

# Exercise 10 - Solutions

1.

| Step | M                | D(A) | D(B)     | D(C)     | D(D)     | D(E)     | D(F)     |
|------|------------------|------|----------|----------|----------|----------|----------|
| 0    | A, B, C, D, E, F | 0    | $\infty$ | $\infty$ | $\infty$ | $\infty$ | $\infty$ |
| 1    | B, C, D, E, F    | 0    | 1(B)     | 1(C)     | $\infty$ | $\infty$ | $\infty$ |
| 2    | B, D, E, F       | 0    | 1        | 1        | 3(C)     | $\infty$ | $\infty$ |
| 3    | D, E, F          | 0    | 1        | 1        | 2(B)     | 2(B)     | $\infty$ |
| 4    | D, F             | 0    | 1        | 1        | 2        | 2        | $\infty$ |
| 5    | F                | 0    | 1        | 1        | 2        | 2        | 5(B)     |

So the routing table of node A is:

| Dest: | A | B | C | D | E | F |
|-------|---|---|---|---|---|---|
| Via:  | A | B | C | B | B | B |

2. Round 1: Round 2 Round 3 (no further changes after round 3!)

Router A:

| Dest. | Next Hop     | Cost                             |
|-------|--------------|----------------------------------|
| A     | A            | 0                                |
| B     | B            | 1                                |
| C     | C            | 1                                |
| D     | <del>B</del> | <del><math>\infty</math> 2</del> |
| E     | <del>B</del> | <del><math>\infty</math> 2</del> |
| F     | <del>B</del> | <del><math>\infty</math> 5</del> |

Router B:

| Dest. | Next Hop     | Cost                             |
|-------|--------------|----------------------------------|
| A     | A            | 1                                |
| B     | B            | 0                                |
| C     | <del>A</del> | <del><math>\infty</math> 2</del> |
| D     | D            | 1                                |
| E     | E            | 1                                |
| F     | <del>D</del> | <del><math>\infty</math> 4</del> |

Router C:

| Dest. | Next Hop     | Cost                             |
|-------|--------------|----------------------------------|
| A     | A            | 1                                |
| B     | <del>A</del> | <del><math>\infty</math> 2</del> |
| C     | C            | 0                                |
| D     | D            | 2                                |
| E     | <del>A</del> | <del><math>\infty</math> 3</del> |
| F     | <del>D</del> | <del><math>\infty</math> 5</del> |

Router D:

| Dest. | Next Hop     | Cost                             |
|-------|--------------|----------------------------------|
| A     | <del>B</del> | <del><math>\infty</math> 2</del> |
| B     | B            | 1                                |
| C     | C            | 2                                |
| D     | D            | 0                                |
| E     | <del>B</del> | <del><math>\infty</math> 2</del> |
| F     | F            | 3                                |

Router E:

| Dest. | Next Hop     | Cost                             |
|-------|--------------|----------------------------------|
| A     | <del>B</del> | <del><math>\infty</math> 2</del> |
| B     | B            | 1                                |
| C     | <del>B</del> | <del><math>\infty</math> 3</del> |
| D     | <del>B</del> | <del><math>\infty</math> 2</del> |
| E     | E            | 0                                |
| F     | <del>B</del> | <del><math>\infty</math> 5</del> |

Router F:

| Dest. | Next Hop     | Cost                             |
|-------|--------------|----------------------------------|
| A     | <del>D</del> | <del><math>\infty</math> 5</del> |
| B     | <del>D</del> | <del><math>\infty</math> 4</del> |
| C     | <del>D</del> | <del><math>\infty</math> 5</del> |
| D     | D            | 3                                |
| E     | <del>D</del> | <del><math>\infty</math> 5</del> |
| F     | F            | 0                                |

3. Advertising a smaller cost than the true cost will attract traffic to a malicious router. Possible purpose:

- Listen in on a lot of traffic on the network ("sniffing")
- Denial-of-service attack ("black hole")

Advertising a larger cost than the true cost will direct away from a router.

Possible purpose:

- Reserve more bandwidth for traffic originating at the node
- Avoid volume charges on traffic

4. Recall:
- A router will send its own LSP to each of its direct neighbors
  - A router receiving an LSP will resend it only if its sequence number shows it's new
  - In that case, it will be resent to each of its neighbors except for the router from which it was received

Conclusion 1: A single LSP will traverse each link at most twice, once in each direction

$\Rightarrow$  The packet is sent at most  $2|E|$  times. ( $|E|$  denotes the number of edges)

Conclusion 2: The LSP traverses a link only once if and only if the destination router has not seen this packet before. Otherwise the LSP traverses each link twice.

$\Rightarrow$  The packet is sent exactly  $2|E| - (|V| - 1) = 2|E| - |V| + 1$  times.

( $|V|$  denotes the number of vertices)