WN Sheet 6 Sol.

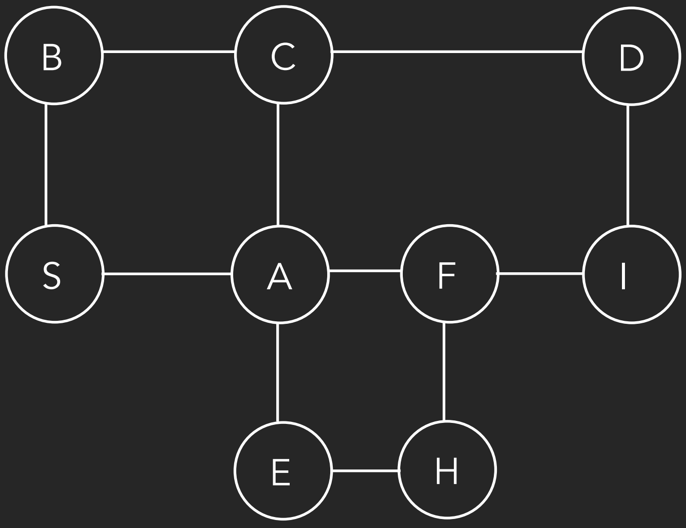
Ad-hoc Routing

1) Compare Proactive and Reactive Routing?

Solution

Proactive Routing	Reactive Routing
Based on periodic exchanges that update the routing tables to all possible destinations, even if no traffic goes through.	Is based on on-demand route discoveries that update routing tables only for the destination that has traffic going through.
Better for stable networks	Better for highly dynamic networks

2) Consider the following network. If node S wants to send a packet to node D using DSR. Node S has no prior knowledge of network topology. Assume that each node can directly communicate with any of its neighbors. Describe the route discovery process used by node S to find a route to node D.



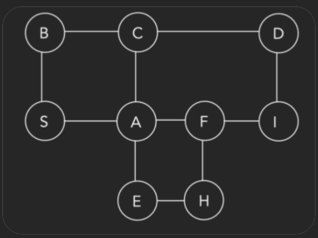
If node J gets in the range of [I,H] and wants to send a packet to A. Describe the route discovery

Solution

S broadcasts $RREQ$ with route record $[S]$

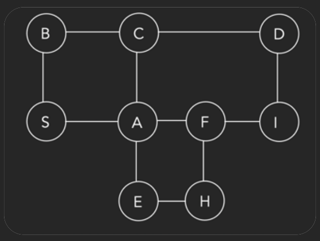
Node	RREQ Sent	Receivers
S	$[S]$	B, C

Blue highlights nodes that will broadcast next (neighbors that received new RREQs)



Now B, A broadcasts $RREQ$ to their neighbors and its ignored by those who receivied/sent it already as marked in grey.

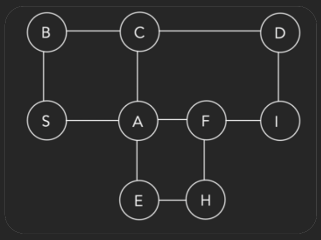
Node	RREQ Sent	Neighbors
S	$[S]$	B, A
B	$[S, B]$	S, C
A	$[S, A]$	S, C, F, E



We will assume that C came first from A; in general, we will use alphabetical order in such cases.

Now C, F, E broadcasts $RREQ$ to their neighbors and it's ignored by…

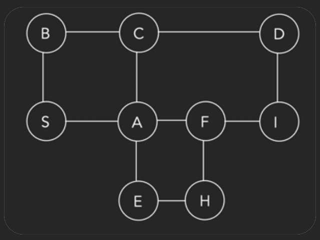
Node	RREQ Sent	Neighbors
S	$[S]$	B, A
B	$[S, B]$	S, C
A	$[S, A]$	S, C, F, E
C	$[S, A, C]$	B, A, D
F	$[S, A, F]$	A, H, I
E	$[S, A, E]$	A, H



By alphabetical order, E sends $RREQ$ to H first.

