Building interdomain traffic engineering tools

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State-of-the-art

- **Large-scale event-driven simulators:**
  - SSFNet
  - JSim

- **Route prediction:**
  - CBGP
  - RCP
CBGP

• An efficient open-source BGP simulator written by Bruno Quoitin

  • http://cbgp.info.ucl.ac.be

• Key features

  • allows to model large network topologies
  • allows to reproduce BGP routing policies such as
    • import and export filters, communities,...
  • Perl and Python interfaces for interacting with CBGP

• Part of the TOTEM TE toolbox
  (http://totem.info.ucl.ac.be)
CBGP config example

# Setup BGP in router 0.1.0.0
bgp add router 1 0.1.0.0
bgp router 0.1.0.0
add network 0.1/16
add peer 2 0.2.0.0
peer 0.2.0.0 up

# Setup BGP in router 0.2.0.0
bgp add router 2 0.2.0.0
bgp router 0.2.0.0
add peer 1 0.1.0.0
peer 0.1.0.0 next-hop-self
add peer 2 0.2.0.2
peer 0.1.0.0 up
peer 0.2.0.0 up

# Setup BGP in router 0.2.0.2
bgp add router 2 0.2.0.2
bgp router 0.2.0.2
add peer 2 0.2.0.0
peer 0.2.0.0 up
TE over CBGP (1)

- TE tool collects
  - IGP information for topology (e.g. pyrt)
  - BGP routes (e.g. zebra)
  - Traffic statistics (e.g. netflow)

- TE tool
  - changes IGP weights inside CBGP
  - injects eBGP update messages inside CBGP
  - keeps traffic info up to date
TE over CBGP (2)

Based on traffic engineering objectives, TE tool determines the BGP route to be advertised to each border router via iBGP

- by sending different BGP UPDATEs for each important prefix to each ingress routers, TE tool can influence the flow of the IP traffic
- ingress routers send transit traffic inside tunnels (MPLS, GRE, ...) to egress routers or TE tool ensures consistency in IP forwarding if no tunnels are used
CBGP case studies

- Tweaking iBGP to limit impact of peering failure on traffic matrix
- Assessing impact of internal link and router failures on best route choice inside the AS
- Optimizing (on-line) a cost function defined on outbound traffic of a stub AS
- Computation of interdomain MPLS LSPs in PCE's
Purpose of interdomain TE?

(for ISPs)

- reduce congestion
- reduce costs
- improve delays
- better load-balance traffic
- improve network robustness
- make TM more stable
- ...

Internet architectures WG, Cambridge (MA), 26/1/05
Open questions
(for ISPs)

- Is congestion on peering links important?
- Do we need online or offline TE solutions?
- Do we need to optimise for delay?
- Do we need to optimise for bandwidth?
- Is multipath routing useful?
- Do we need interdomain MPLS?
- Do we need new policies?
Open questions
(for ISPs)

- Do we need to quickly reroute in case of failures?
  If yes, how fast?
- Billing issues?
- What about interdomain QoS?
Relevance of interdomain TE

- Does someone really care about it? or is it just about research?
- Is interdomain TE aimed at providing solutions to operational problems or just architectural guidelines?
- Is interdomain TE relevant for interdomain architecture at all?