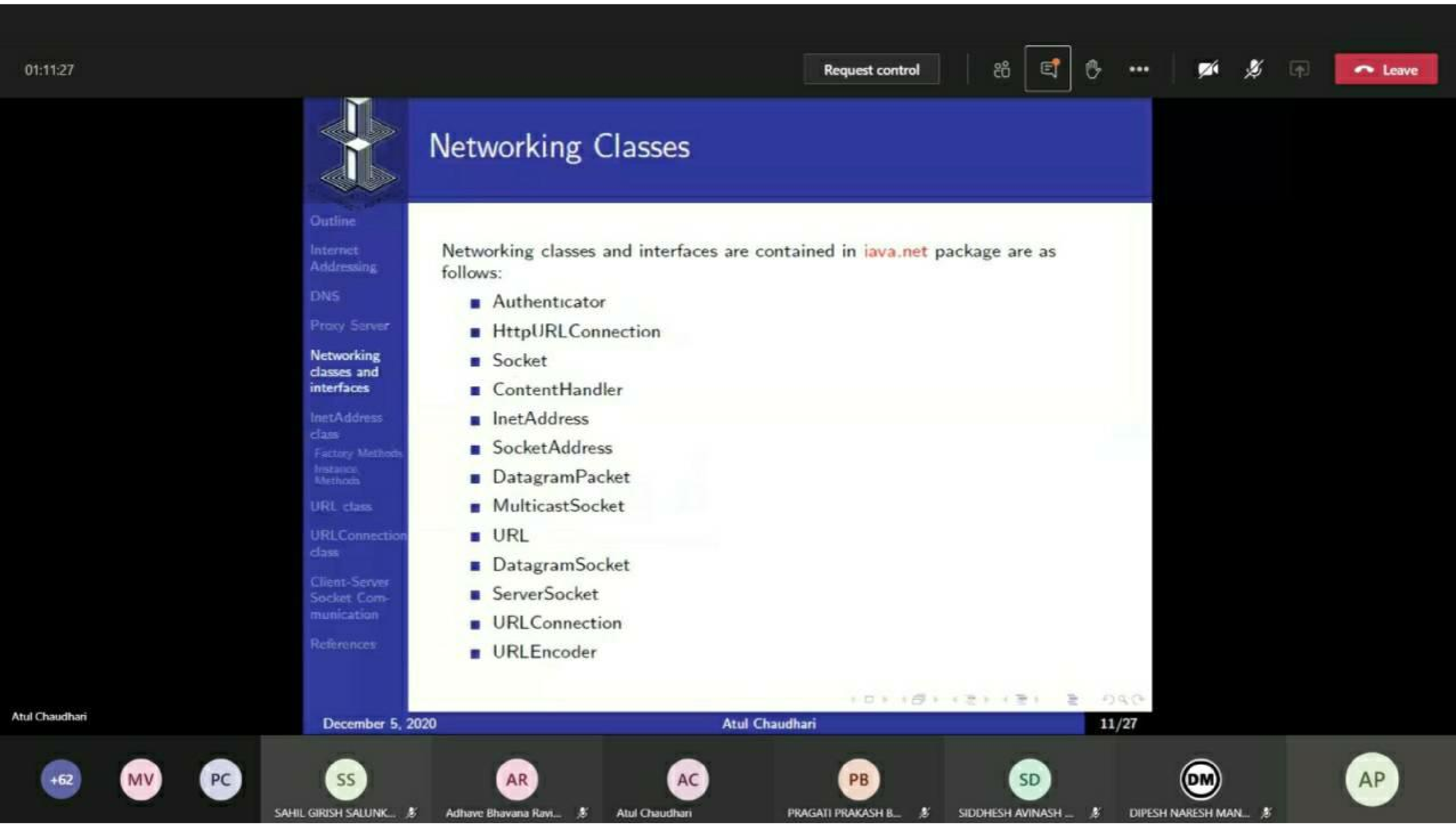

Domain Naming Service(DNS)

