

Internet Structural Analysis by End-to-End Measurement

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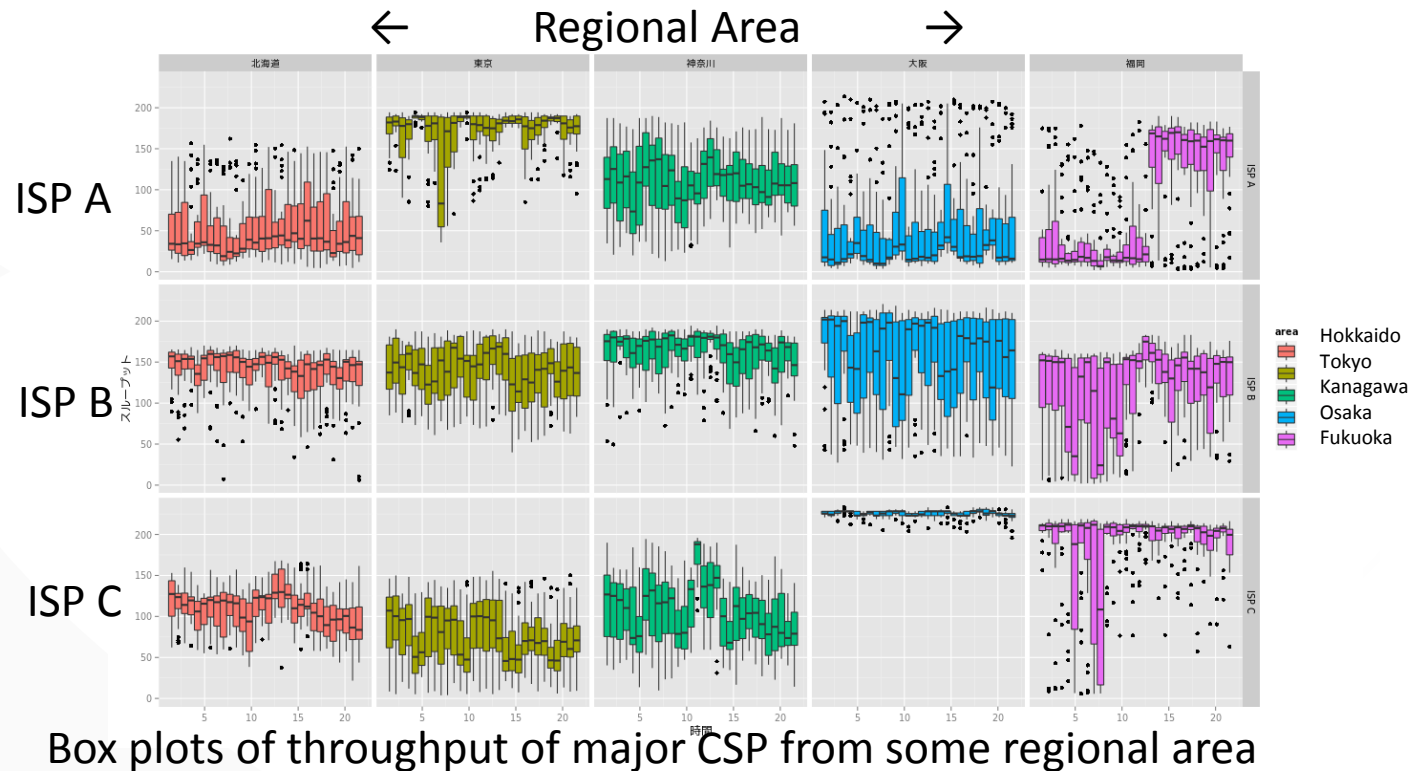
- Motivation and Research Interest
 - Focused on structural analysis of the Internet mainly using by end-to-end active measurement.
 - Our target is Improving customer satisfaction, Designing networks, and Planning business strategies, as a global Tier 1 carrier and a largest Japanese ISP operator.
 - Recently the large ISPs traffic share is decreasing, though they could gather many data from internal equipment.
- CDN analysis
 - Observed two big events, iOS8 and Windows10 distribution, the results are in following slides.

