
TeliaSonera

Operator Experience from ISIS Convergence Tuning

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RIPE 47

Agenda

- Background
- Monitoring Routing
- Tuning Convergence
- Impact on Network
- Conclusions

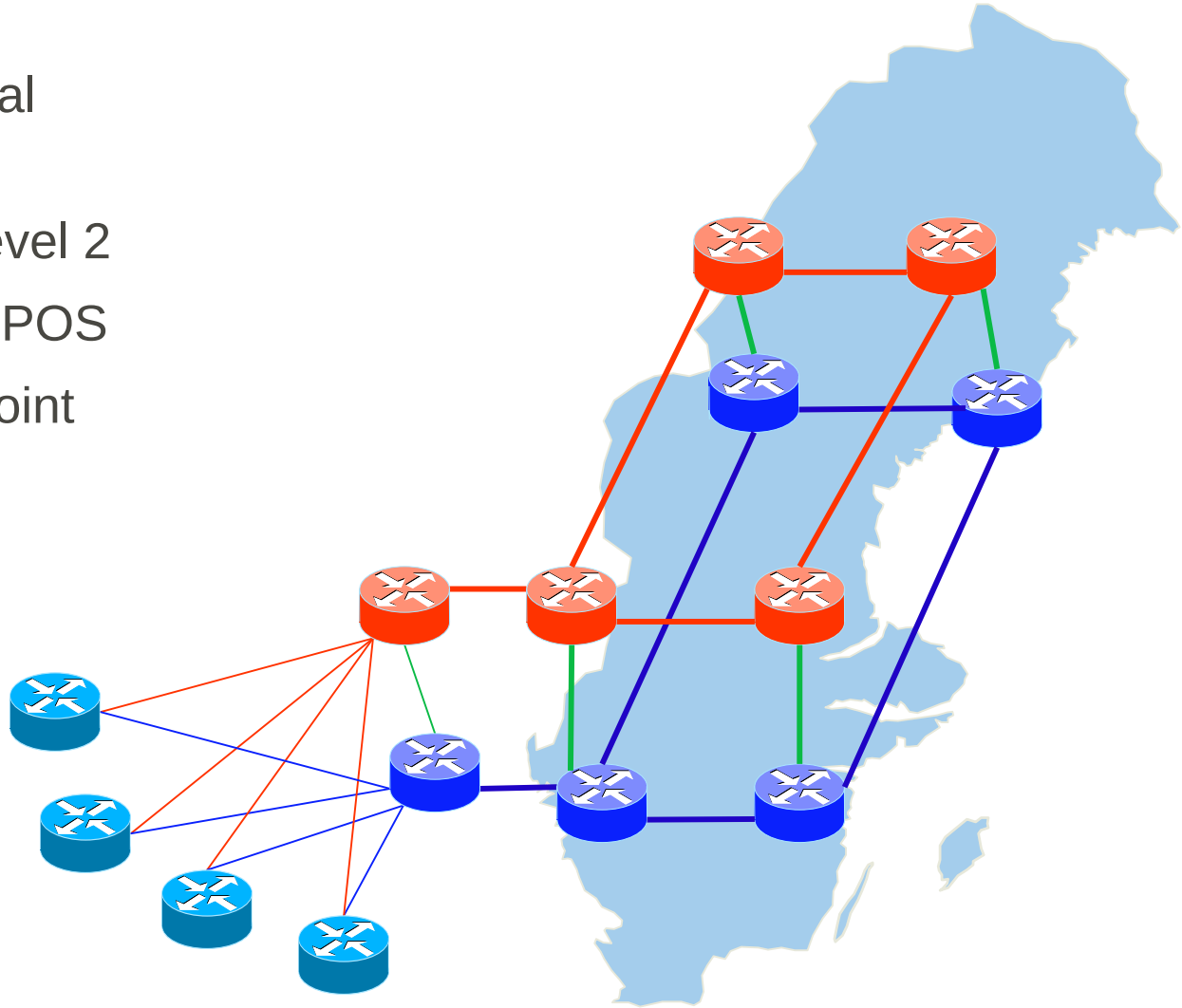
Background – Motivation

- Fast convergence expected requirement for new IP based services.
- MPLS Fast Reroute
- Towards Milli-Second IGP Convergence
  - <draft-alaettinoglu-ISIS-convergence-00>

Goal of sub-second convergence was set.

