# Lab Course
# “RouterLab”

## RIP - Routing Information Protocol
## (RFC 2453)

Some of the slides come from: http://www.ietf.org/proceedings/07dec/slides/IDRTut-0.pdf

# Miscellaneous

- Feedback
- Any other thing that needs discussion?

# Internet Routing

- There is no single....
  - Routing Protocol
  - Routing Configuration
  - Routing State,
  - Routing Management
- ..... for the entire Internet!
- Routing System is a collection of many components hopefully operating in a consistent manner

# Internet Routing (I)

- All routing systems have the same basic approach:
  - I tell you what I know and you tell me what you know!

- All routing systems aim at:
  - Avoid loops
  - Avoid dead-ends
  - Find “optimal” (or “best”) path
    - for any definition of optimality

# Internet Routing (II)

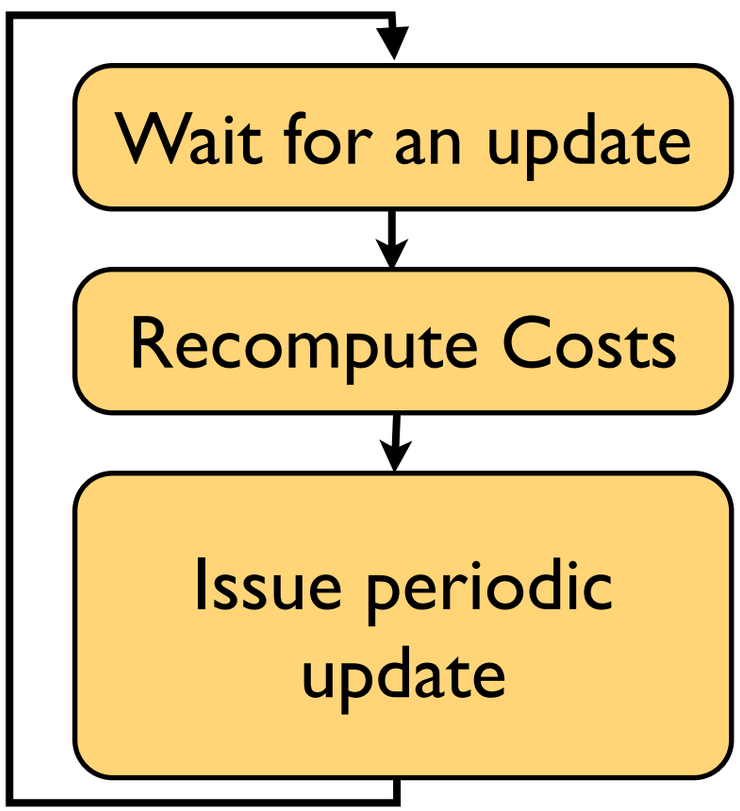
- Distance Vector
  - I tell you all my “best” routes for all destinations that I know and you tell me yours.
  - Build simplified topology from local perspective
  - E.g. RIP
- Link State
  - I announce to everyone about my links and the addresses I originate on each link and listen to everyone’s announcement.
  - Build full topology
  - E.g. OSPF

# RIP (Distance Vector)

- I tell you all my “best” routes for all destinations that I know and you tell me yours
- Build simplified topology from local perspective
- If any of your routes better than mines I’ll use you for those destination
- I’ll let all my other neighbors know

# RIP (Distance Vector)

- Is an instantiation of the Bellman-Ford Algorithm
  - Define $D_x(Y)$ := cost of the least-cost path from X to Y
  - Then: $d_{(me)}(Dst) = \min_{\binom{All\ \ my}{neighbors}} \{d_{(me)}(n_x) + d_{(n_x)}(Dst)\}$



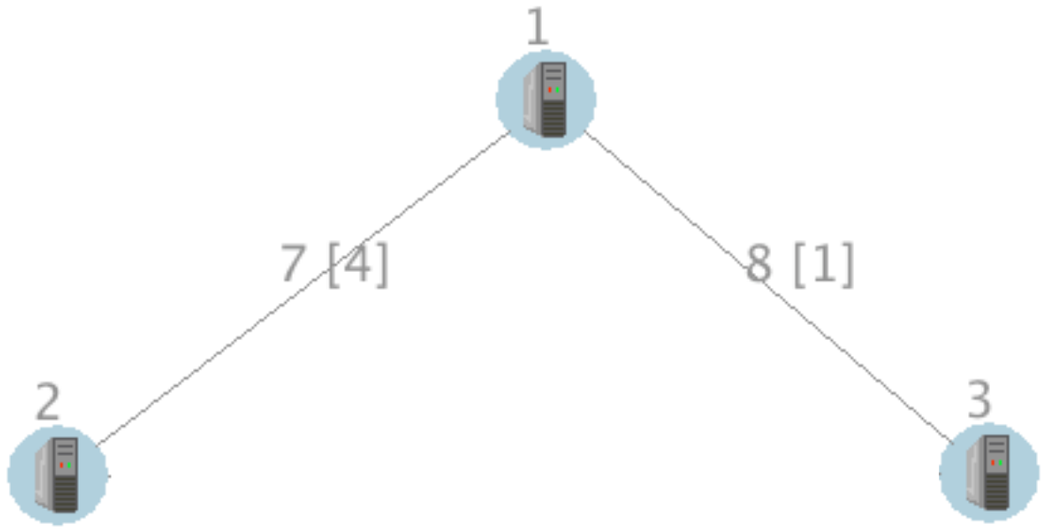
# RIP Advertisements

- Every 30 seconds Response Message
- Each containing network-distance pairs
- Max 25 pairs per Message
- Request Message to ask for full or partial dumps
  - Used for example for new links

