Routing:
Link State Algorithm

Common Plan for Distributed Routing

- Determine live neighbors
  - HELLO protocol: send HELLO packet periodically to neighbors
- Advertisement step
  - Periodically send some information to neighbors
- Integration step
  - Compute routing/forwarding table from advertisements

Link-State Routing

Advertisement:

- Each node sends information about its links to its neighbors
- They re-send this to their neighbors, etc.
- Each node discovers every other node and link in the network (the complete graph)

Integration:

- Each node then runs a shortest path computation, e.g. Dijkstra's Algorithm, over its local version of the graph

Dijkstra's Algorithm

Initialization:

N' = {u}
For all nodes v adjacent to u, set
    D(v) = c(u,v) and p(v) = u
Otherwise, set
    D(v) = ∞ and p(v) undefined

Loop until all nodes in N':

Find w ∉ N' with smallest D(w),
    add w to N'
For all v adjacent to w and w ∉ N',
    If D(w) + c(w,v) < D(v), set
        D(v) = D(w) + c(w,v) and
        p(v) = w

Notation:

u = source node

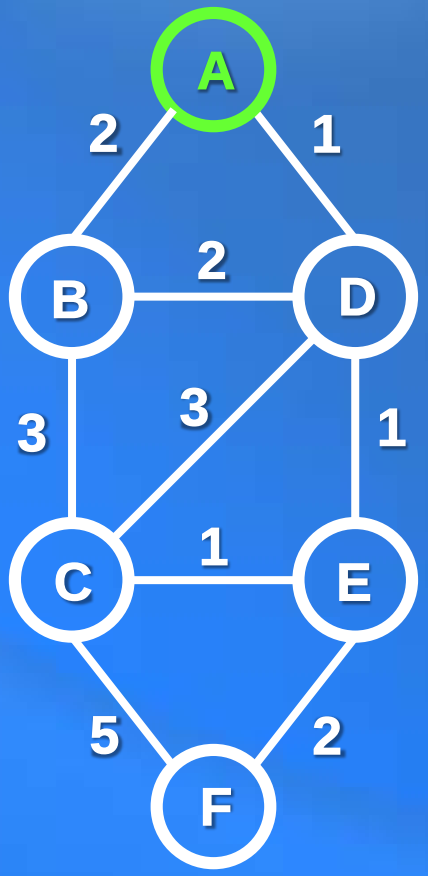
N' = set of nodes whose least cost path is known

c(x,y) = link cost from x to y

D(v) = current estimate of path cost from u to v

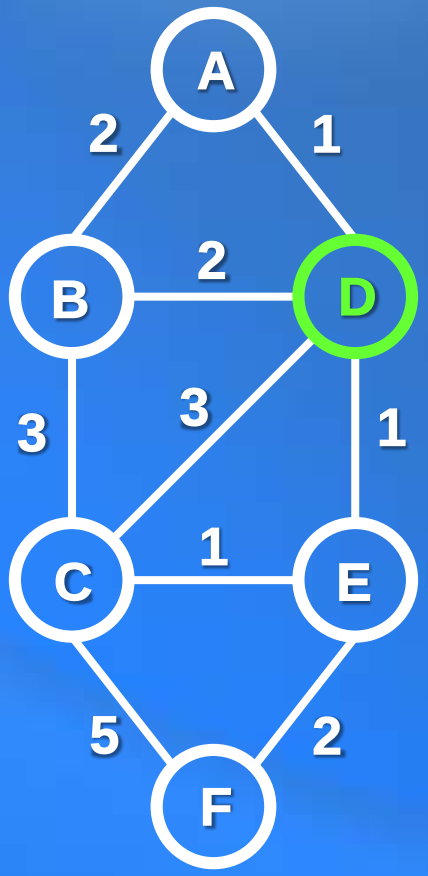
p(v) = predecessor node along path from u to v

Example (Source = A)



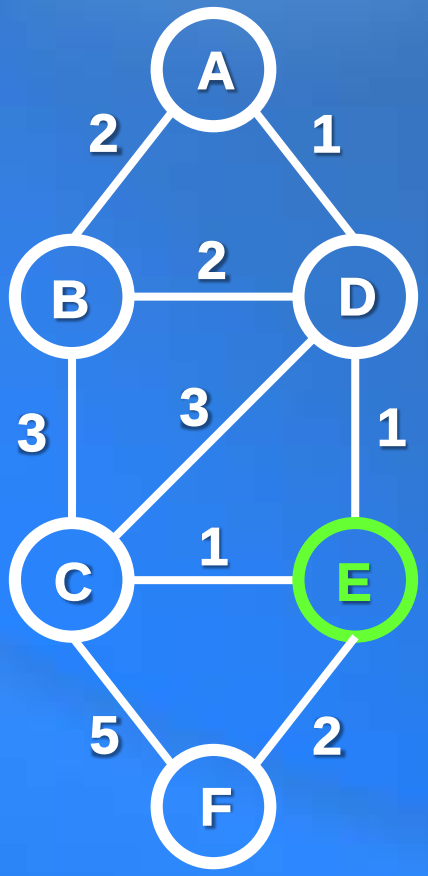
Step	N'	B		C		D		E		F	
		D	p	D	p	D	p	D	p	D	p
0	A	2	A	∞	-	1	A	∞	-	∞	-
1											
2											
3											
4											
5											