Our Measurement system

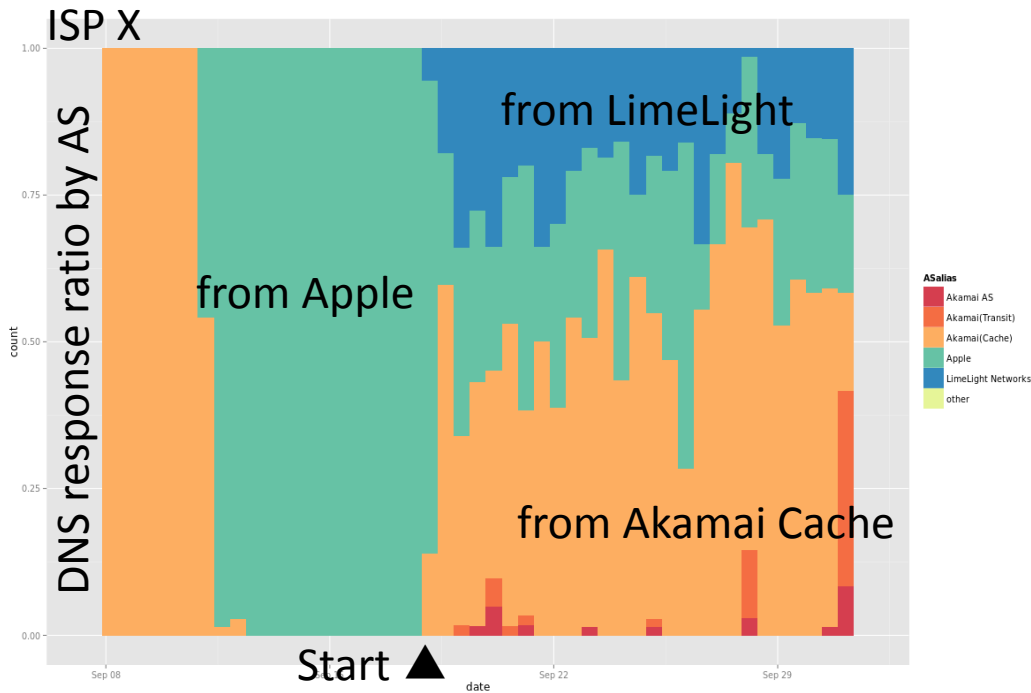


Setting over 150 active probes connected with residential FTTH access.

Measuring ICMP RTT, trace, DNS lookup and http throughput from the viewpoint of end-user.

