Route Flapping Effects on OSPF

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Summary

- How OSPF with excessive route flaps behaves ?
- Finding:
  - OSPF is not efficient when a route flaps excessively
  - One of the causes is the fixed-timer limits
    - MinLSInterval and MinLSArrival
  - Resulting in a few seconds loss of connectivity
- Flap damping technology can solve such problems

Motivation

- How quick can OSPF protocol calculate a route ?
- Millisecond convergence
  - transient loops occur during convergence
  - convergence time should be kept as small as possible
- What problems would occur ?
  - route/link flapping

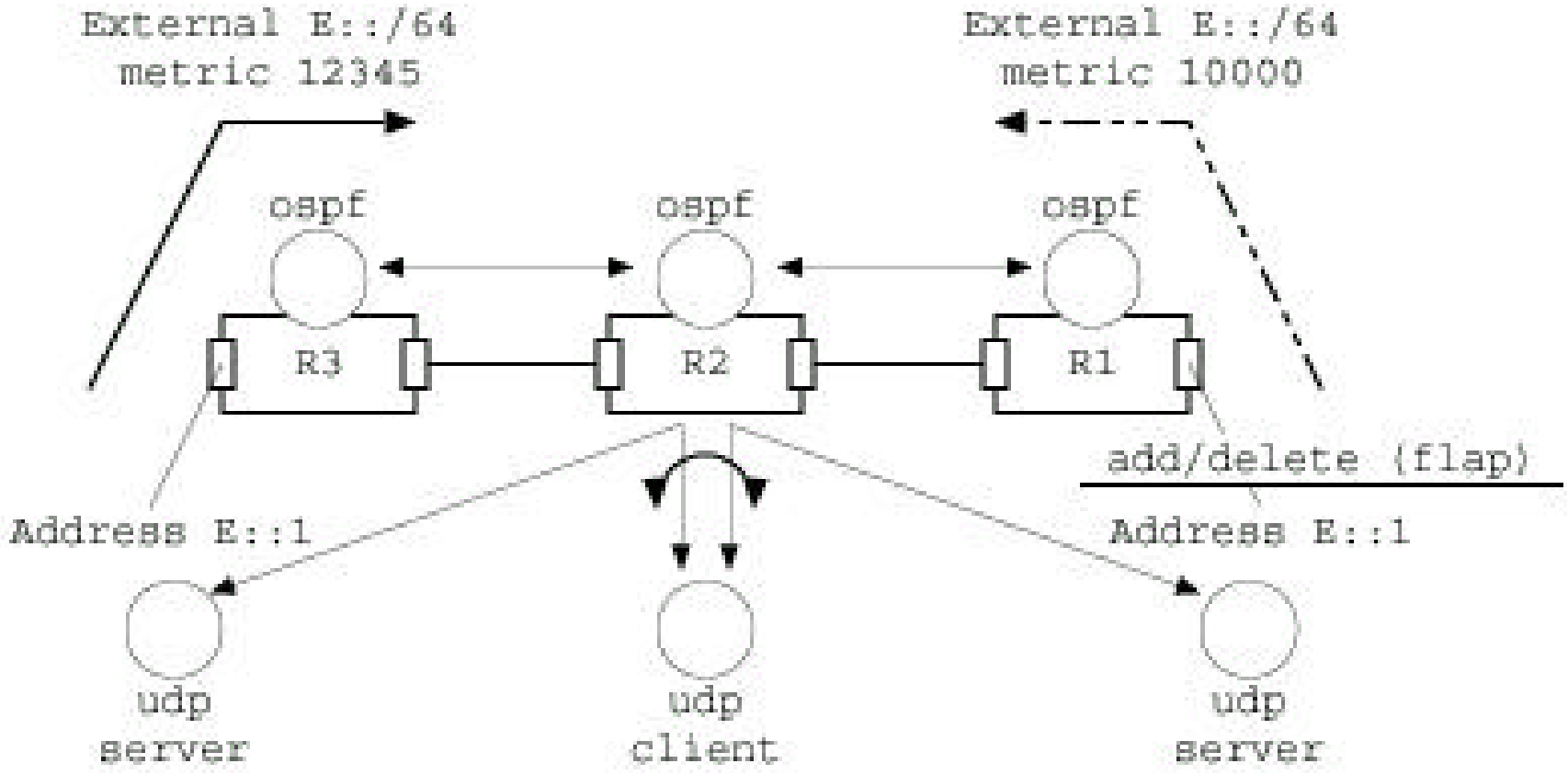
Examin through an experiment

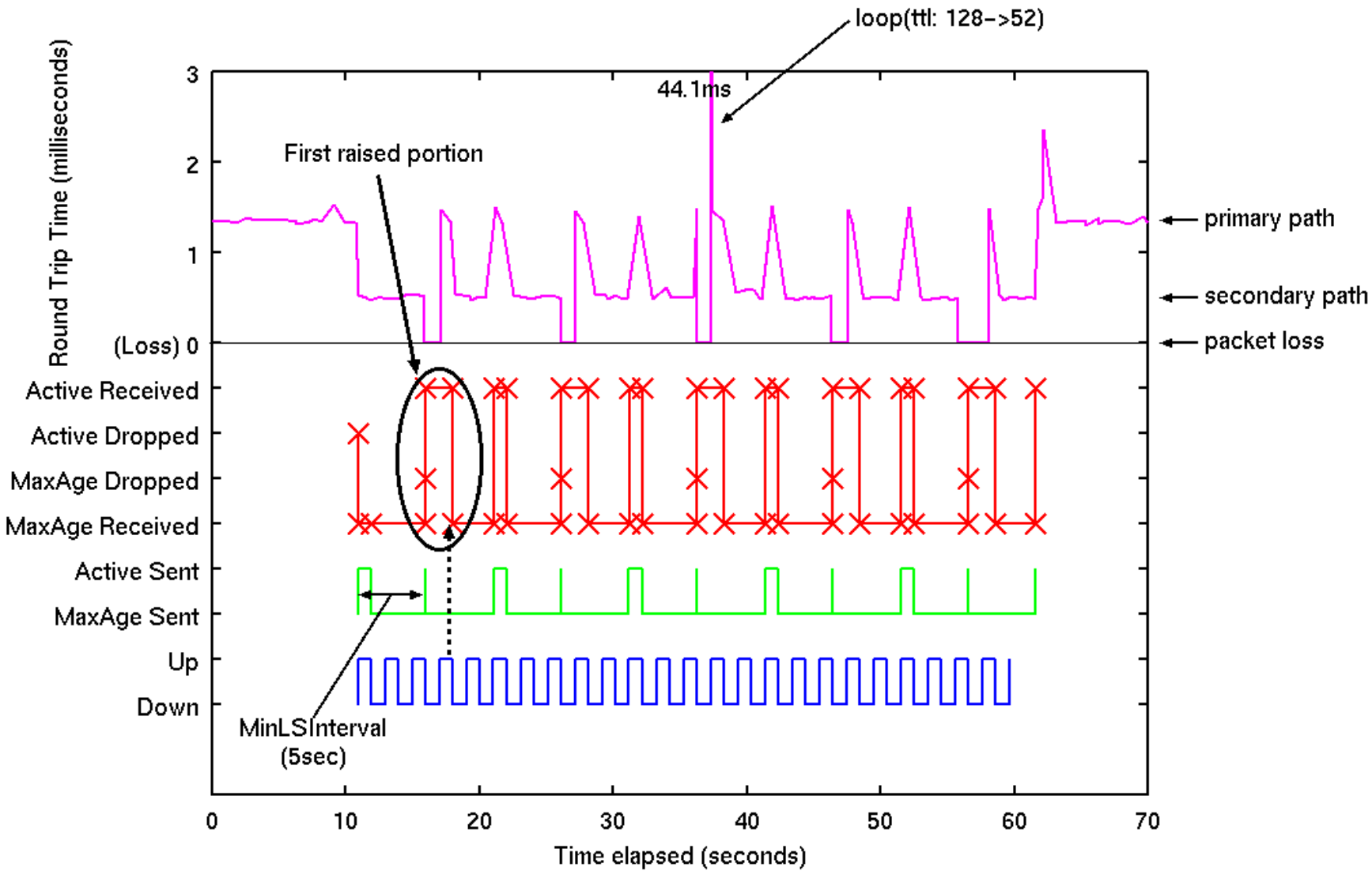
- An Experiment to find OSPF behavior when a route is updated at excessive-rate
  - excessive-rate = less than a few seconds
  - How route flappings effect on IP reachability ?

