Application Program Development

APD545

Instructor: Maryam Sepehrinour
Email: Maryam.Sepehrinour@SenecaPolytechnic.ca

Outcomes- segment#1

Understanding of Java Networking

Networking protocols

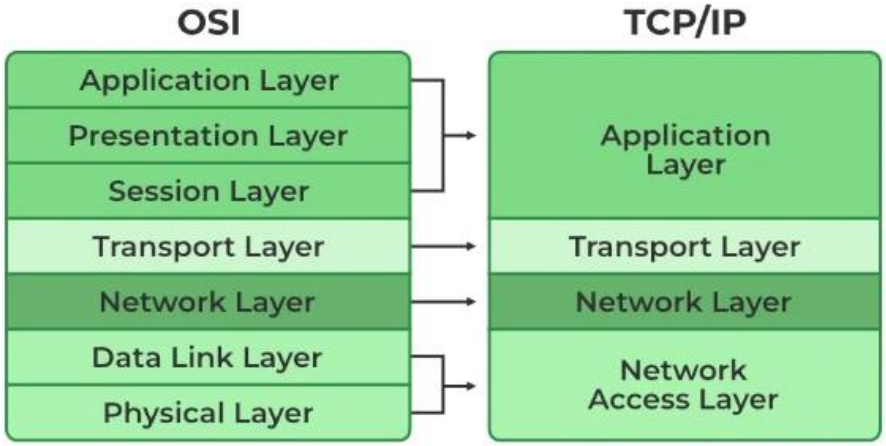
Java Sockets and their programming

Client and Server Paradigm

Multi-threaded Server

Definitions

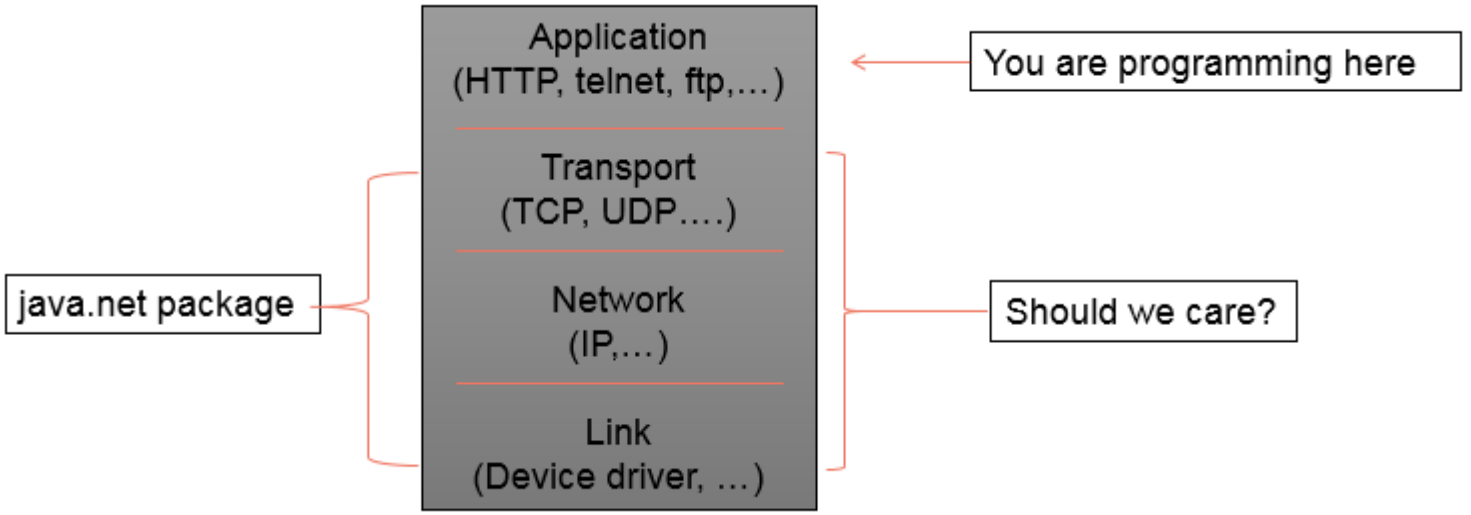
- Computer Networks (Connected Computers)
- Intranet (Private Network)
- Host (a Machine)
- Client/Server
- Transport Protocols
  - TCP (Transmission Control Protocol), connection-based protocol, provides a reliable flow of data
  - UDP (User Datagram Protocol), not connection-based like TCP.



