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On multi-exit routings and AS relationships

Riad Mazloum, Marc-Olivier Buob¹, Jordan Augé¹, Bruno Baynat¹, Timur Friedman¹ and Dario Rossi²

¹UPMC, France

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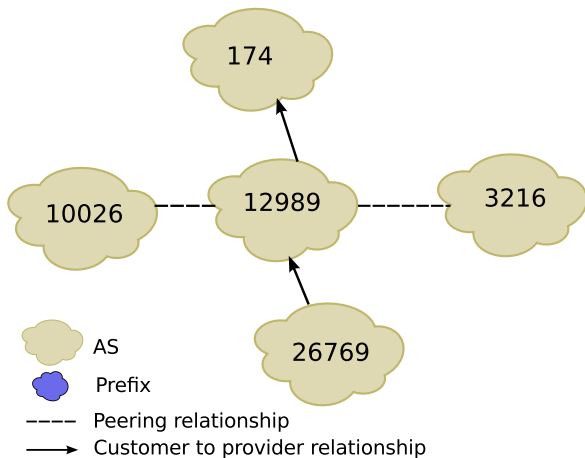
²Telecom ParisTech, France

dario.rossi@enst.fr

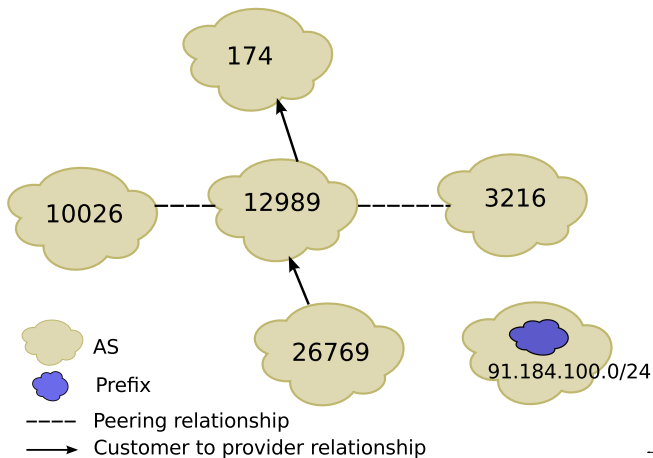
February 06th, 2013 – ISMA 2013 AIMS 5



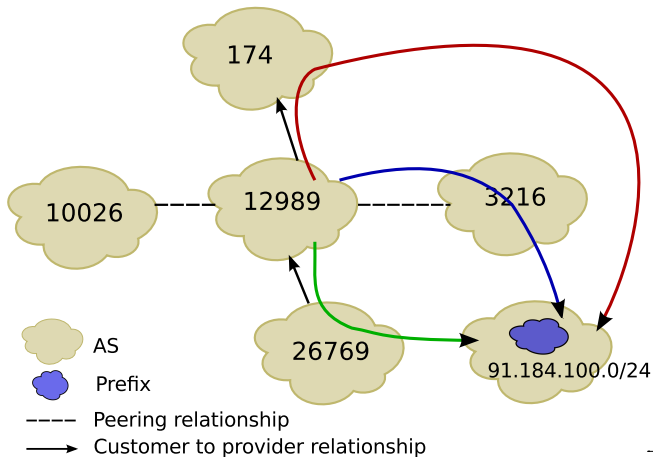
Internet routing example



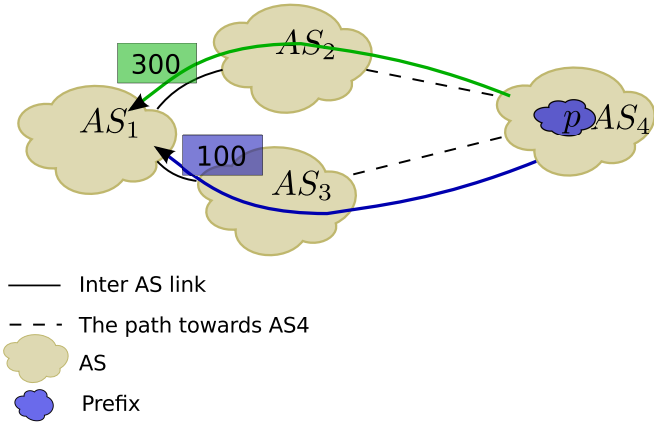
Internet routing example



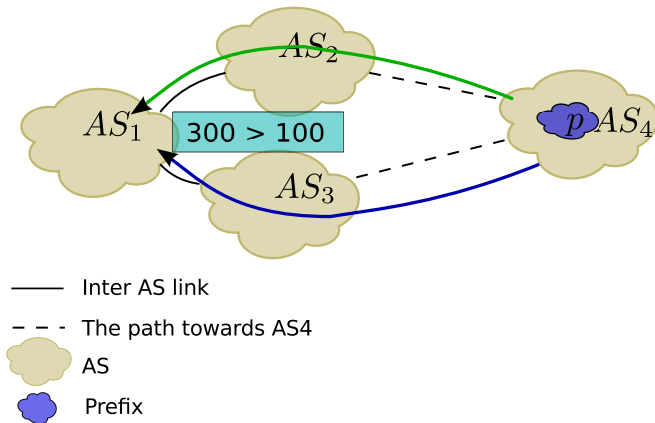
Surprising observations



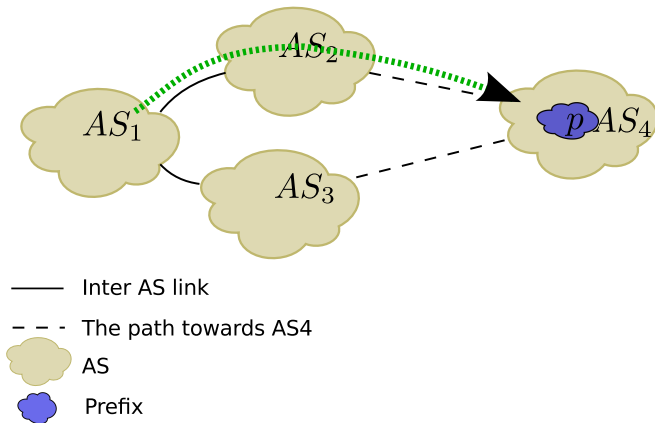
BGP route with higher LP



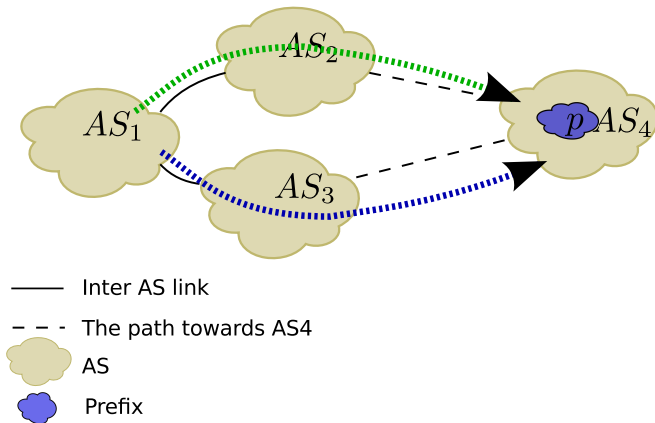
A route has a higher LP



