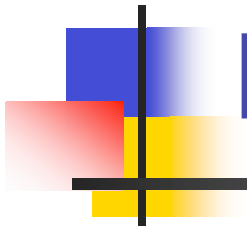
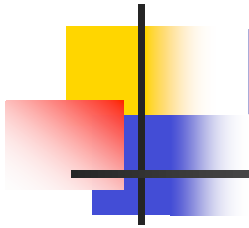


BGP Flap Damping

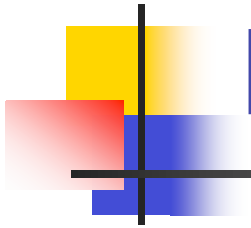
Where to now?

Philip Smith
APNIC 20, Hanoi



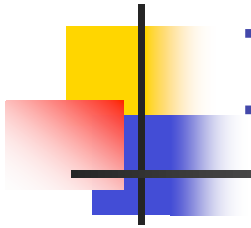
History

- Early Internet was susceptible to "routing storms"
  - Repeated withdrawal and re-announcement of /24 address blocks
  - Consumed significant CPU on early routers
  - Caused instability in the Internet
- "Flap damping" proposed to mitigate the effects of this instability



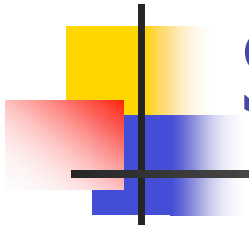
History

- Route flap damping was introduced to BGP4
  - RFC2439 describes the algorithm and conditions flap damping is applied under
- Requirements:
  - Fast convergence for normal route changes
  - Suppress oscillating routes
  - Announce stable routes
  - History predicts the future



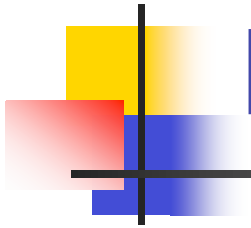
Issues

- Implementations are highly configurable
- No prior operational experience of the optimum configuration
- Operational experience showed that vendor defaults seemed too aggressive for the operational Internet
  - A couple of prefix flaps resulted in disconnectivity in the order of tens of minutes
  - BGP reset or router restart had severe implications for ISPs in the emerging commercial Internet



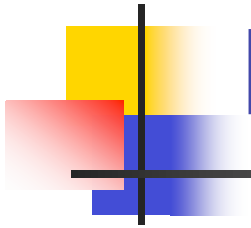
Solutions

- RIPE 178 documented the problems and proposed acceptable route flap damping configuration parameters
- Updated by RIPE 210 to include “Golden Networks”
  - The address blocks of the 13 Root Servers
- Further updated by RIPE 229
  - Added website and more configuration examples



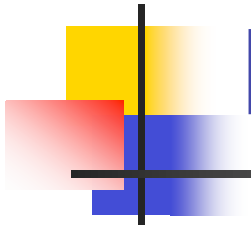
New Problems

- We all thought RIPE 229 would solve the problems
- It has not



Research work examples:

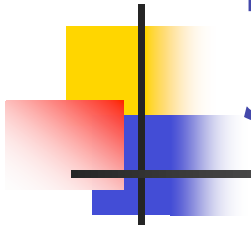
- "Route Flap Damping Exacerbates Internet Routing Convergence"
  - Zhuoqing Morley Mao, Ramesh Govindan, George Varghese & Randy H. Katz, August 2002
- "What is the sound of one route flapping?"
  - Tim Griffin, June 2002
- Various work on routing convergence by Craig Labovitz and Abha Ahuja a few years ago
- "Happy Packets"
  - Closely related work by Randy Bush *et al*



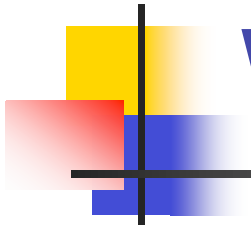
Morley Mao *et al*

- Route changes caused by path exploration increments the flap penalty
  - e.g. implementations penalise attribute changes
  - Best path lost → next best path chosen → neighbouring AS sees this as AS_PATH attribute change → penalty incremented
- Natural reaction is to only penalise decreasing path changes
  - But this is not immune to local provider policies
- Proposed *selective route flap damping*

Morley Mao *et al*
Selective Route Flap Damping

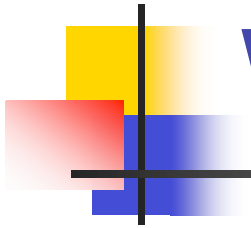


- Requires sender of route to include (relative) preference of route compared with previous announcement
  - Encoded as a BGP community?
- BGP keeps two bits to store comparative value of last two announcements received
  - 00 – fewer than two routes received
  - 01 – preference values of the route routes the same
  - 10 – latest route is higher preference than previous
  - 11 – latest route is lower preference than previous
- Comparison bits recomputed on fresh announcement
  - New value compared with old value
  - Change in value ⇒ route flap
- Simulation results highly successful



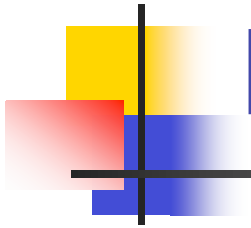
What next?

- Should route-flap damping be declared obsolete?
  - Or modified? If so, how?
- Is flap damping bad for your network?
  - Do we need flap damping any more?
  - How many people just switch it on because the vendor document says so?



What next?

- Needed at Internet edge?
  - i.e. ISPs who are not providing transit to any other ASNs
  - They can suppress external oscillating paths thereby improving network stability
  - Recommend yes (?)
- Needed in the Internet core?
  - Transit providers
  - Flap amplification, rich path diversity
  - Recommend no (?)



Discussion