



RIPE NCC

RIPE NETWORK COORDINATION CENTRE

Does The Internet Route Around Damage?

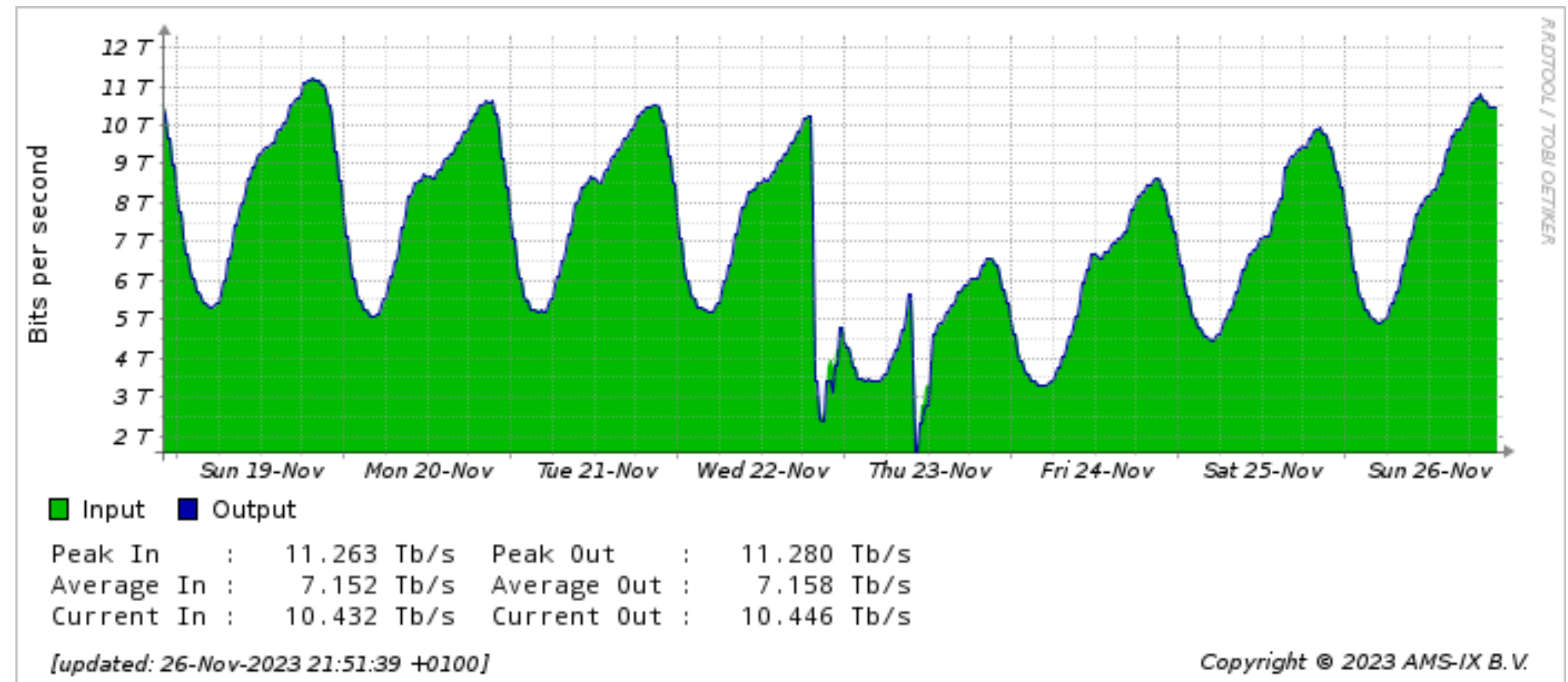
A RIPE Atlas perspective of outages
at large IXPs

