Intro to Computer Network

HW4

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1) Dijkstra's (link state) algorithm

		D(B)	D(C)	D(D)	D (E)	D (F)	D (G)	D (H)
step	N'	P (B)	P(C)	P(D)	P(E)	P(F)	P(G)	P(H)
0	A	1, A	2, A	∞	1, A	5, A	∞	∞
1	AE	1, A	2, A	∞		4, E	6, E	∞
2	AEB		2, A	2, B		4, E	6, E	∞
3	AEBD		2, A			4, E	6, E	4, D
4	AEBDC					4, E	6, E	4, D
5	AEBDCF						6, E	4, D
6	AEBDCFH						6, E	
7	AEBDCFHG							

1) Find E, not in N' such that D (E) is minimum
   Add E to N'
   D(B)= min{D(B), D(E)+c (E, B)} =min {1,1+∞} =1
   D(C)= min{D(C), D(E)+c(E,C)}=min{2,1+∞}=2
   D(D)= min{D(D), D(E)+c(E,D)}=min{∞,1+∞}=∞
   D (F)= min{D(F), D(E)+c (E, F)} =min {5,1+3} =4
   D (G)= min{D(G), D(E)+c(E,G)}=min{∞,1+5}=6
   D (H)= min{D(H), D(E)+c(E,H)}=min{∞,1+∞}=∞

2) Find B, not in N' such that D (B) is minimum
   Add B to N'
   D(C)= min{D(C), D(B)+c(B,C)}=min{2,1+∞}=2
   D(D)= min{D(D), D(B)+c(B,D)}=min{∞,1+1}=2
   D (F)= min{D(F), D(B)+c (B, F)} =min {4,1+∞} =4
   D (G)= min{D(G), D(B)+c(B,G)}=min{6,1+∞}=6
   D (H)= min{D(H), D(B)+c(B,H)}=min{∞,1+∞}=∞

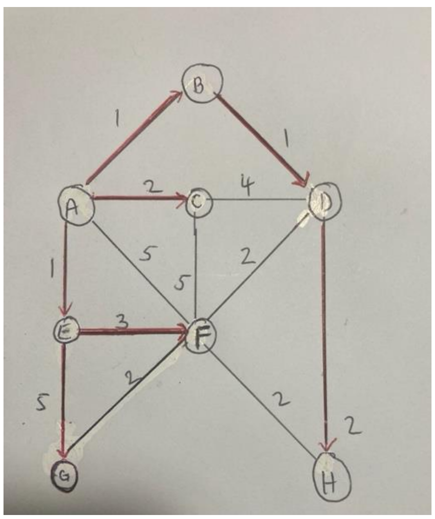
3) Find D not in N' such that D (D) is minimum
   Add D to N'
   D(C)= min{D(C), D(D)+c (D, C)} =min {2,2+4} =2
   D (F)= min{D(F), D(D)+c (D, F)} =min {4,2+2} =4
   D (G)= min{D(G), D(D)+c(D,G)}=min{6,2+∞}=6
   D (H)= min{D(H), D(D)+c(D,H)}=min{∞,2+2}=4

4) Find C, not in N' such that D (C) is minimum
   Add C to N'
   D (F)= min{D(F), D(C)+c (C, F)} =min {4,2+5} =4
   D (G)= min{D(G), D(C)+c(C,G)}=min{6,2+∞}=6
   D (H)= min{D(H), D(C)+c(C,H)}=min{4,2+∞}=4

5) Find F, not in N' such that D (F) is minimum
   Add F to N'
   D (G)= min{D(G), D(F)+c (F, G)} =min {6,4+2} =6
   D (H)= min{D(H), D(F)+c (F, H)} =min {4,4+2} =4

6) Find H, not in N' such that D (H) is minimum
   Add H to N'
   D (G)= min{D(G), D(H)+c (H, G)} =min{6,4+∞}=6

Resulting shortest -path tree from A



2) Distance-vector Algorithm

Step 1

Node A

Destination	Vector	Hop
A	0	A
B	1	B
C	2	C
D	∞	----
E	1	E
F	5	F
G	∞	----
H	∞	----

Node B

Destination	Vector	Hop
A	1	A
B	0	B
C	∞	----
D	1	D
E	∞	----
F	∞	----
G	∞	----
H	∞	----