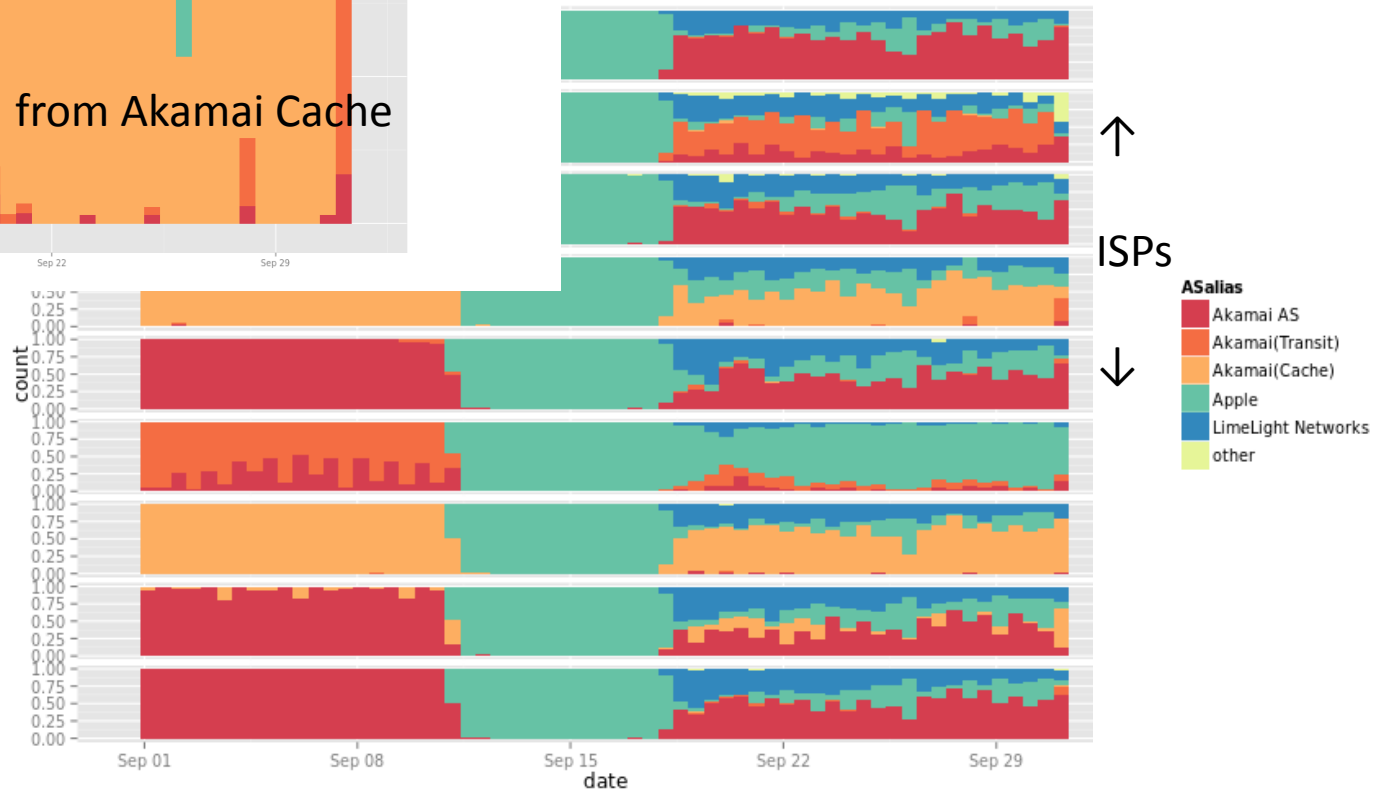


CDN analysis (iOS8 update : 2014/09)