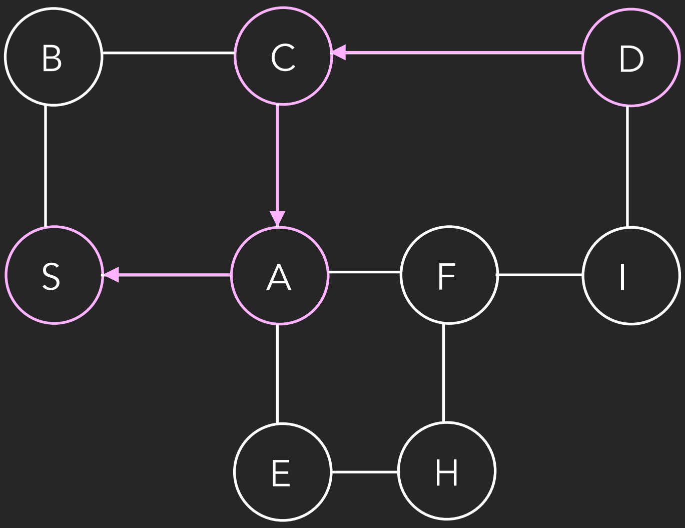
Now H, I broadcast $RREQ$ to their neighbors and it's ignored by… and meanwhile, D replies to C with $RREP$ (let's finish flooding as it will continue anyway then show that).

Node	RREQ Sent	Neighbors
S	$[S]$	B, A
B	$[S, B]$	S, C
A	$[S, A]$	S, C, F, E
C	$[S, A, C]$	B, A, D
F	$[S, A, F]$	A, H, I
E	$[S, A, E]$	A, H
H	$[S, A, E, H]$	E, F
I	$[S, A, F, I]$	D, F



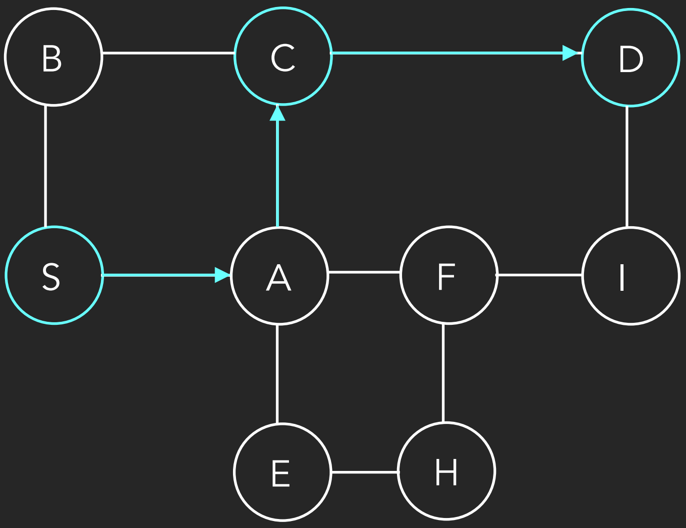
Surely, D ignores the $RREQ$.

Route Reply from D to C includes $[S, A, C, D]$ in the body and its reversed form in the header.



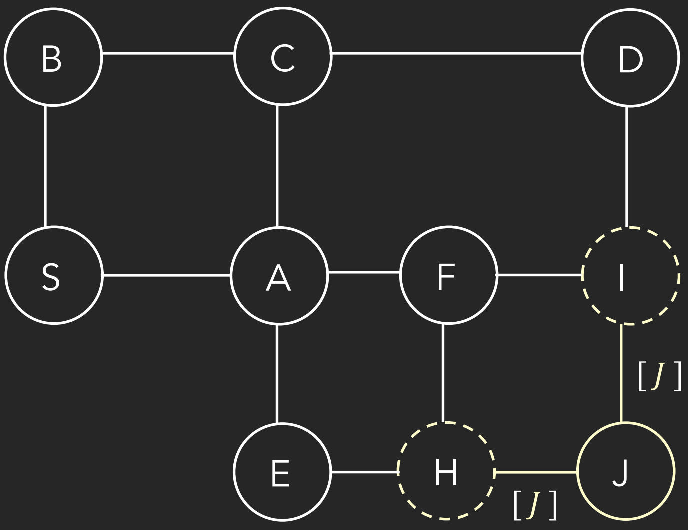
Forwarded from C to A then from A to S which caches the route.