Background – The Network

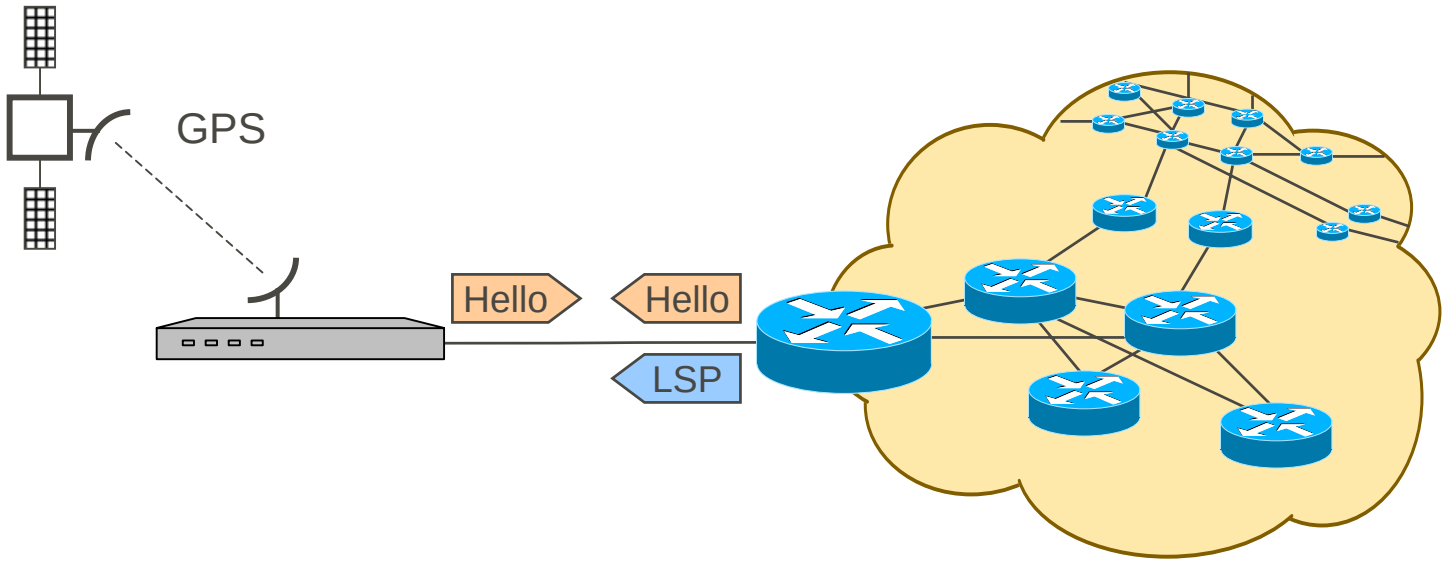
- Classical hierarchical redundant network
- All routers in ISIS level 2
- Inter-POP links are POS
- Links are point-to-point
- Cisco routers



