



vrije Universiteit

amsterdam

Internet-scale BGP simulation (work in progress)

Maciek Wojciechowski, Benno Overeinder
Guillaume Pierre, Maarten van Steen

maciek@NLnetLabs.nl

NLnetLabs
Vrije Universiteit Amsterdam

Outline

- BGP research motivation
- Approach - emulation on a cluster
- Protocol abstraction level
- Some performance numbers
- What do we want from the audience...

Motivation

- Prefix table growth (more than 250k right now)
- AS number growth (more than 27k right now)
- Growing network interconnectivity
- BGP pathological behaviors

What-if?

- What if topology changes?
- What if AS number/prefix number grows?
- What is the impact of different policies on protocol behavior?
- How certain techniques (e.g. route flap damping) affect convergence?
- Better protocol understanding

Approach

- Don't simulate – emulate
- Start with simple solution and add things that we will consider important
- Scale the time
- Calibrate

Model

- Abstract protocol and network:
 - no physical network modeling
 - 1 AS -> 1 node
 - explicit prefix tables
 - standard BGP announce and withdraw messages
 - FIB updates and propagation according to policy
 - very much freedom for particular node behavior

Calibration

- We need to calibrate to be relevant
- Try to gather data from the Internet (network topology, announced prefixes, sent updates) and run our simulation upon them
- Calibration will not give us as good accuracy as event-driven simulation

Our software

- Written in Java with simulator clearly separated from BGP framework
- Uses network adjacencies from CAIDA
- Runs on homogeneous cluster
- Stores prefixes on hard drives
- Propagating prefixes obtained from BGP table

Performance

- About 500ms to fully propagate a new prefix
- About 2000 messages per minute
- Up to 15000 prefixes per minute
- 100GB of compressed storage for 250k prefixes

Directions

- Write easily extendable scenarios framework
- Try to gather as much real world data/scenarios and run the simulation upon them
- Main Task: validate the simulator and measure/observe/analyze BGP dynamic behavior

Collaboration

- We need data to validate the simulator (root causes, scenarios, ...)
- Ideas of things that can be simulated with such approach are welcome
- Contact us: {maciek,benno}@nlnetlabs.nl !

References

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