need to pick something to optimize:
- delay (queuing & transmission)
- # of hops
- geographic climatic
- total throughput
- combo.
The set of optimal routes from all sources to a given dest form a tree rooted at dest, called sink tree.
Shortest path Routing (Dijkstra)

Find shortest path from A to F
**Flooding**

Every incoming packet is sent out on every outgoing line except the one it arrived on.

Claim: duplicate packets create.

Flooding follows optimal path with damping?

\begin{itemize}
  \item [1)] Use hop counter when zero: disregard packet.
  \item [2)] Don't send packet more than once.
\end{itemize}
Distance Vector Routing (Dynamic)

- Each router maintains a table of best known distance to each dest. and which line to use to get there.
- Table is updated by exchanging info with neighbors
- Router is assumed to know the "distance" to each of its neighbors
Example

A estimates delay to B, C to be 8, 10 resp.

A periodically receives a list of estimated delays to each destination from its neighbors.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

time line

A sends this to neighbors C, B
in a subnet with longest path length N hops, within 
N exchanges everyone will 
know about newly revived router.
\[ A \stackrel{L}{\leftrightarrow} B \stackrel{C}{\leftrightarrow} D \stackrel{E}{\leftrightarrow} \]

\[
(1, A) \quad (1, B) \quad (3, '14, 0) \\
(2, 1) \quad (3, c) \quad (4, 0) \quad (4, 0) \\
(5, 1) \quad (5, c) \quad (6, c) \quad (6, 0) \\
(1, 0) \quad (2, c) \quad (3, '14, 0) \\

count-to-infinity problem.
Link State Routing

1. Discover neighbors
   Hello packet when connected
2. Measure delay to neighbor
3. Construct with this info
4. Send packet to all other routers
   Use flooding
5. Compute routes