- Each computer on the Internet has a numerical address, called an IP address.
- For example, the numerical address of the yahoo web server is 149.142.5.42.
- Because the numbers are hard to remember, popular servers on the internet have names associated with their numbers.
- For example, the name associated with the yahoo web server is www.yahoo.com
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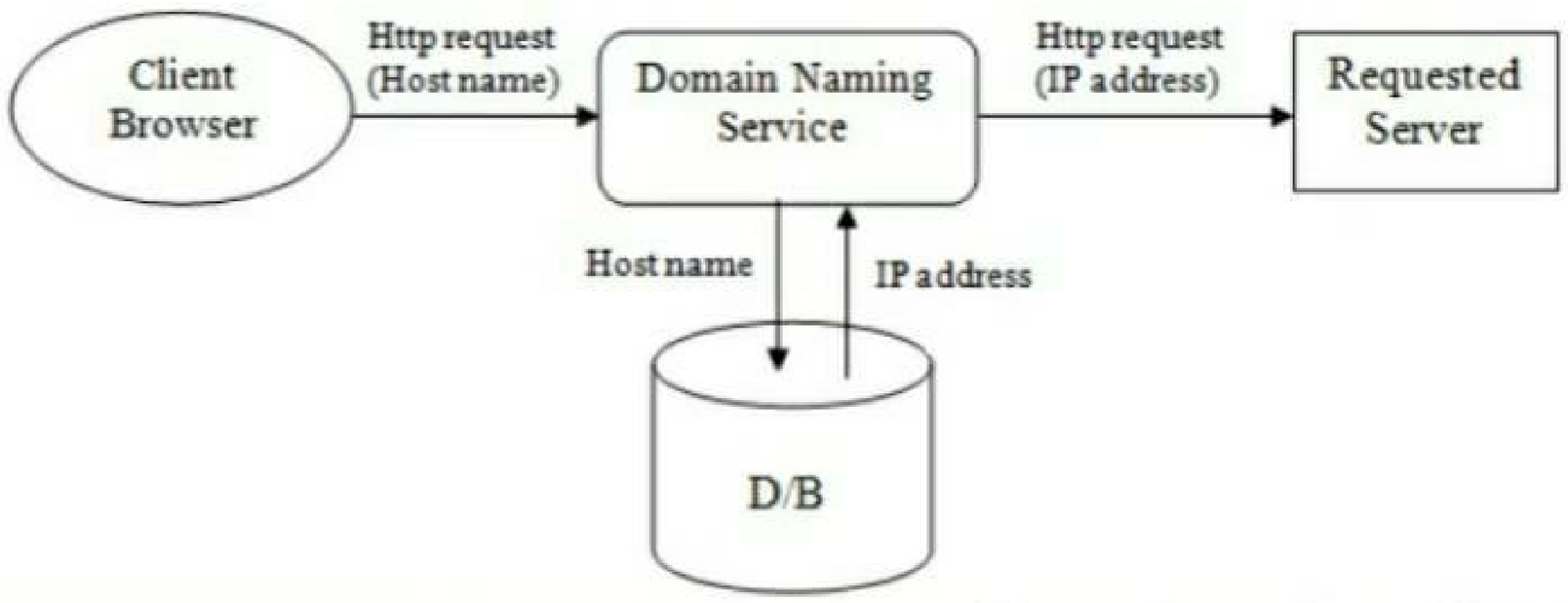
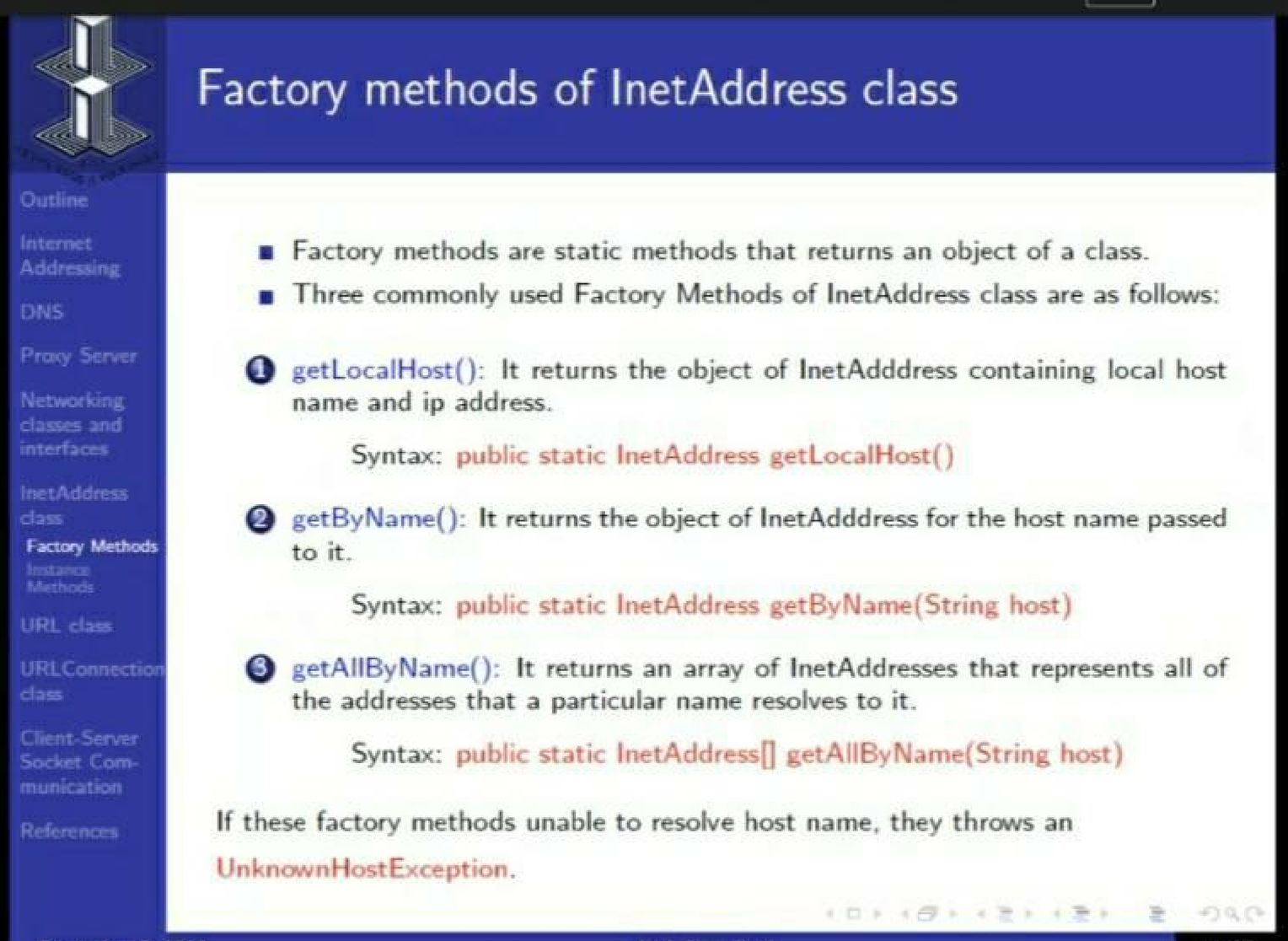
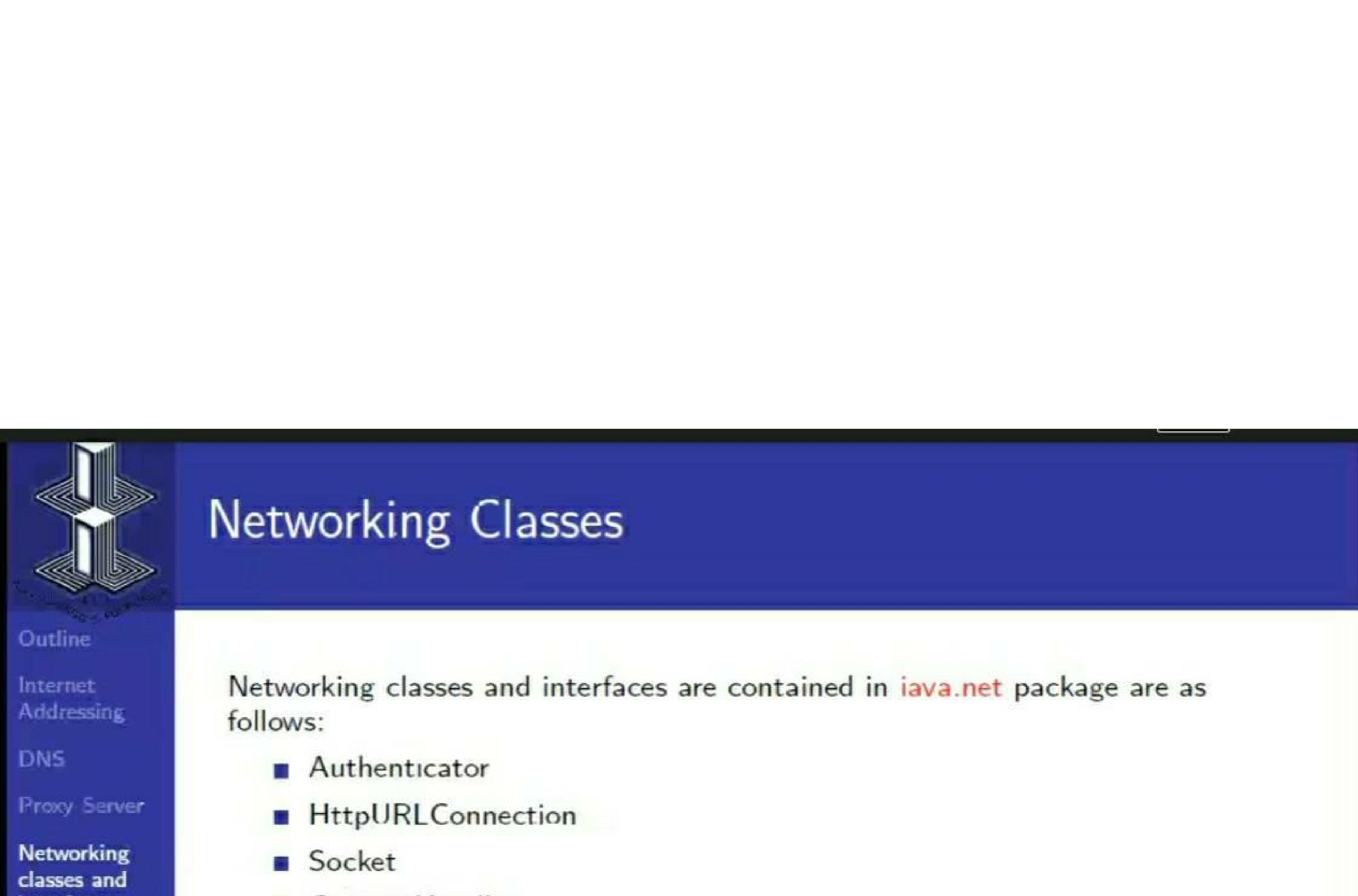
- The http request send by client-browser first comes to DNS where it resolves the host name with IP address and then forwards the request to requested server.





InetAddress class

- InetAddress class is used to encapsulate numerical IP address and host name for that IP address.
- InetAddress class has no visible constructor.
- It provides methods to get the IP of any host name
- To create InetAddress object you have to use Factory method.



Networking Classes

Networking classes and interfaces are contained in iava.net package are as follows:

- Authenticator
- HttpURLConnection
- Socket
- ContentHandler
- InetAddress
- SocketAddress
- DatagramPacket
- MulticastSocket
- URL
- DatagramSocket
- ServerSocket
- URLConnection
- URLEncoder

Methods of URL class

Following are the methods of URL class:

1. int getProtocol( ): it returns the protocol of the URL.
2. String getHost( ): it returns the host name of the URL.
3. int getPort( ): it returns the Port Number of the URL.
4. String getFile( ): it returns the file name of the URL.
5. URLConnection openConnection(): it returns the instance of URLConnection i.e. associated with this URL.

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Network Classes contd...

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- Internet Addressing
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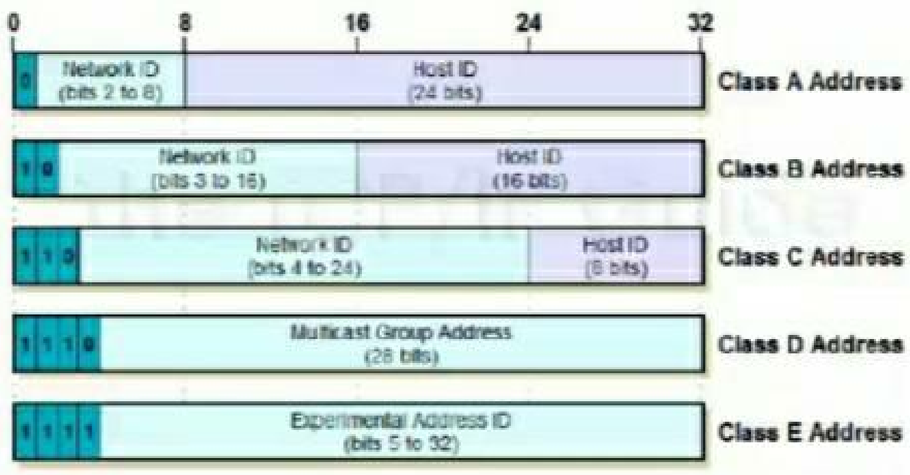

Network Class	Default Subnet Mask	Range of first octet	Example
Class A	255.0.0.0	0-127	10.52.36.11
Class B	255.255.0.0	128-191	172.16.52.63
Class C	255.255.255.0	192-223	192.168.123.132

