

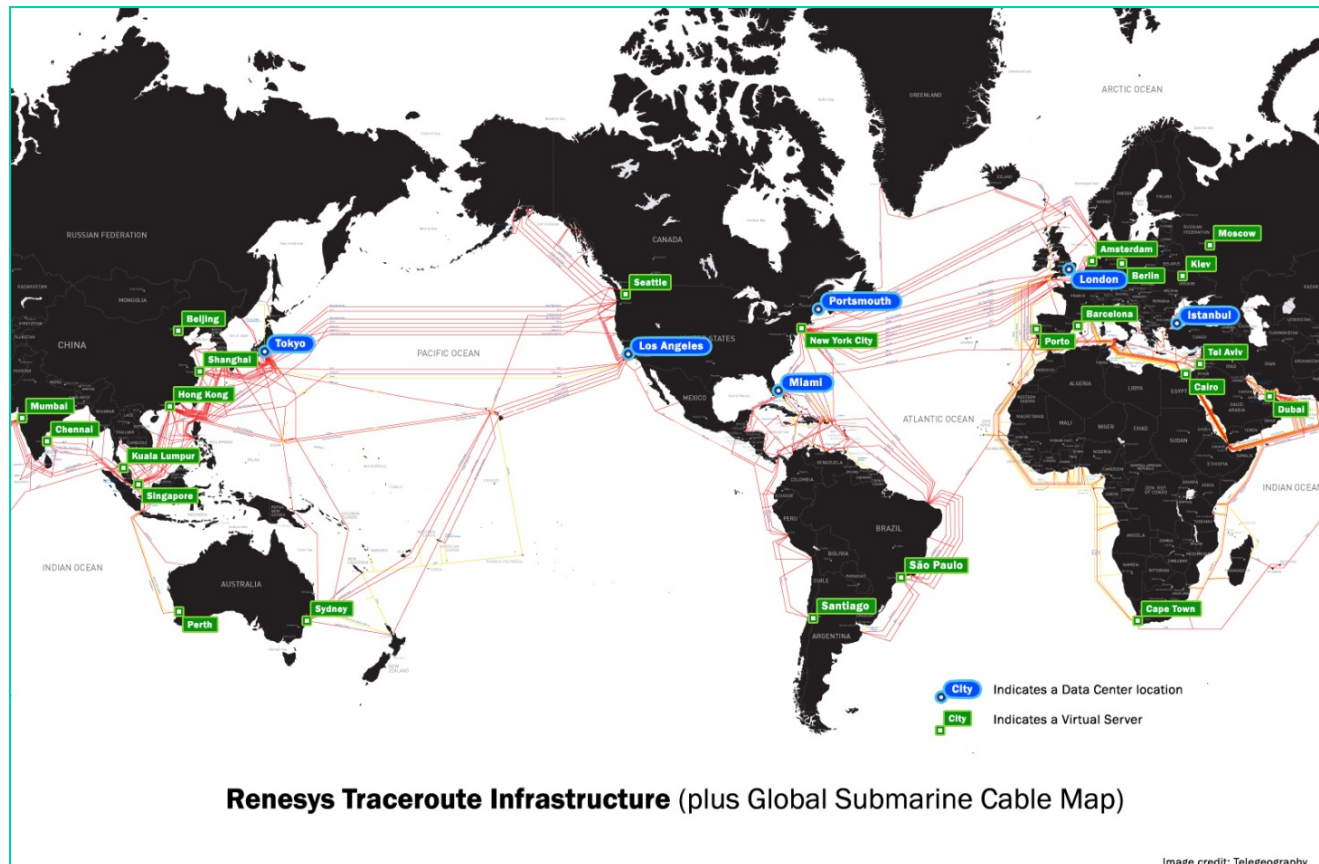
Middle East Latency Analysis: 2011

MENOG 9
Muscat, Oman
October 2011

Doug Madory, Renesys Corp

Renesis Traceroute Infrastructure

- Renesis performs daily traceroutes of the entire Internet from dozens of locations around the world.
 - ~1.9MM traceroutes into ME daily



Latency Analysis Methodology

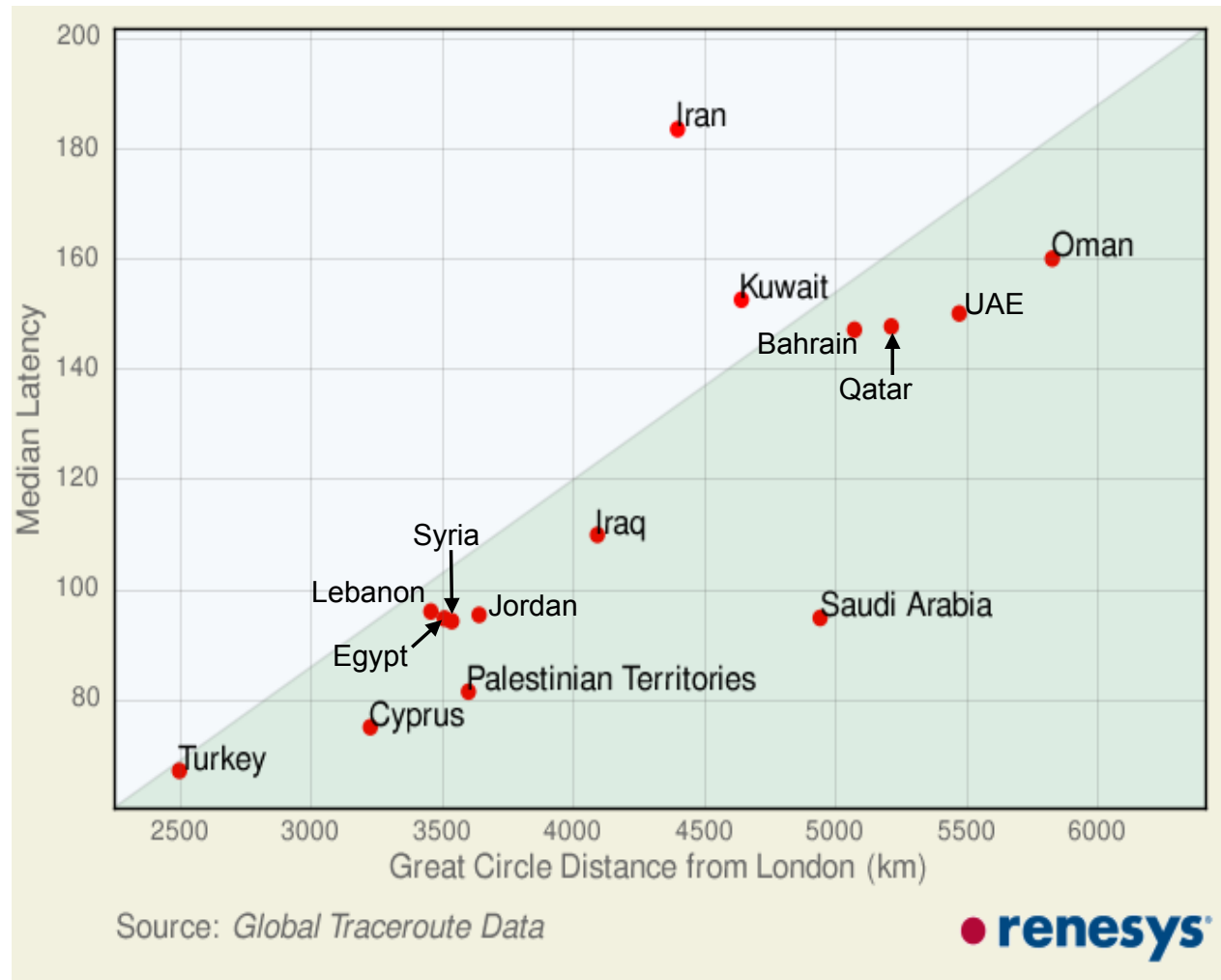
- Compute the daily median overall latencies from traceroutes to responding hosts in Middle East.
 - Approximately 100k unique hosts “tracerouted” per day per country (actual count varies by country).
 - This analysis only uses two sources (London, Hong Kong).
- Observe differences in median latency by country and explore reasons behind increases or decreases.