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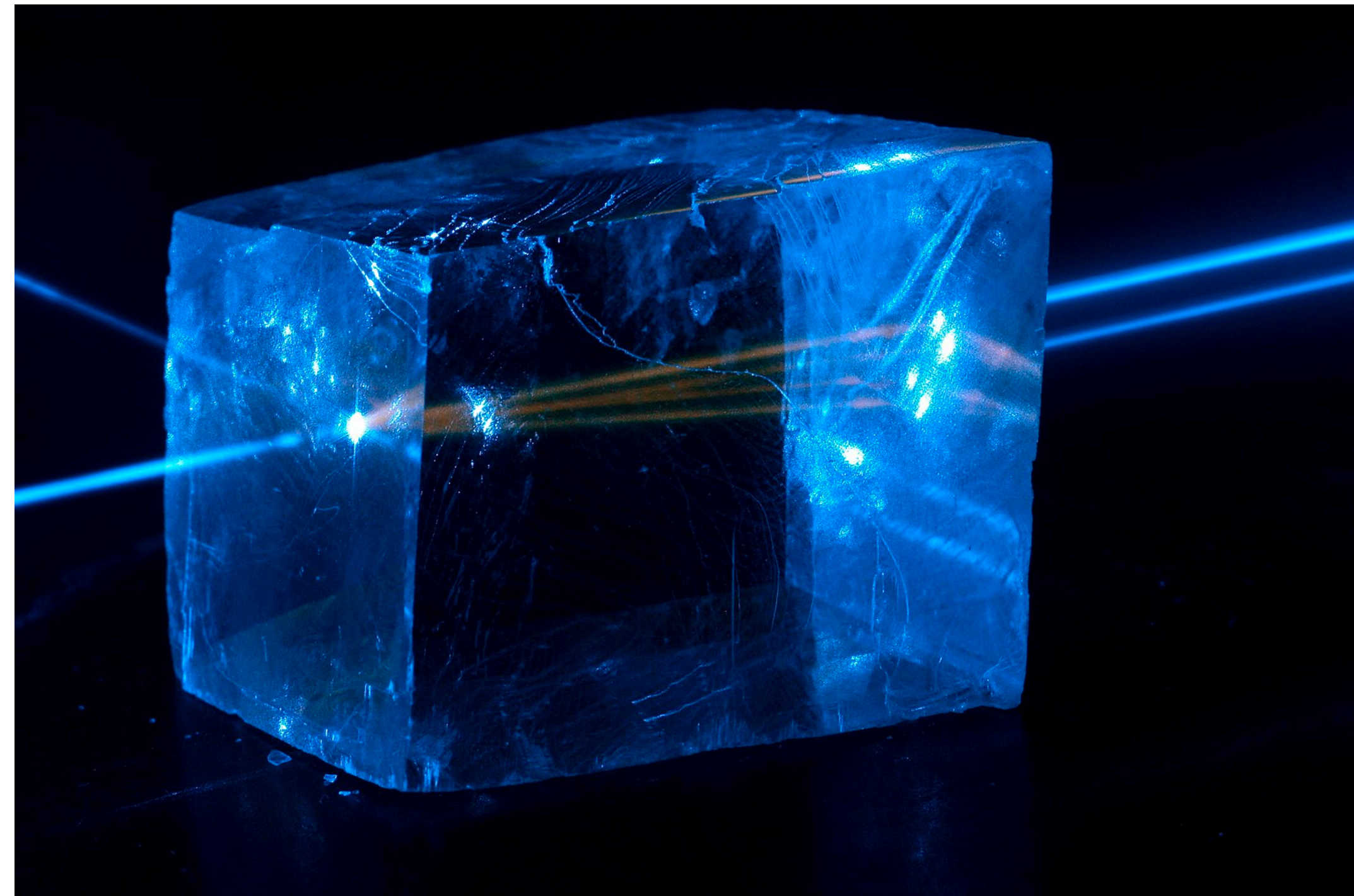
Background



- Even the largest networks and IXPs occasionally have outages
- Most recent: AMS-IX
 - Extensive post mortem!
- Earlier case studies:
 - 2015 AMS-IX
 - 2018 DE-CIX
 - 2021 LINX
- Does Internet route around damage?



What Did RIPE Atlas See?

