ROUTING IN SWITCHED NETWORKS - 07.02.2006

Henal Agrawal[1]

Routing

- The process of sending a message from a source to a destination through intermediate nodes.
- A **route - a path from the souce to the destination**
- **Needed for any Network**
  - **during connection establishment for circuit: switching/virtual circuit**
  - **whenever a packet arrives at a switching node (router) for datagrams**
  - **we will cover mostly routing for packet switching networks**
- **Routing Algorithm/Protocol**
  - **Finds one or more routes between a source and a destination and sends packets through it**
  - **Usually stores routes in routing table for future use**
    - **table needs to be updated if existing routes change or new routes found**
  - **Algorithms differ in how routes are found, which route is selected, when and how are routed updated**

Routing Protocol Goals

- Correctness - should find a route
- Optimal - compute **best route**
- **Efficiency/Low overhead - should not send too many messages to find route**
- **Robust - can handle failures like link failure, node crashes**
- **Rapid convergence when network conditions change**

Performance Metrics

- Used for the selection of a route among multiple possible routes
- Some examples
  - Minimum number of hops
  - Least **cost**
    - **cost can be based on different things like traffic carried, types of links, available bandwidth etc.**
- Delay, Throughput.

When/Where is the Routing Decision Taken

- When?
  - Per packet or virtual circuit establishment
- Where?
  - Distributed - made by each node as it recieves the packet
  - Centralized - one node decides routes for everybody
  - Source - Decided at the source of the packet, complete path to the destination of packet put in packet (**source routing)**

Routing Strategies

- Fixed/Static
- Flooding
- Random
- Adaptive/Dynamic

Fixed/Static Routing

- Single permanent route for each source to destination pair
- Routing table created and updated manually
- Table is fixed until manually change
- No dynamic update when network condition change (for ex. a link goes down or a shorter path comes up, or some link becomes congested)
- Fine for very small networks
- Not good for larger networks that interconnect larger no. of nodes

Fixed Routing Tables

CENTRAL ROUTING DIRECTORY

To Node \ From Node	1	2	3	4	5	6
1	—	1	5	2	4	5
2	2	—	5	2	4	5
3	4	3	—	5	3	5
4	4	4	5	—	4	5
5	4	4	5	5	—	5
6	4	4	5	5	6	—

Node 1 Directory

Destination	Next Node
2	2
3	4
4	4
5	4
6	4

Node 2 Directory

Destination	Next Node
1	1
3	3
4	4
5	4
6	4

Node 3 Directory

Destination	Next Node
1	5
2	5
4	5
5	5
6	5

Node 4 Directory

Destination	Next Node
1	2
2	2
3	5
5	5
6	5

Node 5 Directory

Destination	Next Node
1	4
2	4
3	3
4	4
6	6

Node 6 Directory

Destination	Next Node
1	5
2	5
3	5
4	5
5	5

Fig. 1. Illustrative Example