Internet Performance and Vulnerability

Lixin Gao

University of Massachusetts

Amherst, MA, USA

Data and Control Planes

- Control plane
  - Routing Protocols: IS-IS, OSPF, BGP, RIP,….
  - Control Messages: ICMP, ARP, RARP,…
- Data plane
  - Data traffic: TCP, UDP, ICMP,….
- No separation of data and control planes
  - No separate lane for police or rescue workers

Anomalies

- Loops: observed in both data and control planes
  - Backbone traffic, Hengartner et al. IMW 2002
  - end-to-end measurement, Paxon, TON 1999,
- Misconfigurations: Mahajan, SIGCOMM2002
- Large number of BGP updates:
  - Observed by Labovitz et al. TON 1997
  - Anomaly traffic: spread of worm, Cowie et al. 2002

NeX**tworking'03** *June 23-25,2003, Chania, Crete, Greece*
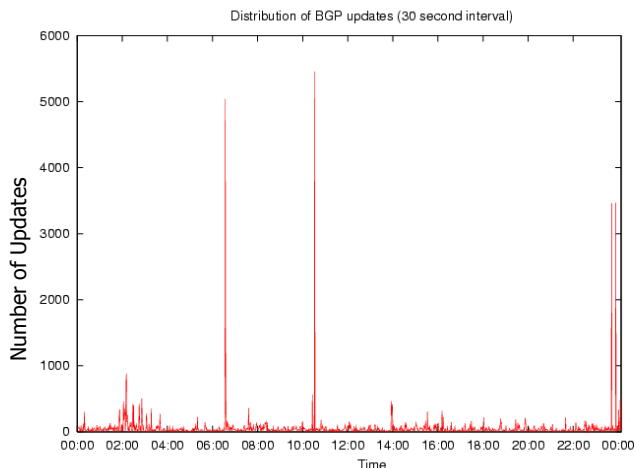*The First COST-IST(EU)-NSF(USA) Workshop on EXCHANGES & TRENDS IN NETWORKING* Gao

3

Potential Causes

- Human factors:
  - Interference
  - Misconfiguration: persistent route oscillation
- Protocol behavior:
  - convergence delay due to changes (policy, failure)
- Control plan failure: session reset
- Measurement artifact: Wang et al IMW 2002
- Interaction of data and control planes

NeX**tworking'03** *June 23-25,2003, Chania, Crete, Greece*
The First COST-IST(EU)-NSF(USA) Workshop on EXCHANGES & TRENDS IN NETWORKING Gao
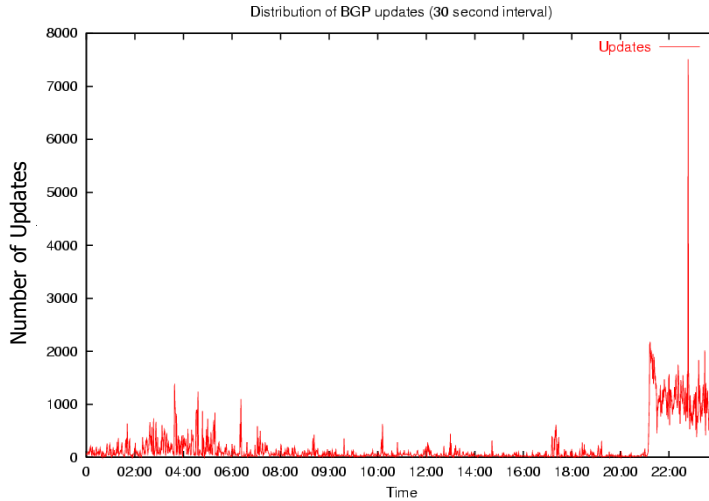
4

Interaction of Data and Control Planes

- Impact of updates on data performance
  - Data performance during convergence period
    - Pei et al. DSN 2003
  - Data performance with large number of updates
- Impact of data plane on control plane
  - Congestion leads to session reset:
    - Shaikh et al SIGCOMM 2000
  - Packet size, ….
- Potential cascading effect

BGP updates on Jan. 12, 2003
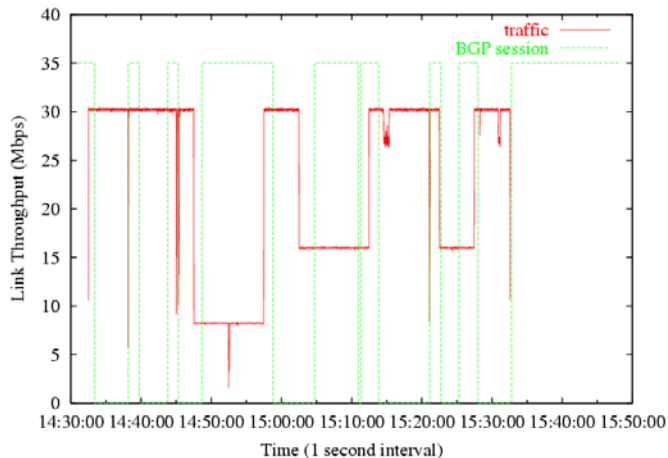
BGP Updates during Slammer Worm on Jan. 24, 2003

Distribution of BGP updates (30 second interval)

Impact of Data traffic on BGP Session

More Issues

- Impact of updates on data performance
  - Data performance during convergence period
    - loops, delay,…
  - Data performance with large number of updates
- Potential cascading effect

NeXtworking'03 *June 23-25,2003, Chania, Crete, Greece*
The First COST-IST(EU)-NSF(USA) Workshop on EXCHANGES & TRENDS IN NETWORKING Gao

9