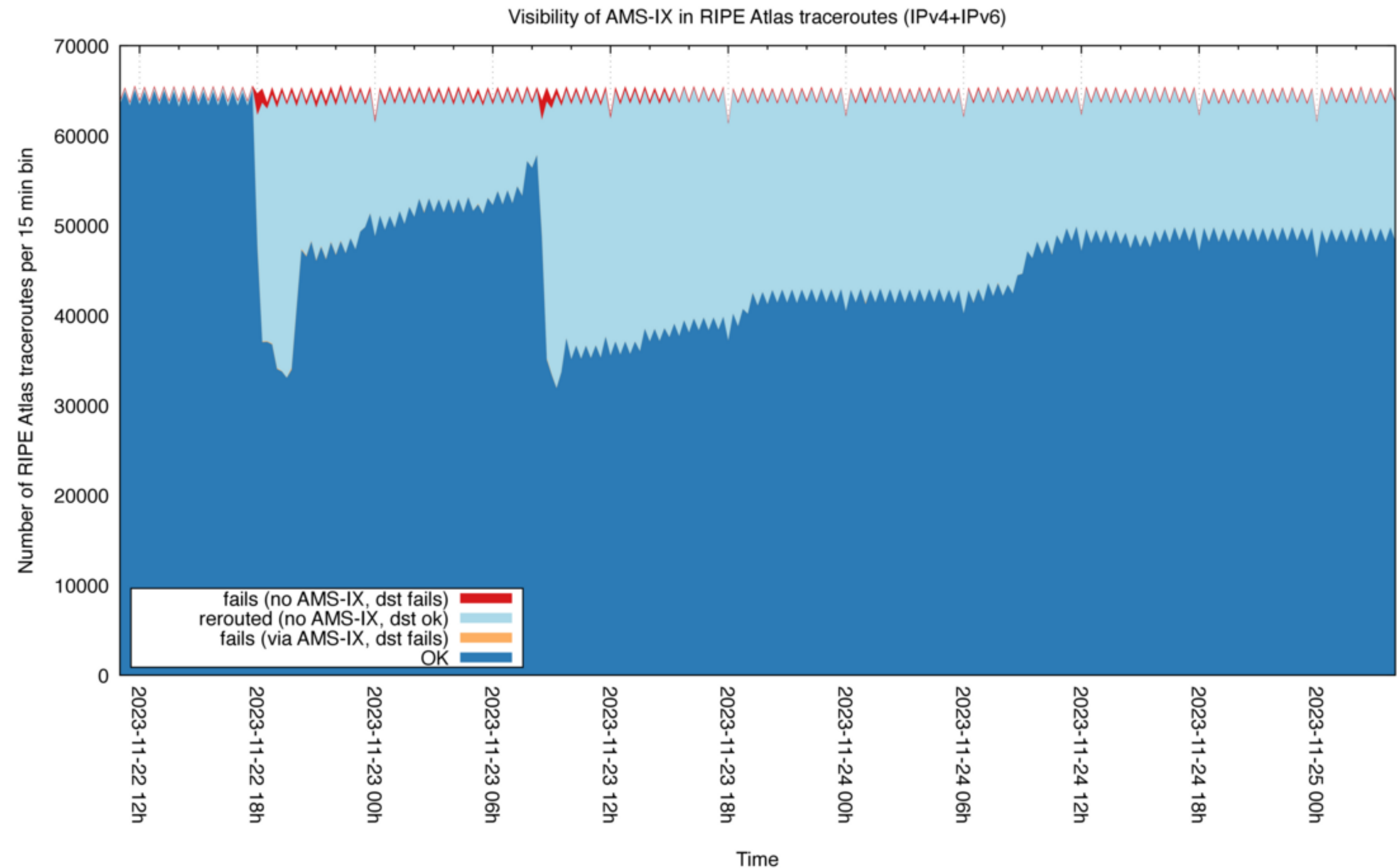


[https://commons.wikimedia.org/wiki/
File:Fluorescence_in_calcite.jpg](https://commons.wikimedia.org/wiki/File:Fluorescence_in_calcite.jpg)