Network Measurements – Tools

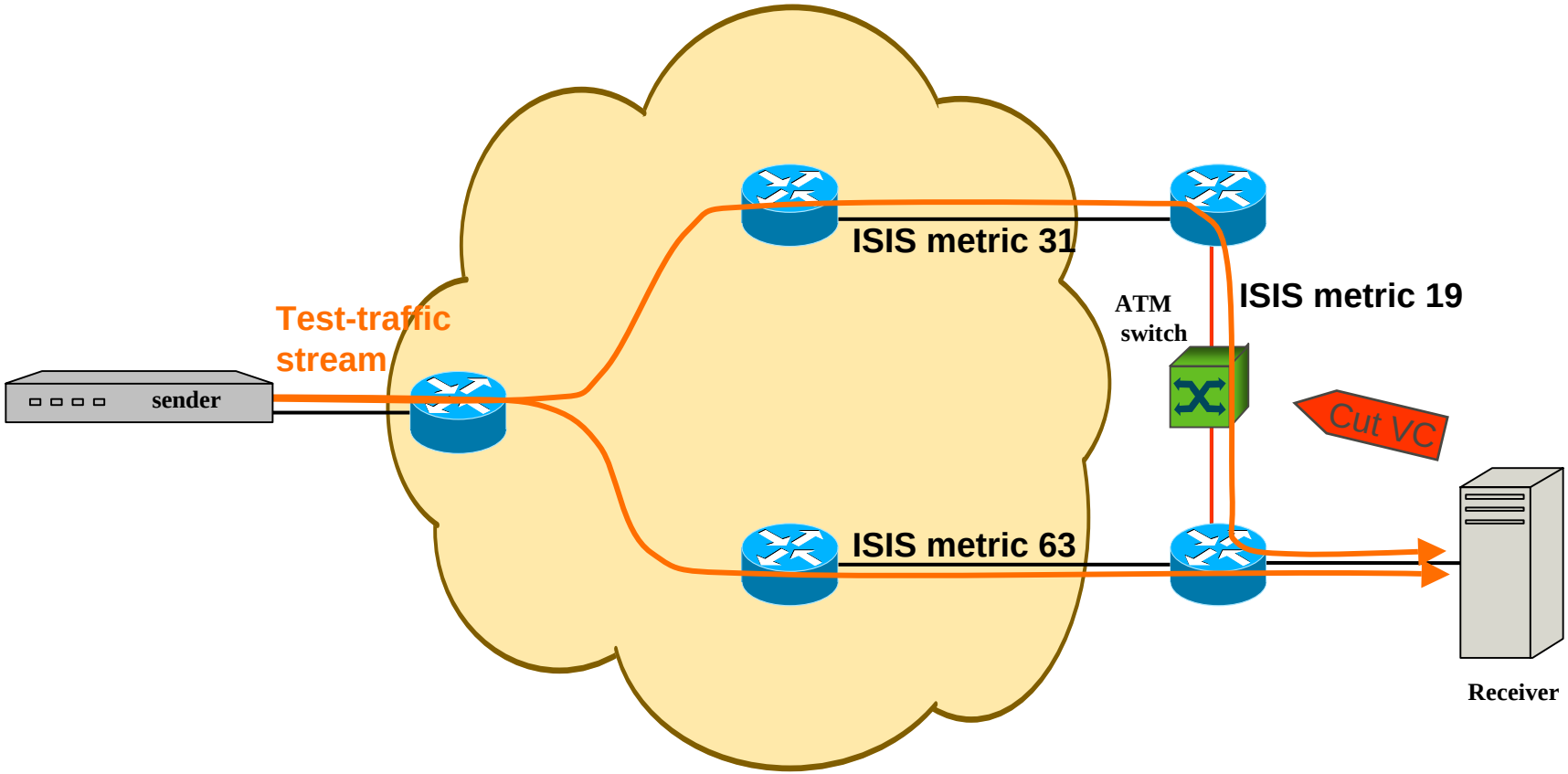
- To understand the protocol behaviour
  - Analysis through database queries (developed in-house)
- To monitor network (especially during change)
  - Weekly reports (developed in-house)
  - Network map (Packet Design – Route Explorer)
  - SNMP traps (Packet Design – Route Explorer)

Network Measurements – LSP logging



- The collection host ”behaves” like a router.
- It receives LSPs from neighbour, timestamps them and stores them.
- The data is transferred to a server where it is inserted into a database for analysis.

Network Measurements – Convergence



Tuning Convergence – What have we done?