Node C

Destination	Vector	Hop
A	2	A
B	∞	----
C	0	C
D	4	D
E	∞	----
F	5	F
G	∞	----
H	∞	----

Node D

Destination	Vector	Hop
A	∞	----
B	1	B
C	4	C
D	0	D
E	∞	----
F	2	F
G	∞	----
H	2	H

Node E

Destination	Vector	Hop
A	1	A
B	∞	----
C	∞	----
D	∞	----
E	0	E
F	3	F
G	5	G
H	∞	----

Node F

Destination	Vector	Hop
A	5	A
B	∞	----
C	5	C
D	2	D
E	3	E
F	0	F
G	2	G
H	2	H

Node G

Destination	Vector	Hop
A	∞	----
B	∞	----
C	∞	----
D	∞	----
E	5	E
F	2	F
G	0	G
H	∞	----

Node H

Destination	Vector	Hop
A	∞	----
B	∞	----
C	∞	----
D	2	D
E	∞	----
F	2	F
G	∞	----
H	0	H

Update

Step2

Node A

Destination	Vector	Hop
A	0	A
B	1	B
C	2	C
D	2	B
E	1	E
F	4	E
G	6	E
H	7	F

A to D

$D_A(D)$=min {c (A, B) + $D_B(D)$, c (A, C) +$D_C(D)$, c (A, F) +$D_F(D)$} =min {1+1, 2+4, 5+2} =min {2,6,7} =2

A to F

$D_A(F)$=min {c (A, F) + $D_F(F)$, c (A, C) +$D_C(F)$, c (A, E) +$D_E(F)$} =min {5+0,2 +5, 1+3} =min {5,7,4} =4

A to G

$D_A(G)$=min {c (A, F) + $D_F(G)$, c (A, E) +$D_E(G)$} =min {5+2, 1+5} =min {7,6} =6

A to H

$D_A(H)$=min {c (A, F) + $D_F(H)$} =min {5+2} =min {7} =7

Node B

Destination	Vector	Hop
A	1	A
B	0	B
C	3	A
D	1	D
E	2	A
F	3	D
G	∞	----
H	3	D

B to C

$D_B(C)$=min {c (B, A) + $D_A(C)$, c (B, D) +$D_D(C)$} =min {1+2, 1+4} =min {3,5} =3

B to E

$D_B(E)$=min {c (B, A) + $D_A(E)$} =min {1+ 1} =min {2} =2

B to F

$D_B(F)$=min {c (B, A) + $D_A(F)$, c (B, D) +$D_D(F)$} =min {1+5, 1+2} =min {6,3} =3

B to G

$D_B(G)$=min {c (B, A) + $D_A(G)$, c (B, D) +$D_D(G)$} =min {1+∞, 1+∞} =min {∞, ∞} =∞

B to H

$D_B(D)$=min {c (B, D) + D_D (H)} =min {1+2} =min {3} =3

Node C

Destination	Vector	Hop
A	2	A
B	3	A
C	0	C
D	4	D
E	3	A
F	5	F
G	7	F
H	6	D

C to B

$D_C(B)=\min\{c(C, A) + D_A(B), c(C, D) + D_D(B)\} = \min\{2+1, 4+1\} = \min\{3,5\} = 3$

C to D

$D_C(D)=\min\{c(C, D) + D_D(D), c(C, F) + D_F(D)\} = \min\{4+0, 5+2\} = \min\{4,7\} = 4$

C to E

$D_C(E)=\min\{c(C, A) + D_A(E), c(C, F) + D_F(E)\} = \min\{2+1, 5+3\} = \min\{3,8\} = 3$

C to F

$D_C(F)=\min\{c(C, F) + D_F(F), c(C, A) + D_A(F), c(C, D) + D_D(F)\} = \min\{5+0, 2+5, 4+2\}$

$= \min\{5, 7,6\} = 5$

C to G

$D_C(G)=\min\{c(C, F) + D_F(G)\} = \min\{5+2\} = \min\{7\} = 7$

C to H

$D_C(H)=\min\{c(C, D) + D_D(H), c(C, F) + D_F(H)\} = \min\{4+2, 5+2\} = \min\{6,7\} = 6$

Node D

Destination	Vector	Hop
A	2	B
B	1	B
C	4	C
D	0	D
E	5	F
F	2	F
G	4	F
H	2	H

D to A

$D_D(A)$=min {c (D, B) + $D_B(A)$, c (D, C) +$D_C(A)$, c (D, F) +$D_F(A)$} =min {1+1, 4+2, 2+5} =min {2,6,7} =2

