1 Introduction

1.1 Network Software

Network Software

- Protocol hierarchies
- Design issues for the layers
- Connection-oriented versus connectionless service
- Service primitives
- The relationship of services to protocols

Layers, Protocols, and Interfaces
Sample Information Flow

![Layer Diagram]

Example information flow supporting virtual communication in layer 5.

Service Primitives

<table>
<thead>
<tr>
<th>Primitive</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>LISTEN</td>
<td>Block waiting for an incoming connection</td>
</tr>
<tr>
<td>CONNECT</td>
<td>Establish a connection with a waiting peer</td>
</tr>
<tr>
<td>ACCEPT</td>
<td>Accept an incoming connection from a peer</td>
</tr>
<tr>
<td>RECEIVE</td>
<td>Block waiting for an incoming message</td>
</tr>
<tr>
<td>SEND</td>
<td>Send a message to the peer</td>
</tr>
<tr>
<td>DISCONNECT</td>
<td>Terminate a connection</td>
</tr>
</tbody>
</table>

Six service primitives that provide a simple connection-oriented service.
Interaction Using Acknowledged Datagrams

A simple client-server interaction using acknowledged datagrams.

Relationship between Services and Protocols

The relationship between a service and a protocol.

1.2 Example Networks

Example Networks

- The Internet
- Third-generation mobile phone networks
- Wireless LANs: 802.11
- RFID and sensor networks

Possible Telephone System Structures
Original ARPANET design

The Current Internet Architecture
Overview of the Internet architecture.

The Cellular Phone System

Cellular design of mobile phone networks.

Mobile Phone Handover
Mobile phone handover (a) before, (b) after.

Architecture of the 3G Network

Architecture of the UMTS 3G mobile phone network.

Wireless LANs
One Problem: Multipath Fading

Another Problem: Limited Range
The range of a single radio may not cover the entire system.

RFID Networks

RFID used to network everyday objects.

Sensor Networks

Multihop topology of a sensor network.