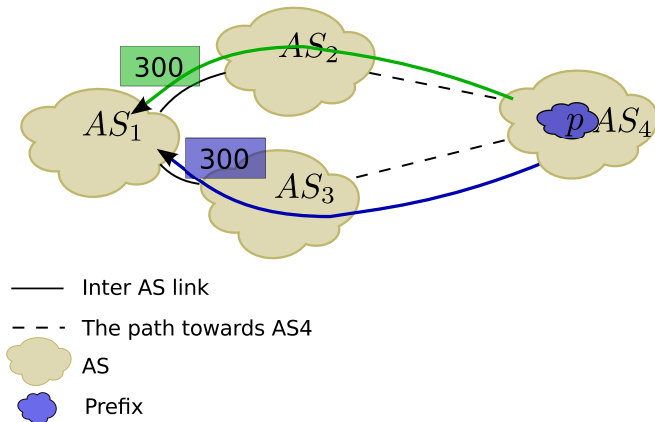
Single next-hop AS



Multi next-hop ASes



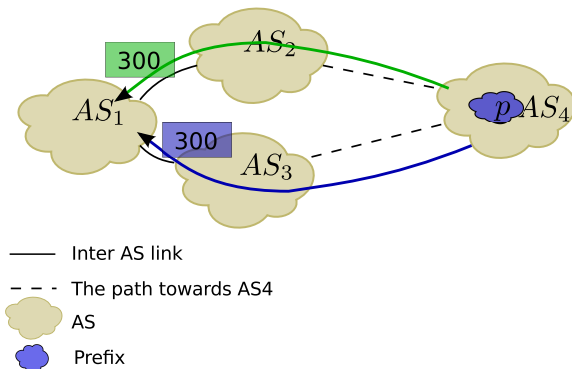
Equal LP for all next-hop ASes



Observed ME \implies equal LP for next-hop ASes

Observed ME \implies equal LP (ME)

$$ME(AS_1, p) = \{AS_2, AS_3\} \implies LP_{AS_1}(AS_2) = LP_{AS_1}(AS_3)$$



Implementation of AS economical policies

Observed ME \implies equal LP (ME)

$$ME(AS_1, p) = \{AS_2, AS_3\} \implies LP_{AS_1}(AS_2) = LP_{AS_1}(AS_3)$$

Implementation of AS economical policies (POLICY)

client > peer > provider

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(ME) + (POLICY)

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(ME) + (POLICY)

$ME(AS_1, p) = \{AS_2, AS_3\} \implies$ same type of relationship between AS_1 and AS_2, AS_3

Does it work?