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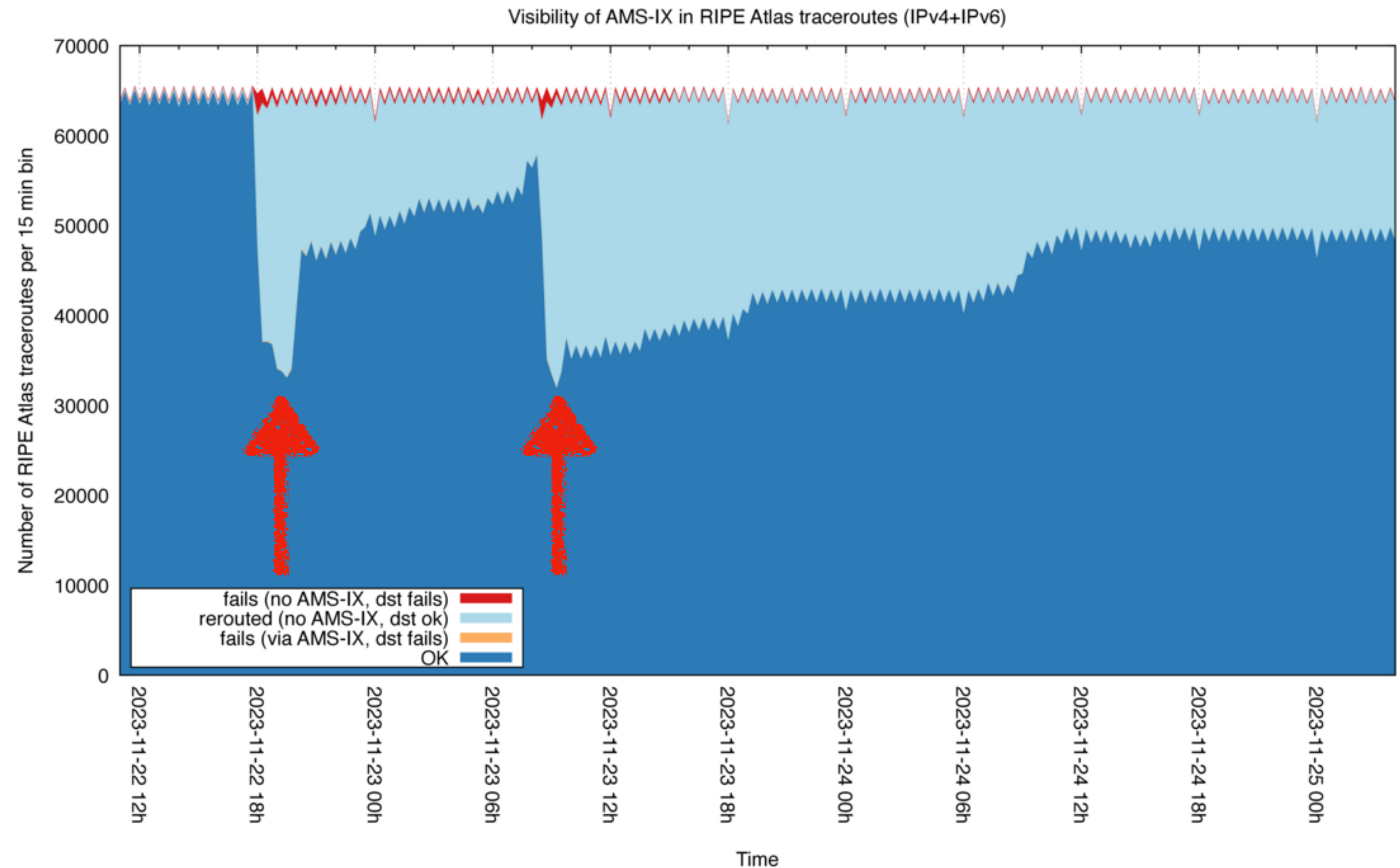
- Method:
 - Find stable traces via IXP
 - Watch these src/dst pairs during event
- Result:
 - Finds 2 distinct drops in AMS-IX visibility (light blue)
 - Very few reachability problems (red)
 - Slow shift back



