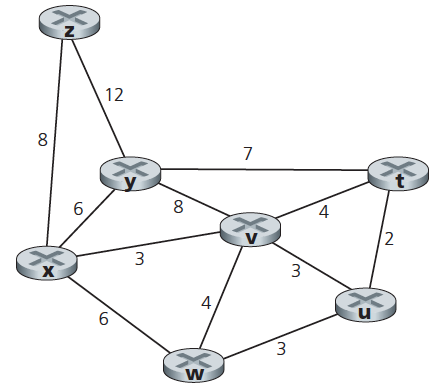
COMP 431 Internet Protocols & Services

Spring 2017  
Kevin Jeffay

Worksheet 15, March 28

1. Consider the following network.



1. With the indicated link costs, use Dijkstra’s shortest-path algorithm to compute the shortest path for each node (router) in the network to all other nodes (routers). Show how the algorithm works by computing a table similar to the table on page 19 of the lecture notes for each node.

Check tables like on slide 21

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Step | Start N | D(U), p(u) | D(v), p(V) | D(W),p(W) | D(X), p(X) | D(Y),p(Y) | D(Z),p(Z) |
| 0 | t | Inf | Inf | Inf | Inf | Inf | Inf |
| 1 | t | 2, t | 4, t | Inf | Inf | 7, t | Inf |
| 2 | t | 2, t | 4, t | 5, u, t | 7, v, t | 7, t | 19, y, t |
| 3 | T | 2, t | 4, t | 5, u, t | 7, v, t | 7, t | 15, x, v, t |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Step | Start N | D(t), p(t) | D(v), p(V) | D(W),p(W) | D(X), p(X) | D(Y),p(Y) | D(Z),p(Z) |
| 0 | U | Inf | Inf | Inf | Inf | Inf | Inf­ |
| 1 | U | 2, u | 3, u | 3, u | Inf | Inf | Inf |
| 2 | U | 2, u | 3, u | 3, u | 6, v, u | 9, t, u | Inf |
| 3 | U | 2, u | 3, u | 3, u | 6, v, u | 9, t, u | 14, x, v, u |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Step | Start N | D(t), p(t) | D(u), p(u) | D(W),p(W) | D(X), p(X) | D(Y),p(Y) | D(Z),p(Z) |
| 0 | V | Inf | Inf | Inf | Inf | Inf | Inf­ |
| 1 | V | 4, v | 3, v | 4, v | 3, v | 8, v | Inf |
| 2 | V | 4, v | 3,v | 4,v | 3,v | 8,v | 11,x |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Step | Start N | D(t), p(t) | D(u), p(u) | D(v),p(v) | D(X), p(X) | D(Y),p(Y) | D(Z),p(Z) |
| 0 | W | Inf | Inf | Inf | Inf | Inf | Inf­ |
| 1 | W | Inf | 3, w | 4, w | 6,w | Inf | Inf |
| 2 | W | 5, u, w | 3, w | 4, w | 6, w | 12, v,w | 14,x,w |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Step | Start N | D(t), p(t) | D(u), p(u) | D(v),p(v) | D(W), p(w) | D(Y),p(Y) | D(Z),p(Z) |
| 0 | X | Inf | Inf | Inf | Inf | Inf | Inf­ |
| 1 | X | Inf | Inf | 3, x | 6,x | 6, x | 8,x |
| 2 | X | 7,v, x | 6, v, x | 3, x | 6,x | 6, x | 8,x |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Step | Start N | D(t), p(t) | D(u), p(u) | D(v),p(v) | D(W), p(w) | D(x),p(x) | D(Z),p(Z) |
| 0 | y | Inf | Inf | Inf | Inf | Inf | Inf­ |
| 1 | Y | 7, y | Inf | 8,y | Inf | 6, y | 12, y |
| 2 | Y | 7, y | 9, t, y | 8, y | 12, v, w | 6, y | 12, y |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Step | Start N | D(t), p(t) | D(u), p(u) | D(v),p(v) | D(W), p(w) | D(x),p(x) | D(y),p(y) |
| 0 | Z | Inf | Inf | Inf | Inf | Inf | Inf­ |
| 1 | Z | Inf | Inf | Inf | Inf | 8, z | 12, z |
| 2 | Z | 19, y, z | Inf | 11, x, z | 14, x, z | 8, z | 12, z |
| 3 | Z | 15, v, x, z | 14,v, x, z | 11, x, z | 14, x, z | 8, z | 12, z |

*b*) Given the shortest paths that you compute, show the routing table that would result at each node. Do all nodes end up with routing tables using the same least cost paths?

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T | | U | | V | | W | | X | |
| t | 0 | t | t | t | t | t |  | t |  |
| u | u | u | 0 | u | u | u |  | u |  |
| v | u | v | t | v | 0 | v |  | v |  |
| w | u | w | t | w | w | w |  | w |  |
| x | v | x | v | x | x | x |  | x |  |
| y | y | y | t | y | y | y |  | y |  |
| z | v | z | v | z | x | z |  | z |  |