Active Measurement of the AS-Path Prepending Method

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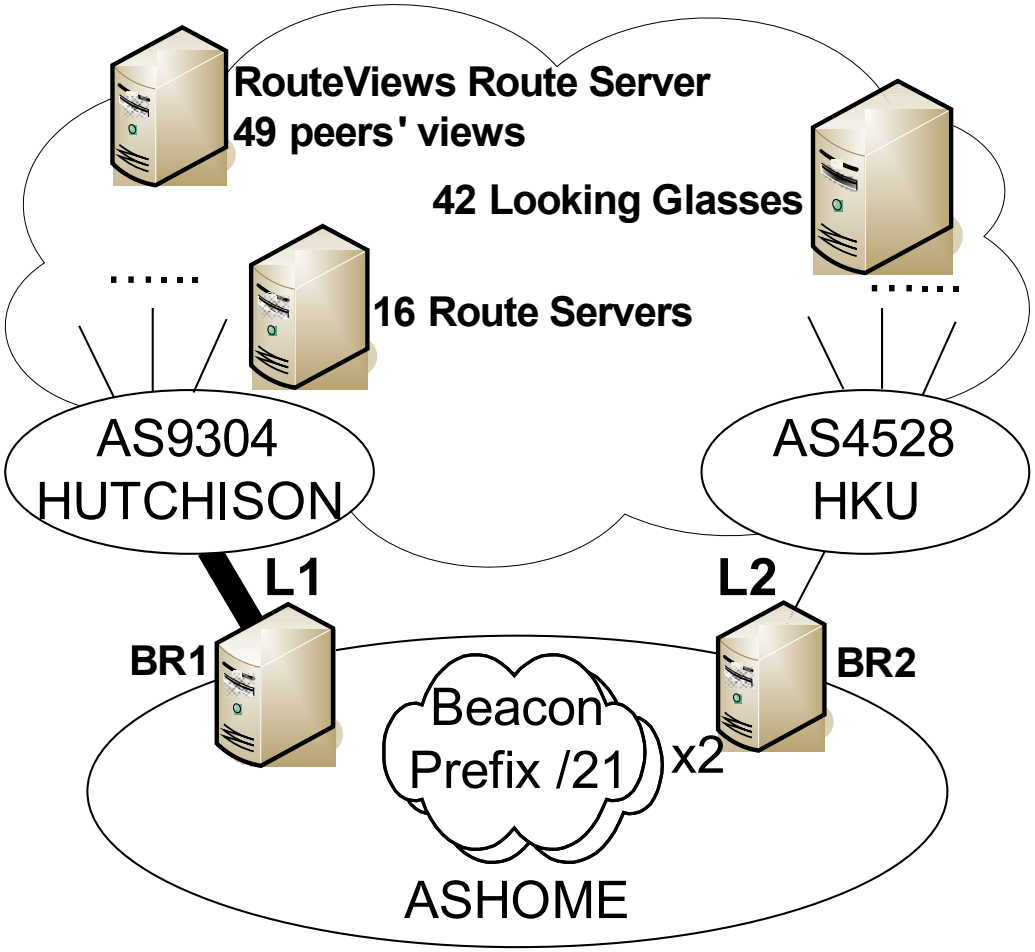
Motivations

- Apply AS-Path prepending on a trial-and-error basis to control the inbound traffic
- How effective can the AS-Path prepending method be?
- What would happen to the routes after prepending a link?
- What would happen to the Internet if a lot of ASes prepended their routes?