Current Median Latency vs Distance

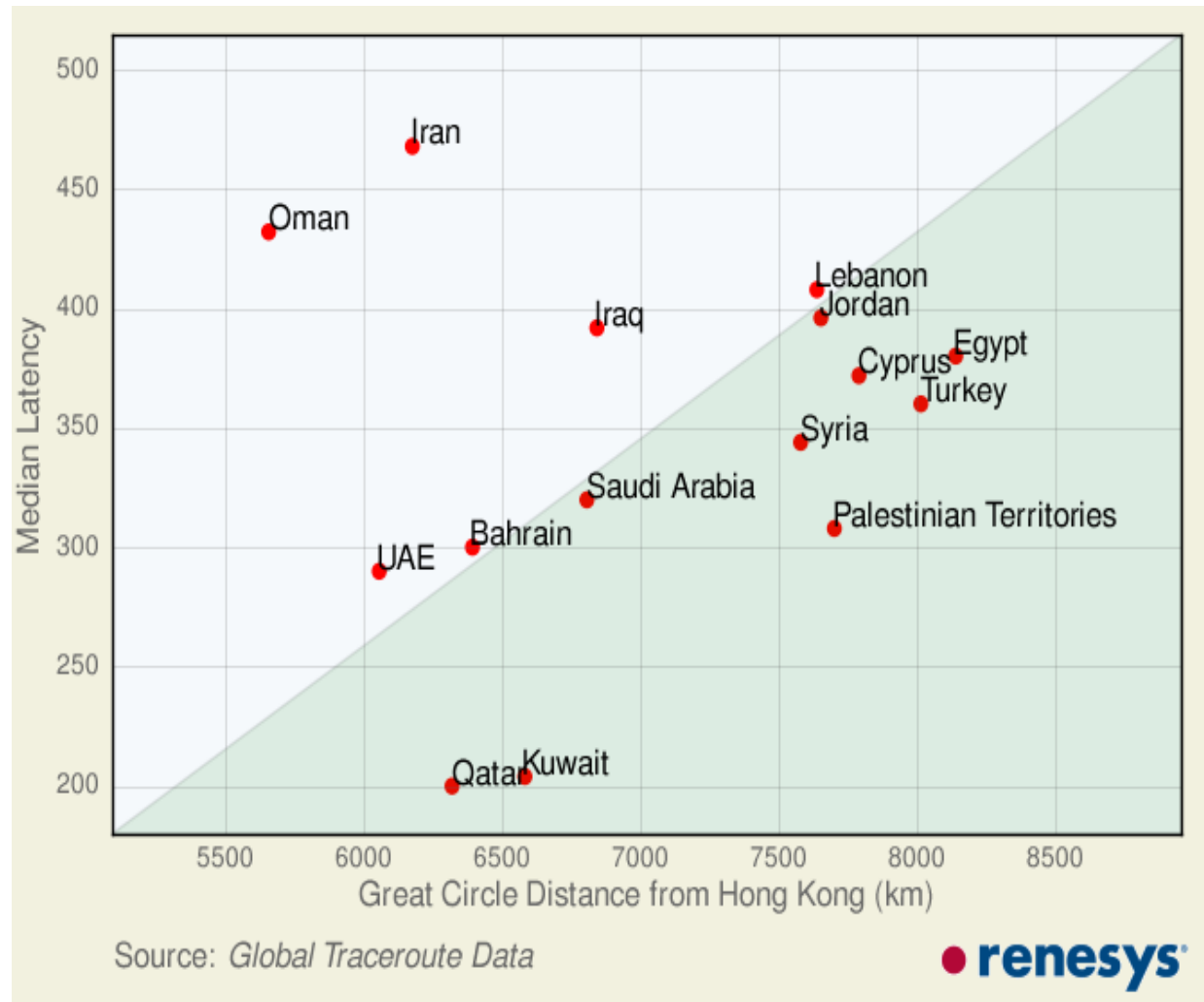
Median Latencies from London

- **Shortest Latencies:** Turkey, Cyprus, PS
- **Longest Latencies:** Iran
- **Largest *decreases* since 1 Jan 2011:**
 - LB (84ms)
 - IQ (70ms)
 - OM (41ms)
 - CY (26ms)



Median Latencies from Hong Kong

- **Shortest Latencies:**
Qatar, Kuwait
- **Longest Latencies:**
Iran, Oman
- **Largest *increases***
since 1 Jan 2011:
 - QA (76ms)
- **Largest *decreases***
since 1 Jan 2011:
 - IQ (72ms)
 - SA (44ms)



Latency Analysis in 2011

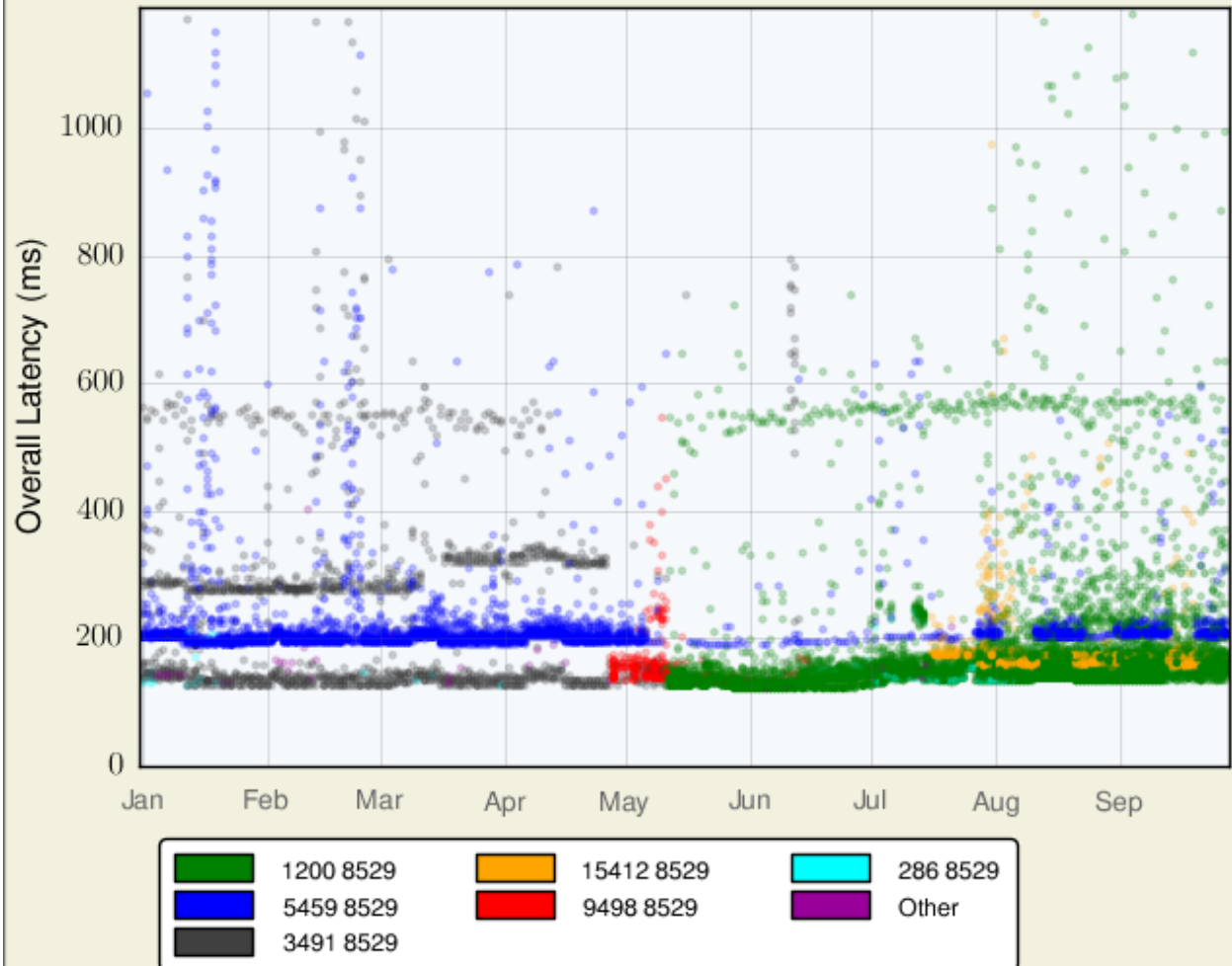
- Connectivity to ME region, much more stable
 - In the past, we'd be analyzing complete outages due to major cable breaks
- Now, task is to fine-tune transit paths to reduce latency
 - Similar connectivity concerns of Europe, North America