# RIP

- Very simple
- Verbose (and slow) during convergence
  - Good news can travel fast
  - Bad news can travel slow
- Hard to detect loops
- Flat
- Does not scale (16 hops = infinity)

# Good news




Time

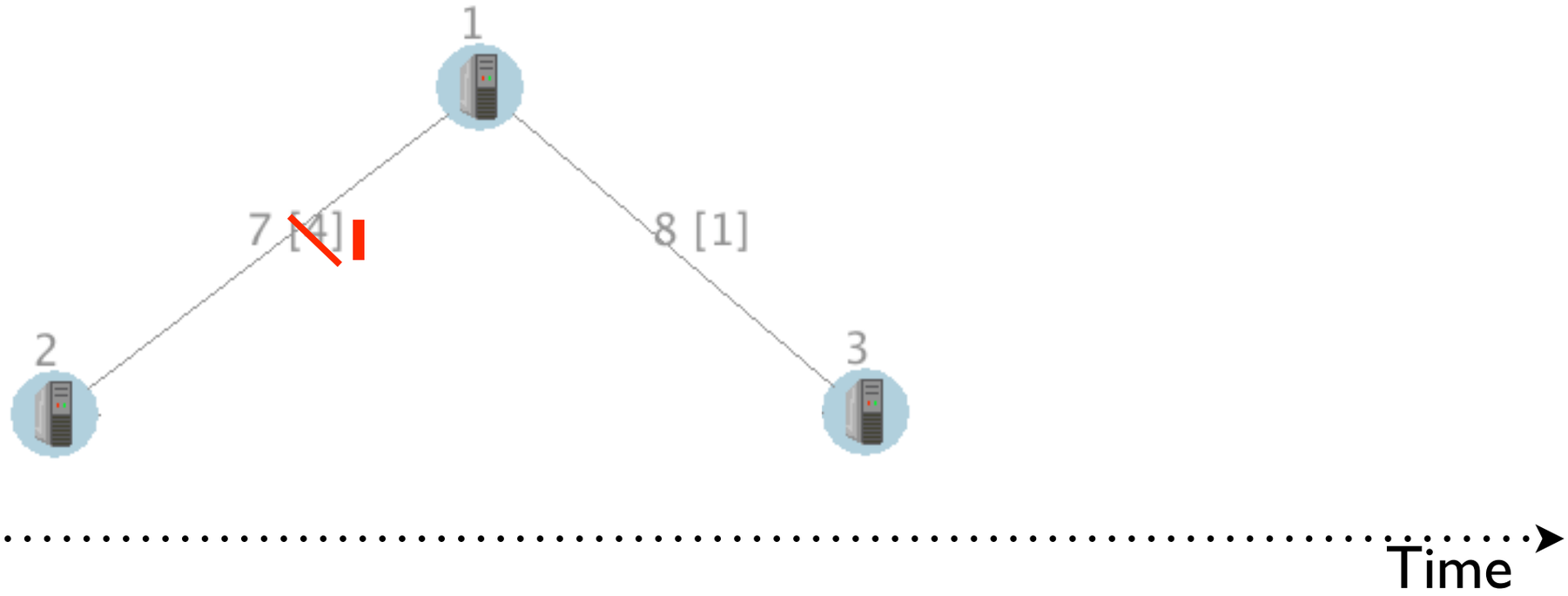
- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| 4 | 1 |

