Internet on FIRE (IoF)

GOALS

Experiment at scale with BGP Timers (MRAI)

BGP is the only inter-AS routing protocol of the Internet

Its convergence can be very slow ... **minutes!!**

Improve BGP convergence by proper MRAI setting

CHALLENGES

MRAI is a timer that prevents **signaling storms**, normally set at 30s

Its modification (reduction and /or dynamic configuration) can lead to instabilities

Find sound settings for MRAI to improve convergence and reduce signaling overhead based on a custom centrality metric: Destination Partial Centrality (DPC)

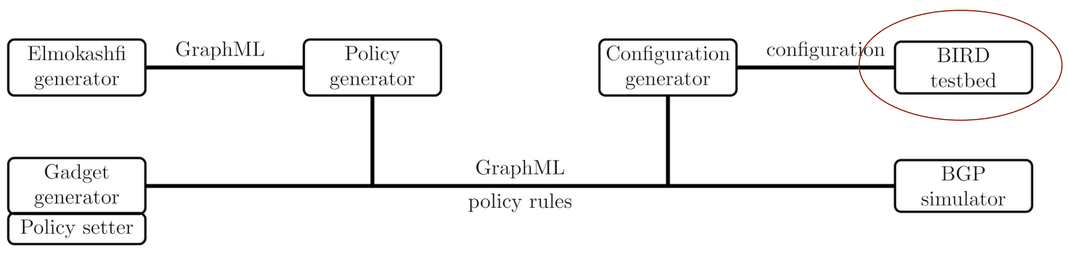
EXPERIMENT SETUP

Modular experiment environment

Topology generation + Real World Open Source Software (BIRD) + Wall1 and Wall2 Test Beds

Bird instances run on several nodes exploring Internet-like AS topologies of up to 20000 nodes

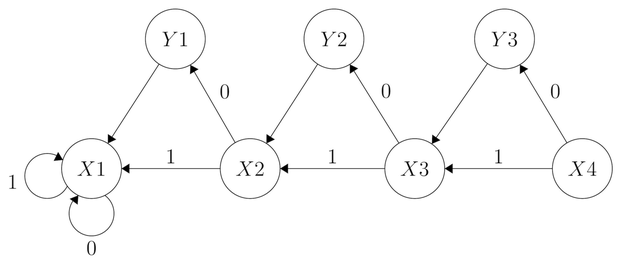
A route change triggers reconfiguration: measure convergence time and message overhead



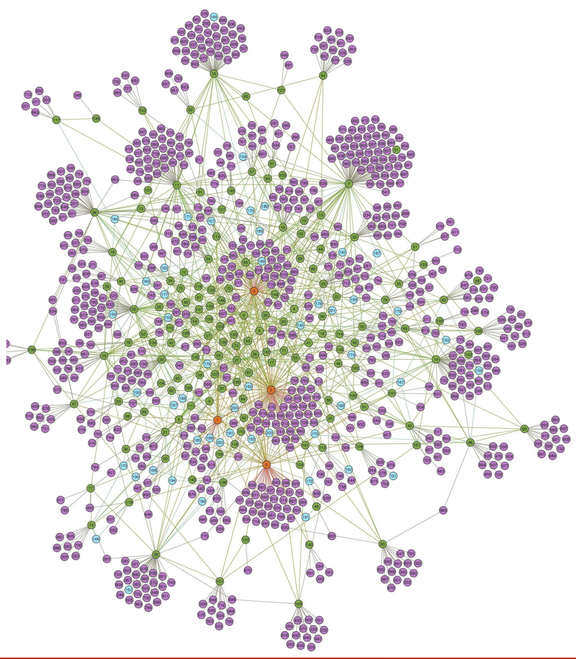
EXPERIMENTAL TOPOLOGIES

Two different topology scenarios

A) "gadgets" where instabilities (route flapping) are known to arise



B) Large internet-like topologies: realistic working conditions (up to 20.000 AS)



CONVERGENCE TIME AND SIGNALING OVERHEAD

A) "gadget" topology 17 nodes

1 – Unstable MRAI setting (high overhead)

2 – Standard MRAI (slow)