How to read following charts

- Charts represent latencies over time by provider-provider handoffs
- Each dot represents traceroute latencies observed on a single day
- Colors denote which handoff was used to enter the market
- Source of latency can be something other than provider handoffs
- However, horizontal bands represent discrete distributions of latencies by AS-AS edge

Traceroutes to Oman from London, GB

01 Jan 2011 to 27 Sep 2011



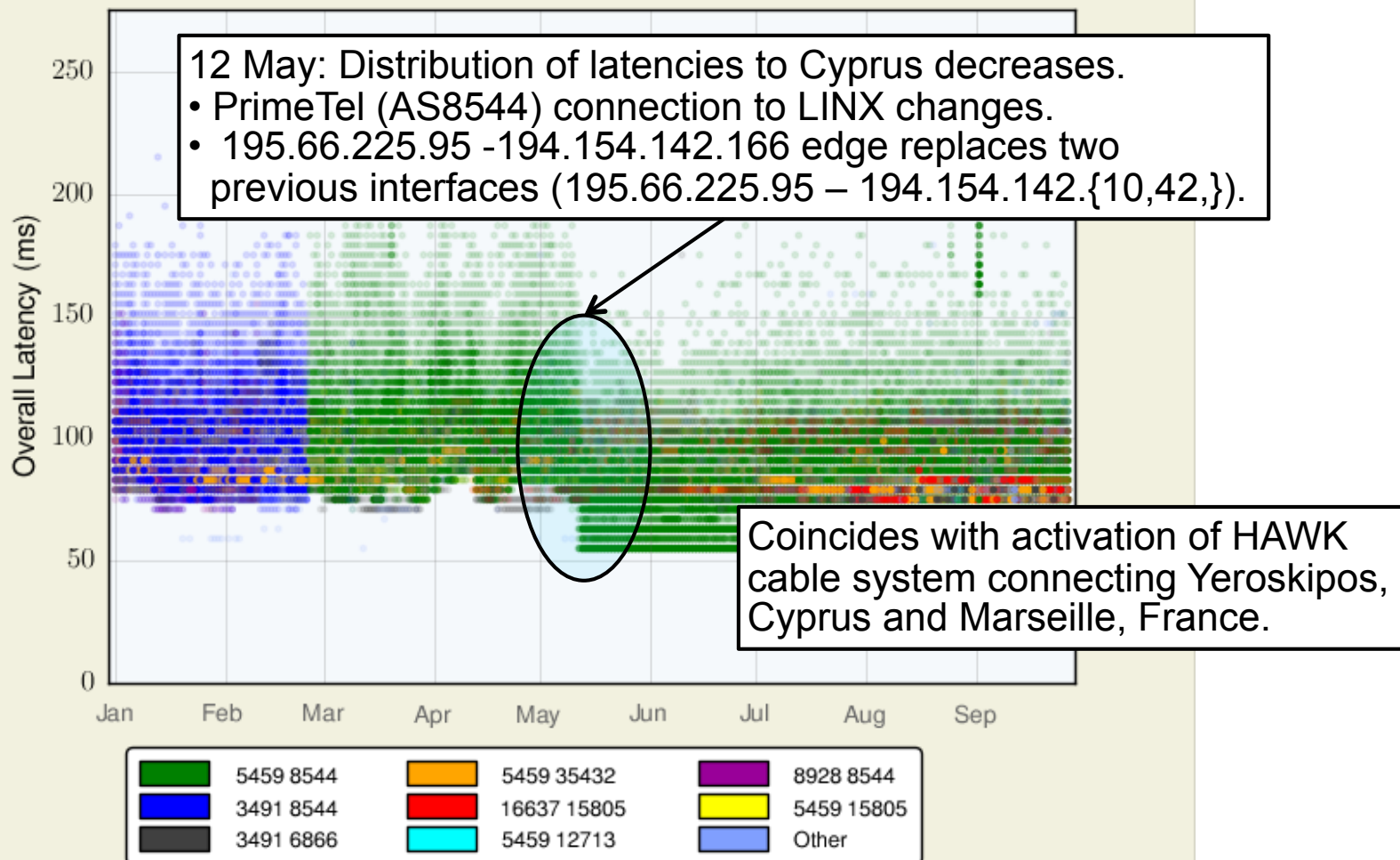
Question 1

- Why did median latencies to Cyprus ***decrease*** from London?

Cyprus from London

Traceroutes to Cyprus from London, GB

01 Jan 11 to 27 Sep 11



Question 1

- Why did median latencies to Cyprus **decrease** from London?
 - Likely due to HAWK cable system activation between France and Cyprus



The screenshot shows a web page from Capacity magazine. The header includes the 'capacity magazine' logo and a navigation menu with links for 'Regions', 'Markets', 'People', 'Tech-know', 'CapacityTV', and 'A'. Below the header, there are additional links for 'News', 'Big interview', 'Company strategies', 'Country focus', and 'Features'. The main content area features a large headline: 'Reliance Globalcom's HAWK cable to connect France and Cyprus', dated '22 June 2011 | Fiona Bradley'. There are 'Print' and 'Share' buttons to the right of the headline. The article text begins with: 'Reliance Globalcom announced the launch of its next-generation submarine cable system connecting Cyprus to France. The cable system, called HAWK, will provide 2.7Tbps of capacity and cover over 3,181 km connecting Yeroskipos in Cyprus and Marseille in France. HAWK will connect to Reliance Globalcom's global submarine and European backhaul network linking Marseille to London, Paris and Frankfurt. The new cable aims to reduce latency between Cyprus and London compared to existing cables.'

