BGP: Good MEDs Gone Bad!

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Agenda

• Goals
• Potato Terminology
• What are MEDs?
• Where MEDs Make Sense
• MED Deployment Considerations
• Conclusion
Goals of this Talk

- Increase awareness of MED deployment considerations
- Increase awareness of MED-related protocol constraints
- Encourage operators to better understand their vendor(s) MED-related implementation
- Nothing new or Earth-shattering here…
Before We Begin...

- How many folks here know exactly what your MED policy is?
- How many folks here accept MEDs from customers? By default?
- How many folks here accept MEDs from peers? By default?
- How many folks here don’t know?
Potato Terminology

- **Hot Potato** == *Closest-Exit Routing*; default shortest path routing
- **Cold Potato** == *Best-Exit Routing*; shortest hops, reflect IGP topology, route around congestion, marketing, other..
- **Mashed Potato** == “Less than Ideal” Routing; unintentional, often results from intended Best-Exit Routing
What Are MEDs?

- BGP MULTI_EXIT_DISC (MED), formerly known as INTER_AS_METRIC
- Optional non-transitive BGP attribute used to discriminate among multiple exit or entry points into the same neighboring AS
- All preceding selection criteria being equal, prefer path with LOWEST MED.
Where MEDs Make Sense

• Preferred S.1 --> D.1 path is A->C->D->G per advertised MEDs
• If MEDs weren’t advertised AS100 would have no way to know that AS 200’s D is optimal path
MED Deployment Considerations

- MEDs Break With Aggregation
- Inconsistent Vendor Behavior
- Persistent Route Oscillation Condition
- Route Flap Dampening and MED Churn
- Comparing Between Different Autonomous Systems
- Security Considerations
- BGP Update Packing
MEDs & Aggregation

- Aggregates are often generated from multiple locations within an AS
- When MEDs are derived from IGP metrics associated with said aggregates VERY sub-optimal routing may result
• Only 10.1/16 aggregate is advertised to AS 100. MEDs are derived from IGP metrics associated with aggregate source router F as BGP NEXT_HOP.

• Preferred S.1 --> D.1 path is A->B->E->F->D->G per advertised MEDs. AS 200 more-specific makes no difference.
Inconsistent Vendor Behavior

- Does your router vendor:
  - advertise MEDs to IBGP peers as a default behavior?
  - advertise MEDs to EBGP peers as a default behavior?
  - advertise MEDs to confederation peers by default?
  - compare MEDs between confederation peers and EBGP peers?
  - prefer no MED over MED of zero over …?
  - consider max MED (2^32-1) as unfeasible?
  - compare MEDs between different autonomous systems by default?
  - impose temporal route selection behavior to MEDs?
Persistent Route Oscillation

- MEDs are primary trigger for persistent route oscillation
- See RFC 3345 for details
- Alternatively, see Daniel Walton’s FEB ‘01 talk on this topic.
Flap Dampening & MED Churn

• MEDs are often derived from IGP metrics (generally, this is a good idea to ensure BGP path selection is aligned with IGP)

• However, it means that IGP instabilities within an AS, or on even a single link, result in BGP route updates/withdraws

• Results in significant churn; may result in routes suppression. Transit AS IGP instabilities affect downstream prefixes.

• Some implementations do [arguably] clever things in a attempt to scope such behaviors -- Does your vendor? Have you disabled it?
Flap Dampening & MED Churn (cont.)

Origins of Internet Routing Instability (1999)

Craig Labovitz, G. Robert Malan, Farnam Jahanian

http://citeseer.nj.nec.com/labovitz99origins.html
Comparing MEDs Between Different Autonomous Systems

• MEDs values are derived from many different policies:
  – Static/Explicit
  – IGP Metrics:
    • Additive or local?
    • Do your peers use the same IGP? Is the available metric space the same?
  – Are your peers aware they’re sending MEDs?
  – Are they sending MEDs at all?
Security Considerations

- MEDs may be used to manipulate a peer’s route selection criteria in order to gain some advantage over that peer, usually via traffic diversion
- Do you accept MEDs from peers (or customers) as a default behavior?
- Use your imagination…
MEDs & Update Packing

• BGP Update packing allows prefixes with like attribute sets to be packed into a single update message.
• Provides an array of benefits!
• Lots of [potentially useless] MEDs lessens the benefits update packing provides.
Conclusions

• MEDs work in lots of places
• MEDs break in lots of places
• You should be aware of the difference!

• draft-mcpherson-grow-bgp-med-considerations-00.txt will be posted to internet-drafts soon and provides more detailed discussions of this topic.
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