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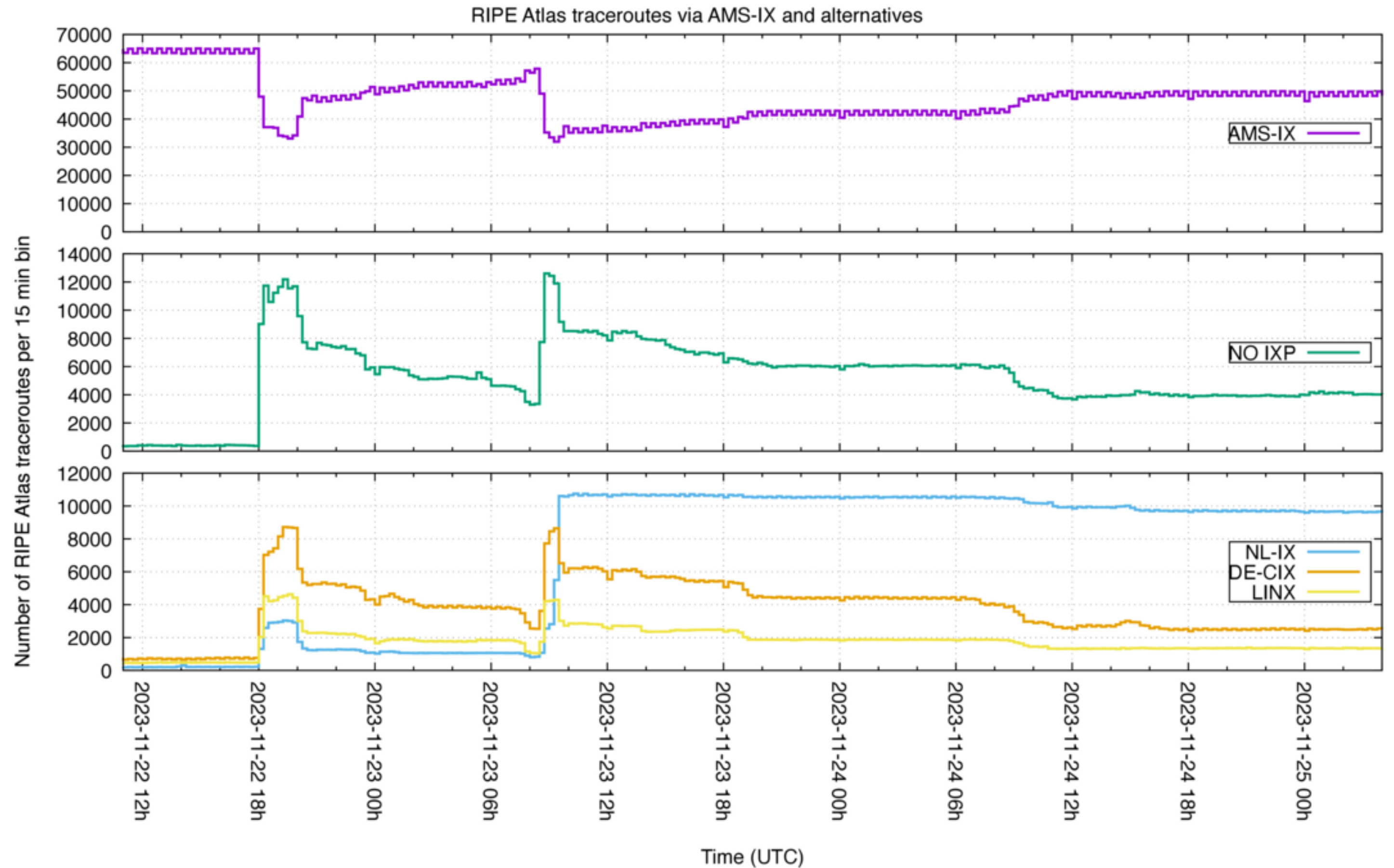
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What Alternative Paths Did We See?



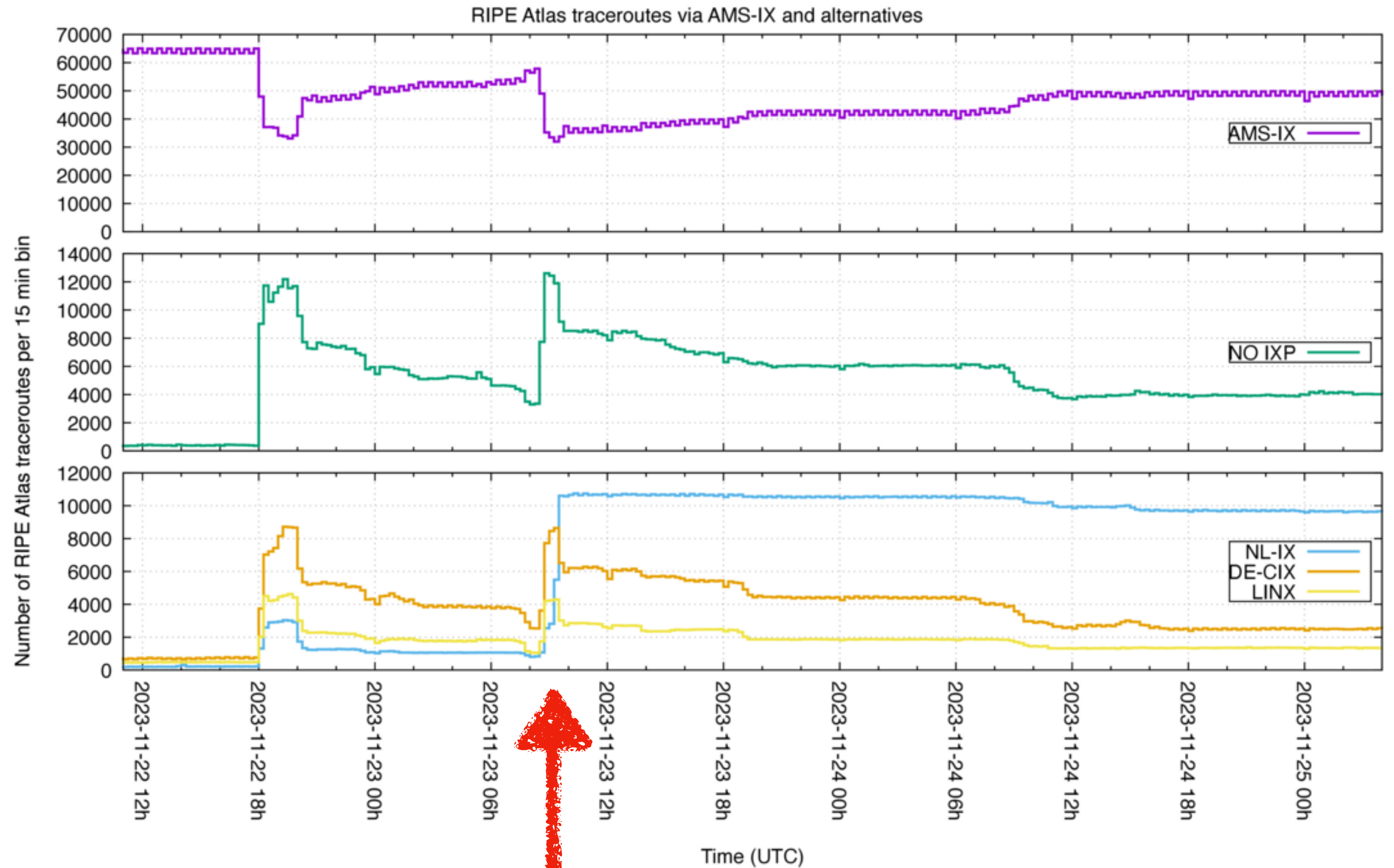
- Even split:
 - Paths without IXP
 - Paths via other IXPs
 - Expected alternatives, due to locality/size
- Start of the 2 events look similar
- Second event had a huge uptick of NL-IX
 - Manual pref change?