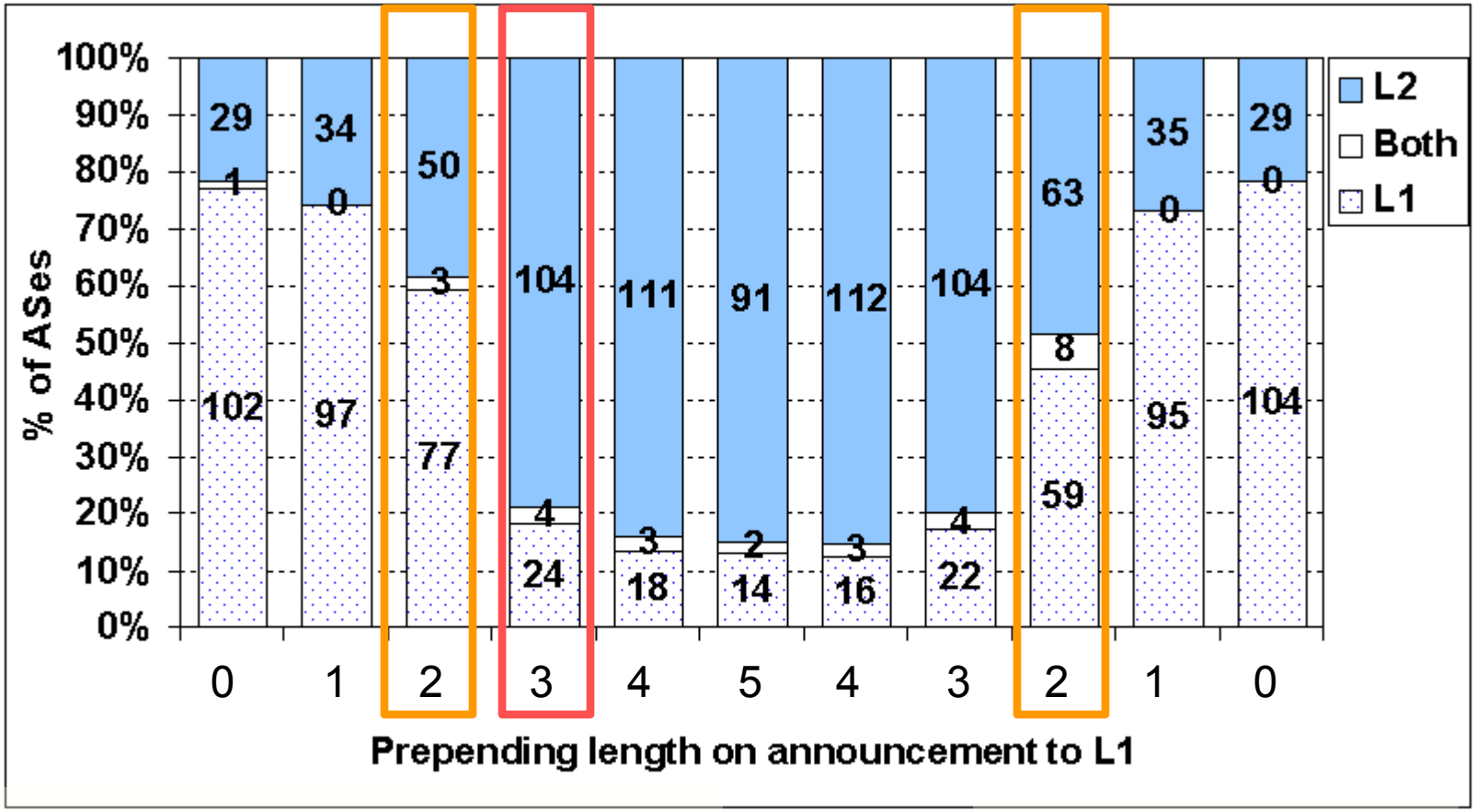
The Measurement Setup

2. Collect routes from different vantage points

1. Announce beacon prefix to both links with prepending on L1



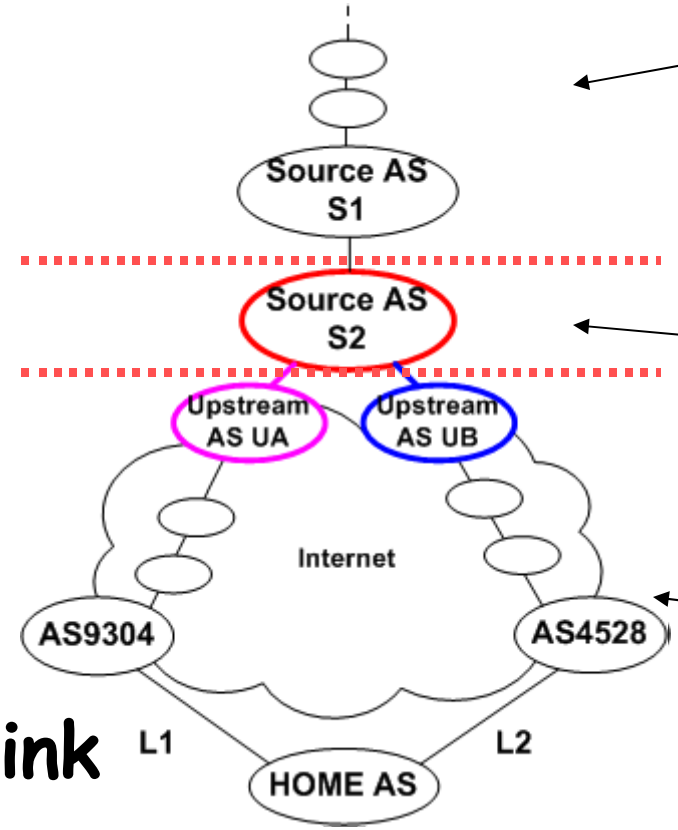
Results



Greatest route change on prepending length 2 →3

Unbalanced phenomenon

Who was responsive to prepending???