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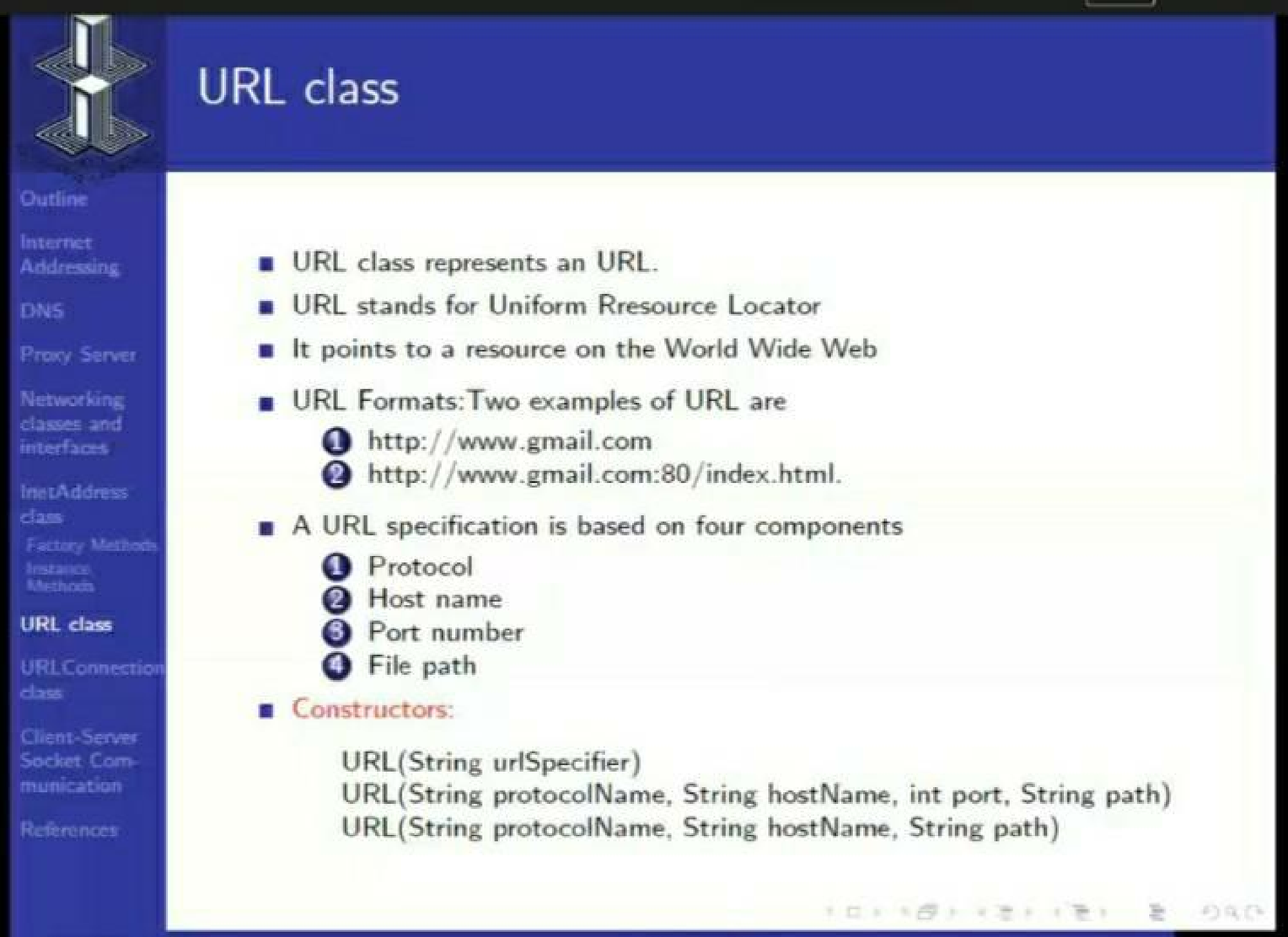