# Good news




- Node 3

| Cost from 3 to | |
|---|---|
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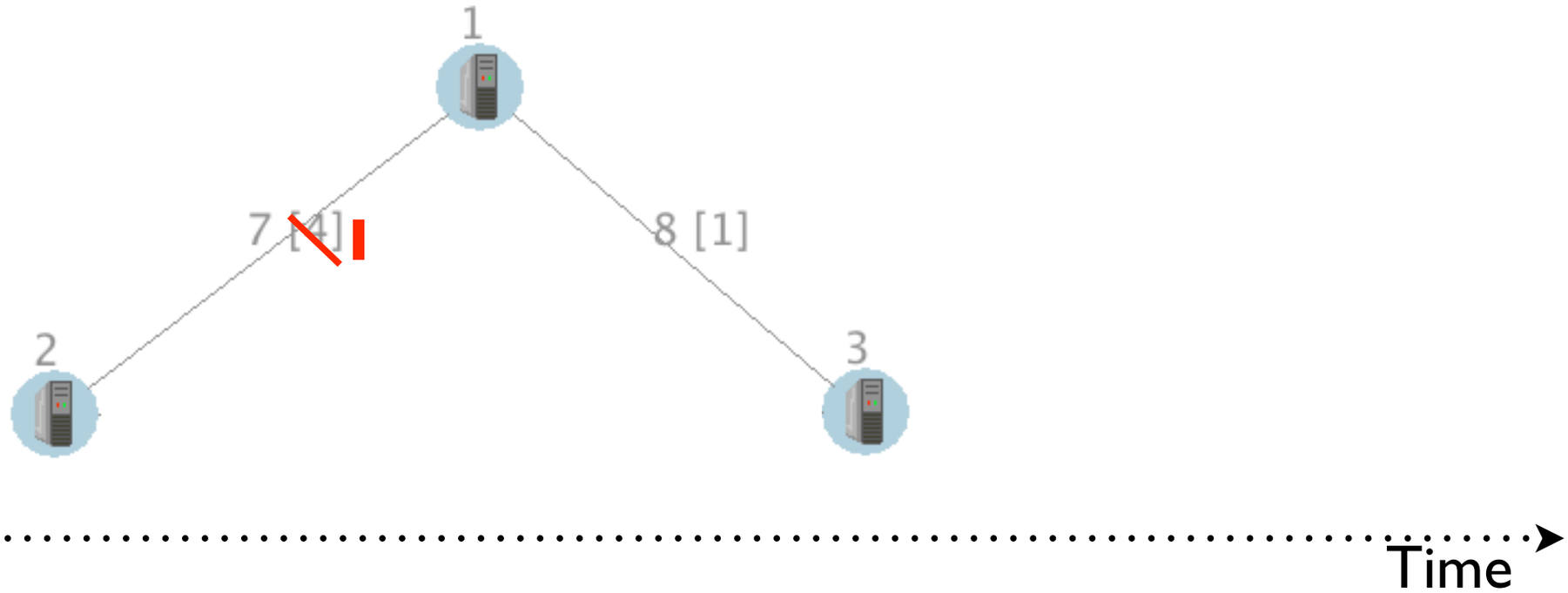
- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| 4 | 1 |