Passive-responsive

Active-responsive

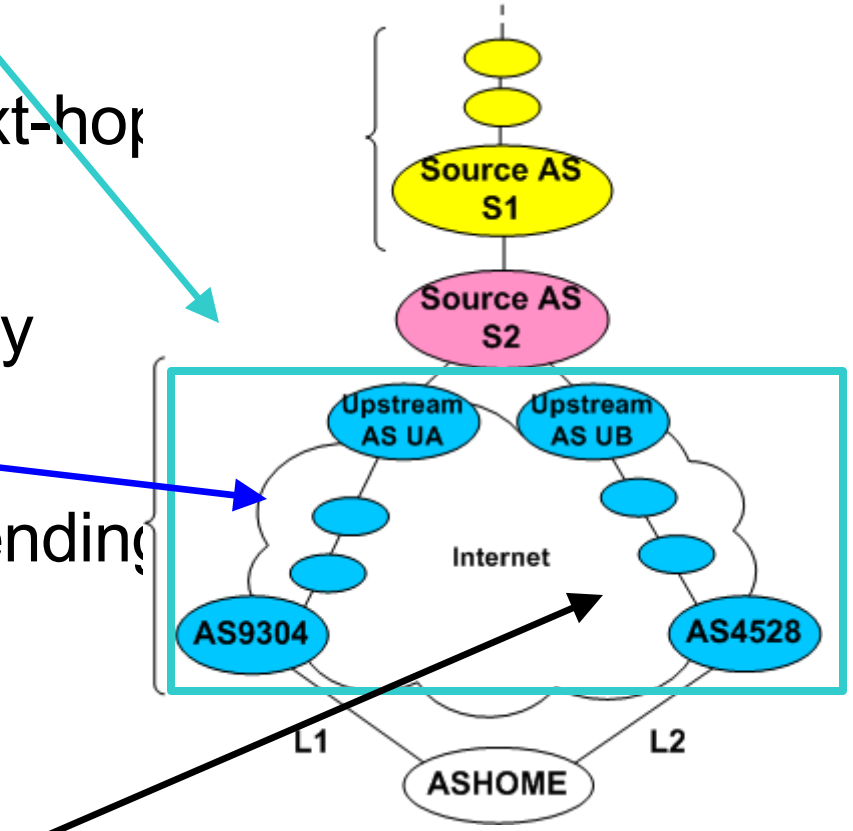
Next-hop change

Non-responsive

Incoming link change

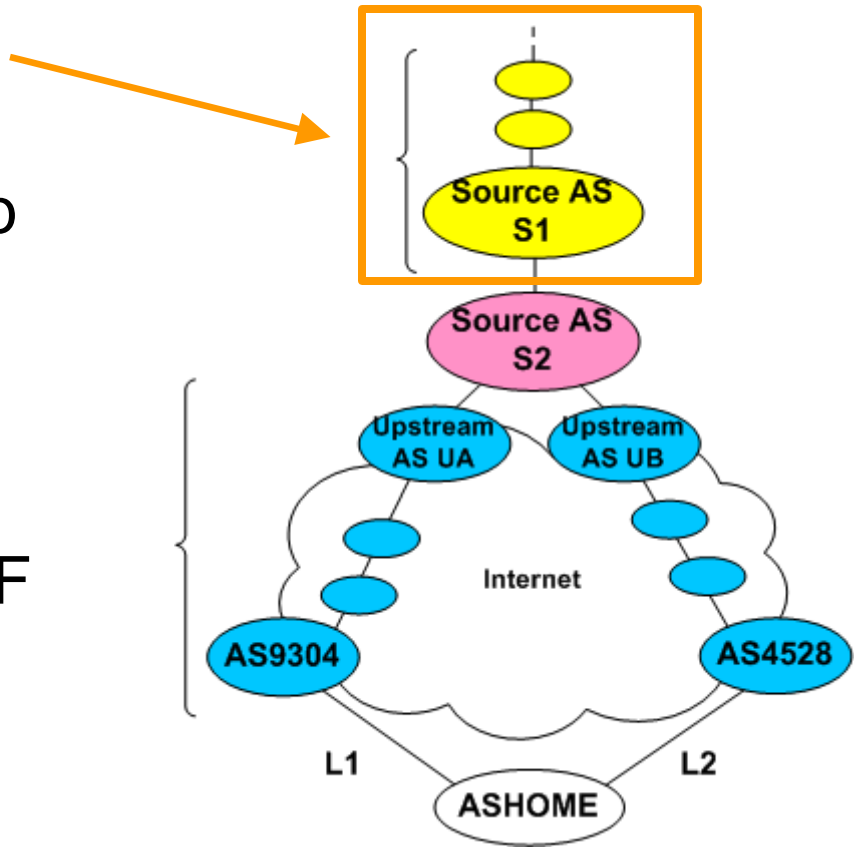
Non-responsive ASes

- 43 ASes
  - No change in either Incoming link and next-hop
- On L1 (14 ASes):
  - Use one next-hop only