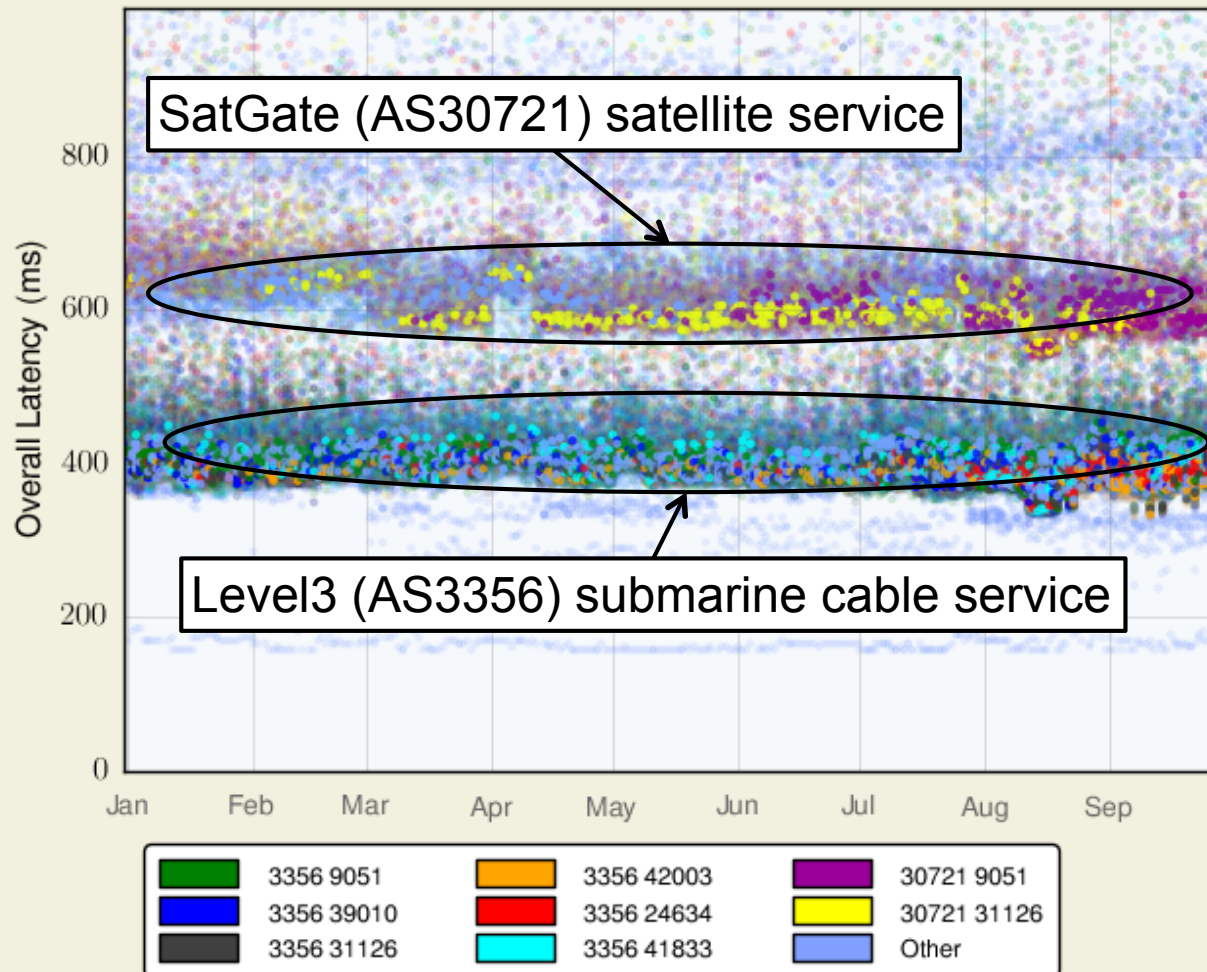
Question 2

- Why did median latencies to Lebanon ***decrease*** from London?

Lebanon from Hong Kong

Traceroutes to Lebanon from Hong Kong

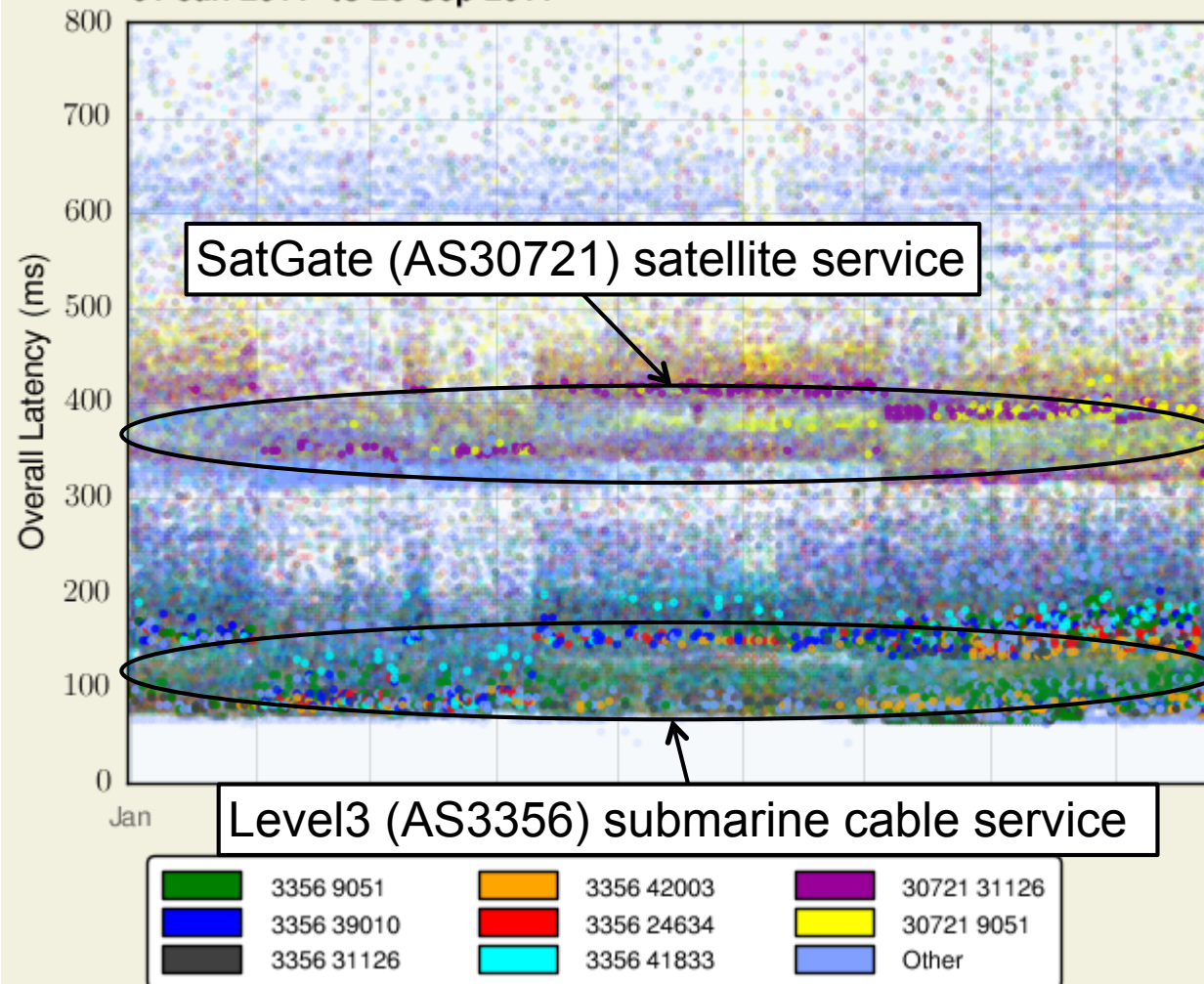
01 Jan 2011 to 27 Sep 2011



Lebanon from London

Traceroutes to Lebanon from London, GB

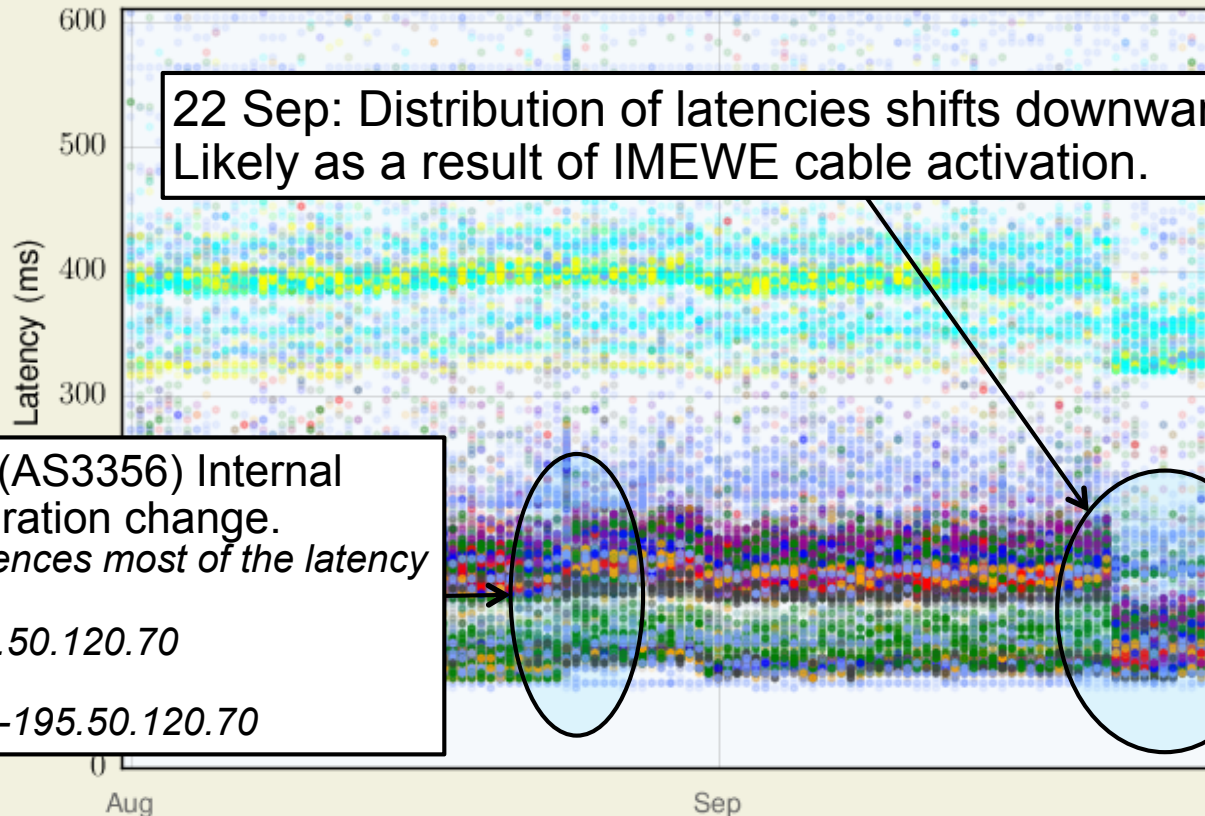
01 Jan 2011 to 26 Sep 2011



Lebanon from London (zoom)