Data Delivery from S to D can now take place.



Notice that the table was also used in the tutorial along with the graphical approach (like written lecture). Author was exhausted to show graphical here and there is one-to-one correspondence with table steps.

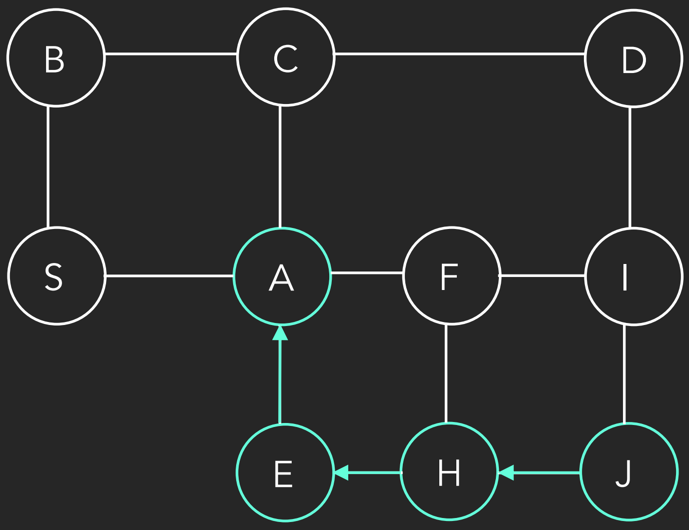
If node J gets in the range of [I,H] and wants to send a packet to A. Describe the route discovery



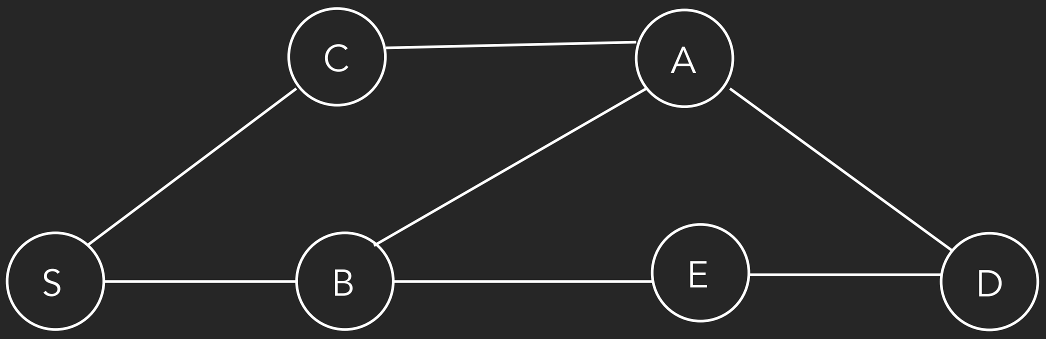
Recall,

Node	RREQ Sent	Neighbors
S	$[S]$	B, A
…		
H	$[S, A, E, H]$	E, F
I	$[S, A, F, I]$	D, F

Hence, both of H and I must have cached a route to A; namely, $[H, E, A]$ and $[I, F, A]$ respectively. Hence, both won't broadcast $RREQ$ and will $RREP$ with $[J, H, E, A]$ and $[J, I, F, A]$ respectively. Assuming it comes from H first then J caches the route and data delivery goes as follows