- On L2 (29 ASes):
  - Not affected by prepending on L1



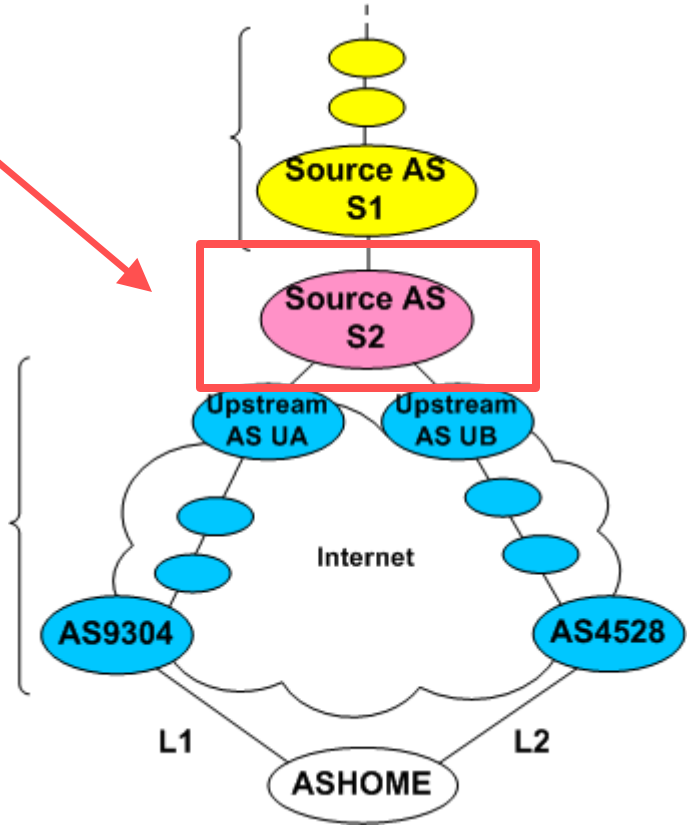
Passive-responsive ASes

- 26 ASes
  - Incoming link change
  - No change in next-hop
- Possible reasons:
  - No other possible routes
  - A higher LOCAL-PREF for that next-hop