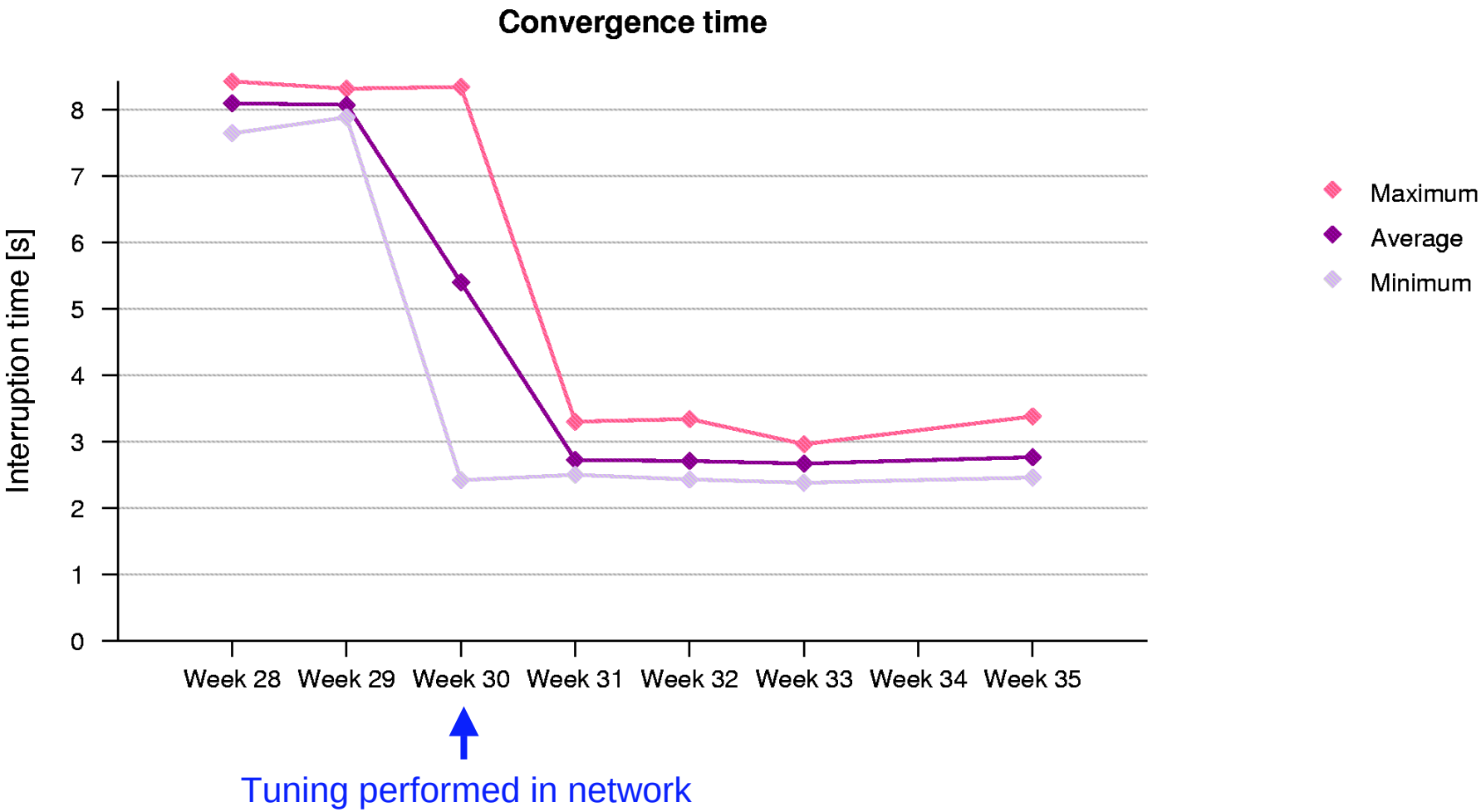
Tuning administrative delays give most impact. In IOS exponential back-off allows us to tune administrative delays at low risk of jeopardising network stability.

- July 2003: global parameters
  - LSP generation
  - SPF delay
  - fast flooding
  - LSP lifetime and refresh intervals
- December 2003: interface specific
  - carrier delay