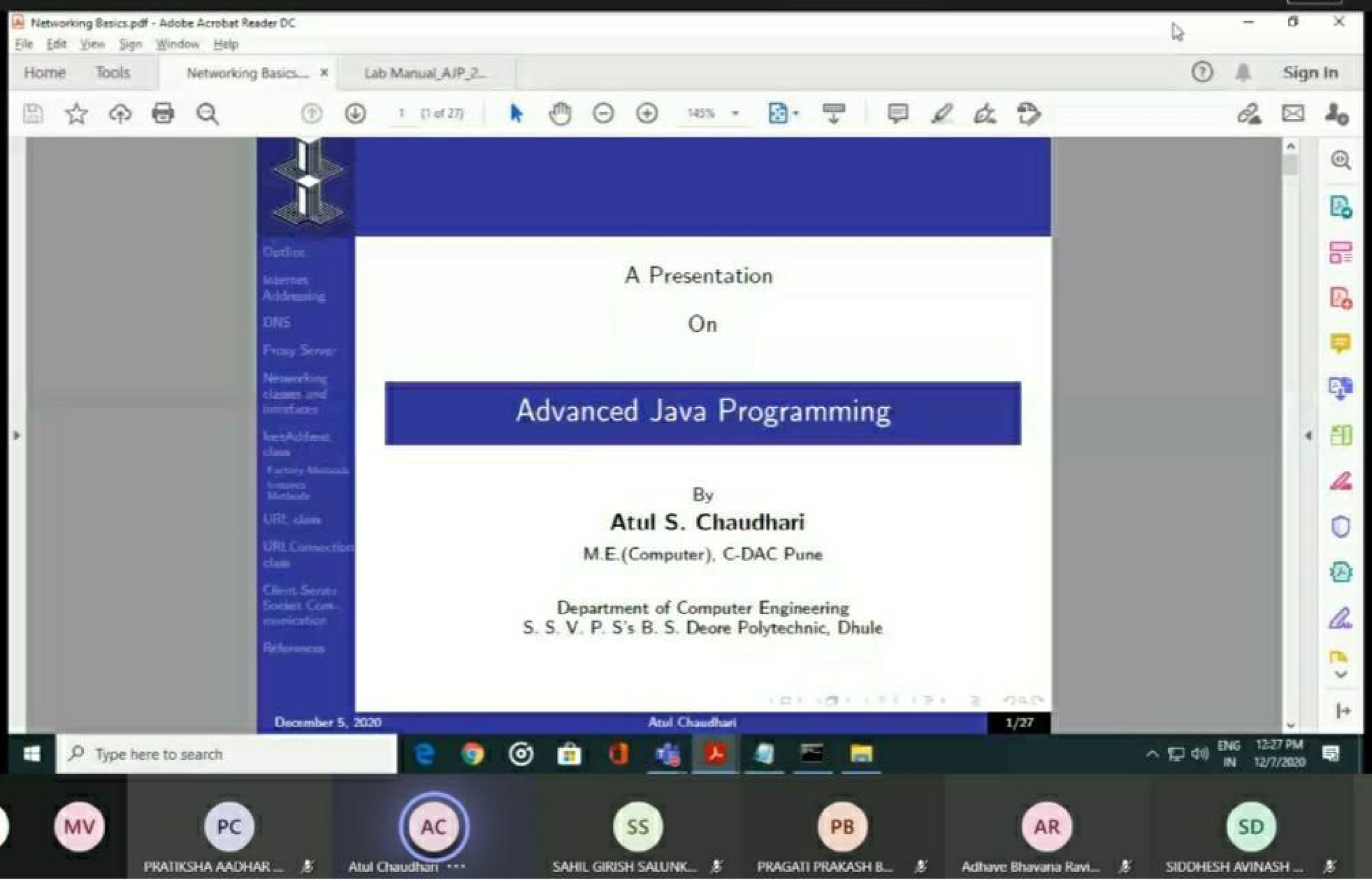

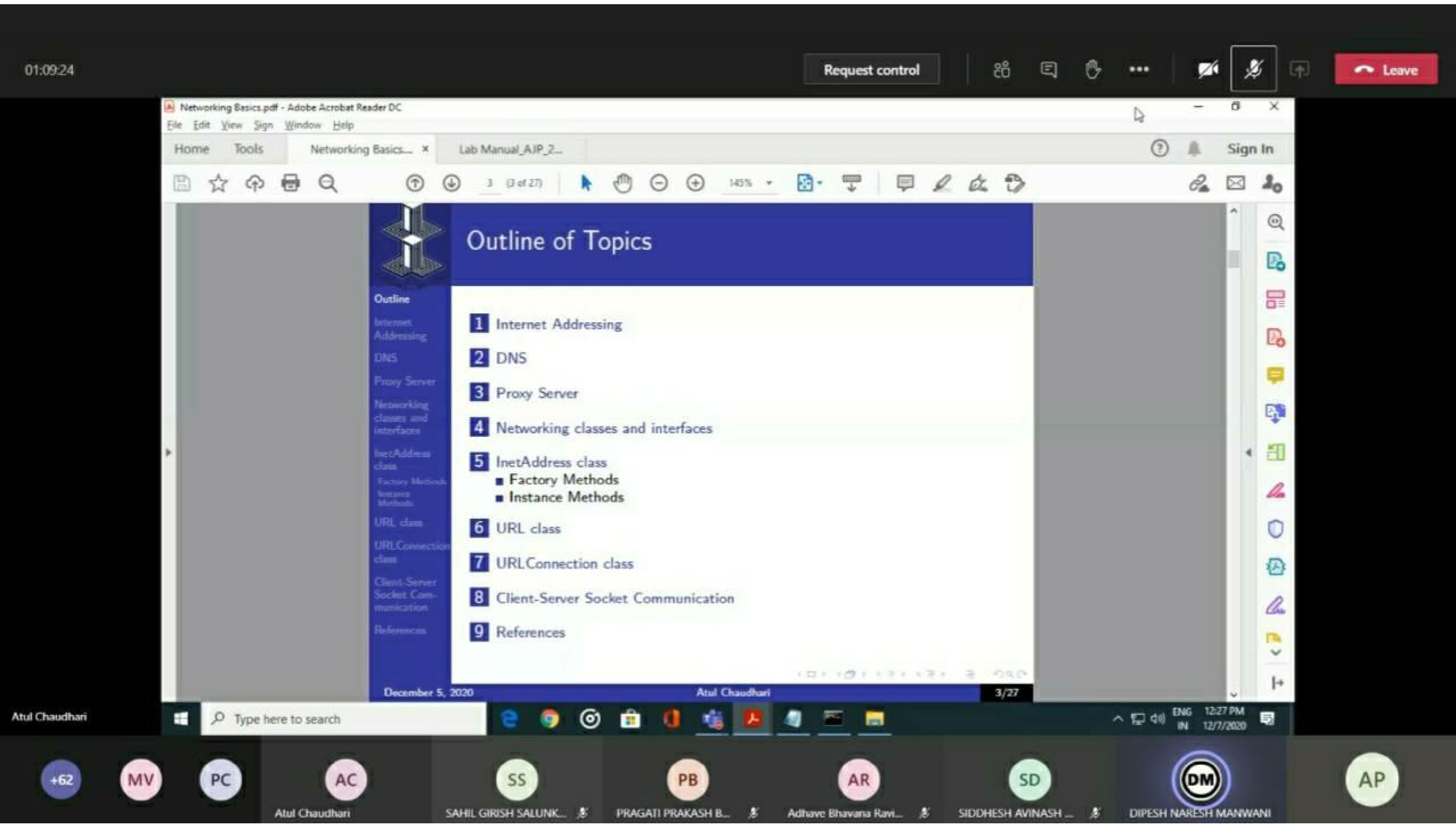

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Network Classes

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Instance Methods

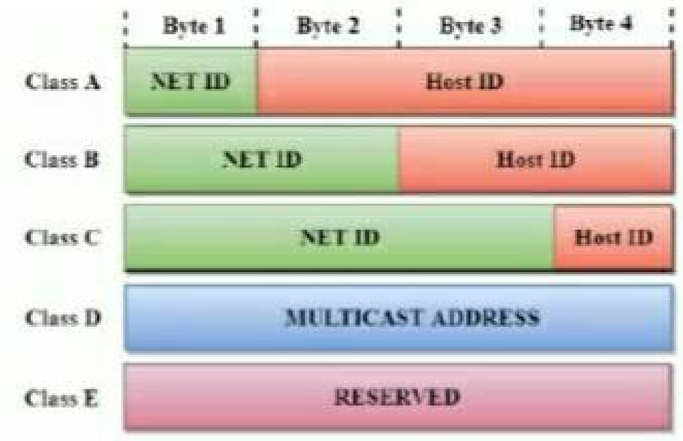
URL class

URLConnection class

Client-Server Socket Communication

References

- An IP address is 32-bit long. An IP address is divided into sub-classes: Class A, Class B, Class C, Class D, Class E
- Each of the address classes has a different default subnet mask.
- You can identify the class of an IP address by looking at its first octet.



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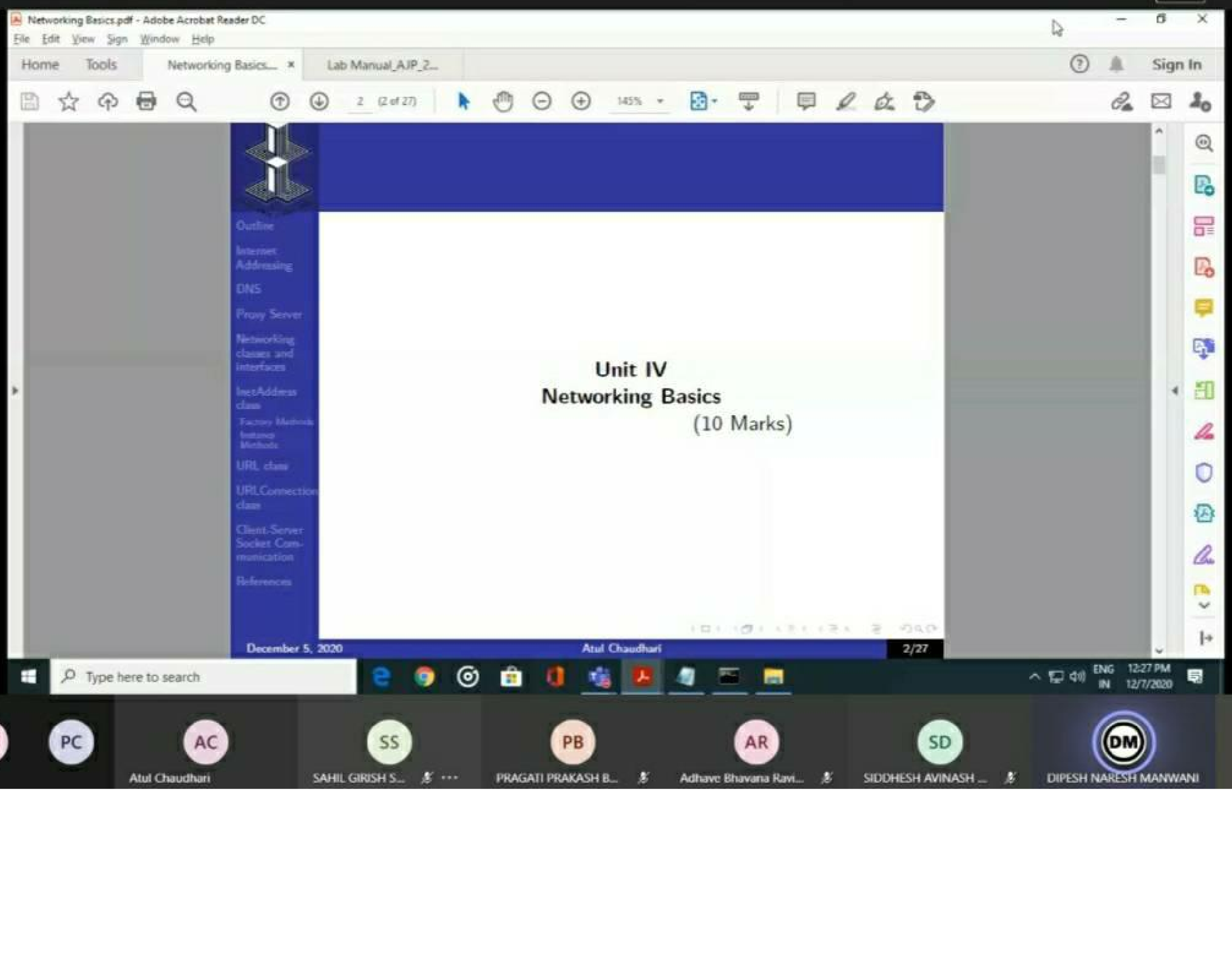
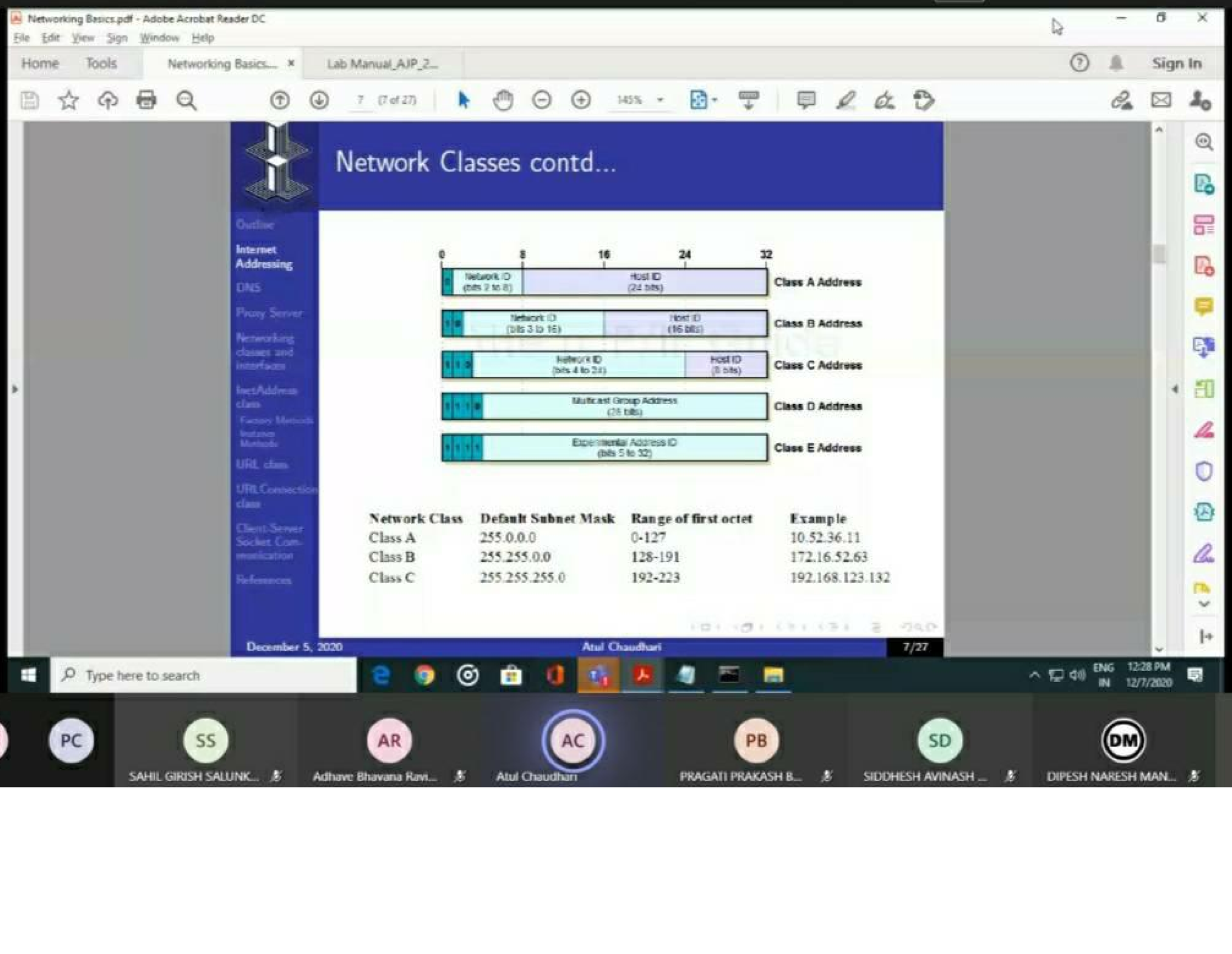