D to C

$D_D(C)$=min {c (D, C) + $D_C(C)$, c (D, F) +$D_F(C)$} =min {4+0, 2+5} =min {4,7} =4

D to E

$D_D(E)$=min {c (D, F) +$D_F(E)$} =min {2+3} =min {5} =5

D to F

$D_D(F)$=min {c (D, F) +$D_F(F)$, c (D, C) +$D_C(F)$, c (D, H) +$D_H(F)$} =min {2+0, 4+5, 2+2} =min {2,9,4} =2

D to G

$D_D(G)$=min {c (D, F) +$D_F(G)$} =min {2+2} =min {4} =4

D to H

$D_D(H)$=min {c (D, H) +$D_H(H)$, c (D, F) +$D_F(H)$} =min {2+0,2+2} =min {2,4} =2

Node E

Destination	Vector	Hop
A	1	A
B	2	A
C	3	A
D	5	F
E	0	E
F	3	F
G	5	G
H	5	F

E to B

$D_E(B)=\min\{c(E, A) + D_A(B)\} = \min\{1+1\} = \min\{2\} = 2$

E to C

$D_E(C)=\min\{c(E, A) + D_A(C), c(E, F) + D_F(C)\} = \min\{1+2, 3+5\} = \min\{3,8\} = 3$

E to D

$D_E(D)=\min\{c(E, F) + D_F(D)\} = \min\{3+2\} = \min\{5\} = 5$

E to F

$D_E(F)=\min\{c(E, F) + D_F(F), c(E, A) + D_A(F), c(E, G) + D_G(F)\} = \min\{3+0, 1+5, 5+2\}$

$= \min\{3,6,7\} = 3$

E to G

$D_E(G)=\min\{c(E, G) + D_G(G), c(E, F) + D_F(G)\} = \min\{5+0, 3+2\} = 5$

E to H

$D_E(H)=\min\{c(E, F) + D_F(H)\} = \min\{3+2\} = \min\{5\} = 5$

Node F

Destination	Vector	Hop
A	4	E
B	3	D
C	5	C
D	2	D
E	3	E
F	0	F
G	2	G
H	2	H

F to A

$D_F(A)$=min {c (F, A) + $D_A(A)$, c (F, C) +$D_C(A)$, c (F, E) +$D_E(A)$} =min {5+0,5 +2, 3+1} =min {5,7,4} =4

F to B

$D_F(B)$=min {c (F, A) + $D_A(B)$, c (F, D) +$D_D(B)$} =min {5+1, 2+1} =min {6,3} =3

F to C

$D_F(C)$=min {c (F, C) + $D_C(C)$, c (F, A) +$D_A(C)$, c (F, D) +$D_D(C)$} =min {5+0, 5+2, 2+4} =min {5,7,6} =5

F to D

$D_F(D)$=min {c (F, D) +$D_D(D)$, c (F, C) +$D_C(D)$, c (F, H) +$D_H(D)$} =min {2+0, 5+4, 2+2} =min {2,9,4} =2

F to E

$D_F(E)$=min {c (F, E) +$D_E(E)$, c (F, A) +$D_A(E)$, c (F, G) +$D_G(E)$} =min {3+0, 5+1, 2+5} =min {3,6,7} =3

F to G

$D_F(G)$=min {c (F, G) +$D_G(G)$, c (F, E) +$D_E(G)$} =min {2+0, 3+5} =min {2,8} =2

F to H

$D_F(H)$=min {c (F, H) +$D_H(H)$, c (F, D) +$D_D(H)$} =min {2+0, 2+2} =min {2,4} =2

Node G

Destination	Vector	Hop
A	6	E
B	∞	----
C	7	F
D	4	F
E	5	E
F	2	F
G	0	G
H	4	F

G to A

$D_G(A)$=min {c (G, F) + $D_F(A)$, c (F, E) +$D_E(A)$} =min {2+5, 5+1} =min {7,6} =6

G to B

$D_G(B)$=min {c (G, E) + $D_E(B)$, c (G, F) +$D_F(B)$} =min {5+∞, 2+∞} =min {∞, ∞} =∞