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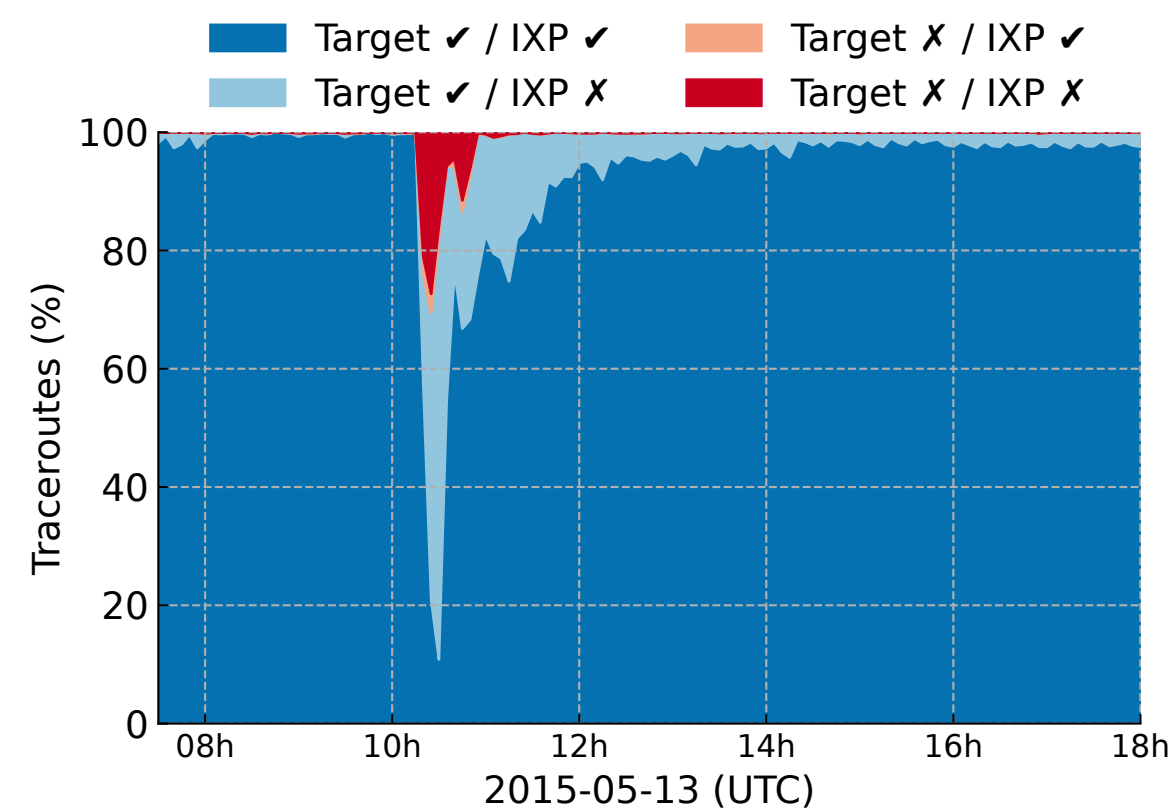
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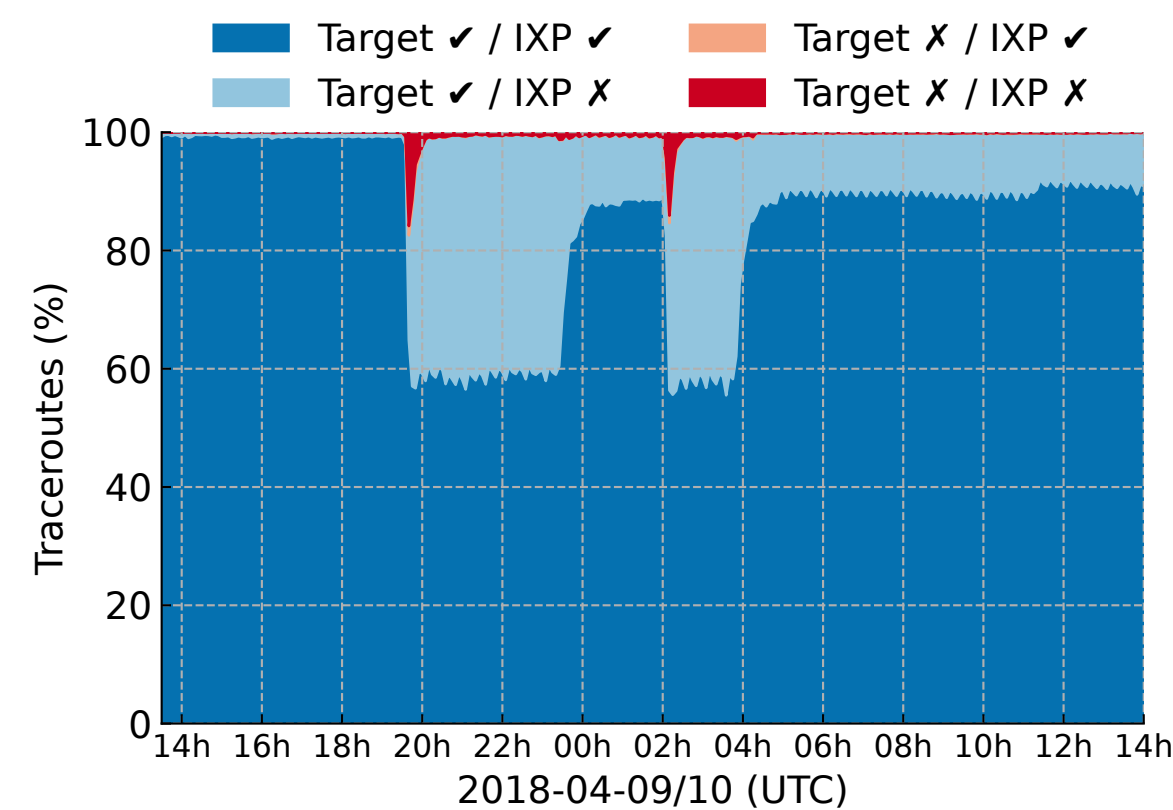
Does The Internet Route Around Damage?