# Good news



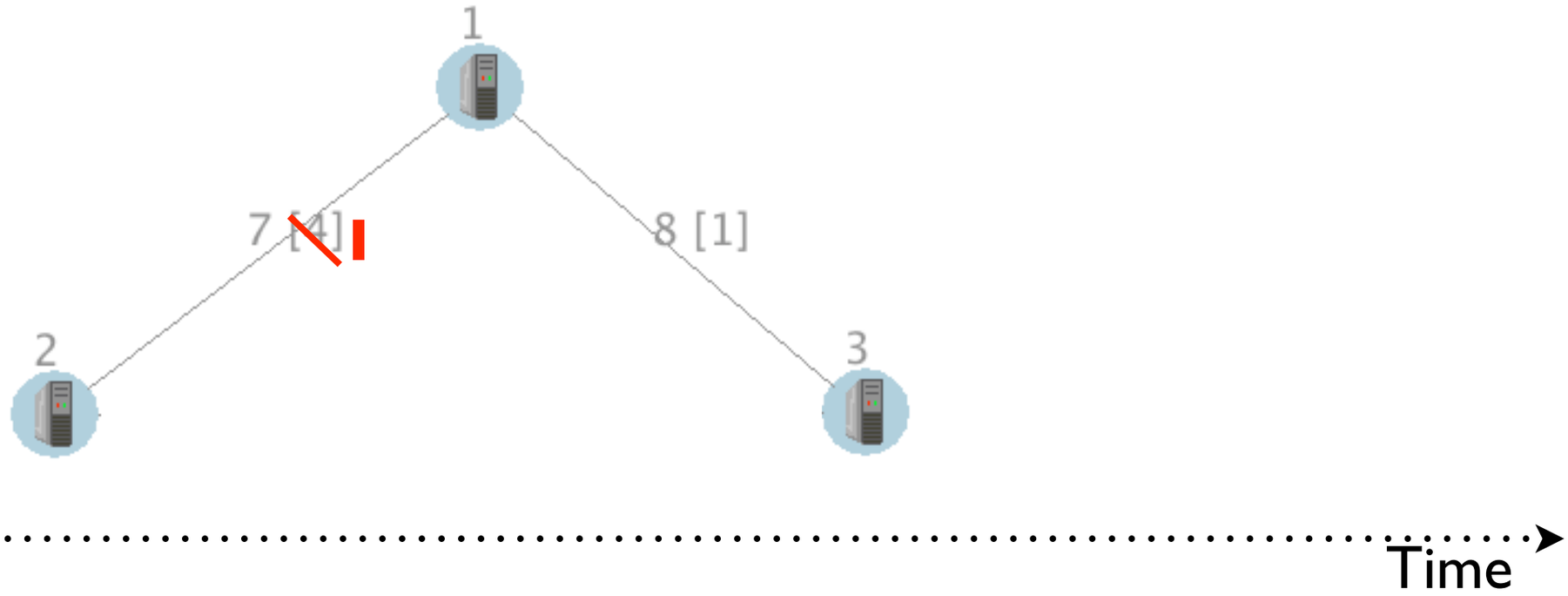

- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~4~~ | 1 |

# Good news




- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

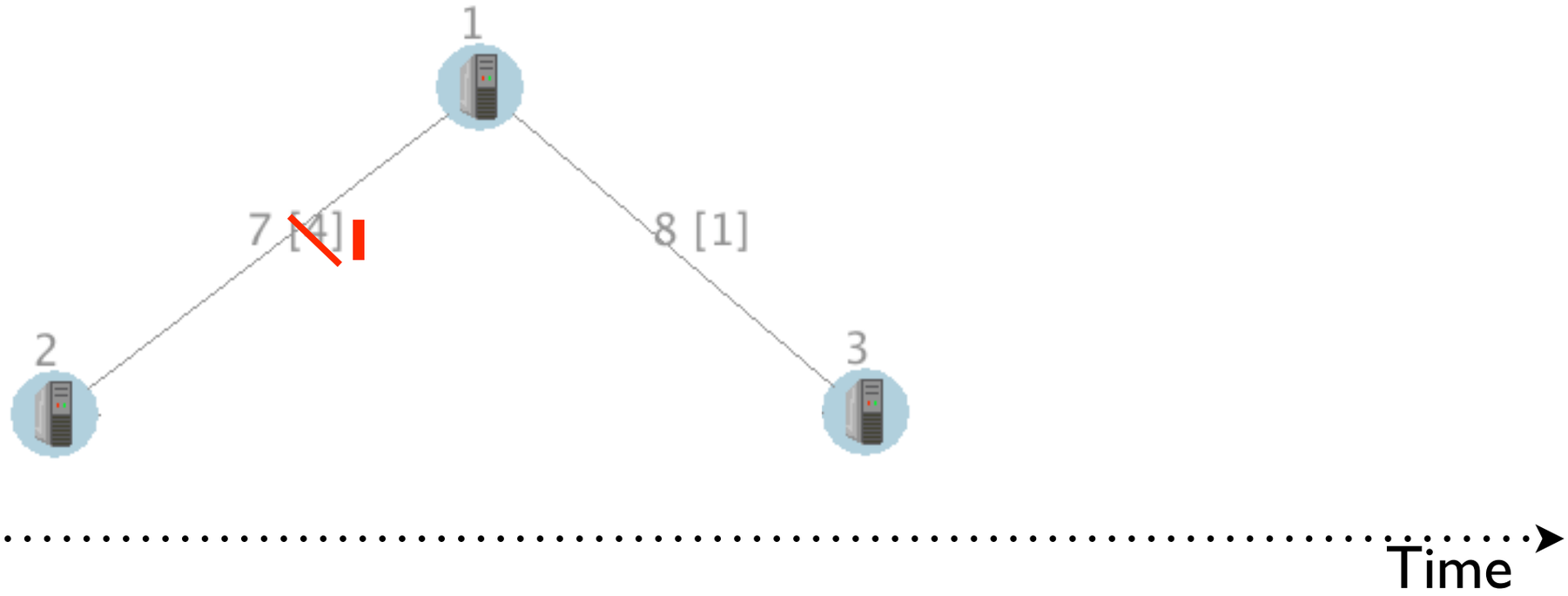
| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | ~~5~~ 2 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~4~~ 1 | 1 |

