Performance Modeling and Design of Computer Systems- Ch 2 Queueing Theory Terminology

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Overview

Classication of Queueing Networks
Open Networks

- open queueing network has external arrivals and departures
- Example
  - CPU uses a time-sharing scheduler to serve a queue of jobs waiting for CPU time
  - Router in a network serves a queue of packets waiting to be routed.
- Queueing theory is built on **stochastic modeling and analysis**
  - Model and analyze service demands of jobs and the interarrival times of jobs as random variables.

Open Networks: Example
Network of Queues with Probabilistic Routing

- Server i receives external arrivals (outside arrivals) with rate r_i .
- Server i also receives internal arrivals from some of the other servers.
- A packet that nishes service at server i is next routed to server j with probability p_{ij} .
- Multiple **class** of the packet, may have different probability according to routing scheme

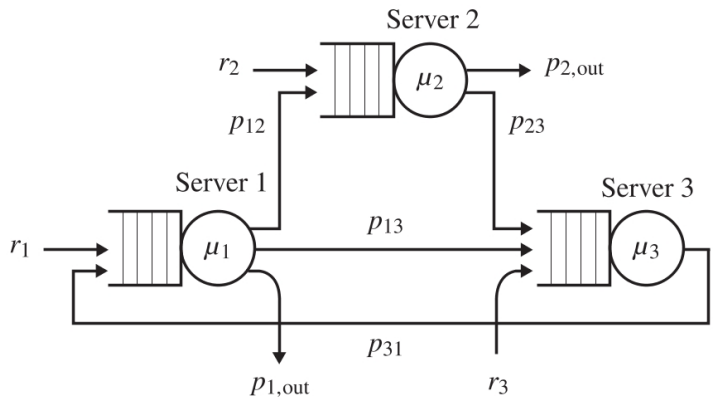

Figure 2.3. Network of queues with probabilistic routing.

Open Networks: Example
Network of Queues with Probabilistic Routing

- Real application in internet
  - Wire delay can be replaced by a server with some rate matching with dire delay
  - **Goal**: is to predict RTT
  - **Deterministic Varation**: instead of P_{ij}, specific path to next server

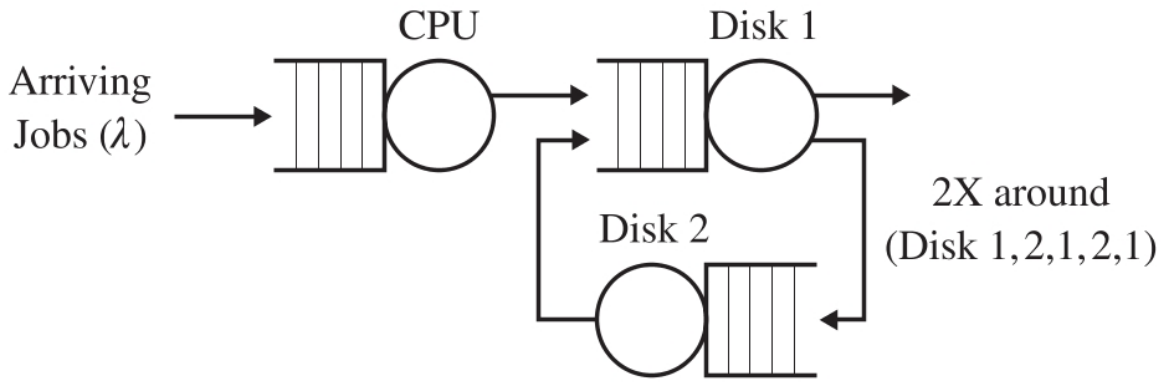

Figure 2.4. Network of queues with non-probabilistic routing.

Goal of Queueing Theory
2 Goals

- Predicting the system perfor- mance. Ex.
  - predicting mean delay or delay variability in service
  - number of jobs that will be in queue
  - mean number of servers being utilized
- Developing design of improved system
- Example
  - Can we build a better system from 1 slow discs or one faster disc
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