Agenda

• What are sockets
• Client/Server interaction
• Single client/server example
• Synchronized data objects
• Multi-threaded servers
• Multi-threaded clients
• Detecting client/server shutdown
Socket

• One end-point of a two-way communication link between two programs running on the network
  – Typically one process is called the server
  – Typically one process is called the client
Server/Client Interaction
(from Jonathan Engelsma’s Java Sockets Tutorial--https://www.youtube.com/watch?v=aEDV0WlwXTs)
Single Client/Server Example

- **echo client**
  - try with resources only works for Java 1.7 or later
  - hydra machines have Java 1.6 (4/2014)
Synchronized Data Objects

- **KnockKnock Server Example**

```
WAITING
  Serve "Bye"
  No
  serve "KnockKnock"

SIGNED
  serve "KnockKnock"

SEND
  Who's There?
  Serve Clue
  Yes
  serve "KnockKnock"
  Input matches Clue + "who"
  serve answer + "Want another?"
  No
  Input does not match Clue + "who"

SENTCLUE
```

Not Who’s There

serve “Try again. KnockKnock”

Input does not match Clue + “who”
Multi-Threaded Servers

• Multi-Threaded KnockKnock Example
Multi-Threaded Client

• Chat Example
Multi-Threaded Client
(Pseudo Code)

**Main Thread**
- New Socket
- Get SocketRead and SocketWrite objects
- Create WriteConsoleThread w/ SocketRead obj
- While (more Stdin)
  - Process/Write to SocketWrite Obj

**WriteConsoleThread**
- While (more Socket Read Obj)
  - Process line
  - Write to console
Detecting client/server shutdown

• Occurs when socket read object returns null
  – Socket.close() on other end does not signal other process of termination

• Server thread: Exit while loop, wrap up processing, and terminate
## Multi-Threaded Client (Detecting Shutdown)

<table>
<thead>
<tr>
<th><strong>Main Thread</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>New Socket</td>
</tr>
<tr>
<td><code>interrupted = false</code></td>
</tr>
<tr>
<td>Get SocketRead and SocketWrite objects</td>
</tr>
<tr>
<td>Create WriteConsoleThread w/ SocketRead obj</td>
</tr>
<tr>
<td>While (more Stdin)</td>
</tr>
<tr>
<td>if (interrupted) break</td>
</tr>
<tr>
<td>Process/Write to SocketWrite Obj</td>
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</tbody>
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<tr>
<td>Notify Main thread of server shutdown by setting <code>interrupted</code> to true</td>
</tr>
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