G to C

$D_G(C)$=min {c (G, F) + $D_F(C)$} =min {2+5} =min {7} =7

G to D

$D_G(D)$=min {c (G, F) +$D_F(D)$} =min {2+2} =min {4} =4

G to E

$D_G(E)$=min {c (G, E) +$D_E(E)$, c (G, F) +$D_F(E)$} =min {5+0, 2+3} =5

G to F

$D_G(F)$=min {c (G, F) +$D_F(F)$, c (G, E) +$D_E(F)$} =min {2+0, 5+3} =min {2,8} =2

G to H

$D_G(H)$=min {c (G, F) +$D_F(H)$} =min {2+2} =min {4} =4

Node H

Destination	Vector	Hop
A	7	F
B	3	D
C	6	D
D	2	D
E	5	F
F	2	F
G	4	F
H	0	H

H to A

$D_H(A)$=min {c (H, F) + $D_F(A)$} =min {2+5} =min {7} =7

H to B

$D_H(B)$=min {c (H, D) + $D_D(B)$} =min {2+1} =min {3} =3

H to C

$D_H(C)$=min {c (H, F) + $D_F(C)$, c (H, D) + $D_D(C)$} =min {2+5,2+4} =min {7,6} =6

H to D

$D_H(D)$=min {c (H, D) + $D_D(D)$, c (H, F) + $D_F(D)$} =min {2+0,2+2} =min {2,4} =2

H to E

$D_H(E)$=min {c (H, F) + $D_F(E)$} =min {2+3} =min {5} =5

H to F

$D_H(F)$=min {c (H, F) + $D_F(F)$, c (H, D) + $D_D(F)$} =min {2+0,2+2} =min {2,4} =2

H to G

$D_H(G)$=min {c (H, F) + $D_F(G)$} =min {2+2} =min {4} =4

Update

Step 3

Node A

Destination	Vector	Hop
A	0	A
B	1	B
C	2	C
D	2	B
E	1	E
F	4	E
G	6	E
H	4	B

A to H

$D_A(H)$=min {c (A, B) +D_B(H), c (A, C) +D_C(H), c (A, E) +D_E(H), c (A, F) + D_F(H),}

=min {1+3, 2+6, 1+5,5+2} =min {4, 8,6,7} =4

Node B

Destination	Vector	Hop
A	1	A
B	0	B
C	3	A
D	1	D
E	2	A
F	3	D
G	5	D
H	3	D

B to G

$D_B(G)$=min {c (B, A) + $D_A(G)$, c (B, D) +$D_D(G)$} =min {1+6, 1+4} =min {7, 5} =5

Node C

Destination	Vector	Hop
A	2	A
B	3	A
C	0	C
D	4	D
E	3	A
F	5	F
G	7	F
H	6	D

Node D

Destination	Vector	Hop
A	2	B
B	1	B
C	4	C
D	0	D
E	3	B
F	2	F
G	4	F
H	2	H

D to E

$D_D(E)$=min {c (D, B) +$D_B(E)$, c (D, C) +$D_C(E)$, c (D, F) +$D_F(E)$, c(D, H)+$D_H(E)$} = min {1+2, 4+3, 2+3,2+5} =min {3, 7, 5, 7} =3

Node E

Destination	Vector	Hop
A	1	A
B	2	A
C	3	A
D	3	A
E	0	E
F	3	F
G	5	G
H	5	F

E to D

$D_E(D)$=min {c (E, A) +$D_A(D)$, c (E, F) +D_F(D,) c (E, G) +$D_G(D)$} =min {1+2,3+2,5+4} =min {3,5,9} =3

Node F

Destination	Vector	Hop
A	4	E
B	3	D
C	5	C
D	2	D
E	3	E
F	0	F
G	2	G
H	2	H

Node G

Destination	Vector	Hop
A	6	E
B	5	F
C	7	F
D	4	F
E	5	E
F	2	F
G	0	G
H	4	F

G to B

$D_G(B)$=min {c (G, E) + $D_E(B)$, c (G, F) +$D_F(B)$} =min {5+2, 2+3} =min {7, 5} =5

Node H

Destination	Vector	Hop
A	4	D
B	3	D
C	6	D
D	2	D
E	5	F
F	2	F
G	4	F
H	0	H

H to A

$D_H(A)$=min {c (H, D) + $D_D(A)$, c (H, F) + $D_F(A)$} =min {2+2, 2+4} =min {4,6} =4