Active-responsive ASes

- 47 ASes
  - Both Incoming link and next-hop change
- Possible reasons:
  - Apply shortest-path policy
  - No higher LOCAL-PREF to a particular next-hop



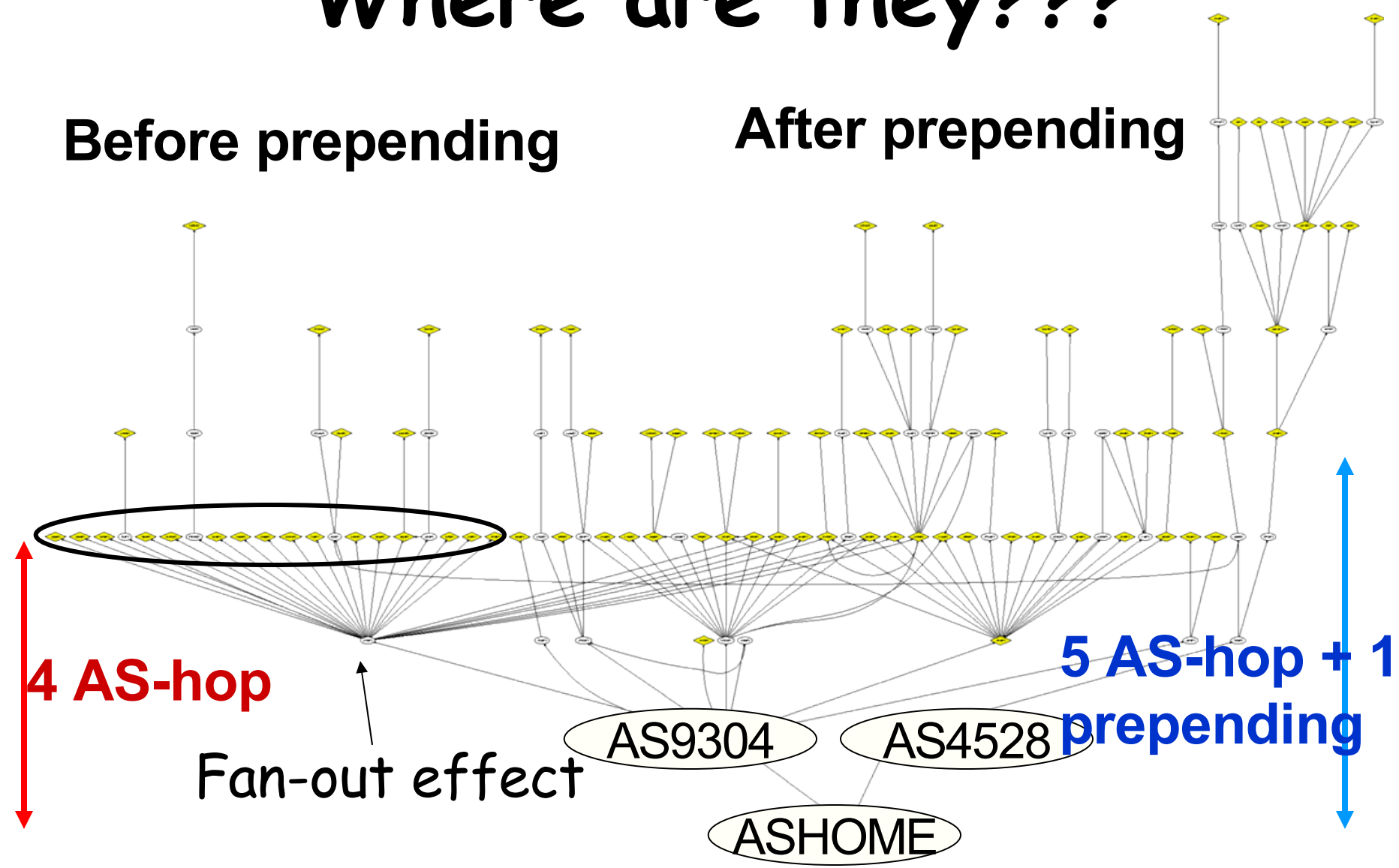
Who are those Active-responsive ASes?

