Networks (Preview for P3)

Content taken from IPP 2.3.3 and the following:
"Distributed Systems: Principles and Paradigms" by Andrew S. Tanenbaum and Maarten Van Steen (Chapter 4)
Various online sources (including wikipedia.org and openclipart.org)
Overview

- **Topologies** – how a network is arranged (hardware)
- **Routing** – how traffic navigates a network (hardware and software)
- **Protocols** – how machines communicate (software, low-level)
- **IPC paradigms** – how processes communicate (software, high-level)
• IPC paradigms – how processes communicate (software, high-level)
IPC paradigms

- Inter-process communication (IPC)
  - Message-passing (explicit)
    - Symmetric (SPMD) vs. asymmetric (differentiated hosts)
    - Sockets and MPI
  - Remote procedure calls (implicit)
    - Synchronous vs. asynchronous
Remote Procedure Call (RPC)

- **Key idea:** transparency
  - It should look like the procedure call is happening locally
  - Similar in spirit to PGAS remote memory accesses
  - Implement server / client stubs to handle the call
- **Parameter marshalling**
  - Preparing parameters for transmission over a network

**Figure 4-6.** Principle of RPC between a client and server program.

**Figure 4-7.** The steps involved in doing a remote computation through RPC.
Asynchronous RPC

Figure 4-10. (a) The interaction between client and server in a traditional RPC. (b) The interaction using asynchronous RPC.

Figure 4-11. A client and server interacting through two asynchronous RPCs.
P3 - DHT

- Distributed hash table
  - n MPI ranks / processes
  - 2 threads per rank
    - Server
    - Client
  - Keys assigned to ranks via provided hash function
  - RPC wrappers for local table operations
    - Rough structure suggested
    - You design the exact protocol