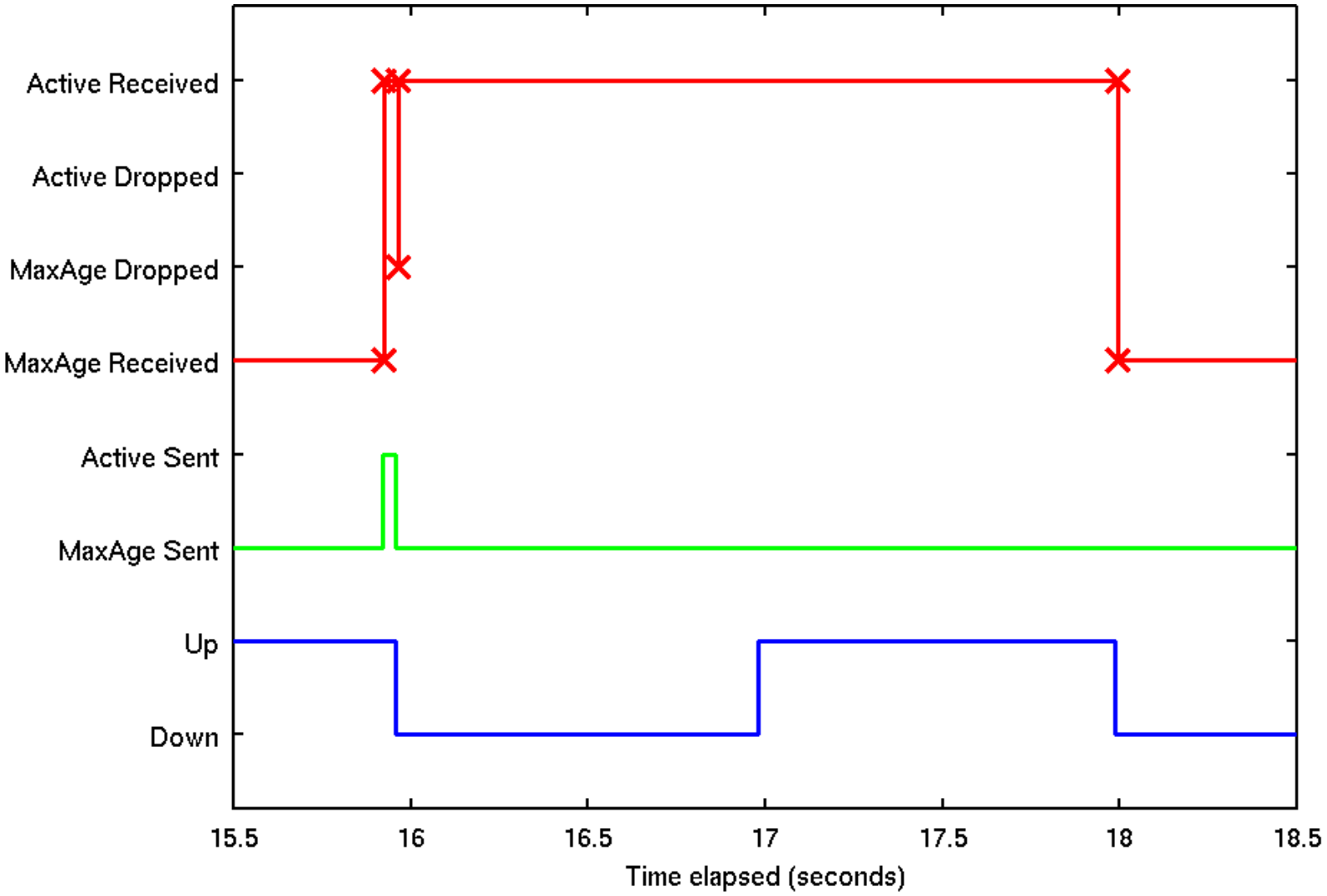
Assumption

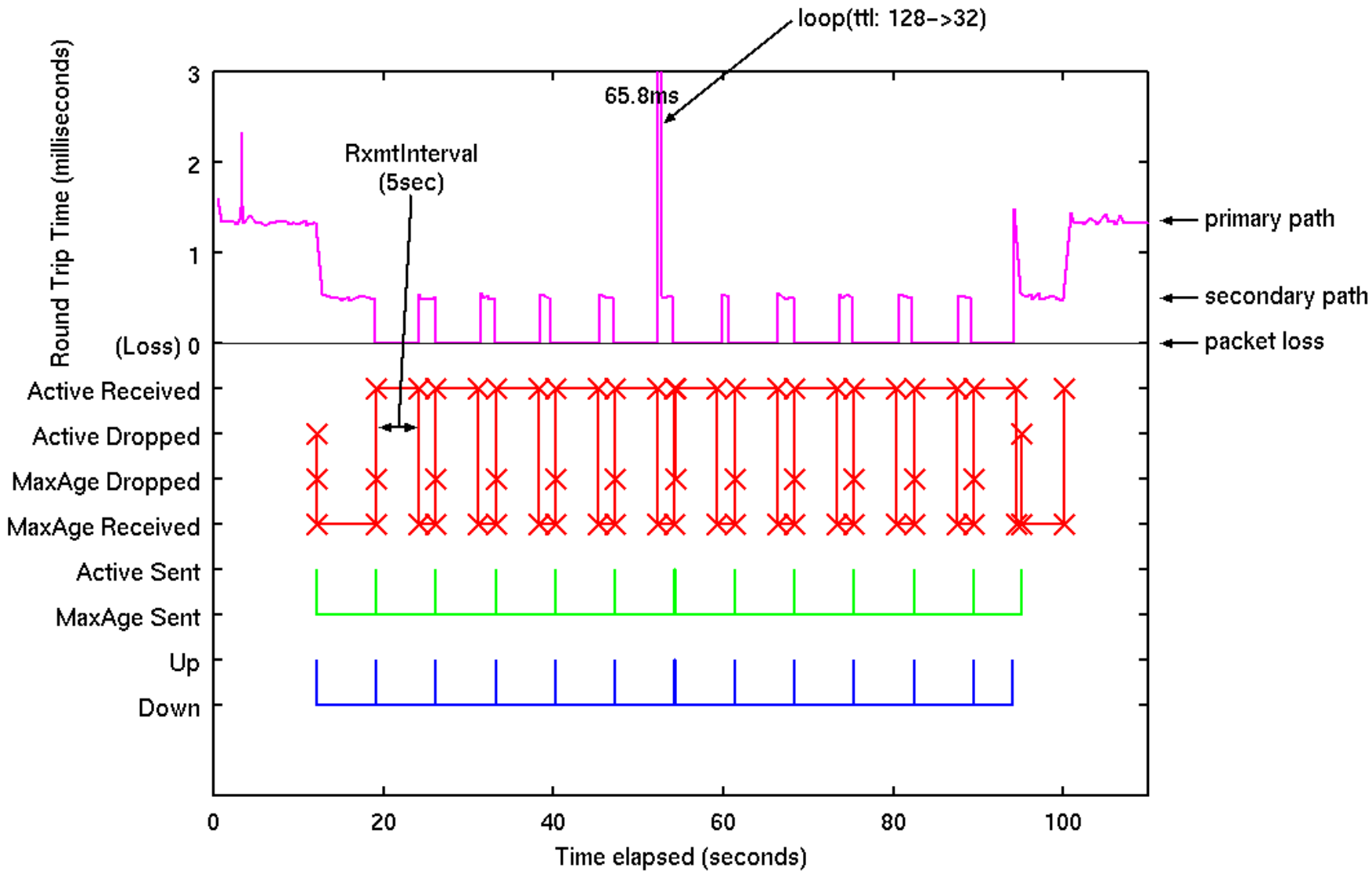
- There should be multiple paths to the destination
- originating LSA is involved
  - redistributing other protocol's route
  - link up-down of the connected link(s)