(ME) + (POLICY)

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Check with CAIDA's inference dataset

- Get types of relations of cases such between AS_1 and AS_2, AS_3 from CAIDA's inference dataset
- Check whether all of the next-hop ASes have the same relationship

Does it work?

(ME) + (POLICY)

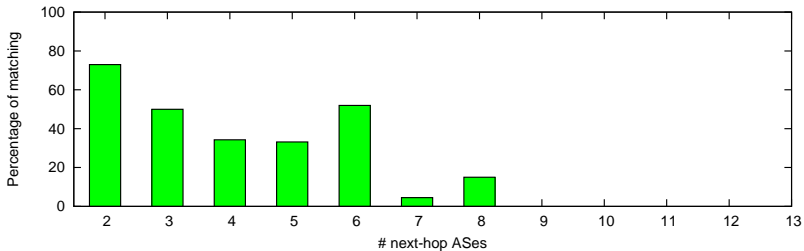
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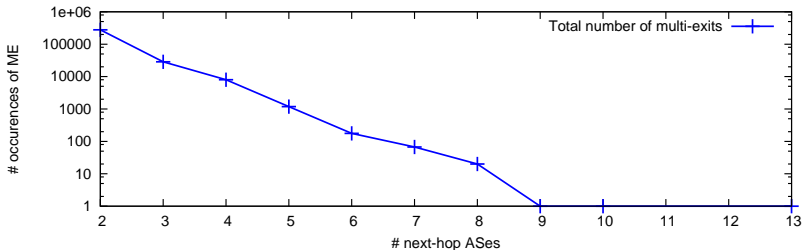
- Get types of relations of cases such between AS_1 and AS_2, AS_3 from CAIDA's inference dataset
- Check whether all of the next-hop ASes have the same relationship
- About **70% matching** **30% mismatching**

Multi-exit occurrences and relationship matching

Percentage of matching between multi-exit nex-hop relationships and CAIDA inference



Occurrences of multi-exit routing



Data

Multi-exit discovery:

- BGP: BGPmon, Colorado State University project¹

¹<http://bgpmon.netsec.colostate.edu/>

²<http://www.top-hat.info/>

³<http://www.team-cymru.org/Services/ip-to-asn.html>

⁴<http://www.caida.org/data/active/as-relationships/>

Data

Multi-exit discovery:

- BGP: BGPmon, Colorado State University project¹
- traceroute: TDMI/TopHat, UPMC project²
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Data

Multi-exit discovery:

- BGP: BGPmon, Colorado State University project¹
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AS relationships:

- CAIDA AS relationship inference database⁴

Our data is available on request.

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²<http://www.top-hat.info/>

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Discussion

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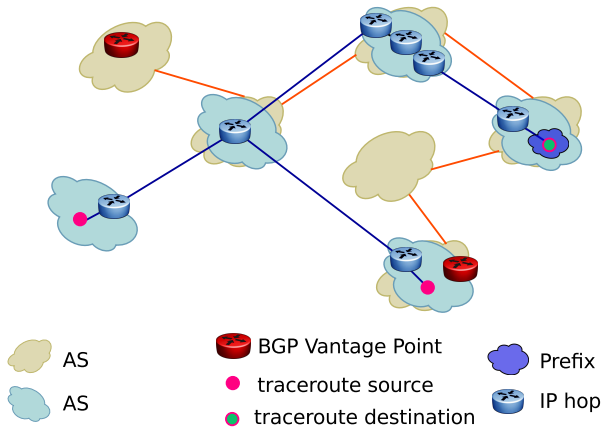
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- Check whether all of the next-hop ASes have the same relationship

Have another ideas?

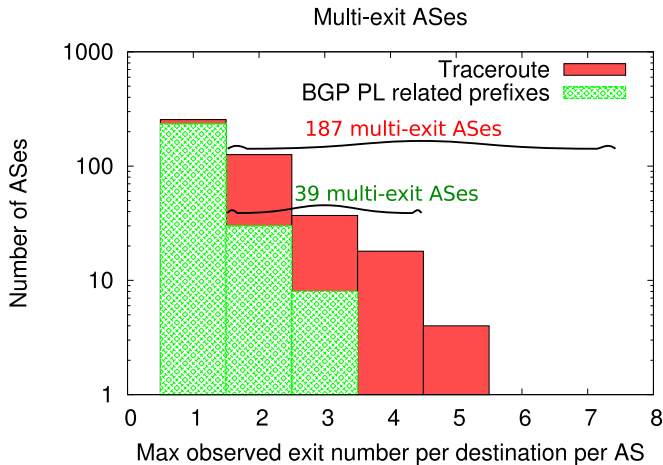
- Feedback about the problem and the analysis process
- Get confirmation about the results (we don't have a ground truth of AS relationships)
- Possible collaborations

Reserved slides...

