1 Routing - General Questions

1. What is the difference between forwarding, switching, and routing?

2. Compare and contrast link-state and distance-vector routing algorithms.

3. How are link costs usually selected?

4. What are the drawbacks of dynamic link weights?

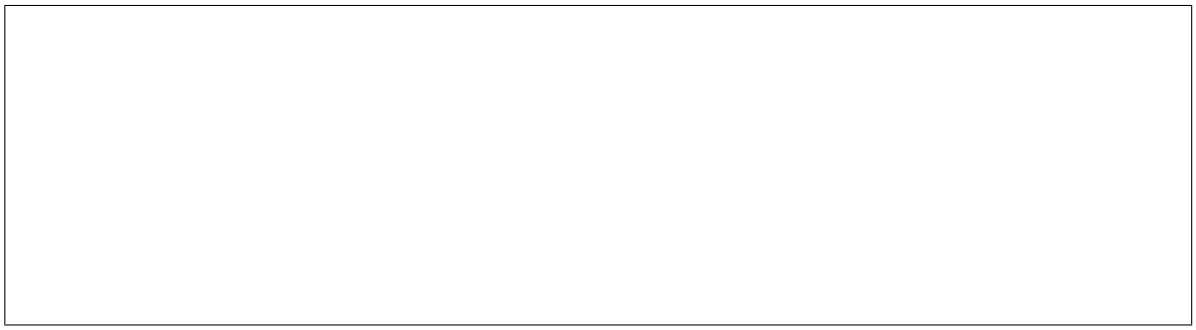
5. What approach is used to avoid that each router must hold the complete Internet routing tables?

2 Network Graph

1. Plot the topology associated with the following link and cost matrix:

$$E = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \end{pmatrix} \quad , \quad C = \begin{pmatrix} 0 & 4 & 0 & 5 \\ 0 & 0 & 3 & 2 \\ 2 & 0 & 0 & 0 \\ 0 & 4 & 3 & 0 \end{pmatrix}$$

2. How many one, two, three and four step paths are there? Show algorithmically that all nodes are reachable.



3 Link State Routing

1. Use Dijkstra's algorithm to calculate the least-cost path from SRC to DST for the topology given in Fig. 1.

2. Would a change in the weight associated with link AF to 7 be sufficient to re-route traffic over router F?

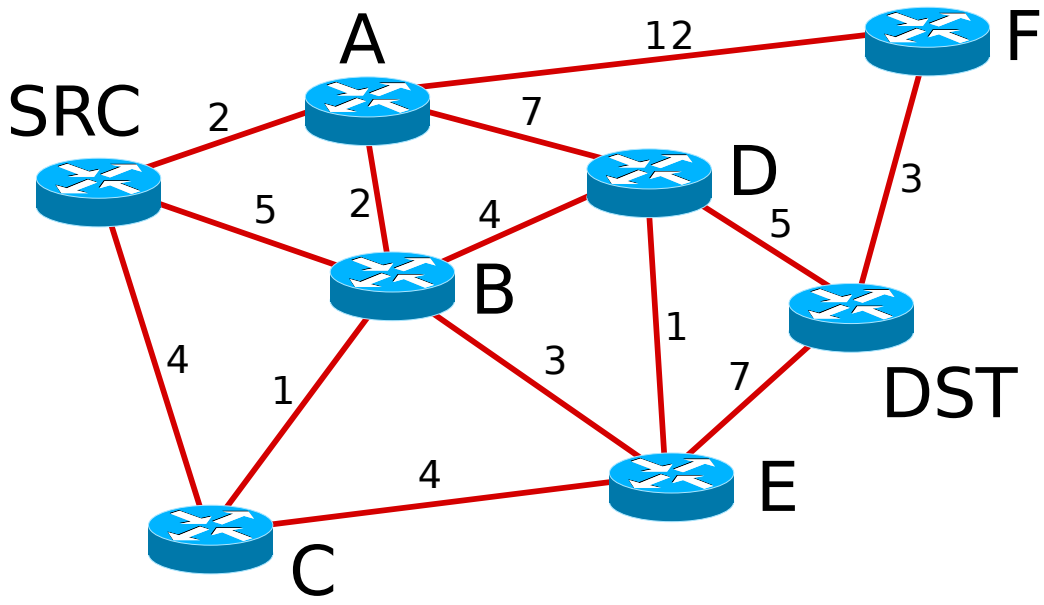


Figure 1: Topology 1

step	M	d(A) / p(A)	d(B) / p(B)	d(C) / p(C)	d(D) / p(D)	d(E) / d(E)	d(F) / p(F)	d(DST) / p(DST)

4 Distance Vector Routing

1. Use the distance vector algorithm to calculate the distance and forwarding tables for the topology given in Fig. 2.
2. What path is considered from SRC to DST after T=1 and T=2, respectively?