URLConnection class

- URLConnection is an abstract class that represents an active connection to a resource specified by a URL.
- This class can be used to read and write data to the specified resource referred by the URL.
- Constructors:

  URLConnection(URL url)

- A program that uses the URLConnection class directly follows this basic sequence of steps:
  1. Construct a URL object.
  2. Invoke the URL object's openConnection( ) method to retrieve a URL-Connection object for that URL.
  3. Configure the URLConnection.
  4. Read the header fields.
  5. Get an input stream and read data.
  6. Get an output stream and write data.
  7. Close the connection.



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- An IP address has two parts. The first part of an IP address is used as a network address, the last part as a host address.

N/W Address	Host Address

32 bits

Example 192.168.123.132

192.168.123.0 Network address.

0.0.0.132 Host address.

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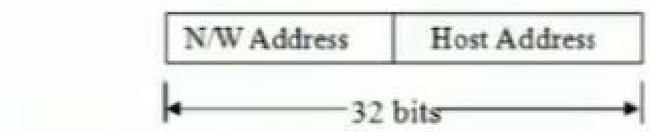

Example 192.168.123.132

192.168.123.0	Network address.
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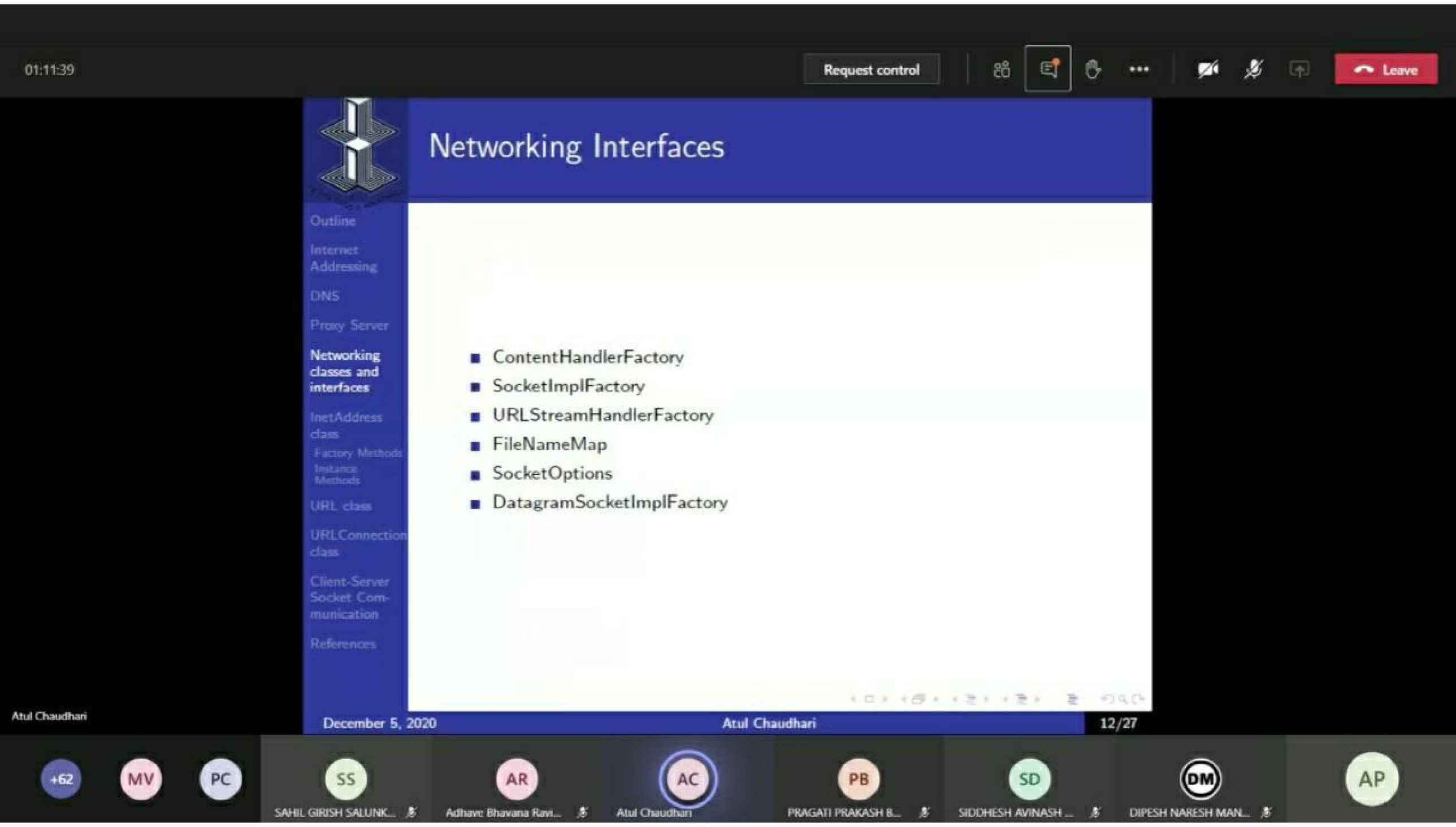
Domain Naming Service(DNS) contd...

There are several parts to an internet name:

- Top Level Domain (TLD): This is the last part of the name.
  Example: .com, .org, .edu, .gov
- Domain Name: This is the middle part of the name and often the most important. It is specific to the company or organization.
  Example: google, yahoo.
- Host Name: This is the name of the server within the company, usually named after the service provided.
  Example: www, news, mail.
- Method/Scheme: This is the method used for the communication.
  Example: http:// for web connections, ftp:// for ftp connections.