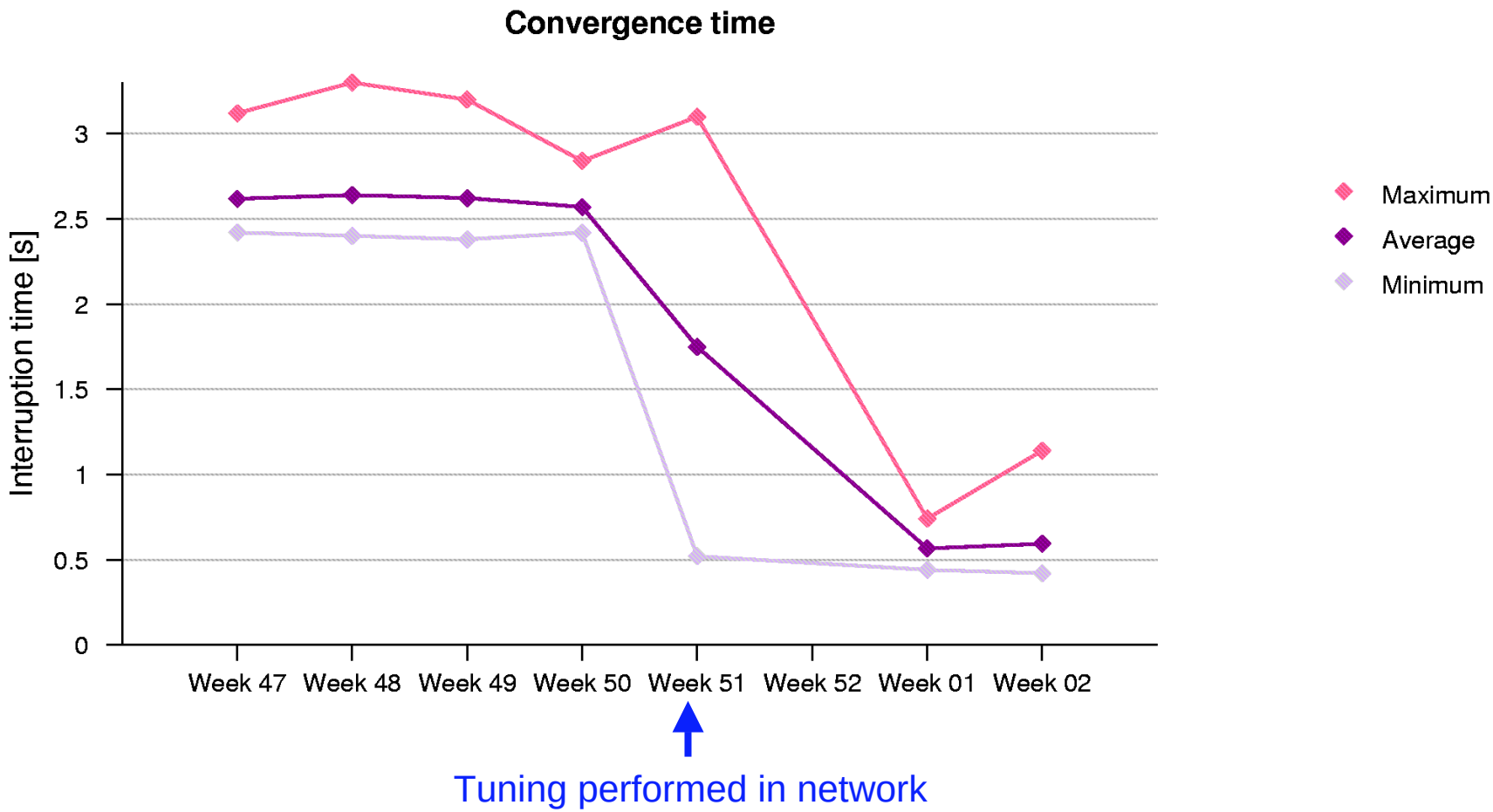
Tuning Convergence - Expected impact

- ~5 s due to decreased SPF delay.
- ~2 s due to decreased carrier delay.
- Flooding might be affected to some degree.
  - Slower due to higher risk for competition for CPU time?
  - Faster due to “ip fast-convergence”.