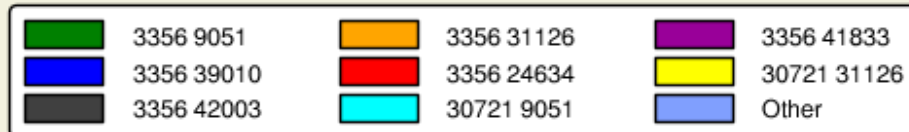
Traceroutes to Lebanon from London, GB

01 Aug 2011 UTC to 27 Sep 2011 UTC



22 Sep: Distribution of latencies shifts downwards by ~60ms. Likely as a result of IMEWE cable activation.

24 Aug: Level3 (AS3356) Internal network configuration change. Hop which experiences most of the latency changes from 4.69.143.237-195.50.120.70 to 4.69.139.{71,103}-195.50.120.70



Question 2

- Why did median latencies to Lebanon ***decrease*** from London?
 - Likely due to recent activation of IMEWE cable system.

Question 3

- Why has OmanTel's median latency *increased* from Hong Kong but *decreased* from London?

Oman from London

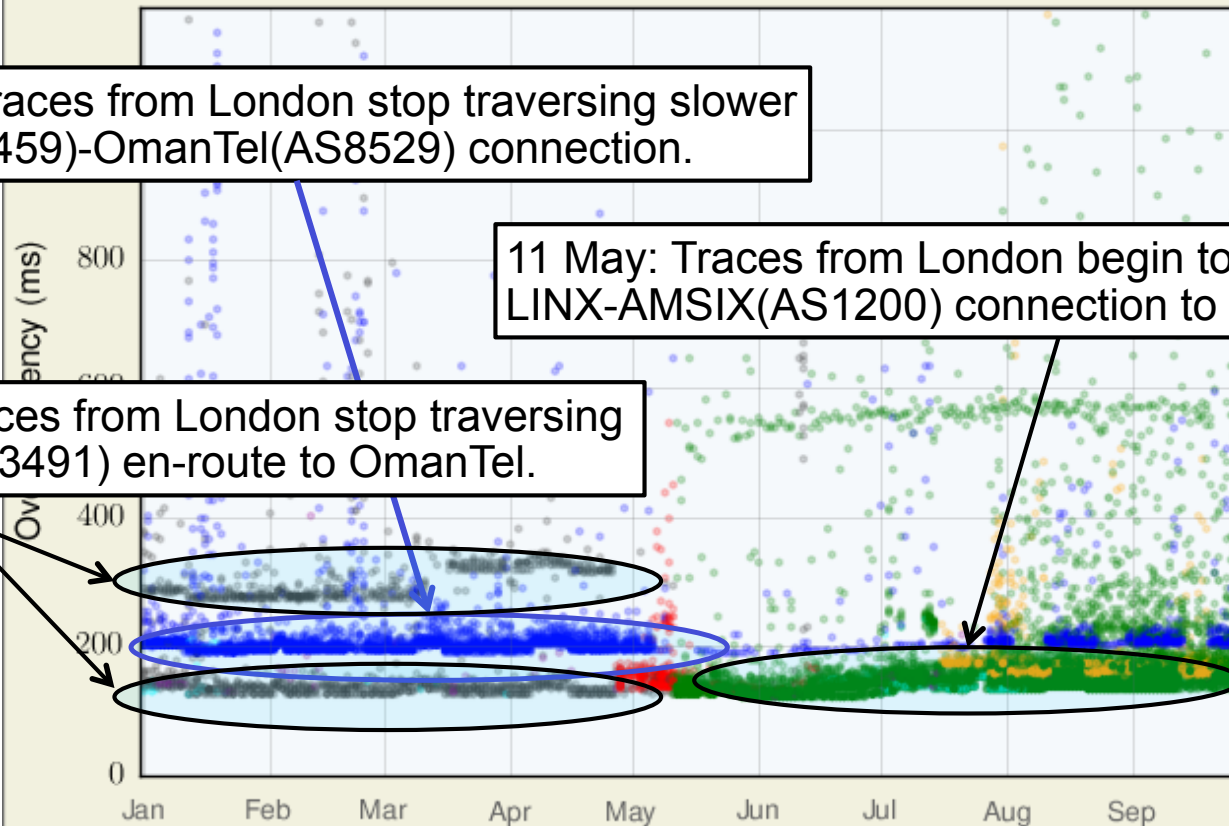
Traceroutes to Oman from London, GB

01 Jan 2011 to 27 Sep 2011

10 May: Traces from London stop traversing slower LINX(AS5459)-OmanTel(AS8529) connection.

11 May: Traces from London begin to traverse faster LINX-AMSIX(AS1200) connection to reach OmanTel.

27 Apr: Traces from London stop traversing PCCW (AS3491) en-route to OmanTel.



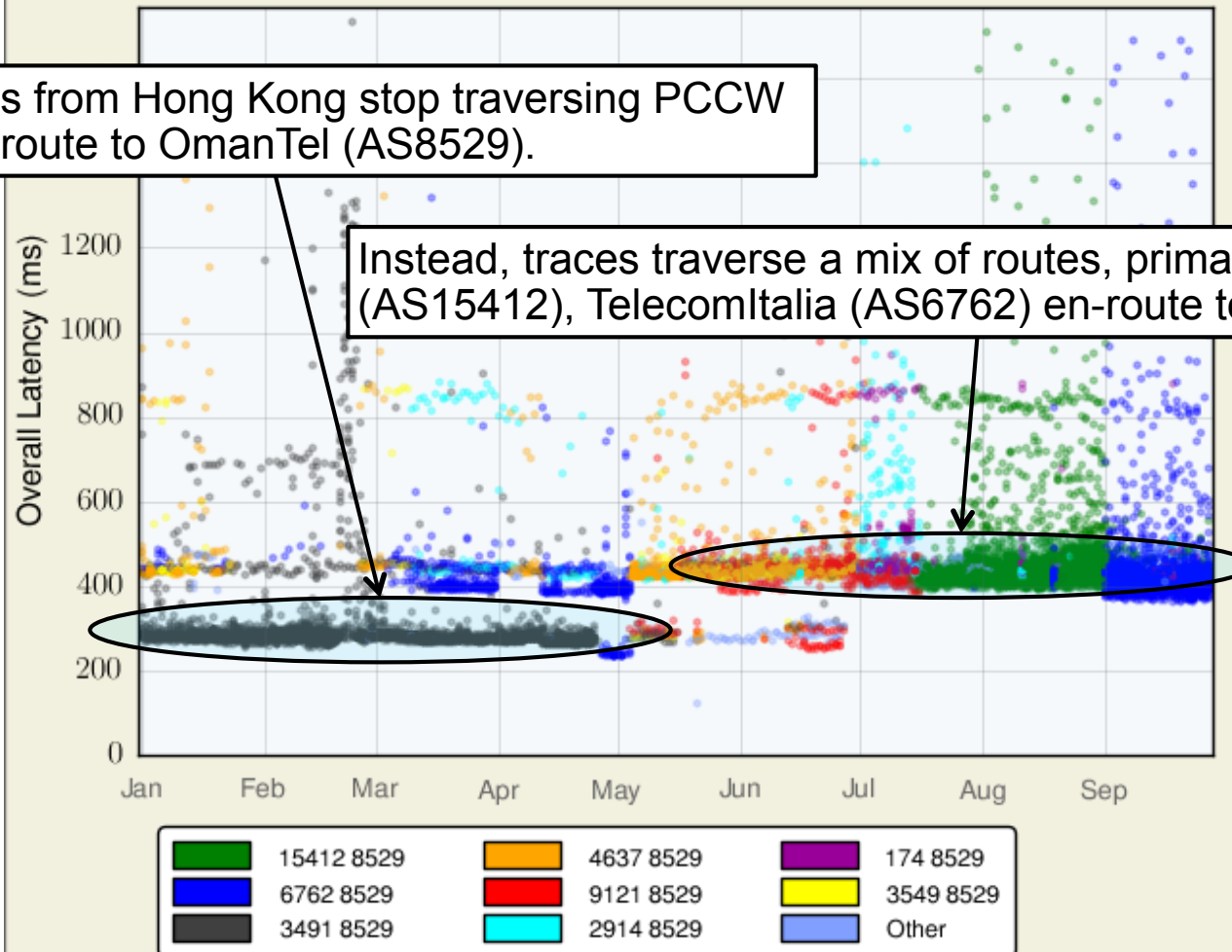
Oman from Hong Kong

Traceroutes to Oman from Hong Kong

01 Jan 2011 to 27 Sep 2011

26 Apr: Traces from Hong Kong stop traversing PCCW (AS3491) en-route to OmanTel (AS8529).

Instead, traces traverse a mix of routes, primarily Flag (AS15412), TelecomItalia (AS6762) en-route to OmanTel.



