Two BGP Mechanisms for Squashing Updates

- Rate limiting on sending updates
  - Send batch of updates every MinRouteAdvertisementInterval (MRAI) seconds (+/- random fuzz)
  - Default value is 30 seconds
  - A router can change its mind about best routes many times within this interval without telling neighbors

- Route Flap Dampening
  - Punish routes for “misbehaving”

Effective in dampening oscillations inherent in the vectoring approach

Must be turned on with configuration
Route Flap Dampening (RFC 2439)

Routes are given a penalty for changing. If penalty exceeds suppress limit, the route is dampened. When the route is not changing, its penalty decays exponentially. If the penalty goes below reuse limit, then it is announced again.

- Can dramatically reduce the number of BGP updates
- Requires additional router resources

How it works

![Graph showing route dampening over time with penalty for each flap = 1000. Route dampened for nearly 1 hour. Half-life = 15 minutes. 6 flaps, one every 10 minutes.](image-url)
Problems with Flap Damping: punishes small updates for “well connected” destinations

AS 11

AS 11

AS 736

AS 7018

AS 889

AS 67

AS 555

AS 458

The prefix is not “misbehaving” -- it is BGP!!

Rate Limiting

MRAI = Minimum Router Advertisement Interval (in seconds)

<table>
<thead>
<tr>
<th>MRAI seconds</th>
<th>Your Best Path</th>
<th>what you send to your neighbors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>889 736 11</td>
<td>Announce 555 67 11</td>
</tr>
<tr>
<td></td>
<td>7018 736 11</td>
<td>Withdraw</td>
</tr>
<tr>
<td></td>
<td>458 11</td>
<td>Announce 7018 555 67 11</td>
</tr>
<tr>
<td></td>
<td>7018 736 11</td>
<td>Keep quite!</td>
</tr>
</tbody>
</table>

Your Best Path:

- Announce 555 67 11
- Withdraw
- Announce 7018 555 67 11
- Keep quite!
30 Second Bursts

Updates often came in bursts, about every 30 seconds, June 25-26th. (data source = RIPE NCC)

Rate limiting in action (IBGP vs EBGP)

AS 7018 IBGP (MRAI = 4 Seconds)
AS 7018 EBGP (MRAI = 30 Seconds)

10 minute bins
Why is Rate Limiting Needed?

Rate limiting dampens some of the oscillation inherent in a vectoring protocol.

SSFNet (www.ssfnet.org) simulations,

Two Main Factors in Delayed Convergence

- BGP can explore many alternate paths before giving up or arriving at a new path
  - No global knowledge in vectoring protocols
- Rate limiting timer slows everything down

Current interval (30 seconds) was picked “out of the blue sky”
What you should do now ...

- Read and think about lecture notes,
- Read and think about RFC 1058 (RIP)
- Read and think about
  - Damping BGP. ISP column by Geoff Huston