Network Configuration



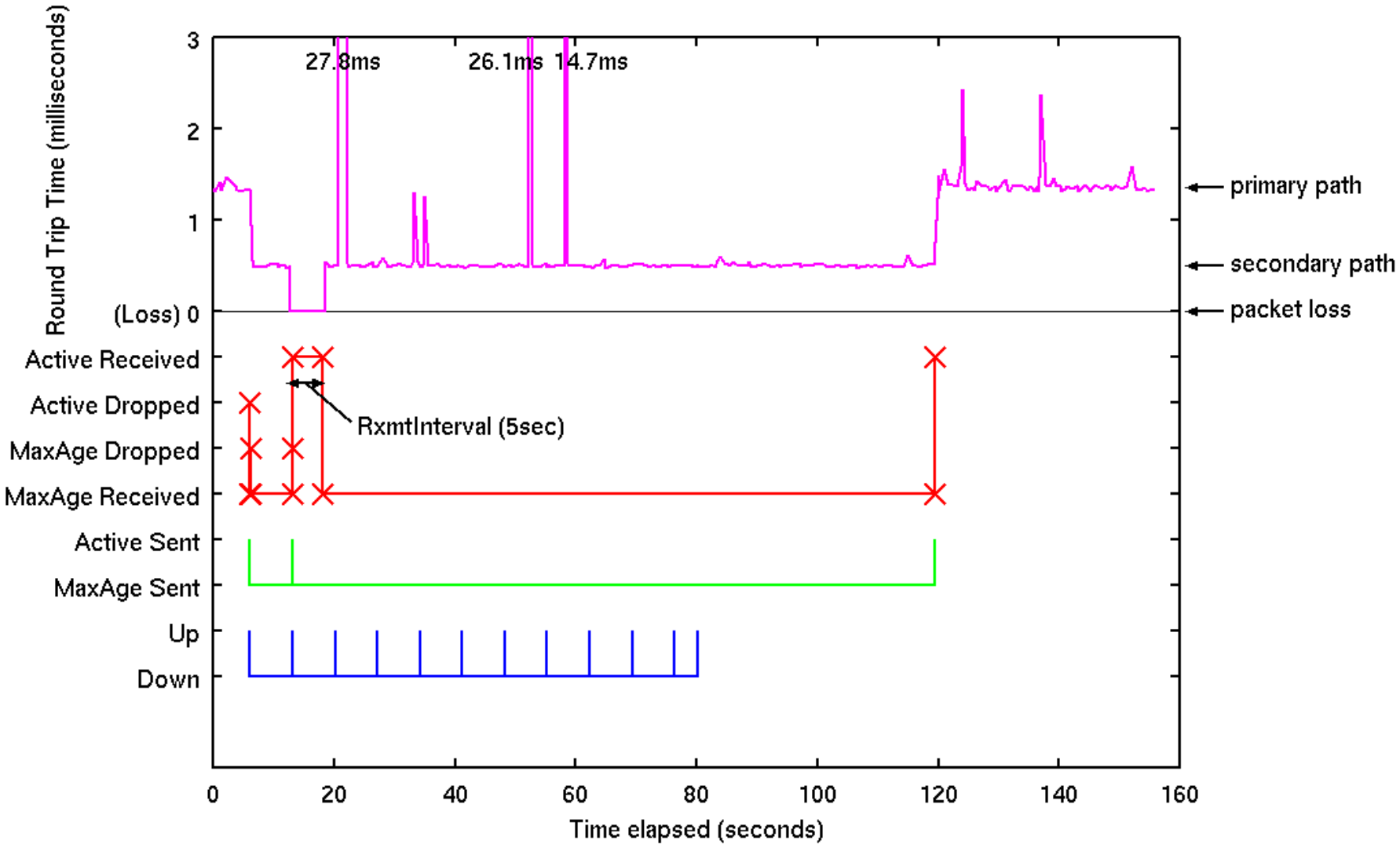

loop(ttl: 128->52)
44.1ms
First raised portion
Round Trip Time (milliseconds)
3
2
1
(Loss) 0
primary path
secondary path
packet loss
Active Received
Active Dropped
MaxAge Dropped
MaxAge Received
Active Sent
MaxAge Sent
Up
Down
MinLSInterval
(5sec)
0
10
20
30
40
50
60
70
Time elapsed (seconds)