Question 3

- Why has OmanTel's median latency **increased** from Hong Kong but **decreased** from London?
 - London – Traces from London now traversing faster link to OmanTel at AMSIX
 - Hong Kong – Traces no longer traversing faster PCCW link, now mostly traversing Flag, Telecom Italia (via London)

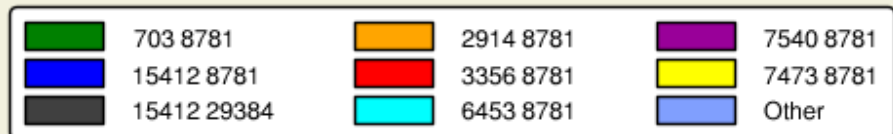
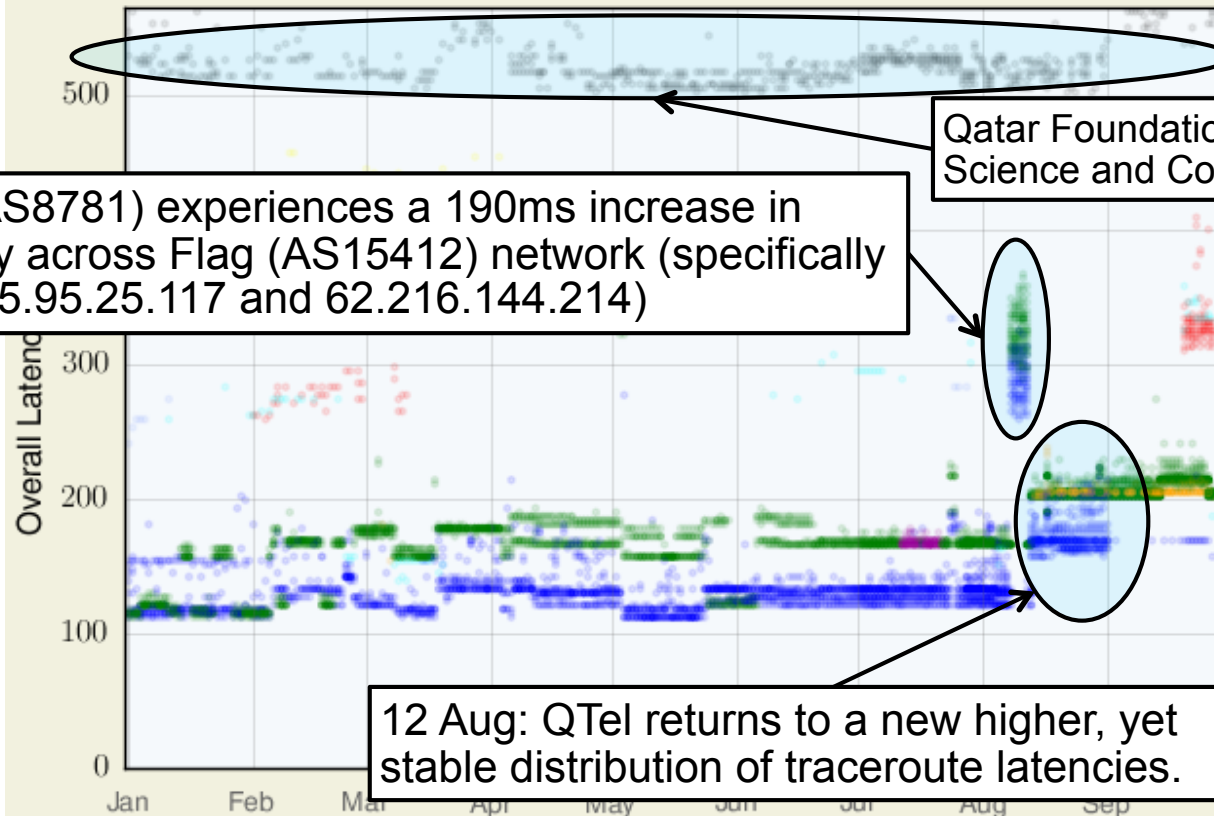
Question 4

- Why has the median latency Qatar **increased** from Hong Kong?

Qatar from Hong Kong

Traceroutes to Qatar from Hong Kong

01 Jan 2011 to 27 Sep 2011



Qatar from London

Traceroutes to Qatar from London, GB

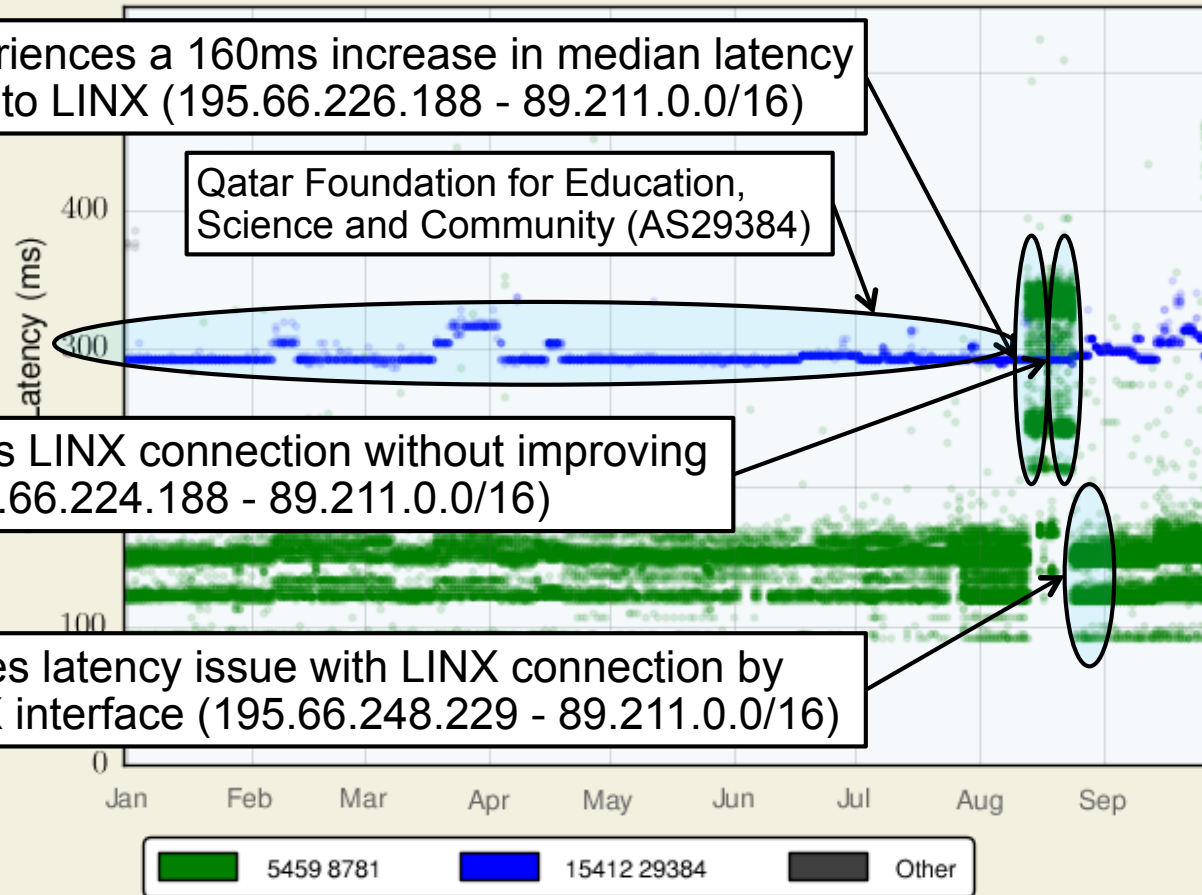
01 Jan 2011 to 27 Sep 2011

13 Aug: QTel experiences a 160ms increase in median latency across connection to LINX (195.66.226.188 - 89.211.0.0/16)

Qatar Foundation for Education, Science and Community (AS29384)

19 Aug: QTel changes LINX connection without improving latency problem (195.66.224.188 - 89.211.0.0/16)

25 Aug: QTel resolves latency issue with LINX connection by change to third LINX interface (195.66.248.229 - 89.211.0.0/16)



Question 4

- Why has the median latency Qatar **increased** from Hong Kong?
 - An event in Aug on Flag's network caused an increase in the distribution of latencies.