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| 1 | 1 |

# Good news




- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | ~~5~~ 2 |

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 2 |

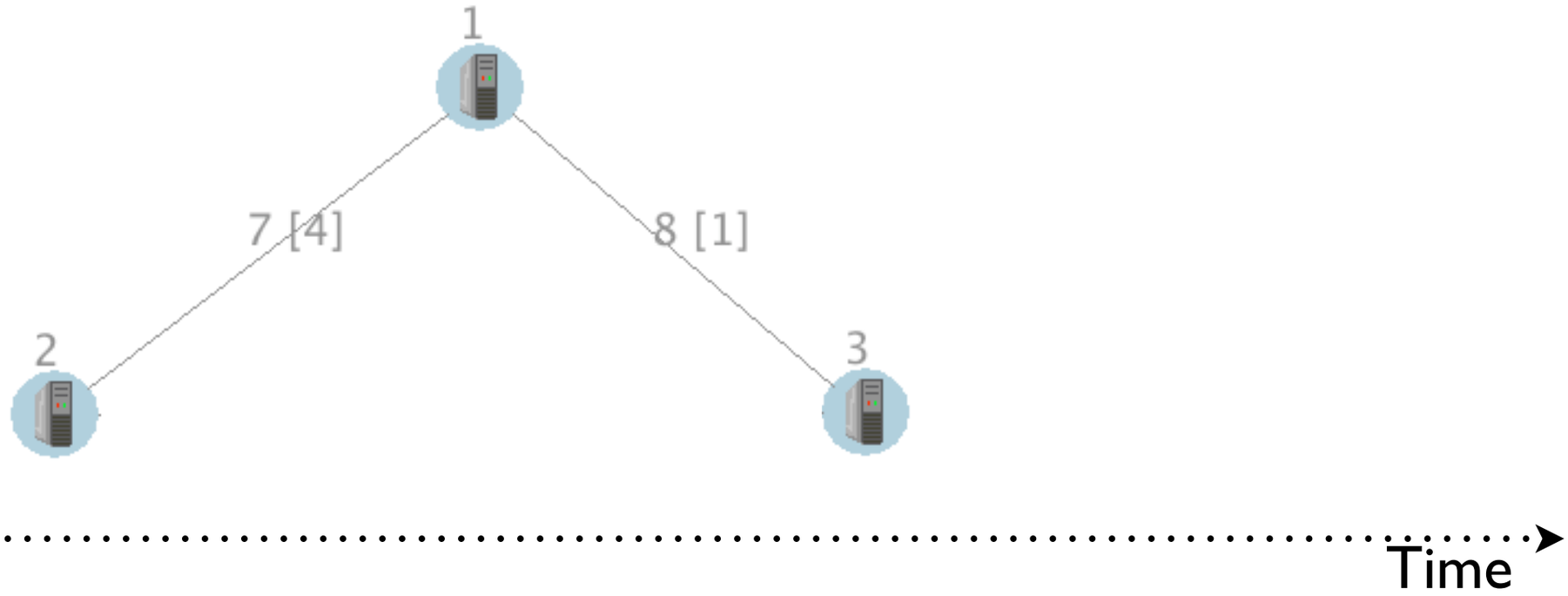
- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~4~~ 1 | 1 |