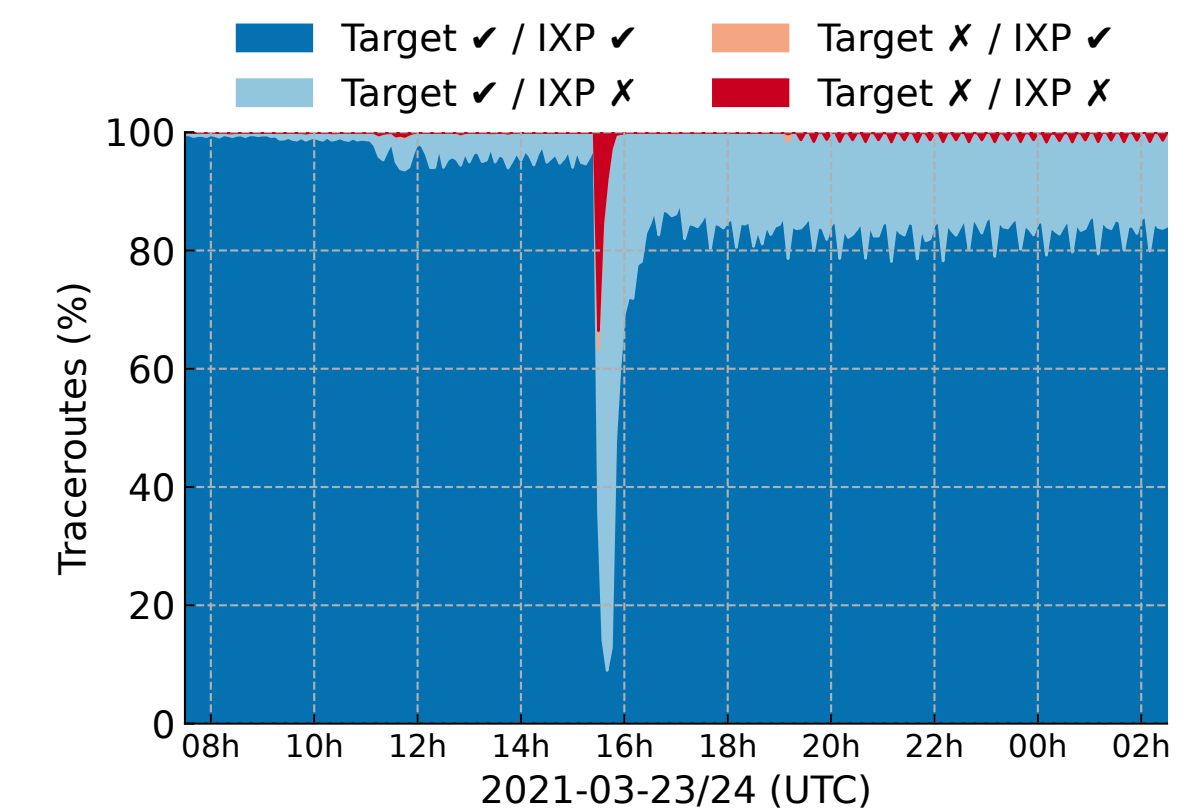
- For the recent and also 3 earlier cases of outages at large IXP it mostly does
- Differences in rate of return-to-initial state. Why?