3 – DPC-based MRAI

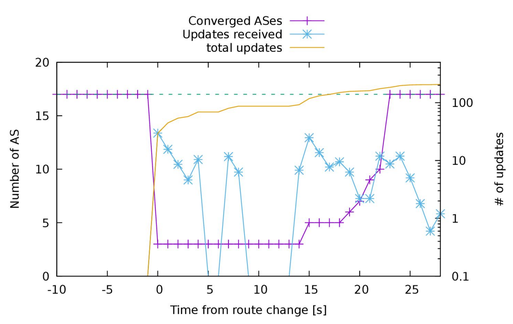
B) 4000 nodes Internet-like

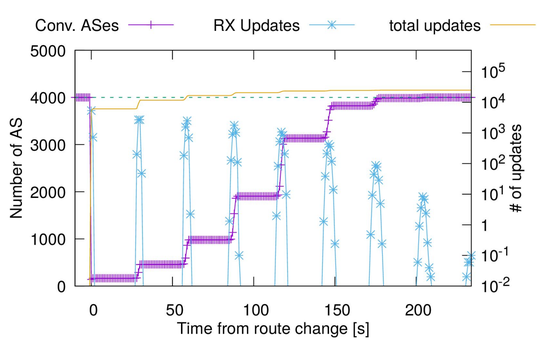
1 – Standard MRAI (slow)

2 – DPC (fast)

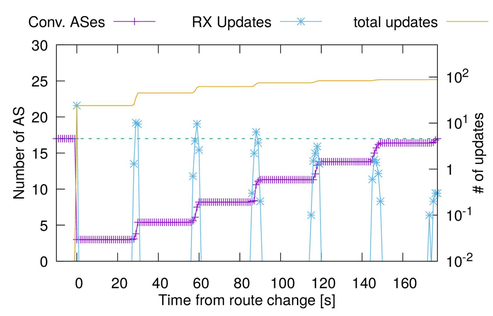
3 - Good trade-off (overhead increase)/(convergence speed-up)

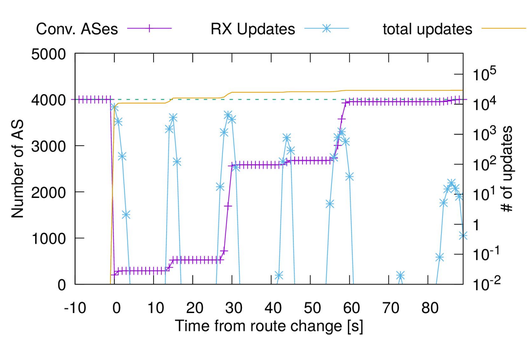
1



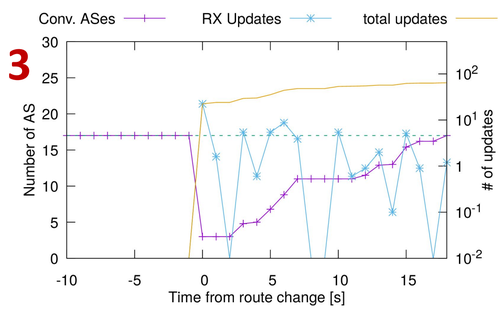


2





3



3

	Strategy	mean	
updates	Fabrikant		
	No MRAI	24806	+16%
	30 s		
	DPC	29044	
conv. (s)	Fabrikant		
	No MRAI	184.6	-62%
	30 s		
	DPC	70.86	

CONCLUSIONS

Fed4FIRE+ Testbeds are fundamental to run modified BGP daemon (Bird) on realistic topologies

MRAI settings are critical for improved stability and convergence of the Internet upon route changes (happens every second!)

Results **show for the first time how to improve BGP convergence "at scale". We tested up to 20.000 emulated BIRD instances.**

Software and experimental setup available for the community to explore other solutions: https://iof.disi.unitn.it/software.html

FOLLOW UP

Keep running experiments to scale even more.

Make the first Internet-scale assessment of MRAI impact on BGP.

Improve DPC-based MRAI settings.

Present solid and robust MRAI strategies at RIPE and other operators gatherings

Contacts: Renato Lo Cigno: renato.locigno@unitn.it
Leonardo Maccari: leonardo.maccari@unive.it