Chapter 6
Delivery and Routing of IP Packets

- Connection-Oriented vs. Connectionless Services
- Direct vs. Indirect Delivery
- Routing Methods
- Static vs. Dynamic Routing
- Routing Module and Routing Table Design

Figure 6-1
Direct delivery

Host

Direct delivery

Network

Router

To the rest of the Internet

Host

Direct delivery
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**Figure 6-2**

Indirect delivery

```
Host (source) --> Network --> Router --> Network --> Host (destination)
```

```
Router R1 R2
Host A Host B Destination Route
Destination R2, Host B
Next Hop R1, R2, Host B
```

**Figure 6-3**

Next-hop routing

```
Routing table for host A
Destination     Route
Host B           R1, R2, Host B

Routing table for R1
Destination     Route
Host B           R2, Host B

Routing table for R2
Destination     Route
Host B           Host B
```

```
Host A
Network
Routing table for host A
Destination     Next Hop
Host B           R1

Routing table for R1
Destination     Next Hop
Host B           R2

Routing table for R2
Destination     Next Hop
Host B           —
```

a. Routing tables based on route

b. Routing tables based on next hop
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**Figure 6-4**

Network-specific routing

Routing table for host S based on network-specific routing

<table>
<thead>
<tr>
<th>Destination</th>
<th>Next Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>R1</td>
</tr>
<tr>
<td>B</td>
<td>R1</td>
</tr>
<tr>
<td>C</td>
<td>R1</td>
</tr>
<tr>
<td>D</td>
<td>R1</td>
</tr>
</tbody>
</table>

Routing table for host S based on host-specific routing

<table>
<thead>
<tr>
<th>N2</th>
<th>R1</th>
</tr>
</thead>
</table>

**Figure 6-5**

Host-specific routing

Routing table for host A

<table>
<thead>
<tr>
<th>Destination</th>
<th>Next Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host B</td>
<td>R3</td>
</tr>
<tr>
<td>N2</td>
<td>R1</td>
</tr>
<tr>
<td>N3</td>
<td>R3</td>
</tr>
</tbody>
</table>

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6-5
Default routing

Figure 6-6

Routing table for host A

<table>
<thead>
<tr>
<th>Destination</th>
<th>Next Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>N2</td>
<td>R1</td>
</tr>
<tr>
<td>Default</td>
<td>R2</td>
</tr>
</tbody>
</table>

Rest of the Internet

Figure 6-7

Routing module and table

IP

From IP processing module

Routing table

Next-hop address

To fragmentation module

Routing module

Next-hop address

IP packet

IP packet

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Figure 6-8

Fields in a routing table

<table>
<thead>
<tr>
<th>Mask</th>
<th>Destination address</th>
<th>Next-hop address</th>
<th>Flags</th>
<th>Reference count</th>
<th>Use</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>255.0.0.0</td>
<td>124.0.0.0</td>
<td>145.6.7.23</td>
<td>UG</td>
<td>4</td>
<td>20</td>
<td>m2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 6-9

Configuration for routing examples

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