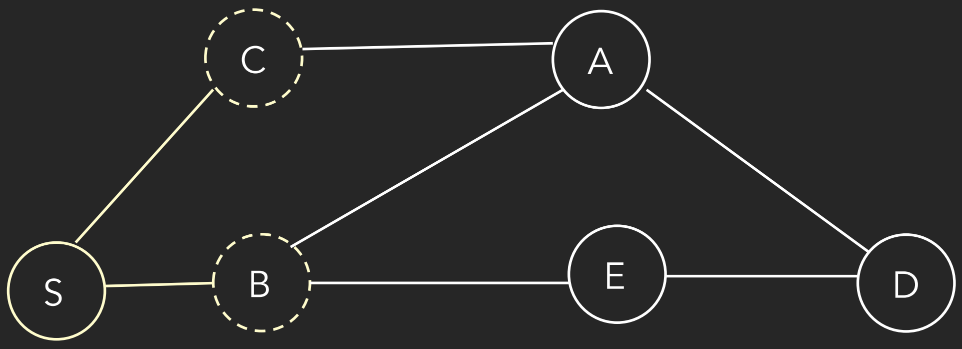


3) Describe the route discovery process used by node S to node D using AODV.



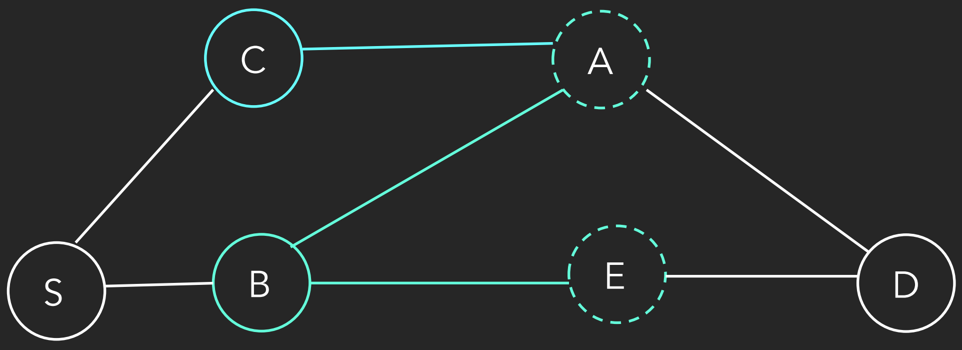
S broadcasts $RREQ$ to B and C

Node	Next Hop(S)	Next Hop(D)
B	S	
C	S	



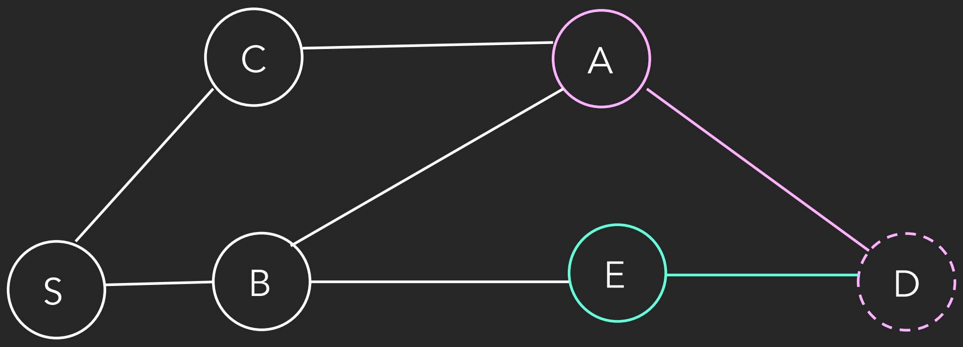
B, C broadcasts $RREQ$ to E, A and A respectively