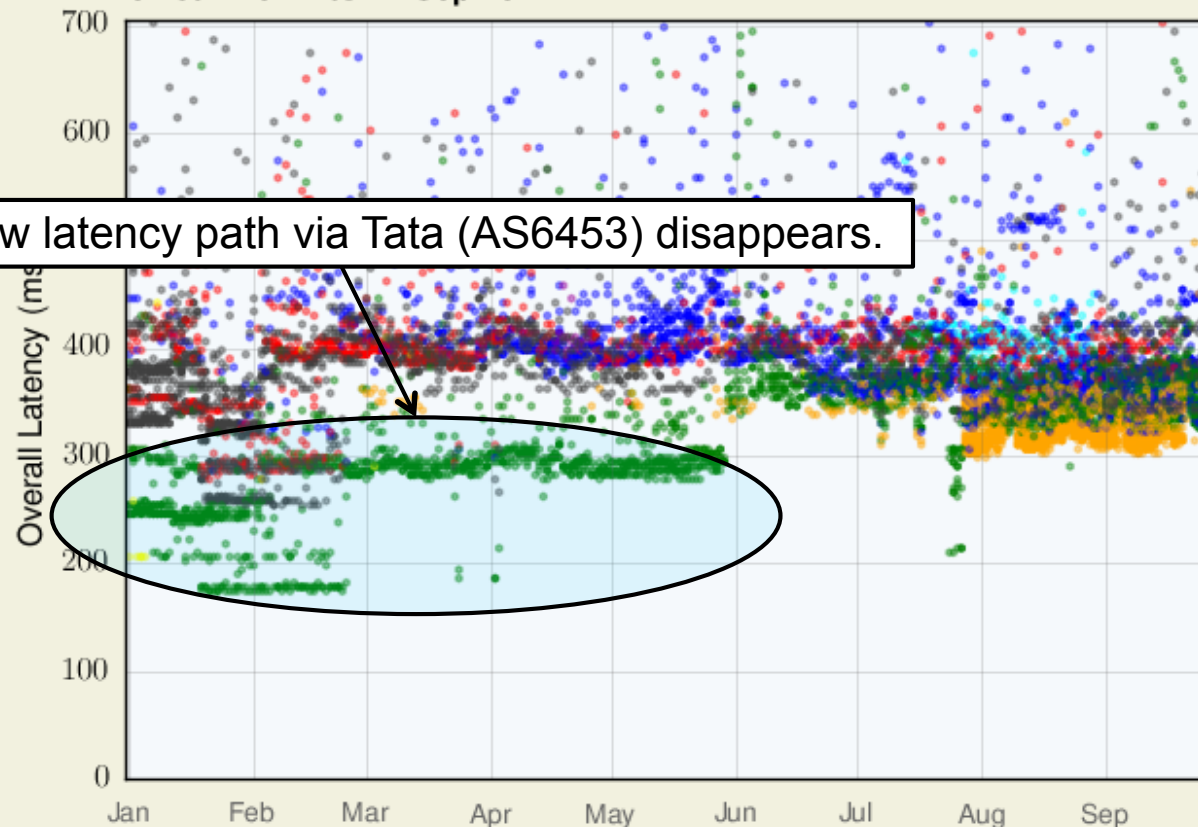
Question 5

- How have median latencies changed to Syria?

