Lecture 3: Networks

Message passing and RMI

Announcements

- Assignment 1 is out and due on Tuesday 2/7 at 11:59 pm
  - Submission details was emailed last night

- We’ll start the official group discussion format next week
  - You’ll be invited to edit a Google document to find a group

- Remember that participation and collaboration counts as 10%
  - Group dynamics and collaboration will be evaluated from the notes shared by the group recorder.
Group Exercise

Synchronization using Semaphores

Barber shop problem
Solution

Semaphores:
- sofa: 4
- chairs: 3
- worker: 3
- cashier: 1
- done: 0
- pay: 0
- receipt: 0

Customer:
- enter();
- sofa.acquire();
- sit_on_sofa();
- chairs.acquire();
- sit_in_chair();
- sofa.release();
- ready.release();
- done.acquire();
- go_to_cashier();
- pay.release();
- receipt.acquire();
- leave();

Barber:
- ready.acquire();
- worker.acquire();
- cut_hair();
- done.release();
- worker.release();
- chairs.release();

Cashier:
- pay.acquire();
- worker.acquire();
- make_transaction();
- worker.release();
- Receipt.release();

Networks
Definition

- Independent machines connected to each other in some topology.

- Machines as:
  - Computers
  - Switches
  - Routers
  - Base stations

- Types of networks:
  - Local Area Network (LAN)
  - Wide Area Network (WAN)
  - Internet
  - Wireless LAN
  - Global System for Mobile (GSM) communication

Issues to consider

- Performance
- Mobility
- Scalability
- Reliability
- Availability
- Quality of Service
Network architectures

- **Client-Server**
  - [Diagram of a client-server network architecture]

- **Peer-to-peer**
  - [Diagram of a peer-to-peer network architecture]

Hybrid

Communication over a network

[Diagram of communication over a network]

Message passing

- Sequence of bits sent over the network.

- Purpose of messages:
  - Send requests
  - Send data
  - Send code to another machine
  - Instruct the machine to perform a task

- Messages can’t just be ad-hoc,
  - A protocol has to be adopted

Network protocols

Demo time!

Get up and come to the board

Is this the only way?

- No!

- Several programming models exist to ease communication.
- Such as:
  - Remote Procedure Call (RPC)
    - Lightweight method to execute code on remote machine
  - Remote Method Invocation (RMI)
    - Object oriented version of RPC
  - Common Object Request Broker Architecture (CORBA)
    - Provides remote procedure invocation through an intermediate layer called the object request broker.
Let’s continue the demo!