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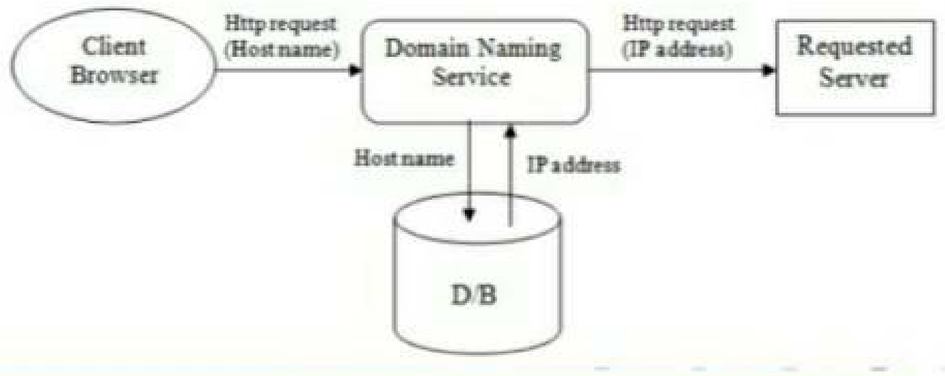

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InetAddress class

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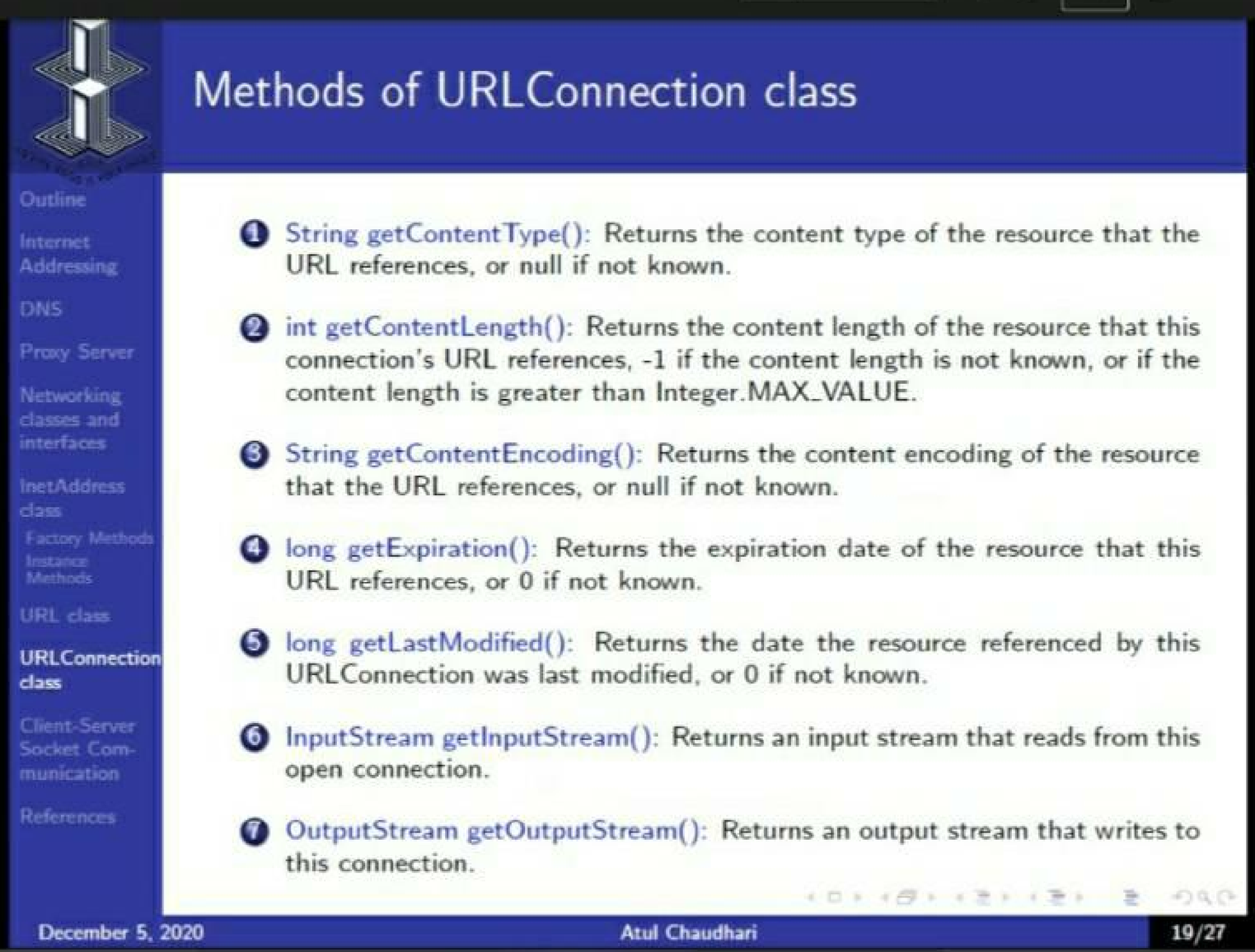

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Subnet Mask

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URLConnection class

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- The subnet mask is used by the TCP/IP protocol to determine whether a host is on the local subnet or on a remote network.
- Subnet mask is a 32-bit number which is used to differentiate between n/w address and host address
- Subnet mask is obtained by setting all bits of n/w address to 1 and setting all bits of host address to 0.

11000000.10101000.01111011.10000100 – IP address (192.168.123.132)
11111111.11111111.11111111.00000000 – Subnet mask (255.255.255.0)

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Networking Interfaces

- ContentHandlerFactory
- SocketImplFactory
- URLStreamHandlerFactory
- FileNameMap
- SocketOptions
- DatagramSocketImplFactory

Proxy Server

- Proxy server is the software installed on some network server.
- A proxy server is a kind of buffer between your computer and the Internet resources you are accessing.
- It takes requests from the client and passes it to another server for processing.
- Functions of Proxy Server
  - Improved Security
  - Privacy Benefits
  - Proxy Server Chaching

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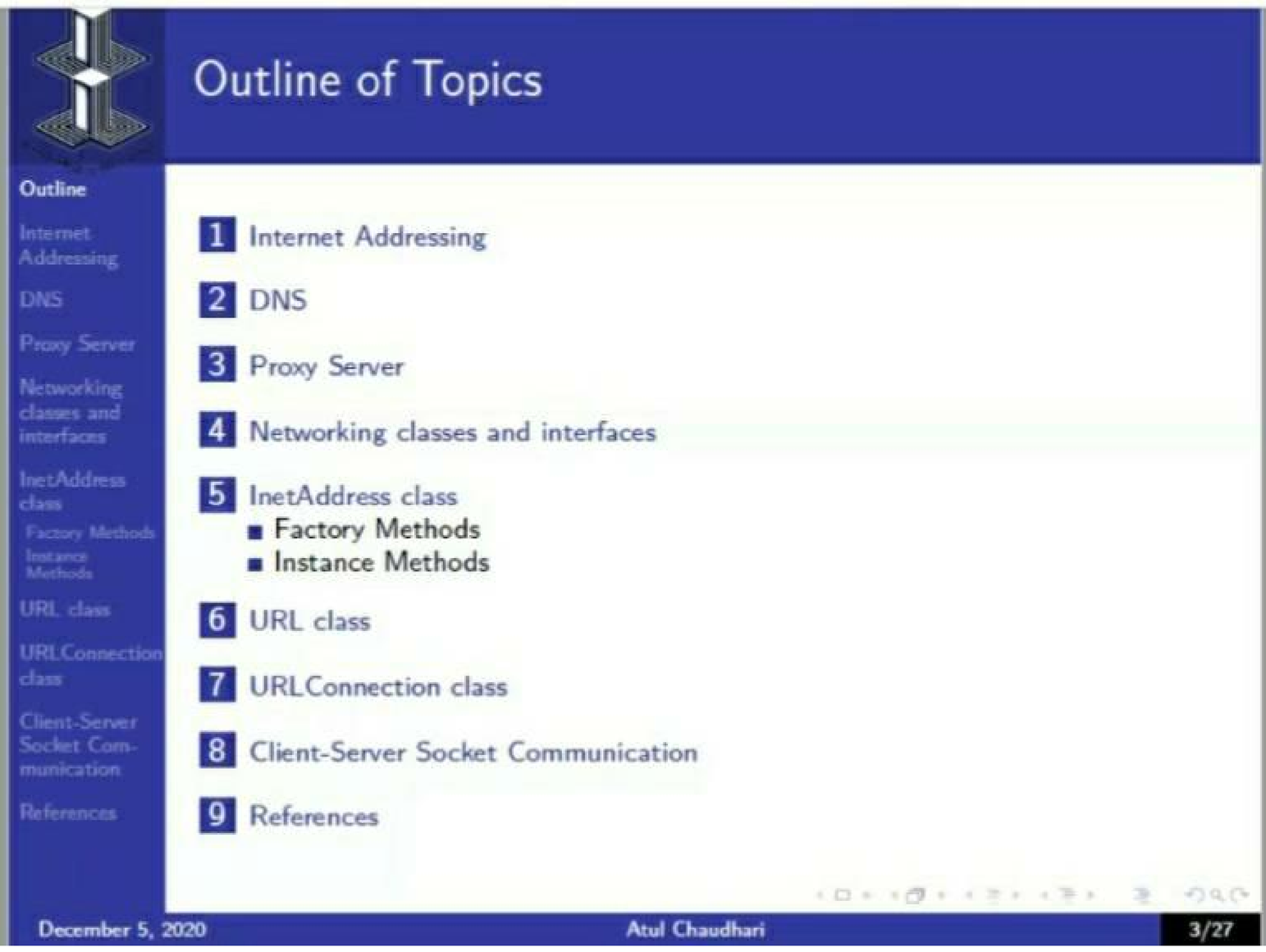

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11000000.10101000.01111011.10000100 – IP address (192.168.123.132)
11111111.11111111.11111111.00000000 – Subnet mask (255.255.255.0)

