Inferring AS Relationships in the Internet [Gao02a]

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Context

- builds on prior work [Gao00a] in routing analysis
 - basic model of BGP
 - defined set of rules to avoid loops due to policy
 - what aspects of BGP can cause problems?policies can affect path choice; policies can *conflict*
- also prior work of Govindan and Reddy to understand AS structure
 - previous measurement of AS degree, inference of hierarchy by AS size

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Digression: Non-converging Policies

- because policies can specify arbitrary behavior, conflicts can result
- problems can happen even with very simple topologies and policies

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example: route from A/B/C to D policy at A/B/C: prefer clockwise path over direct path will oscillate indefinitely between two states



Key Ideas

- tries to infer AS relationships from BGP routing tables
 - customer-provider, peers, siblings
- why care?
 - prior paper [Gao00a] uses structure to avoid policy conflicts
 - implication of policy constraints: physical connectivity doesn't mean reachability
 - can determine structure of the net from publicly available information

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13



AS Relationships?

- provider
 - sells service to customer
 - transit traffic for my customers
 - propagate routes for
 - customers
- customer
 - gets service from provider import all routes that the provider offers
- (transit) peer on same level - tell each other about "their"
 - routes (their networks and their customer's networks) don't transit traffic
- siblings
 - on same "level" as each other
 - agree to share routes with each other
 - agree to transit traffic for each other

18

20

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Assumptions Behind Heuristics

- bigger ASes go at the top
 - size measured by number of edges
 - pragmatic assumption
 - · supported by other work [Faloutsos '99
 - SIGCOMMJ
 - but weakened since large ISPs use multiple ASes
- only certain policies are possible
 - peers don't route traffic through clients
 - etc. (see [Gao00b] for other constraints)
 - empirically good policies, but not required

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22

Other questions/observations?

- terms: export/import
 - see example discussed in place
 - export routes if it's consistent with your policies and relationships
 - import (accept) routes from someone else, again, if it's consistent with your relationship/policies

26

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