BGP Wedgies ---- Bad Policy Interactions that Cannot be Debugged

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What is a BGP Wedgie?

- BGP policies make sense locally
- Interaction of local policies allows multiple stable routings
- Some routings are consistent with intended policies, and some are not
  - If an unintended routing is installed (BGP is “wedged”), then manual intervention is needed to change to an intended routing
- When an unintended routing is installed, no single group of network operators has enough knowledge to debug the problem
¾ Wedgie Example

- AS 1 implements backup link by sending AS 2 a "depref me" community.
- AS 2 implements this community so that the resulting local pref is below that of routes from its upstream provider (AS 3 routes).
And the Routings are...

Intended Routing

Note: this would be the ONLY routing if AS2 translated its “depref me” community to a “depref me” community of AS 3

Unintended Routing

Note: This is easy to reach from the intended routing just by “bouncing” the BGP session on the primary link.
Recovery

• Requires manual intervention
• Can be done in AS 1 or AS 2
Load Balancing Example

- Recovery for prefix P1 may cause a BGP wedgie for prefix P2 ...
AS 1 implements backup links by sending AS 2 and AS 3 a "depref me" communities.

AS 2 implements its community so that the resulting local pref is below that of its upstream providers and its peers (AS 3 and AS 5 routes).

AS 5 implements its community so that the resulting local pref is below its peers (AS 2) but above that of its providers (AS 3).
And the Routings are…

Intended Routing

Unintended Routing
Recovery??

Bring down AS 1-2 session

Bring up AS 1-2 session
Bring down AS 1-2 session AND AS 1-5 session

Try telling AS 5 that it has to reset a BGP session that is not associated with a BEST route!

Bring up AS 1-2 session AND AS 1-5 session
A Global ISP (or Corporate Intranet) Implemented with 5 ASes
Full Wedgie Example, in a new Guise

Message: Same problems can arise with “traffic engineering” across domains.

Intended Routing for some prefixes in AU
Recommendations

• Be aware of BGP Wedgies
• Interdomain communities that can tweak a route’s preference should be defined with care and consistently implemented
• Tools to enumerate all stable routings would be useful
  – inherently exponential in theory, but may not be that bad in practice (on instances much smaller than global Internet!)
  – I’m currently attempting an implementation on top of http://nms.lcs.mit.edu/bgp/rcc/
Comments Appreciated!

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