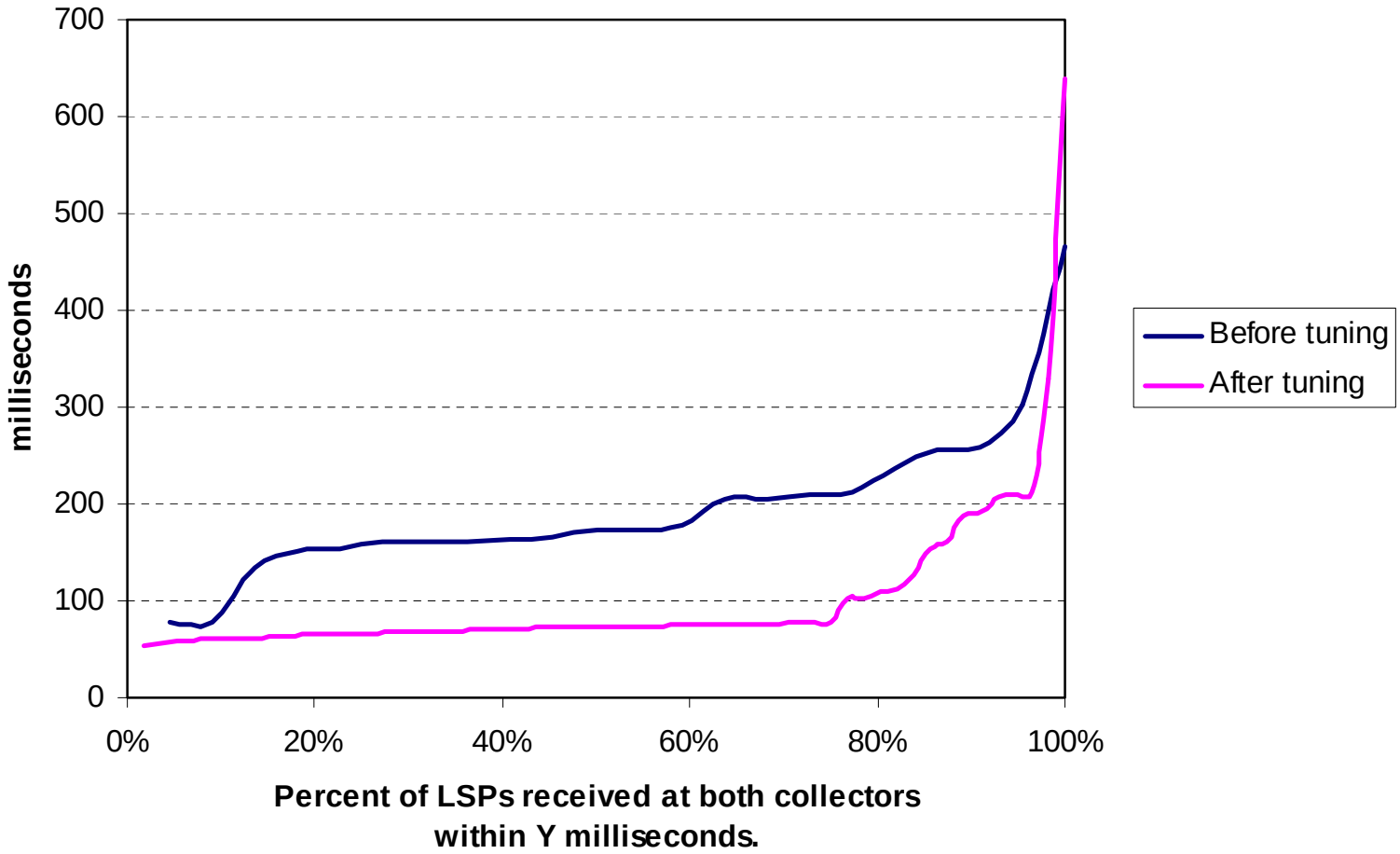
Tuning Convergence – Step 1



Tuning Convergence – Step 2



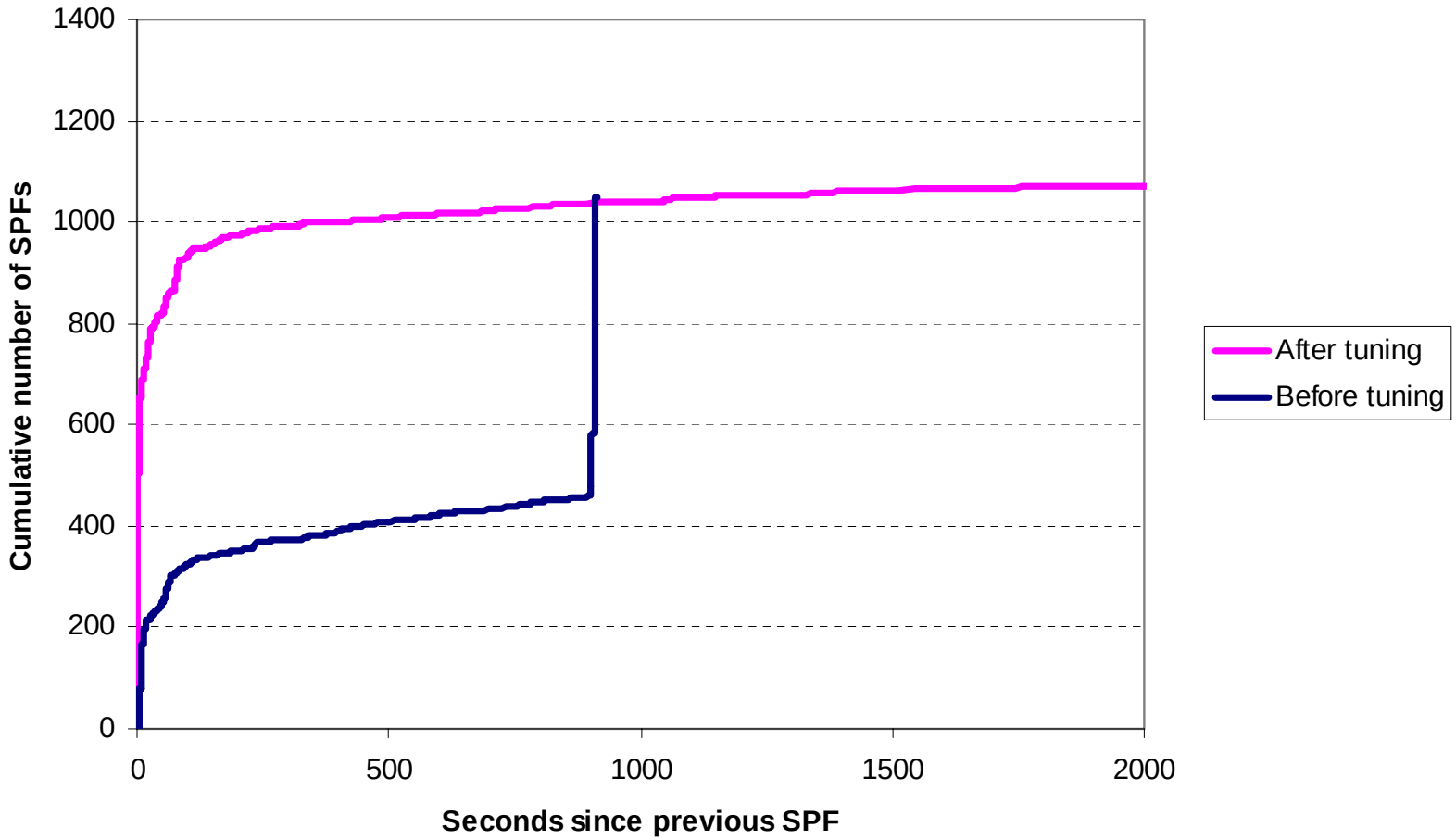
Tuning Convergence – Effect on flooding



Impact on Network – SPFs

- Average number of SPFs at the same level.
- SPFs come closer together.
  - About 35-40% of SPFs performed within 1 second of last SPF (4 weeks after tuning).
- Exponential back-off keeps load of SPFs under control.

