Java

Networking

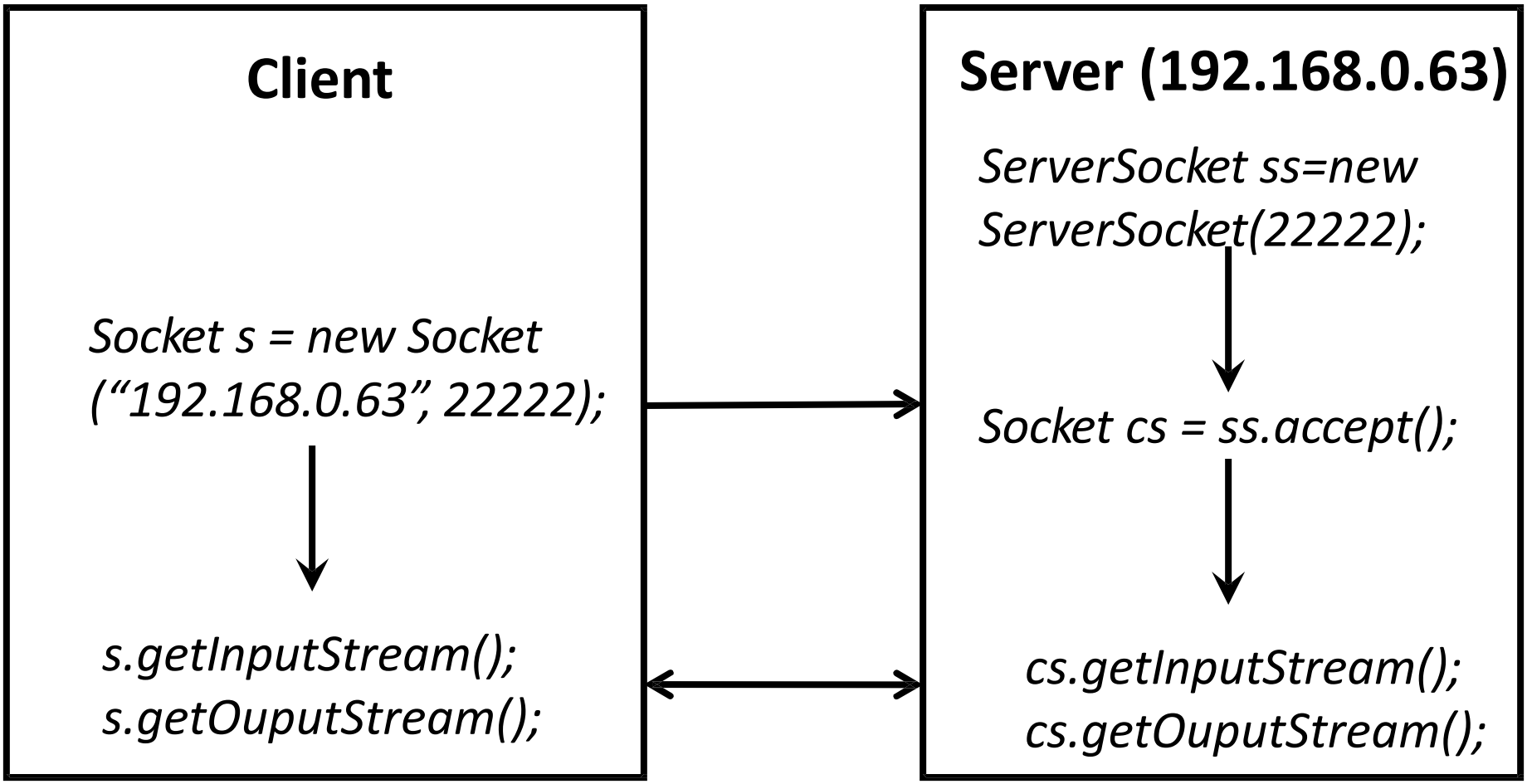
TCP

- TCP stands for Transmission Control Protocol
- TCP is connection-oriented
- It provides reliability
- What is Server and Client?
  - A server is a piece of software which advertises and then provides some service on request
  - A client is a piece of software (usually on a different machine) which makes use of some service

TCP Sockets

- Two types of TCP Sockets
- ***ServerSocket***
  - ServerSocket is used by servers so that they can accept incoming connections from client
- ***Socket***
  - Socket is used by clients who wish to establish a connection to a (remote) server

Scenario


Client
Socket s = new Socket ("192.168.0.63", 22222);
s.getInputStream();
s.getOuputStream();
Server (192.168.0.63)
ServerSocket ss=new ServerSocket(22222);
Socket cs = ss.accept();
cs.getInputStream();
cs.getOuputStream();

TCP Sockets Code

- **Packages**:
  - **tcpsimple** (no threading)
  - **tcpstring** (multithreading, string send and receive)
  - **tcpobject** (multithreading, object send and receive)
  - **tcpdiff** (multithreading, the server sends messages to multiple clients)
  - **tcpforward** (multithreading, the server forwards messages between multiple clients)

UDP *

- UDP stands for User Datagram Protocol
- UDP is not connection-oriented
- It does not provide reliability
- It sends and receives packets known as Datagram

Datagram Packet & Socket *

- One type of Packet and one type of Socket
- ***DatagramPacket***
  - Used to encapsulate Datagram
- ***DatagramSocket***
  - DatagramSocket is used by both server and client to receive DatagramPacket
- ***Example****: DatagramServer.java, DatagramClient.java*

InetAddress *

- Java has a class ***java.net.InetAddress*** which abstracts network addresses
- Major methods
  - getLocalHost()
  - getByAddress()
  - getByName()
- ***Example****: HostInfo.java, AddressGenerator.java, Resolver.java*

HttpURLConnection *

- Java provides a class ***java.net.HttpURLConnection*** that provides support for HTTP connections
- You can obtain HttpURLConnection by calling openConnection( ) on URL object
- You must cast the result to HttpURLConnection
- You can then read/write from/to the connection
- ***Example****: TestHttpURL.java*

HttpClient *

- Java 11 introduced a new networking package **java.net.http** (aka HTTP Client API)
  - It provides enhanced networking support for HTTP clients
  - Superior alternative to **HttpURLConnection**
- **Classes**: HttpClient, HttpRequest, HttpResponse
  - Create an instance of HttpClient
  - Construct an HttpRequest, send it by HttpClient's send()
  - The response is returned by send() from which the headers and response body can be obtained
- ***Example**: TestHttpClient.java*