Example (Source = A)



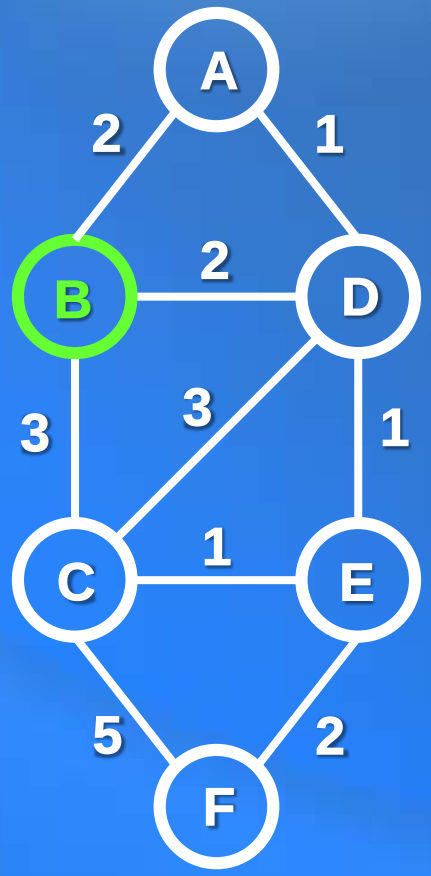
Step	N'	B		C		D		E		F	
		D	p	D	p	D	p	D	p	D	p
0	A	2	A	∞	-	1	A	∞	-	∞	-
1	AD	2	A	4	D			2	D	∞	-
2											
3											
4											
5											

Example (Source = A)



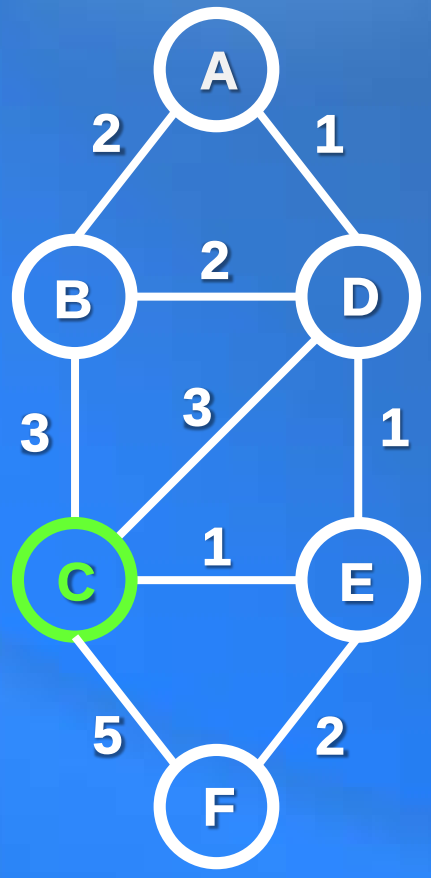
Step	N'	B		C		D		E		F	
		D	p	D	p	D	p	D	p	D	p
0	A	2	A	∞	-	1	A	∞	-	∞	-
1	AD	2	A	4	D			2	D	∞	-
2	ADE	2	A	3	E					4	E

Example (Source = A)