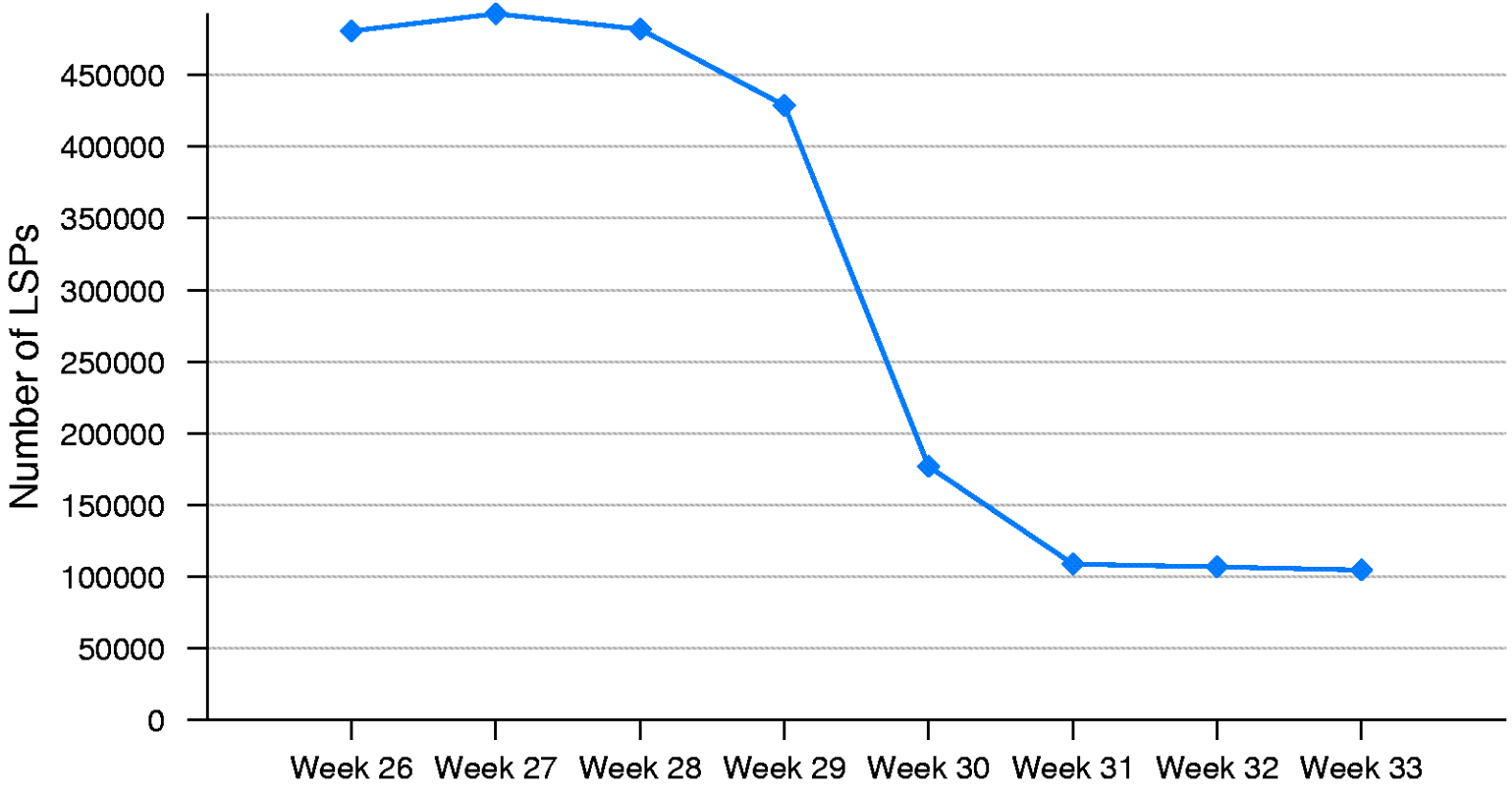
Impact on Network – Time between SPFs



Impact on Network – LSPs

- Total number of LSPs decreased due to longer LSP lifetime and refresh interval.
- Load from LSP generation and flooding very low.
- Exponential back-off for LSP generation.

Impact on Network – Number of LSPs



Conclusions

- Sub-second convergence achieved!
  - Reduced SPF delay 5 seconds
  - Reduced carrier delay 2 seconds
- Stability maintained through use of Cisco specific mechanisms.
- <100 ms convergence requires other methods.
  - IGP-extensions
  - MPLS fast reroute
- IGP is good a source for monitoring network.

Links

IGP Fast Convergence ISIS Case Study – Clarence Filsfils, RIPE 41

http://www.ripe.net/ripe/meetings/archive/ripe-41/presentations/eof-isis/sld001.html

Towards Milli-Second IGP Convergence

http://www.packetdesign.com/news/industry-publications/drafts/convergence.pdf

Packet Design - Route Explorer

http://www.packetdesign.com