Flooding: Advantages

1) In military applications, where large numbers of routers are blown, flooding is desirable.

2) In Distributed database applications, it is some times necessary to update all the databases concurrently, in which flooding is useful.

3) It is used as a metric against which other routing algorithms are compared.

4) Flooding chooses the shortest path, because it chooses all possible path in parallel.

Flow-based Routing:

The flooding and shortest path algorithm takes the topology in to account. Flow based routing algorithm uses both topology and load for routing.

In some networks the mean data flow between each pair of nodes is relatively stable and predictable. The average traffic is known in advance and to a reasonable approximation, constant in time, it is possible to analyze the flows mathematically to optimize routing.

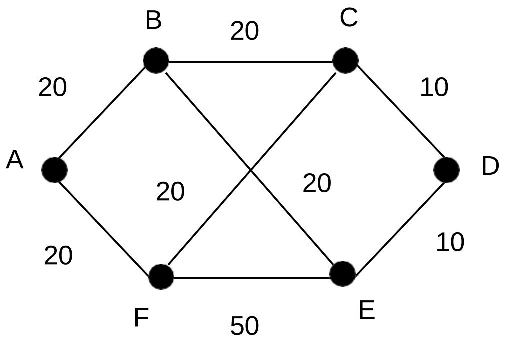
The basic idea behind this, for a given line, if the capacity and average flow are known, it is possible to compute the mean packet delay on that line. From the mean delays on all the lines, the mean packet delay for the whole subnet.

To use this technique, certain information must be known in advance. 1) About the subnet topology 2) about the traffic 3) the line capacity 4) a routing algorithm

The fig.(b) gives the information packets /sec go from source i to destination j. Given this information, it is easy to calculate the total in line for i i.e. λ_i . Using the traffic from the source to destination the mean number of packets/sec on each line. μc_i can be calculated, assuming a mean packet size $1/\mu$. The mean delay for each line can be derived where $1/\mu$ is the mean packet size in bits, λ is the mean flow in packets/sec.

With a capacity μc = 25 packets/sec and an actual flow λ = 14 packets/sec, the mean delay is 91 m sec. When λ =0, the mean delay is 40m sec. With this example we can say the delay depends on both queuing and service time.

The mean delay time for the entire subnet can be calculated as the sum of each of the eight lines, with the weight being the fraction of the total traffic using that line.



(a)

Destination

Source

	A	B	C	D	E	F
A		9 AB	4 ABC	1 ABFD	7 AE	4 AEF
B	9 AB		8 BC	3 BFD	2 BFE	4 BF
C	4 CBA	8 CB		3 CD	3 CE	2 CEF
D	1 DFBA	3 DFB	3 DC		3 DCE	4 DF
E	7 EA	2 EFB	3 EC	3 ECD		4 EF
F	4 FEA	4 FB	4 FEC	4 FD	4 FE	

(b)

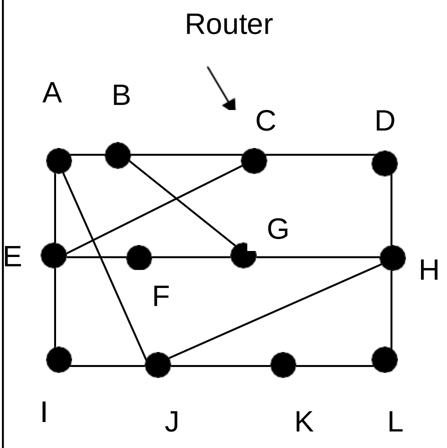
Distance Vector Routing:

This is a dynamic routing algorithm. This algorithm operates by having each router maintain a table (i.e. a vector) giving the best known distance to each destination and which line to use. These tables are updated by exchanging information with the neighbors.

The routing table indexed by and containing one entry for each router in the subnet. This entry contains two parts: The preferred outgoing line to use for the destination and an estimate of time or distance to that destination. The metric used might be number of hops, time delay in msec, total number of packets queued along the path or something similar.

The router is assumed to know the distance to each of its neighbors. If the metric is hops, the distance is just one hop. If the metric is queue length, the router examines each queue. If the metric is delay the router can measure it directly with a special ECHO packets.

Consider an example, in which the delay is used as metric and the router knows the delay to each of its neighbors. Once every T msec each router send to each neighbor a list of its estimated delays to each destination. It also receives a similar list from each neighbor. Let x_i being x's estimate of how long it takes to get router 'i'. If the router knows that the delay to x is 'm' m sec. To get router i via x is (x_i +m) m sec. By performing this calculation for each neighbor, a router can find out which estimate is the best and use that estimate and the corresponding line in its new routing table.



Subnet

New estimated delay from J

	A	I	H	K		Line
A	0	24	20	21	8	A
B	12	36	31	28	20	A
C	25	18	19	36	28	I
D	40	27	8	24	20	H
E	14	7	30	22	17	I
F	23	20	19	40	30	I
G	18	31	6	31	18	H
H	17	20	0	19	12	H
I	21	0	14	22	10	I
J	9	11	7	10	0	-
K	24	22	22	0	6	K
L	29	33	9	9	15	K

JA delay is 8 JI delay is 10 JH delay is 12 JK delay is 6

New routing table for J

Vectors received from J's four neighbors

Input from A,I,H, K and new routing table for J

Fig.(a) shows the subnet and fig.(b) shows the vectors of J for its neighbors. Fig.(c) shows the new routing table for J. Let JA delay is 8, JI delay is 10, JH is 12, JK is 6.

The new route to G from J can be calculated as follows.

J can get A in 8 m sec.

A can get G in 18 m sec(from table)

∴ J can get G in (8+18) 26 m sec.

Similarly the delay to G via I,H and K is (31 +10) 41, (6+12)18, (31+6)37 m sec.

The best of these values is 18, so it makes an entry in its routing table that the delay to G is 18 m sec and that route is via H.