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| 1 | 1 |

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| 1 | 1 |

# Bad news (count to infinity)



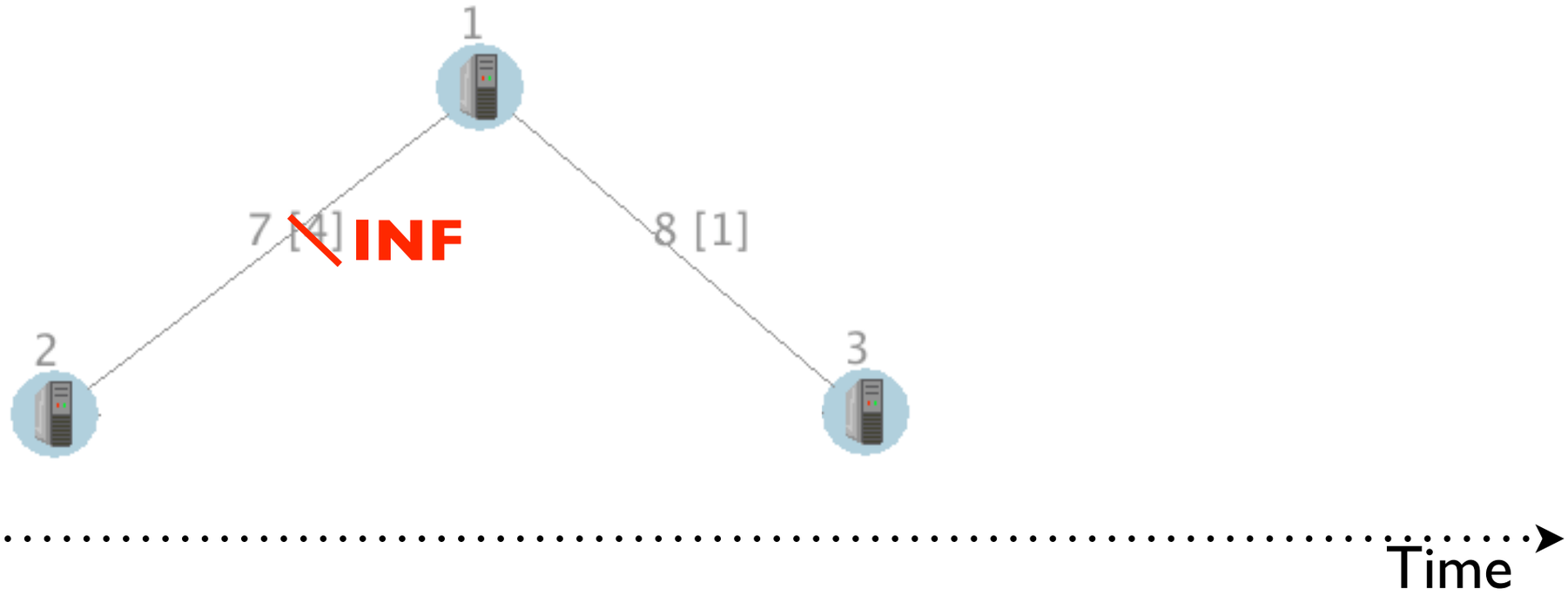

- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| 4 | 1 |

# Bad news (count to infinity)



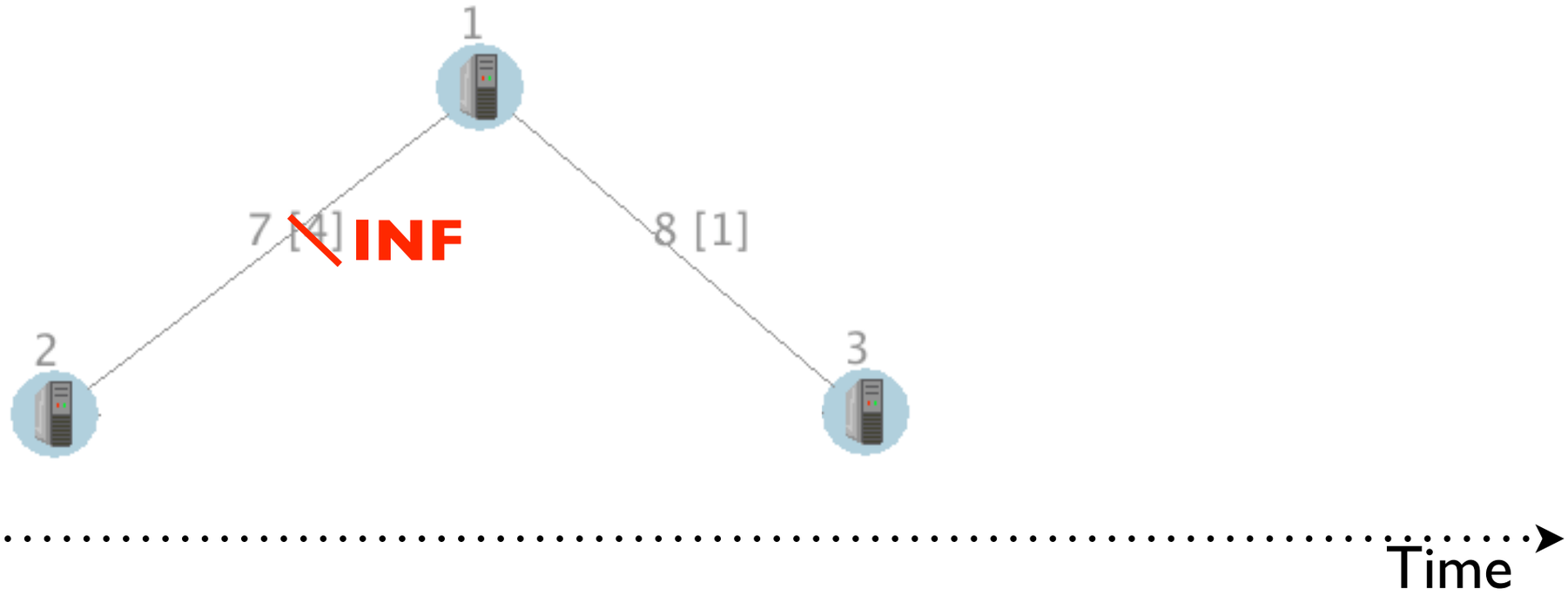

- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| 4 | 1 |