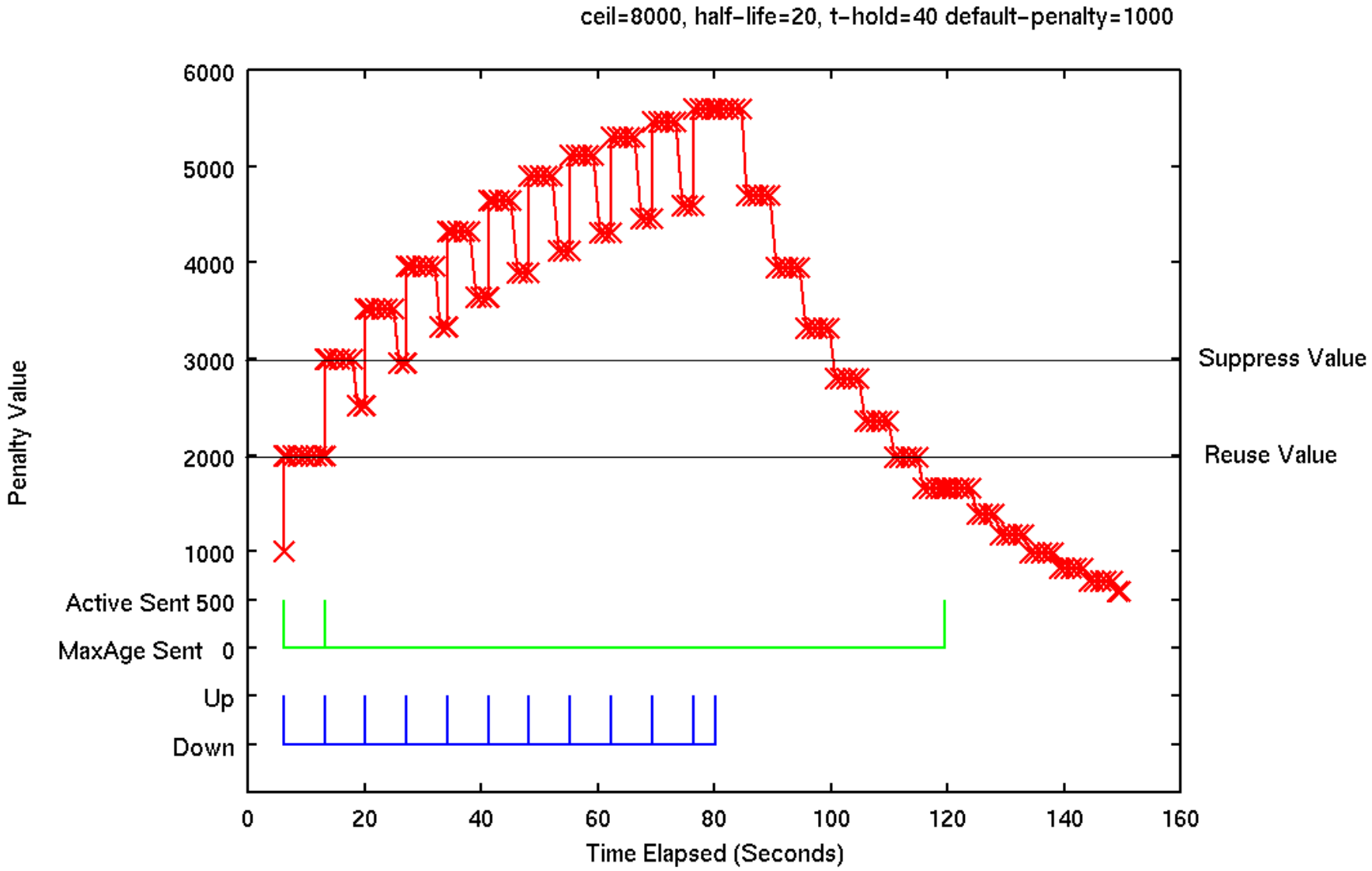

Active Received
Active Dropped
MaxAge Dropped
MaxAge Received
Active Sent
MaxAge Sent
Up
Down
15.5
16
16.5
17
17.5
18
18.5
Time elapsed (seconds)


loop(ttl: 128->32)
65.8ms
RxmtInterval
(5sec)
Round Trip Time (milliseconds)
3
2
1
(Loss) 0
primary path
secondary path
packet loss
Active Received
Active Dropped
MaxAge Dropped
MaxAge Received
Active Sent
MaxAge Sent
Up
Down
0
20
40
60
80
100
Time elapsed (seconds)

Route flap damping

- BGP’s route flap damping algorithm
  - calculate penalty for each routes
  - penalty increases by fixed value when a flap occurs
  - peanlty decreases by expenential while the route is stable
  - suppress value and reuse value decides whether the route will be advertised


Round Trip Time (milliseconds)
3
2
1
(Loss) 0
27.8ms
26.1ms
14.7ms
primary path
secondary path
packet loss
Active Received
Active Dropped
MaxAge Dropped
MaxAge Received
RxmtInterval (5sec)
Active Sent
MaxAge Sent
Up
Down
0
20
40
60
80
100
120
140
160
Time elapsed (seconds)


ceil=8000, half-life=20, t-hold=40 default-penalty=1000
Penalty Value
6000
5000
4000
3000
2000
1000
Active Sent 500
MaxAge Sent 0
Up
Down
Suppress Value
Reuse Value
0
20
40
60
80
100
120
140
160
Time Elapsed (Seconds)

Conclusion

- Behavior of OSPF with route flaps is illustrated
  - flaps can disrupt communication environment due to OSPF fixed-timer limits
  - fixed timer limits are undesireble in production network
- Route flap damping can considerably improve such environment

Future work

- Link flap damping
  - links also may flap
  - a work on IS-IS has been done (at nanog)
  - issues
    - can “traffic/routing thrashing” be avoided ?
    - flaps can be damped only at LSA origination point

References

- J. Moy “OSPF Version 2”, RFC2328
- R. Coltun, D. Ferguson, J. Moy “OSPF for IPv6”, RFC2740
- C. Villamizar, R. Chandra, R. Govindan “BGP Route Flap Damping”, RFC2439
- C. Alaettinoglu, S, Casner “Detailed Analysis of IS-IS Routing Protocol on the Qwest Backbone”, nanog presentation

Introduction

- Routes (sometimes) flap
  - Due to other protocol's flaps and link flaps
  - Flaps may trigger routing recalculation, resulting in transient loops during convergence
- Link-state routing protocols
  - most commonly used inside AS
  - said to be inefficient just because of CPU intensive SPF calculation