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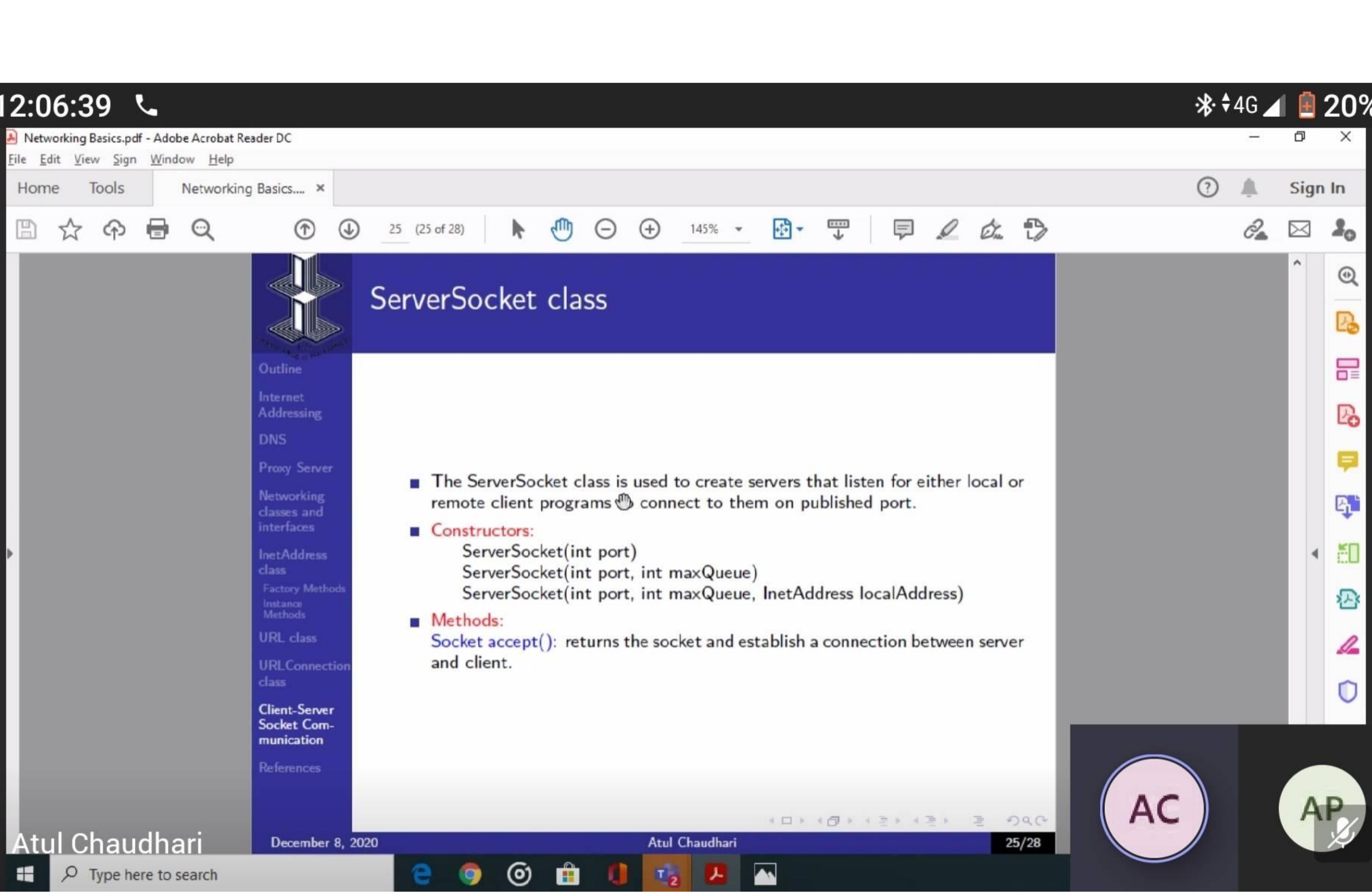
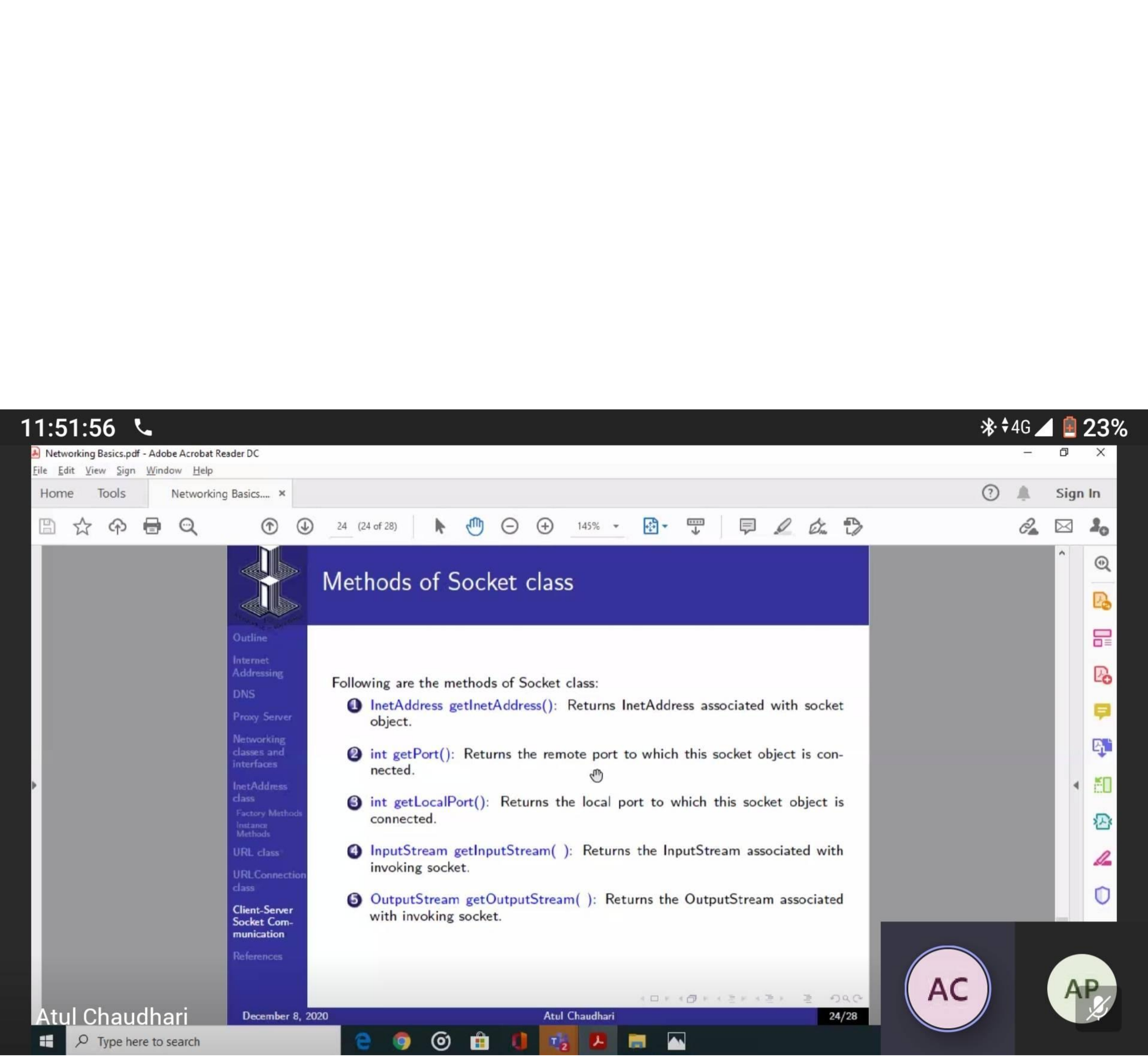
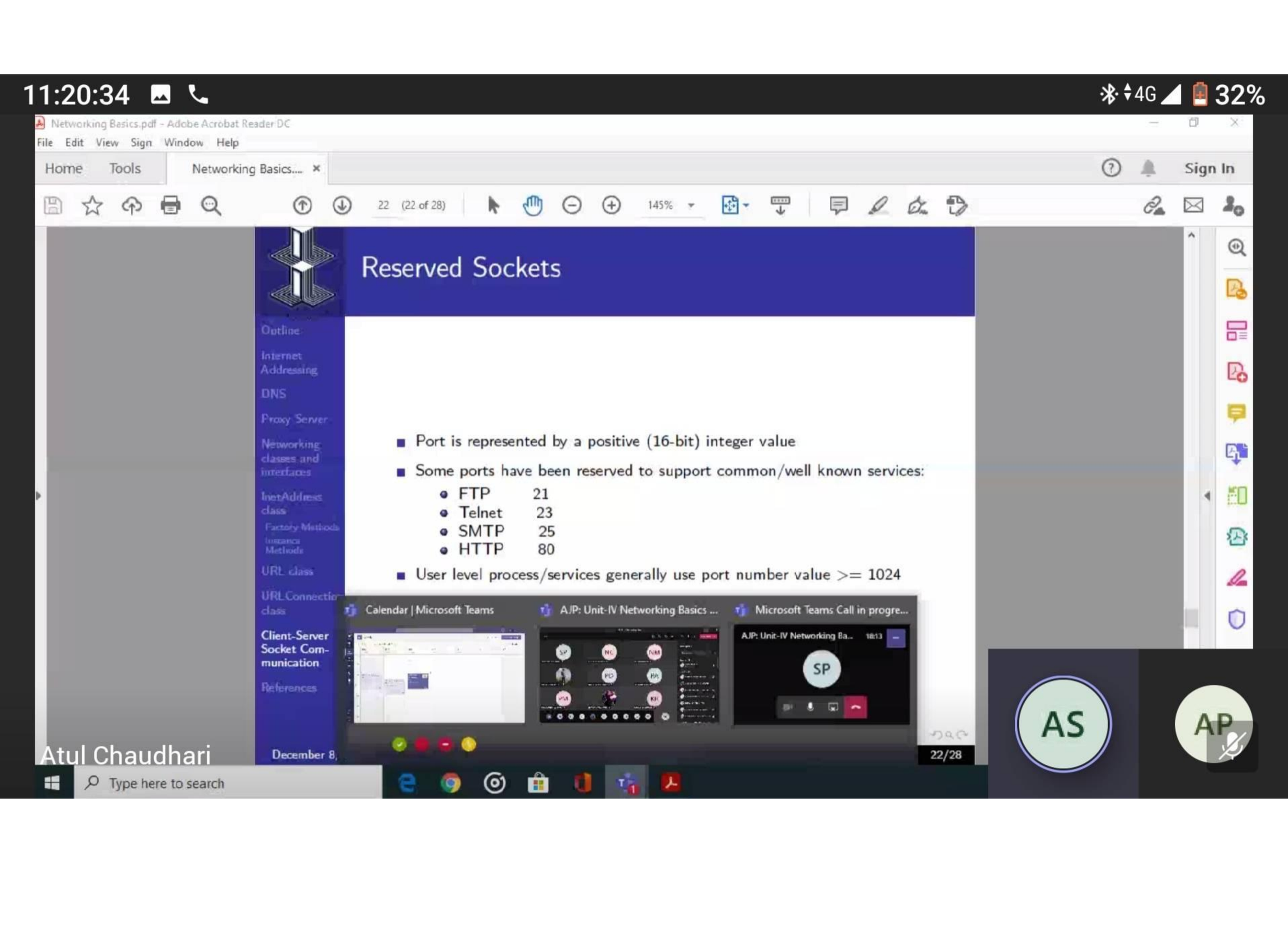
Steps for establishing Connection between Client Socket and Server Socket using TCP