# Bad news (count to infinity)



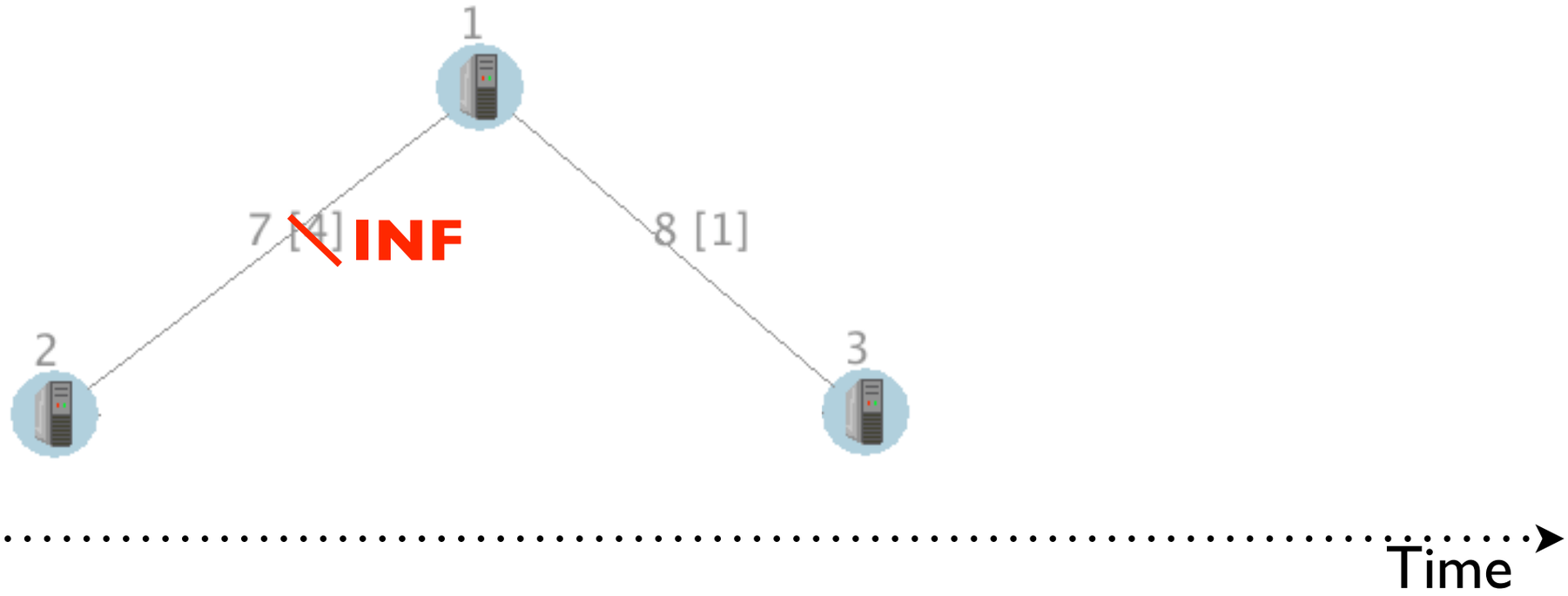

- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~4~~ 6 | 1 |

# Bad news (count to infinity)




- Node 3

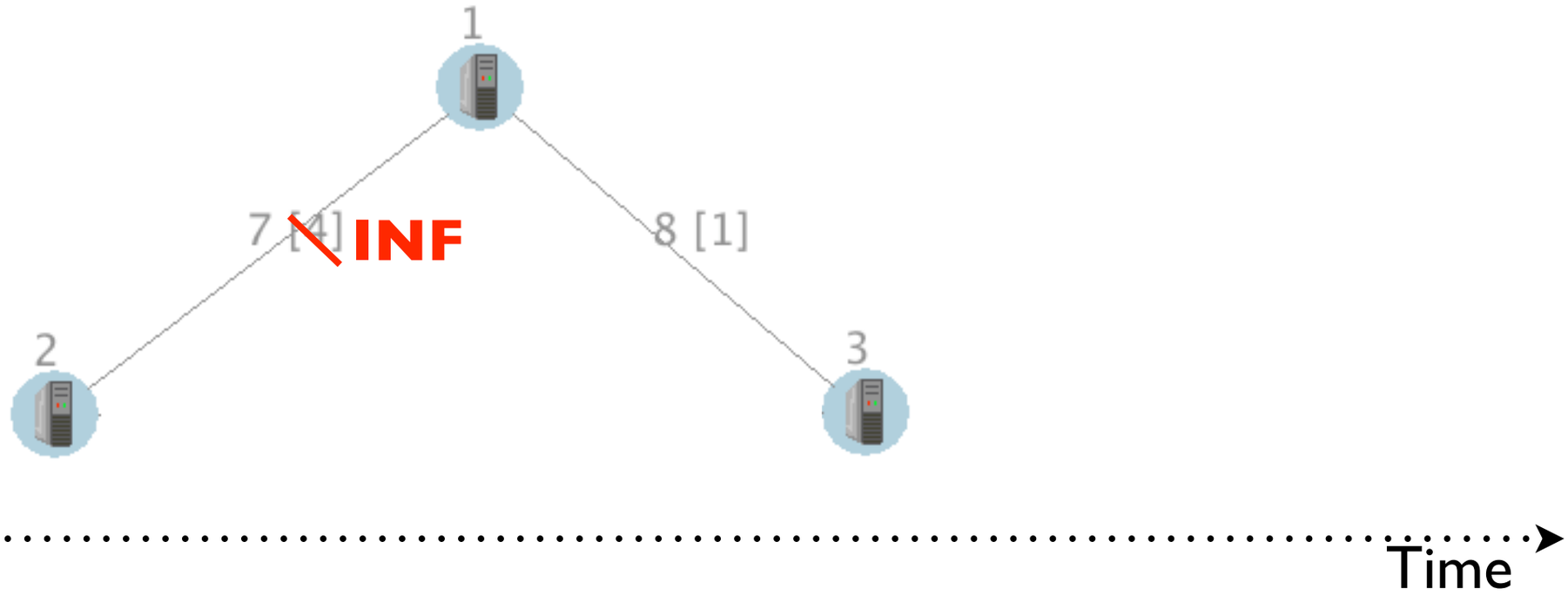
| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | ~~5~~ 7 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~4~~ 6 | 1 |

