

Isolated Routing (1/3)

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In **isolated routing** only the locally available information is evaluated, e.g. length of the output queue or state of a neighbor out

Important examples:

- Flooding, selective flooding or hot potato

Flooding:

- **Idea:** every arriving packet is forwarded over all other ports of the router
- Multiplication of the packets generates an extremely high network load. To curb the packets, there is also a packet hop counter (starting with the maximum network diameter it is decremented with every hop) or a time stamp, or it is ensured that a router never delivers a package twice

Isolated Routing (2/3)

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Selective Flooding:

- **Idea:** Every arriving packet is forwarded over all the ports of the router that show approximately the right direction
- For this, routers need information about the structure of the network

Flooding and selective flooding are usually not practical because of the high network load generated. Applications makes sense in:

- Military use where there is a high susceptibility to disturbance
- Distribution of updates for distributed data bases (synchronicity)

Evaluation: Flooding always finds the shortest route

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Hot Potato Routing:

- **Idea:** Router attempts to get rid of the arriving packet in the fastest way possible: via the output with currently the shortest queue
- **Problems:**
 - Packets seldom find the shortest way but often take detours
 - Increased network congestion – packets continue to be sent even when there is already a congestion of packets enroute to the receiver

RIP – Distance-Vector Routing (1/2)

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Distance-vector routing (or Bellman-Ford or Ford-Fulkerson algorithm) is a decentralized dynamic routing method

- Every router calculates its routing table locally and shares its knowledge of the network topology with neighboring routers
- Routing information is periodically exchanged so that after a certain time every router knows the best path to all the targets in the network
- Through periodic repetition, all routers can adapt to changes in the network, e.g. if a connection fails
- Every router stores (in a vector), besides the next hop entry, the distance to the target → distance vector

RIP – Distance-Vector Routing (2/2)

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- Distance calculation is based on a given routing metric, e.g. number of hops, queue length, transmission time, ...
- Distance vector (DV) is constantly updated by the exchange of routing information with neighboring routers
 - Check triangle inequality:
If distance to Z in DV(A) from neighbor A + distance to A < distance to Z in its own DV? → update own DV
- Distance-vector routing was the first routing method in the ARPANET, it was standardized as **Routing Information Protocol – RIP** in RFC 1058

OSPF – Link-State Routing

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Because of the slow convergence of the distance-vector routing method, it was replaced in 1997 by **OSPF – link-state routing**

Link-state routing is a decentralized dynamic routing method

- Routers exchange information about the status of the connection to neighbors and not complete tables
- Routing information is sent to all the routers in the network (actually: *area*) via broadcast
- This method allows a very fast adaption to changing situations in the network
- Standardized in RFC 2328 and RFC 5340 (updates for IPv6)
- OSPF (“Open Shortest Paths First”) is based on “Shortest Paths First”-algorithm a.k.a. **Dijkstra algorithm**