AMS-IX



DE-CIX



LINX

- Re-analysis: Malte Tashiro (IIJ)

Can This Be Done For Other IXPs?



- Likely. But careful with regards to probe/destination diversity

50.9% of IXPs have at least 2 ASNs within 2ms: 330 (out of 648)

Search the table ("AMS-IX", "atlas=false") 330 results

IXP id as in Peering...	IXP Name	ASNs within 2ms	Probes within 2ms	city	country
31	DE-CIX Frankfurt	104	167	Frankfurt	DE
26	AMS-IX (Amsterdam...	85	135	Amsterdam	NL
18	LINX LON1 (London ...	67	100	London	GB
359	France-IX Paris (Fra...	66	139	Paris	FR
100	MSK-IX Moscow	64	77	Moscow	RU
1320	Hopus (The HOPUS ...	61	113	Paris, Lyon, Marseille...	FR
358	DATAIX (Global Netw...	57	70	Frankfurt, Stockhol...	NL
64	NL-ix (Neutral Intern...	56	142	Amsterdam, Rotterd...	NL
1842	Speed-IX (Speed Int...	51	77	Dronten	NL
255	Equinix Paris (Equini...	49	57	Paris	FR
60	SwissIX (SwissIX Int...	45	79	Zurich	CH
71	NIX.CZ (Neutral Inter...	45	70	Prague	CZ
158	Equinix Singapore (E...	45	85	Singapore	SG
2084	LOCIX Frankfurt	43	50	Frankfurt	DE

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Take Aways



- IXPs are human-made structures and very occasionally have outages
- In cases of outages at large IXPs we looked at, we see “the Internet routes around damage”
- Atlas deployment: More around IXPs
- Why does the Internet route around damage?
 - Rich local peering ecosystems around the large IXPs = healthy interconnect ecosystem?
 - Same in other locations?



Questions



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<https://hachyderm.io/@meileaben>