**Network Programming Theory**

The fundamental networking capabilities are declared by classes and interfaces of package java.net through which Java offers stream based communication.

The classes and interfaces of package java.net also offer packet based communication commonly used to transmit audio and video over the Internet.

**TCP**

TCP (Transmission Control Protocol) is known as connection oriented transport layer protocol. It means that a connection is established and maintained until the messages to be exchanged by the application programs at each end have been exchanged.

TCP makes sure that data gets to the destination without errors. It is also responsible for disassembling and assembling the data.

TCP divides large messages into smaller packets of at most 15KB size. Each of these packets is called segment. TCP numbers these segments and hands it over the IP layer which takes care of handling the actual delivery of data. IP labels each segment with source and destination address and forwards it.

**UDP**

It is a connectionless transport layer protocol. UDP adds no reliability, flow control or error recovery. Each datagram is independent of others and they may be lost by the networks or arrive out of order. A receiving system remains unaware of the sending of a datagram unless it arrives.

UDP is used in situations where reliability is not required and it is helpful in multimedia and multicasting applications.

**IP Address**

It is also called Internet Address. It is a number that uniquely identifies each computer on the network.

Originally all IP address consisted of 32-bit values organized as four 8-bit values(IPv4)

Now 128-bit values organized as eight 16-bit values are used(IPv6). It supports much larger address space.

**Port Number**

A port is a 16-bit number used to identify to which application program incoming messages must be delivered.

TCP/IP reserves port numbers up to 1024. Like port number 21 for FTP, 23 for Telnet, 80 for http and so on.

**Socket**

From the point of view of Java, a socket is an object that knows how to exchange data with another computer using TCP. A socket allows a single computer to serve many different clients at a time.

This is accomplished through the use of a port. A server is allowed to accept multiple clients connected to the same port number although each session is unique.

**Datagrams**

Datagrams are bundles of information passed between machines. Once the datagram has been released to its intended target, there is no assurance that it will arrive or even that someone will be there to catch it. Likewise, when the datagram is received, there is no assurance that it hasn’t been damaged in transit.

Java implements datagrams on top of the UDP by using two classes:

DatagramPacket object is the data container.

DatagramSocket is the mechanism to send or receive DatagramPacket.

**InetAddress**

InetAddress is a class used to encapsulate both numerical IP address and domain name for that address. It can handle both IPv4 and IPv6 addresses.

**URL**

URL is a class in java that provides the mechanism to deal with Internet URLs. The constructor of URL can throw a MalformedURLException.

**URLConnection**

URLConnection class represents a communication link between the URL and the application. This class can be used to read and write data to the specified resource referred by the URL.