

Policy Modeling and Management

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Management of Routing Policies

- Common approach
 - *High-level* definition of routing policies
 - e.g., business relationships (customer-provider, peering)
 - *Low-Level* implementation in network components
 - e.g., CISCO's route-maps
 - Management is error-prone
 - Constant adjustments
 - Manual configuration of each router (component by component)
- ⇒ Ill-specified policies

How to improve policy management?

- Necessary: Understand how policies are deployed in the Internet
 - Which high-level policies are used?
 - Which low-level router features are needed and which not?
- Our approach
 - Try to build a model of routing policies
 - Rely on measurements: RIPE, RouteViews

First step: Appropriate granularity to model routing policies?

Bounds on Policy Granularity

- Per-prefix policies
 - To support traffic engineering, to address customer wishes, ...
 - But: Data analysis suggests this is too fine-grained
- Per-neighbor policies, business relationships
 - Reflect economic constraints
 - *Preference*: E.g., prefer customer routes
 - *Valley-free*: E.g., no export of provider routes to other providers
 - But: High inconsistency between routes observed
 - in model with inferred relationships
 - in our data

What is the right granularity?

Searching for the right granularity

- 1 Infer agnostic per-prefix filters and match with relationships
 - Identify filters by comparing
 - propagation in topology model vs.
 - observable routes
 - ⇒ Considerable amount of “popular” filters
 - ⇒ Popular filters correspond to non-transit policies (“valleys”)
- 2 Study propagation in model with inferred relationships
 - ⇒ High freedom in path choice (e.g., equally good customer routes)?
- 3 Data analysis: Which ASs used as next-hops in best paths?
 - ⇒ Majority of path choices seem per neighbor-based

Summary

- Understanding policies is important for better management
- Approach: Build model of routing policies
- Insight: Granularity of relationships seems appropriate
 - although relationships sufficient to model path choice
- Unused router features (e.g., fine-grained policies)?
- What should be changed in future routers?
 - *Network-wide* instead of *component-by-component*?
 - *Rich* vs. *poor* feature set (flexibility vs. easy management)?
 - ...

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“In search for an appropriate granularity to model routing policies”