- AS701 (UUNET)
- AS852 (TELUS)
- AS1239 (Sprint)
- AS2914 (NTT)
- AS3257 (Tiscali)
- AS6453 (Teleglove)
- AS7018 (AT&T)
- AS7473 (SINGTEL)
- ....

Why are they affected by prepending?

Where are they ?

Where are they???



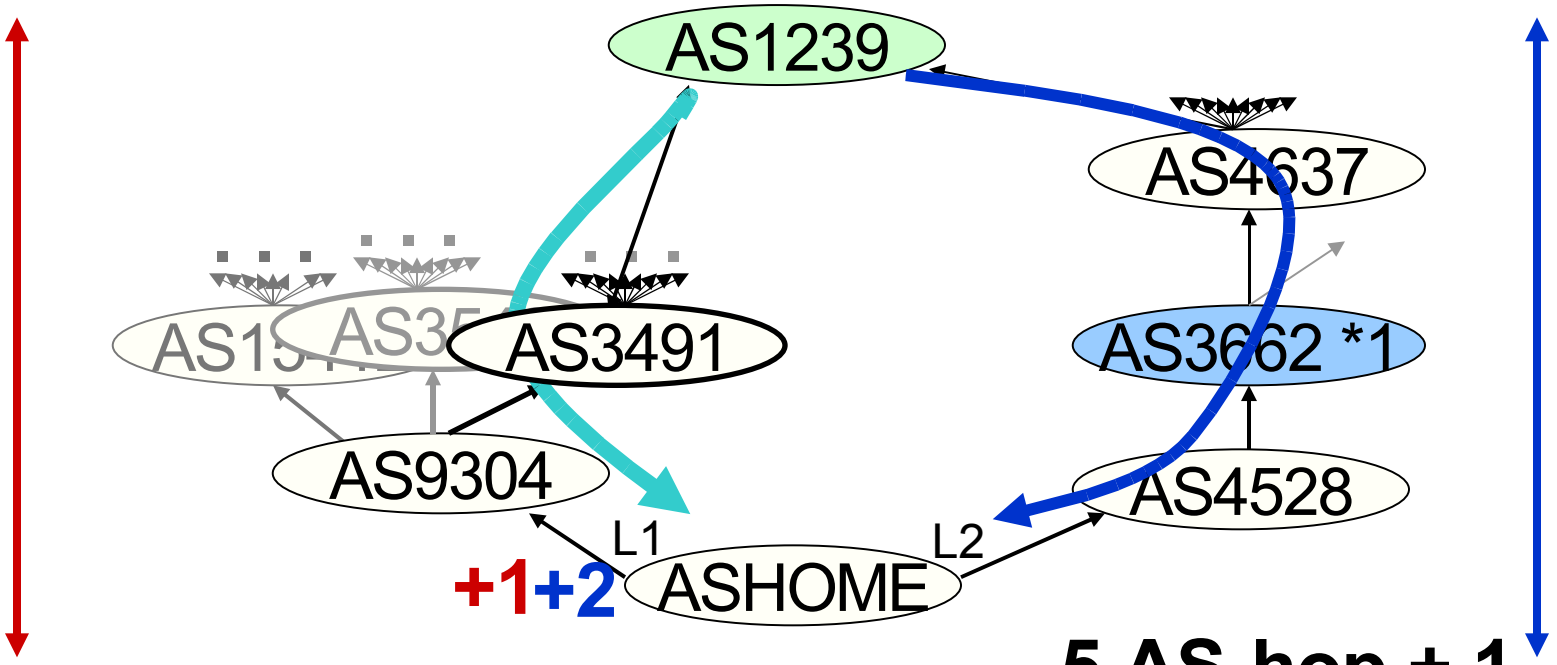
Where are those Active-responsive ASes?

Number of Active-responsive ASes	AS-Path length to L1		
AS-Path length to L2	4	5	6
5	1		
6	32		1
7	5	3	
8	1		2
9	1		1

"=" or ">" policy ?