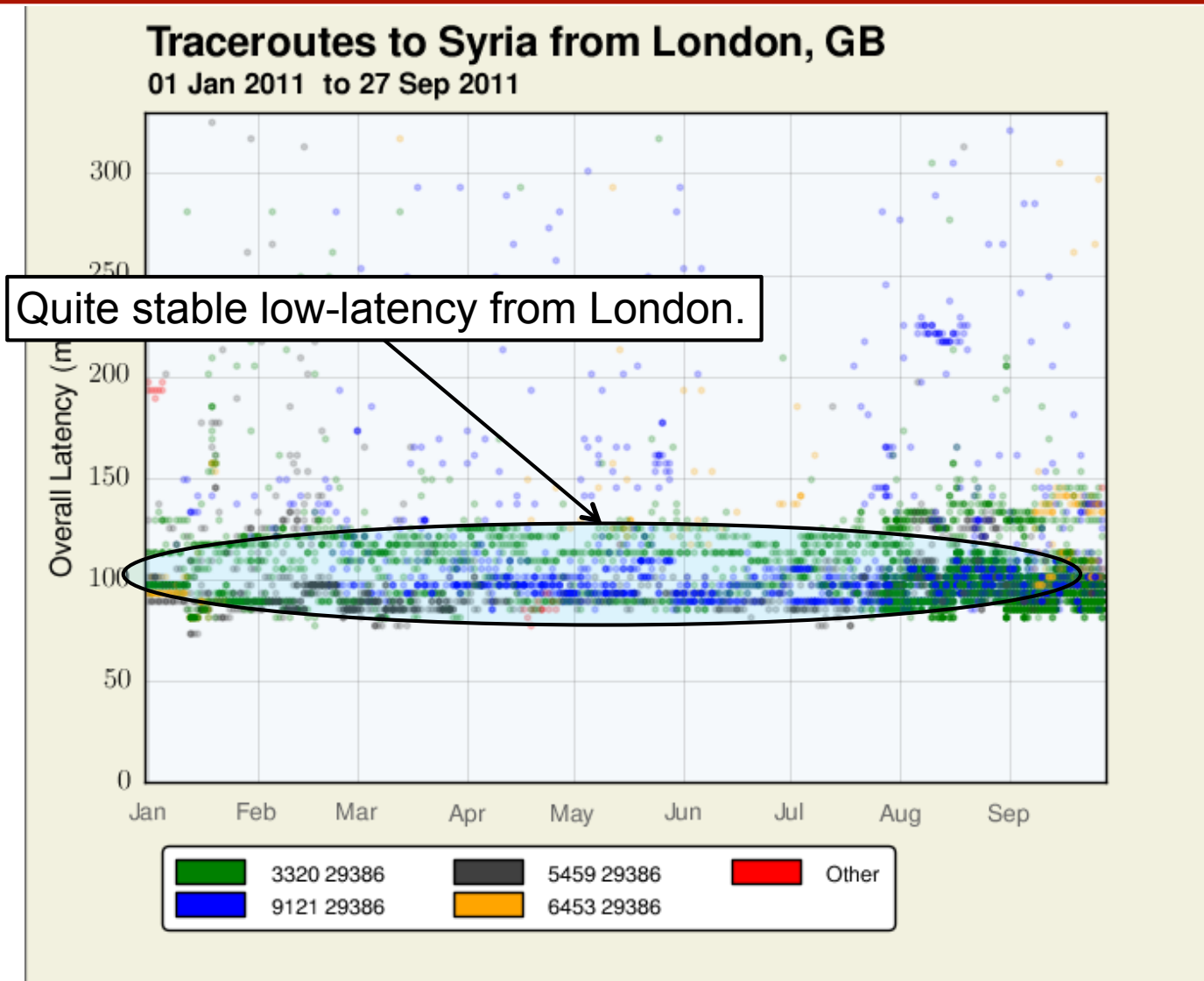
Syria from Hong Kong

Traceroutes to Syria from Hong Kong

01 Jan 2011 to 27 Sep 2011



Syria from London



Question 5

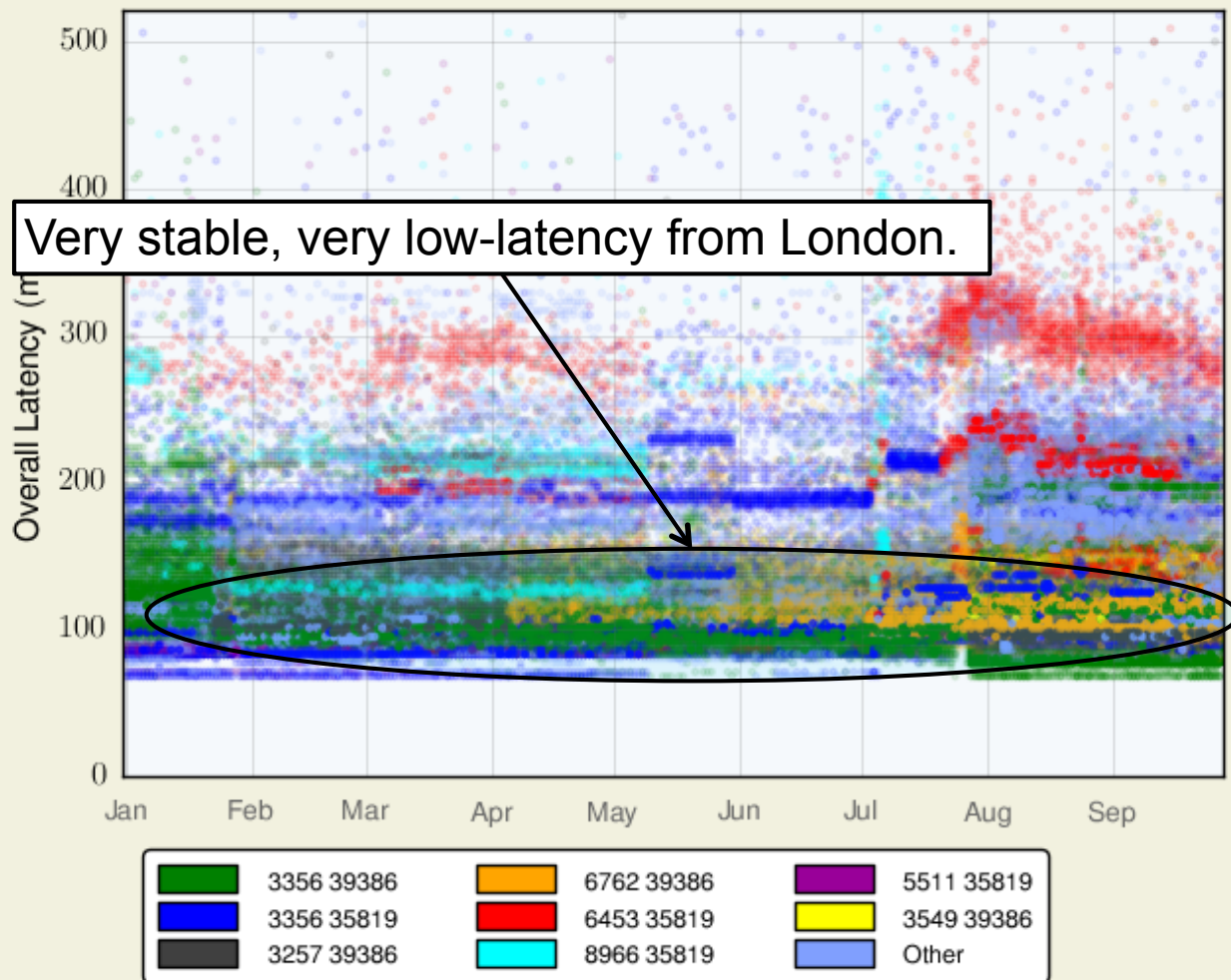
- How have median latencies changed to Syria?
 - Latencies have been very low and stable from London
 - Latencies have increased as low-latency path via AS6453 disappeared at the end of may.

Question 6

- Why have median latencies ***decreased*** to Saudi Arabia from Hong Kong?

Saudi Arabia from London

Traceroutes to Saudi Arabia from London, GB
01 Jan 2011 to 27 Sep 2011

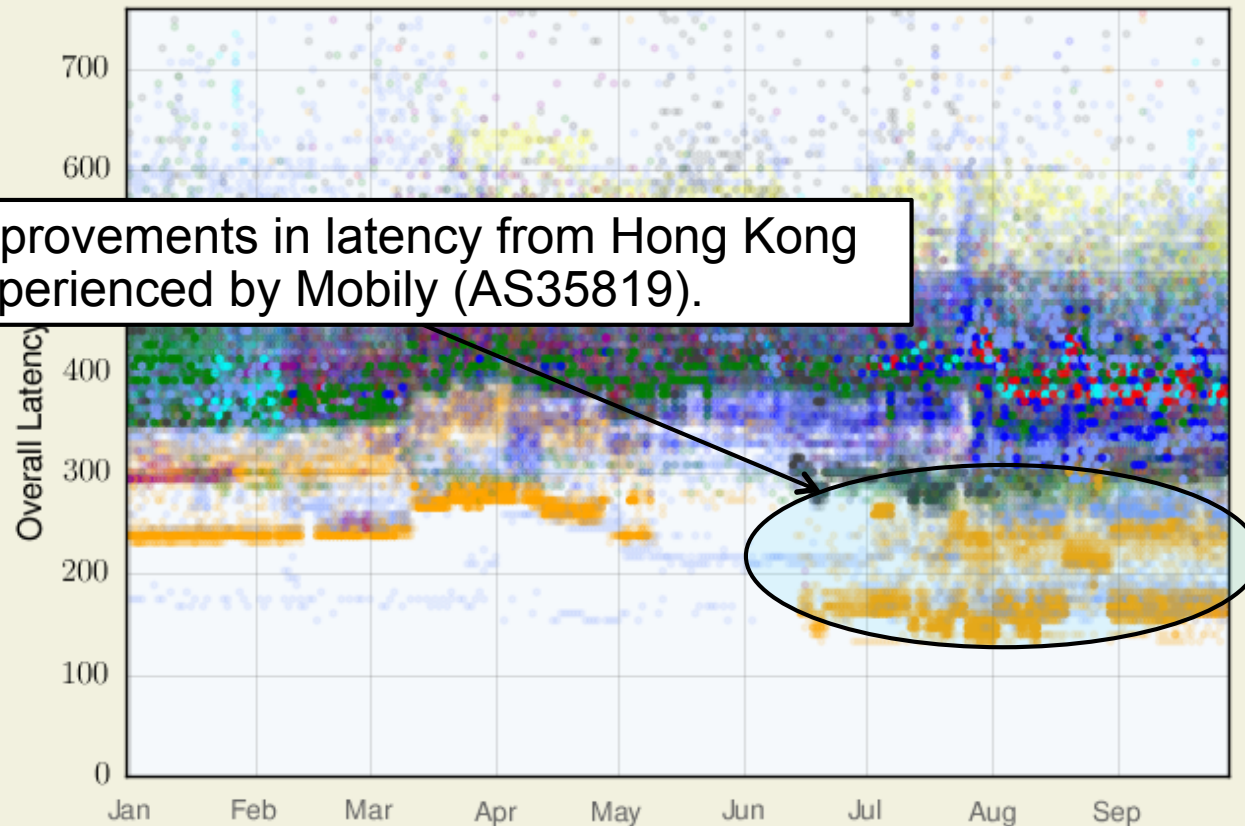


Saudi Arabia from Hong Kong

Traceroutes to Saudi Arabia from Hong Kong

01 Jan 2011 to 27 Sep 2011

Improvements in latency from Hong Kong experienced by Mobily (AS35819).



Conclusion

- While connectivity challenges remain for the ME region, 2011 has been a very stable year *so far*.
 - No regional outages on same scale as previous years (example: FOG, SMW4)
- Remaining challenges just as likely to be ‘distant end’ (e.g. London, Hong Kong).
- Increases in latency can have negative impact on customer experience
- Active measurement strategies can provide insight into emerging latency issues for network and mobile providers.

Thank you!

www.renesys.com