Node	Next Hop(S)	Next Hop(D)
B	S	
C	S	
A	B	
E	B	



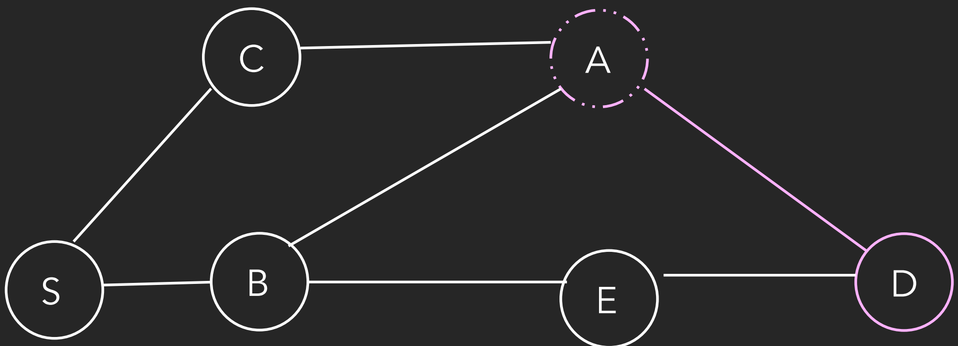
A, E broadcasts $RREQ$ to D

Node	Next Hop(S)	Next Hop(D)
B	S	
	...	
D	A	



Now D sends $RREP$ to A

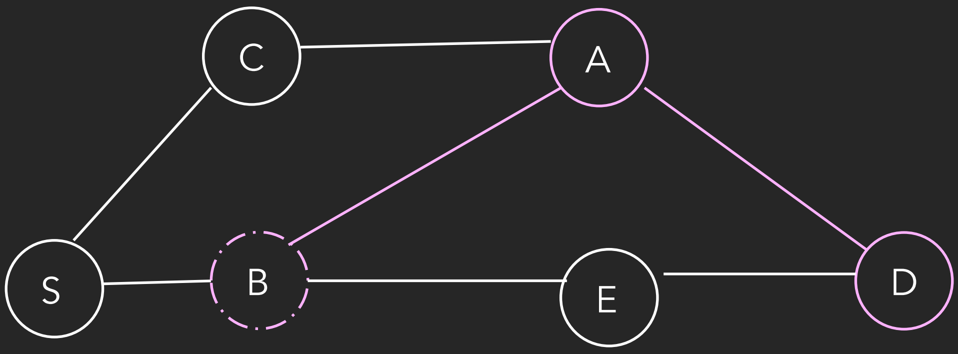
Node	Next Hop(S)	Next Hop(D)
B	S	
C	S	
A	B	D
E	B	
D	A	



# Why? the table of D says that if destination is S then send to A

Now A sends $RREP$ to B

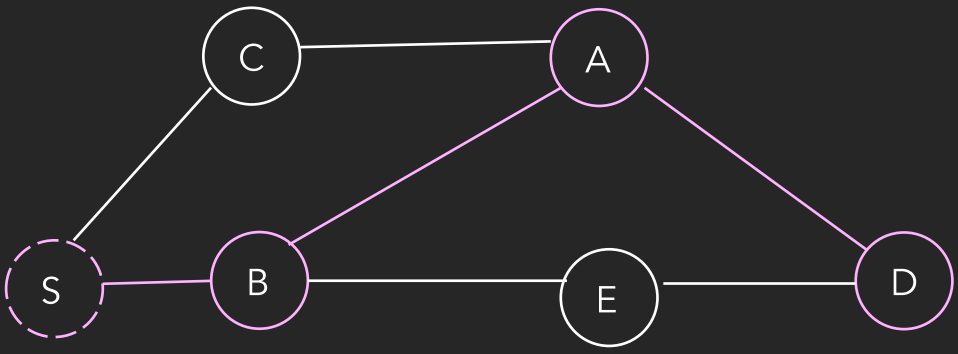
Node	Next Hop(S)	Next Hop(D)
B	S	A
C	S	
A	B	D
E	B	
D	A	



# Why? the table of A says that if destination is S then send to B

Now B sends $RREP$ to S

Node	Next Hop(S)	Next Hop(D)
B	S	A
C	S	
A	B	D
E	B	
D	A	
S		B



# Why? the table of B says that if destination is S then send to S

Now S realizes that it has $NextHop$ info for destination D so it initiates data delivery by sending the data to B which sends it to A which sends it to D.