- Steps for Server program:
  1. Create server socket and begin listing i.e. wait for client request.
  2. Call accept() method to get new connection from client sockets.
  3. Create input and output streams for the returned socket for the data transfer.
  4. Conduct the conversation based on agreed protocol.
  5. Close the client streams and socket when the conversation is over.
  6. Go back to step 2 to accept more or go to step 7
  7. Close the server socket.
- Steps for Client program:
  1. Create Clients socket for connection.
  2. Acquire read and write streams to the socket for data transfer.
  3. Use the streams according to the server's protocol.
  4. Close the streams when the conversation is over.
  5. Close the client socket.

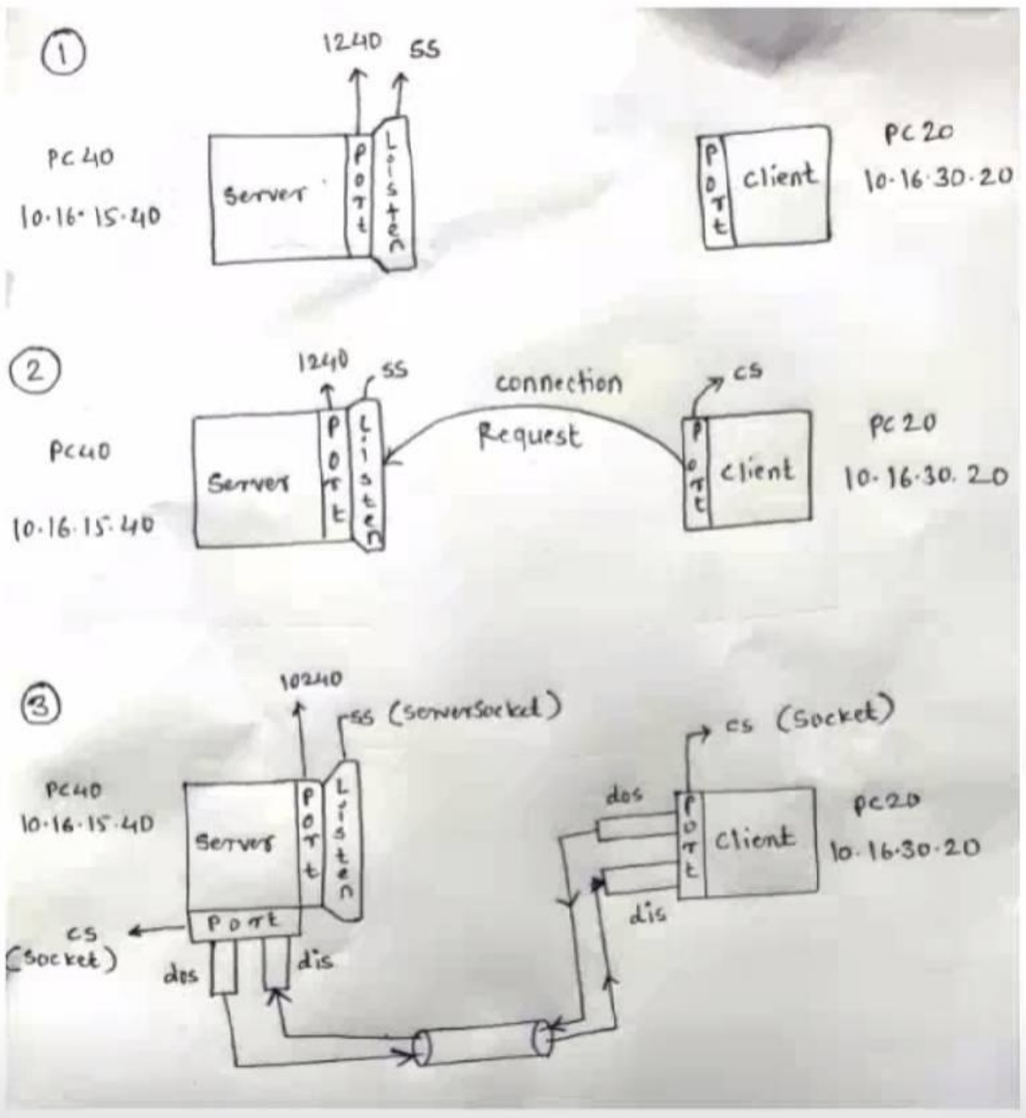






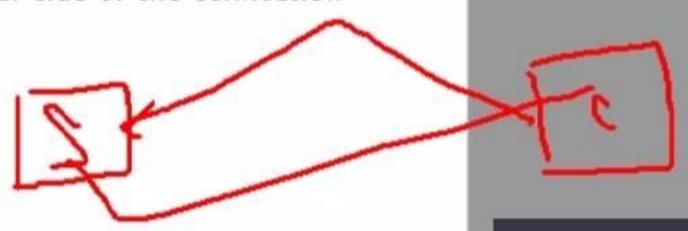
Socket class

- The Socket class is designed to connect to the server socket and initiate protocol exchange.
- The creation of Socket object implicitly establishes a connection between the clients and server.
- Both client and server use this class to read and write the message.
- Constructors:
  Socket(String hostName, int port)
  Socket(InetAddress addrs, int port)



Sockets

- A socket is one end-point of a two-way communication link between two programs running on the network.
- A socket is bound to a port number so that the TCP layer can identify the application that data is destined to be sent.
- Socket classes are used to represent the connection between a client program and a server program.
- The java.net package provides two classes:
  1. Socket class: implements the client side of the connection
  2. ServerSocket class: implements the server side of the connection
- Socket can perform seven basic operations:
  - Connect to a remote machine
  - Send data
  - Receive data
  - Close a connection
  - Bind to a port
  - Listen for incoming data
  - Accept connections from remote machines on the bound port



Methods of URL class

Following are the methods of URL class:

1. String getProtocol( ): it returns the protocol of the URL.
2. String getHost( ): it returns the host name of the URL.
3. int getPort( ): it returns the Port Number of the URL.
4. String getFile( ): it returns the file name of the URL.
5. URLConnection openConnection(): it returns the instance of URLConnection i.e. associated with this URL.

TCP vs UDP protocol

No.	TCP	UDP
1	This Connection oriented protocol	This is connection-less protocol
2	The TCP connection is byte stream	The UDP connection is a message stream
3	It does not support multicasting and broadcasting	It supports broadcasting
4	It provides error control and flow control	The error control and flow control is not provided
5	TCP supports full duplex transmission	UDP does not support full duplex transmission
6	It is reliable service of data transmission	This is an unreliable service of data transmission
7	The TCP packet is called as segment	The UDP packet is called as user datagram.