AS-Path length: **5** **<** **6**

6 **=** **6**



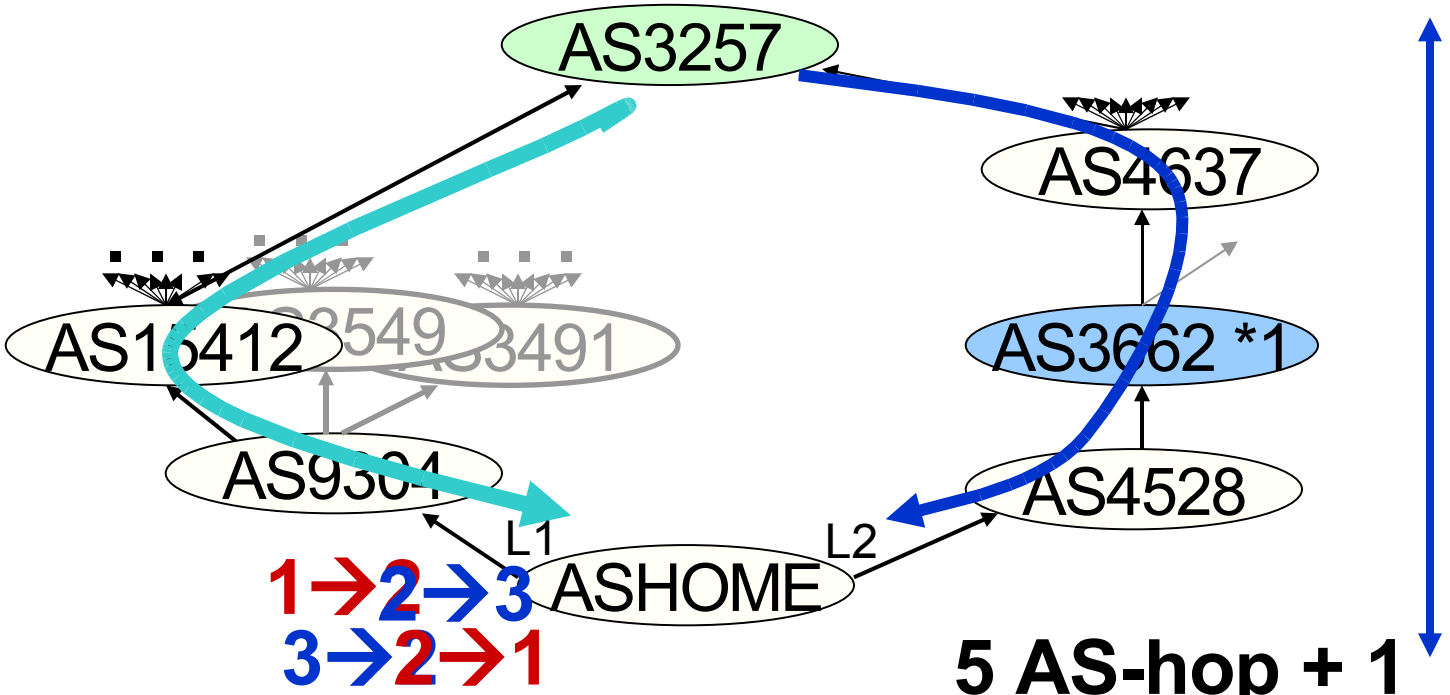
4 AS-hop

5 AS-hop + 1 prepending

"=" or ">" policy ?