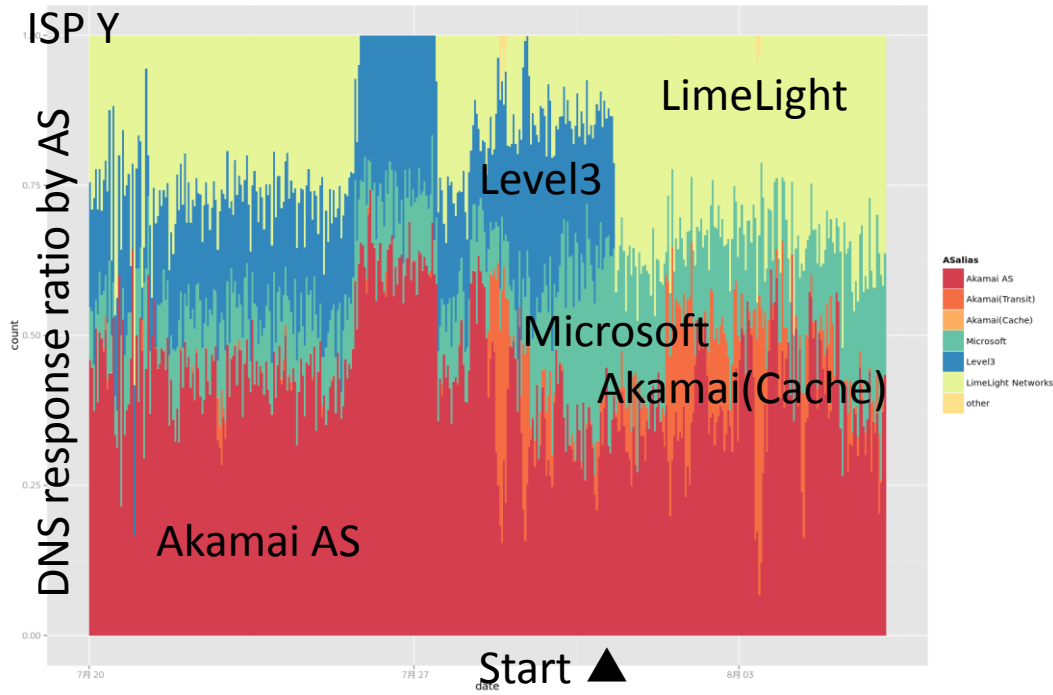


DNS response analysis from 9 ISPs

iOS8 may mainly from apple AS and
Some traffics are offloaded to CDNs.



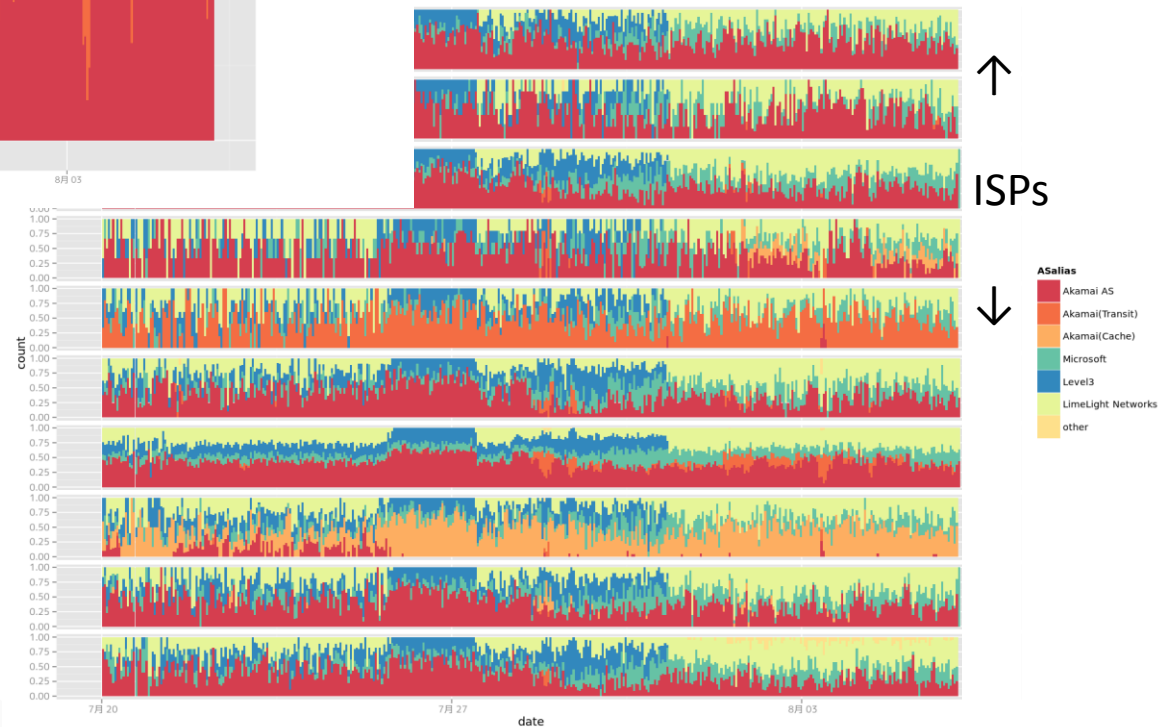
CDN analysis (Windows10: 2015/08)



DNS response analysis from 10 ISPs

Win10 may distributed from two CDNs.
Microsoft traffic is very small.

Some ISPs Akamai cache are not used.
Level3 may not used for Win10.



Discussion

- Most of Internet traffic is not operated by BGP.
- End-to-End measurement is one of the most effective method to know behavior of Large Contents Providers.
- Passive and Internal equipment data is easy to collect but observation area is limited, and active measurement is easy to expand observation but difficult to planning.
- We should share end-to-end measurement results and collaborative analysis to know the Internet and sound development of it.
- Our proposal of measurement system is applied to IETF LMAP WG [*].