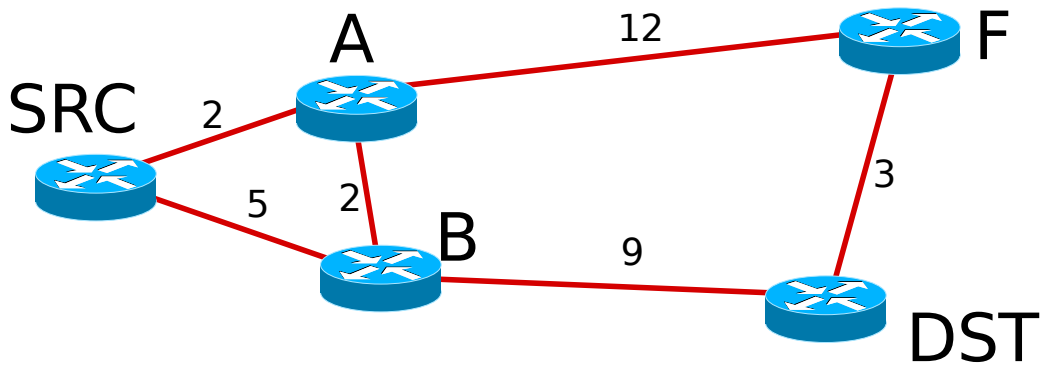


Figure 2: Topology 2

1. T=init:

D^S	A	B
A		
B		
F		
D		

D^A	S	B	F
S			
B			
F			
D			

D^B	S	A	D
S			
A			
F			
D			

D^F	A	D
S		
A		
B		
D		

D^D	B	F
S		
A		
B		
F		

F^S	
A	
B	
F	
D	

F^A	
S	
B	
F	
D	

F^B	
S	
A	
F	
D	

F^F	
S	
A	
B	
D	

F^D	
S	
A	
B	
F	

2. T=1:

D^S	A	B
A		
B		
F		
D		

D^A	S	B	F
S			
B			
F			
D			

D^B	S	A	D
S			
A			
F			
D			

D^F	A	D
S		
A		
B		
D		

D^D	B	F
S		
A		
B		
F		

F^S	
A	
B	
F	
D	

F^A	
S	
B	
F	
D	

F^B	
S	
A	
F	
D	

F^F	
S	
A	
B	
D	

F^D	
S	
A	
B	
F	

3. T=2:

D^S	A	B
A		
B		
F		
D		

D^A	S	B	F
S			
B			
F			
D			

D^B	S	A	D
S			
A			
F			
D			

D^F	A	D
S		
A		
B		
D		

D^D	B	F
S		
A		
B		
F		

F^S	
A	
B	
F	
D	

F^A	
S	
B	
F	
D	

F^B	
S	
A	
F	
D	

F^F	
S	
A	
B	
D	

F^D	
S	
A	
B	
F	

4. T=3:

D^S	A	B
A		
B		
F		
D		

D^A	S	B	F
S			
B			
F			
D			

D^B	S	A	D
S			
A			
F			
D			

D^F	A	D
S		
A		
B		
D		

D^D	B	F
S		
A		
B		
F		

F^S	
A	
B	
F	
D	

F^A	
S	
B	
F	
D	

F^B	
S	
A	
F	
D	

F^F	
S	
A	
B	
D	

F^D	
S	
A	
B	
F	

5 Routing Protocols

1. What is the difference between Intra-AS and Inter-AS routing protocols? List some common protocols for both types.

2. Why are different Intra-AS and Inter-AS protocols used in the Internet?

3. The RIP protocol is used in the network depicted in Fig. 3.

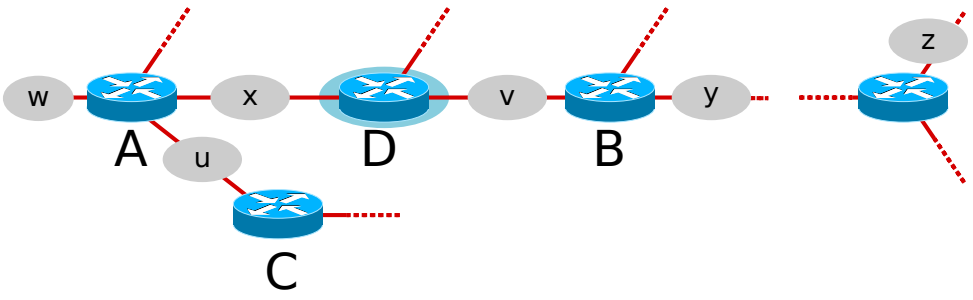


Figure 3: RIP Topology

Router D contains the following routing table entries:

Destination Subnet	Next Router	Hops to Destination
u	A	2
w	A	2
y	B	2
z	B	7
x	-	1
v	-	1

After 30 seconds, the following RIP advertisement is received from router A:

Destination Subnet	Next Router	Hops to Destination
z	C	4
u	-	1
w	-	1
x	-	1

Will router D update its routing table? If so, how?

4. List the types of areas and routers exist in an AS which uses the OSPF routing protocol.