AS-Path length: 6

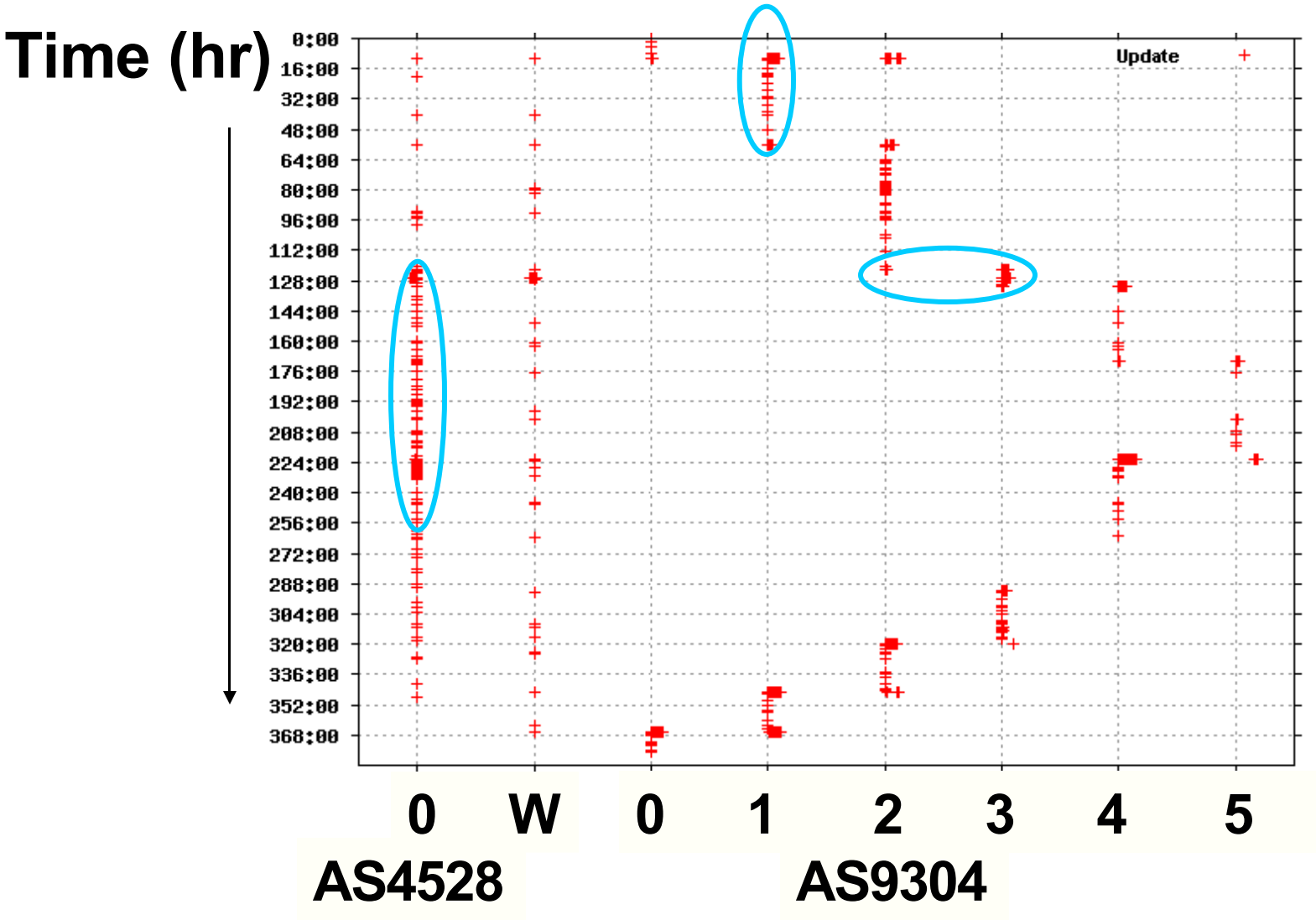
7	>	6
6	=	6
5	<	6



4 AS-hop

5 AS-hop + 1 prepending

BGP Updates


Time (hr)
0:00
16:00
32:00
48:00
64:00
80:00
96:00
112:00
128:00
144:00
160:00
176:00
192:00
208:00
224:00
240:00
256:00
272:00
288:00
304:00
320:00
336:00
352:00
368:00
Update
0
W
0
1
2
3
4
5
AS4528
AS9304

Conclusions & Future Work

- Route changes are introduced by active-responsive ASes
  - Shortest-path policies
  - Topology -> when they will change?
- Possible applications:
  - Predict the amount of traffic shift?
  - Discover the upstream ASes' policies.
- Replicate the measurement experiments in other sites
  - With longer prepending lengths
  - Prepend on both links
  - > 2 links

Acknowledgements

We thank

- Michael Lo for setting up the active measurement facility.
- Lorenzo Colitti for generating the graphs of the AS topology and BGP updates.

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Q&A