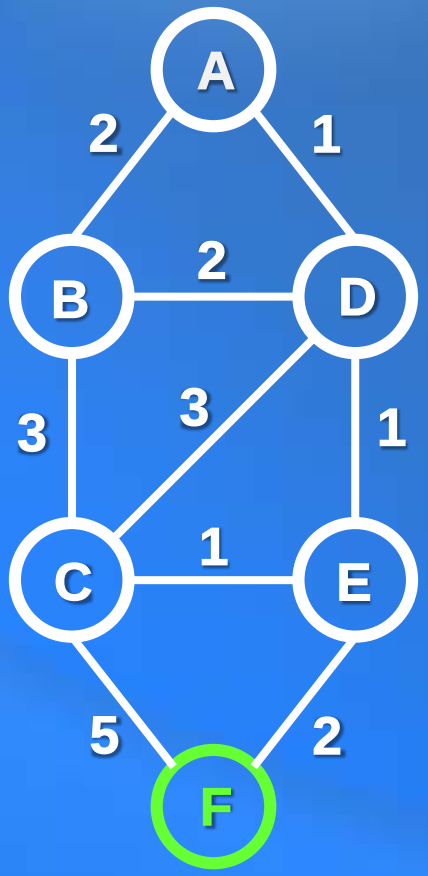
Step	N'	B		C		D		E		F	
		D	p	D	p	D	p	D	p	D	p
0	A	2	A	∞	-	1	A	∞	-	∞	-
1	AD	2	A	4	D			2	D	∞	-
2	ADE	2	A	3	E					4	E
3	ADEB			3	E					4	E

Example (Source = A)



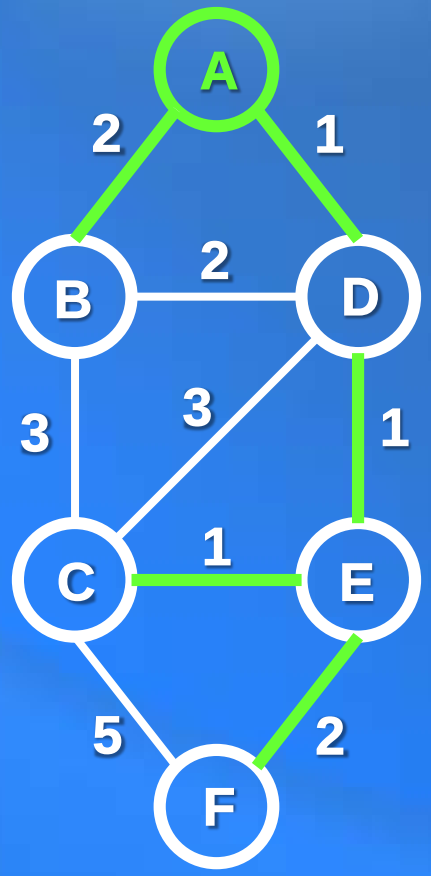
Step	N'	B		C		D		E		F	
		D	p	D	p	D	p	D	p	D	p
0	A	2	A	∞	-	1	A	∞	-	∞	-
1	AD	2	A	4	D			2	D	∞	-
2	ADE	2	A	3	E					4	E
3	ADEB			3	E					4	E
4	ADEBC									4	E

Example (Source = A)



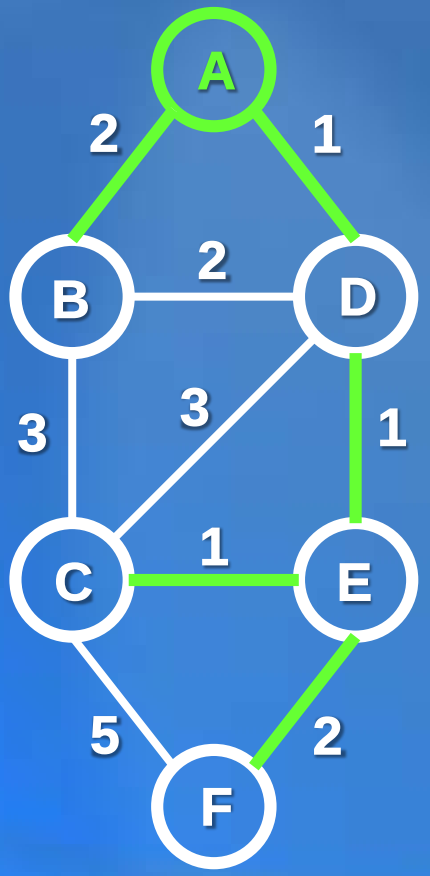
Step	N'	B		C		D		E		F	
		D	p	D	p	D	p	D	p	D	p
0	A	2	A	∞	-	1	A	∞	-	∞	-
1	AD	2	A	4	D			2	D	∞	-
2	ADE	2	A	3	E					4	E
3	ADEB			3	E					4	E
4	ADEBC									4	E
5	ADEBCF										

Shortest Paths



Step	N'	B		C		D		E		F	
		D	p	D	p	D	p	D	p	D	p
0	A	2	A	∞	-	1	A	∞	-	∞	-
1	AD	2	A	4	D			2	D	∞	-
2	ADE	2	A	3	E					4	E
3	ADEB			3	E					4	E
4	ADEBC									4	E
5	ADEBCF										

Forwarding Table



Dest	Link
B	B
C	D
D	D
E	D
F	D