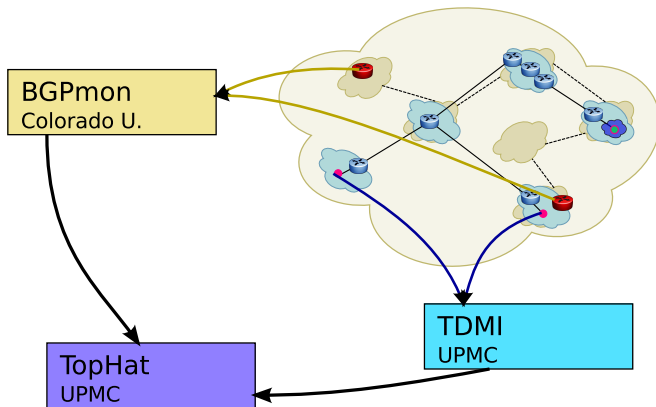
BGP and IP overlap

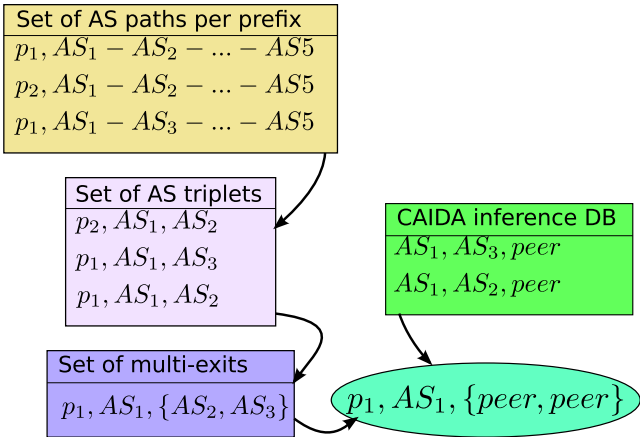


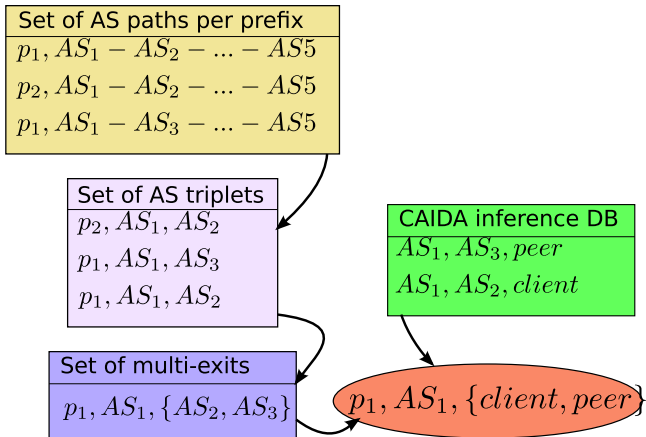
Multi-exit routing, BGP and IP results

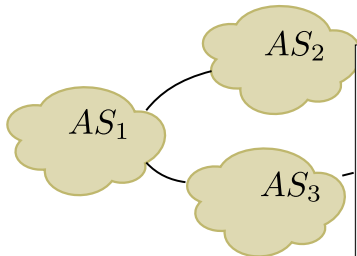


TopHat interconnection










BGP Decision Process:

- 1- Highest local_pref
- 2- Shortest AS path
- 3- Lowest origin type
- 4- Lowest MED

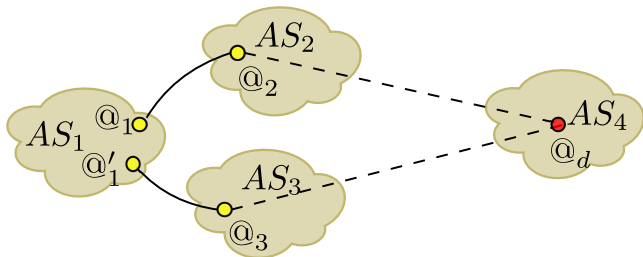
- 5- eBGP over iBGP**
- 6- Lowest IGP cost**
- 7- Tie break solutions**




— Inter AS link

- - - Continuation of the link to the announcing AS

 An Autonomous System (AS)

 The destination prefix p



- Inter AS link
- - - Continuation of the link to the announcing AS
-  An Autonomous System (AS)
-  IP Hop $@_i$
-  The destination IP address $@_d$