Definitions

- IPV4
  - (Uses 32-bit address scheme, Addresses four integers, separate by dots)
- IPV6
  - (Uses 128-bit address scheme, Written in hexadecimal and separated by colons)

Definitions

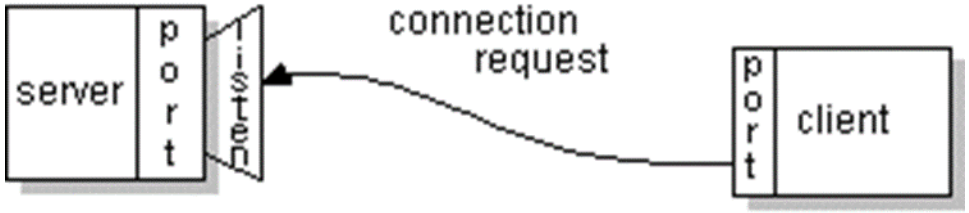


Java Networking

- java.net package contains the classes you will use to establish connection between computers and then send messages between them.
- The package contains two sets of APIs,
  - Low-level API. (socket programming).
  - High-level API. (web-oriented, URL's, URI's)
- A *socket* is one endpoint of a two-way communication link between two programs running on the network.
- Java Socket programming can be connection-oriented (TCP) or connection-less (UDP).

Java Networking

- To make connection,
  - Client exchange information with server.
  - Once client identification is done.
  - Local port is also assigned for communication during connection.



- If all goes well,
  - server accepts the connection.
  - server gets a new socket bound to the same local port.
  - its remote endpoint set to the address and port of the client

Java Networking

- Establishing a simple server in Java requires different steps:
  - ServerSocket serverSocket = new ServerSocket(portNumber, queueLength)
  - Registers an available TCP port number and specifies the maximum number of clients that can wait to connect to the server
  - Programs manage each client connection with a Socket object.
  - server listens for the connections indefinitely.
  - To listen for a client connection, the program calls ServerSocket method accept
  - Socket socket = serverSocket.accept();
  - This returns a Socket when a connection with a client established.

Java Networking

- The server sends information to the client via an OutputStream and receives information from the client via an InputStream.
- DataInputStream inputFromClient = new DataInputStream(socket.getInputStream());
- DataOutputStream outputToClient = newDataOutputStream(socket.getOutputStream());

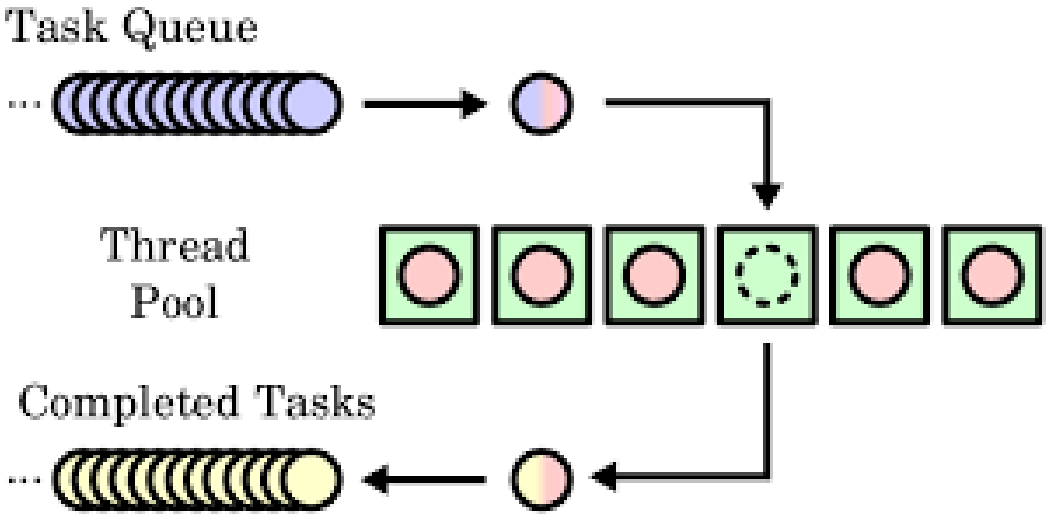
- First step is create a socket to connect to the server.
- Socket connection = new Socket(serverAddress, portNumber);
- If the connection attempt is successful it will return a Socket.

Outcomes- segment#2

Understanding about thread pool.

Definitions

- In the Java language, there are two ways to improve the execution efficiency of the program,
  - One is to use threads
  - The other is to use thread pools. (Pooling technology refers to preparing some resources in advance, and these pre-prepared resources can be reused when needed.)



Advantages of Thread pool

- Reuse threads to reduce resource consumption.
- Improve Responsiveness
- Manage the number of threads and tasks

DisAdvantages of Thread pool

- When too many threads are created, the system execution will slow down, because the number of CPU cores is certain and the number of tasks that can be processed at the same time is also certain.
- When there are too many threads, it will cause the problem of malicious thread contention and frequent thread switching, which will cause the program execution to slow down. Therefore, the appropriate number of threads is the key to the high-performance operation.
- Control the maximum number of tasks: If there are infinite tasks and insufficient memory, it will cause program execution errors.
- The thread pool can control the maximum number of tasks. When the number of tasks exceeds a certain number, a rejection strategy will be used to process the excess tasks, thus ensuring the healthy operation of the system.

Thank you!