# Bad news (count to infinity)




- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

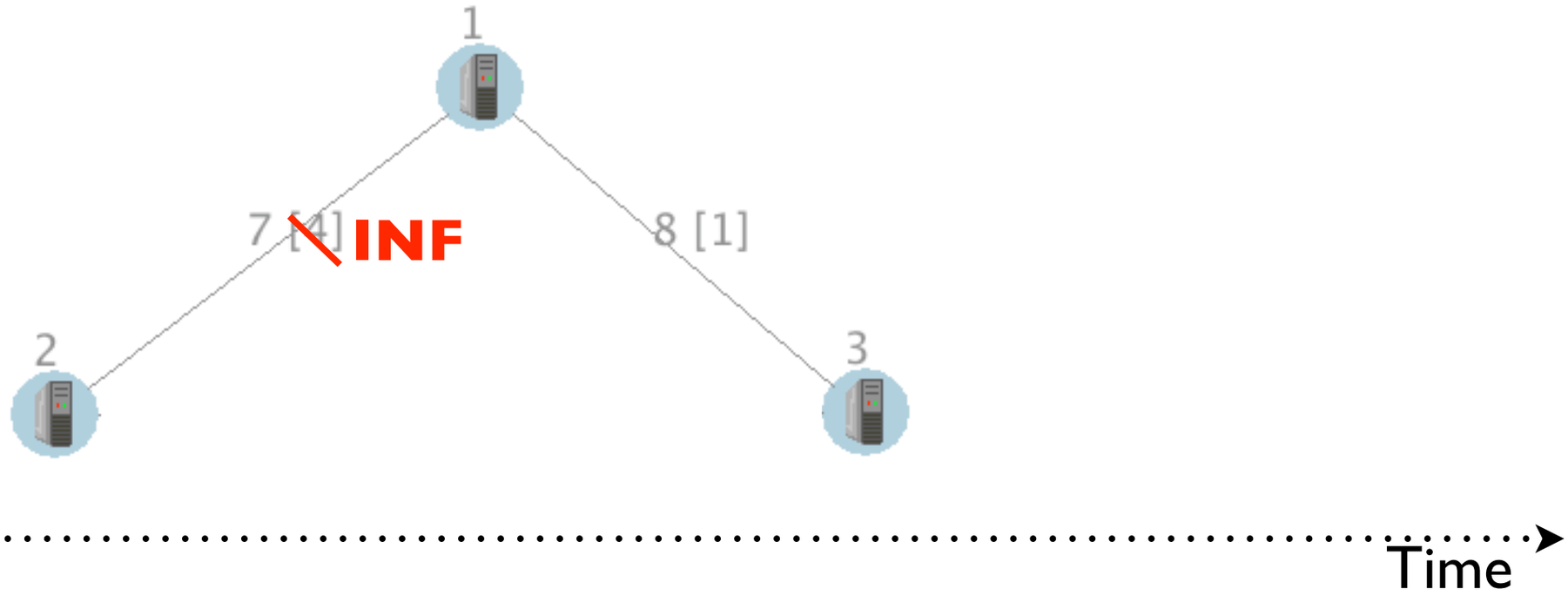
| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | ~~5~~ 7 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~4~~ 6 | 1 |

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~6~~ 8 | 1 |

# Bad news (count to infinity)




- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | ~~5~~ 7 |

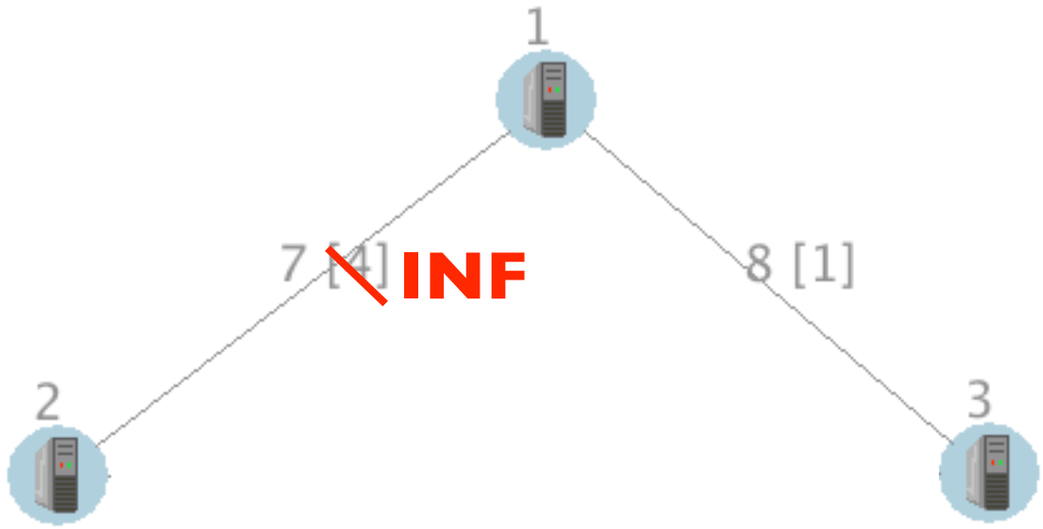
| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | ~~7~~ 9 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~4~~ 6 | 1 |

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~6~~ 8 | 1 |

# Bad news (count to infinity)




Time

- Node 3

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | 5 |

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | ~~5~~ 7 |

| Cost from 3 to | |
|---|---|
| 1 | 2 |
| 1 | ~~7~~ 9 |

- Node 1

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~4~~ 6 | 1 |

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~6~~ 8 | 1 |

| Cost from 1 to | |
|---|---|
| 2 | 3 |
| ~~8~~ 10 | 1 |

# RIP enhancements

- Split Horizon (mandatory)
  - Don’t announce route to neighbor from which route learned
- Split Horizon with Poisoned Reverse (optional)
  - instead tell him the route is not reachable
- Triggered updates (mandatory)
  - If the cost of an entry of the routing table changes a partial update is issued right away

# Worksheet 3

- Use same VLANs topology like in Question 1 Work Sheet 2
- Target: logical networks communicate using RIP
  - Plus additional 10.20.30.0/24 networks announced by loadgen102-xxx (preconfigured)
- Readings:
  - Cisco RIP
  - Juniper RIP
  - RFC 2453
  - man iptables