

Increase of Root and JP queries

-- Long-term trends of number of queries --

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DNS-OARC 2015 Spring Workshop

Last Update: 2015/5/7 1253 (UTC)

Are DNS queries increasing ?

- Some people say that the load to DNS is still increasing and queries to root and TLD DNS servers are also increasing
- However, there is no evidence which indicates the increase of queries to root and TLD DNS servers

DNS-OARC Root Datasets

- "A Day in the Life of the Internet" (DITL) is a large-scale data collection project undertaken by CAIDA and DNS-OARC every year since 2006
 - <https://www.dns-oarc.net/ditl/2011/>
 - 50 hours packet capture at root DNS servers and other DNS servers (48 hours are used by this analysis)
 - Source IP addresses of i.root-servers.net data are anonymized

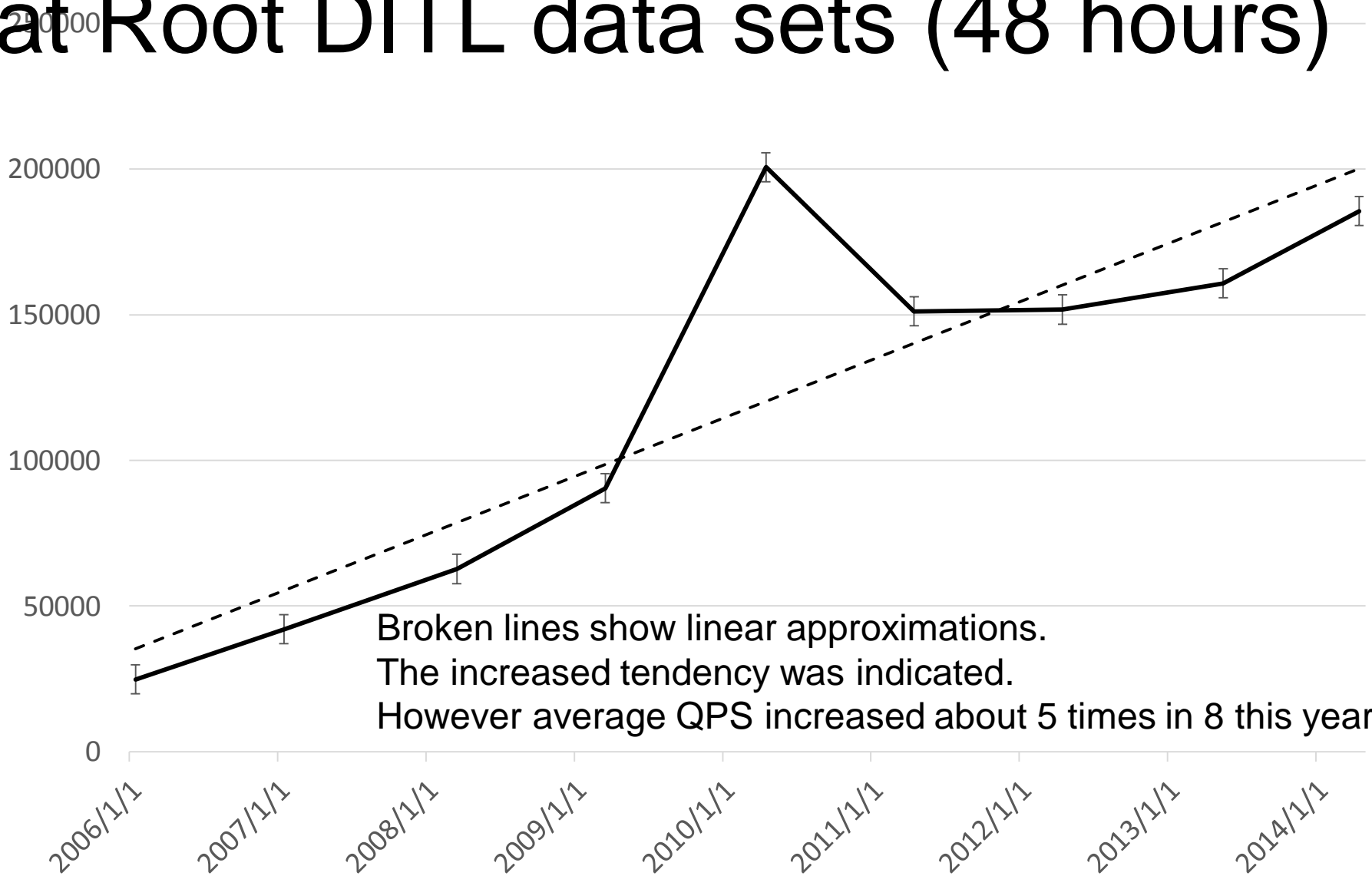
Year	Start(UTC)	End	Analyzed data from
2011	Apr 12 1200	Apr 14 1200	a,c,d,e,f,h,j,k,l,m (10/13)
2012	Apr 17 1200	Apr 19 1200	a,c,e,f,h,j,k,l,m (9/13)
2013	May 28 1200	May 30 1200	a,c,d,e,f,h,j,k,l,m (10/13)
2014	Apr 15 1200	Apr 17 1200	a,c,e,f,h,j,k,m (8/13)

JP datasets

- .JP has 1,391,422 registered domain names (on May 1, 2015)
- JP DNS servers serve approx. 1.6 billion queries per day
- Two datasets
 - Packet captures of all JP DNS servers, around the same time as DNS-OARC DITL event (and more)
 - Query logs of 2 (a and g) JP DNS servers, every day, for 9 years

Name	Operator	Location	Address (IPv4:7, IPv6:6, total 13)	Capture
A.DNS.JP	JPRS	JP*2	203.119.1.1, 2001:dc4::1	Pcap/Log
B.DNS.JP	JPNIC	JP*1	202.12.30.131, 2001:dc2::1	Pcap
C.DNS.JP	JPRS	Worldwide	156.154.100.5, 2001:502:ad09::5	Pcap
D.DNS.JP	IIJ	JP*2, US*2	210.138.175.244, 2001:240::53	Pcap
E.DNS.JP	WIDE	JP*1, US*1, FR*1	192.50.43.53, 2001:200:c000::35	Pcap
F.DNS.JP	NII	JP*1	150.100.6.8, 2001:2f8:0:100::153	Pcap
G.DNS.JP	JPRS	JP*1	203.119.40.1	Pcap/Log

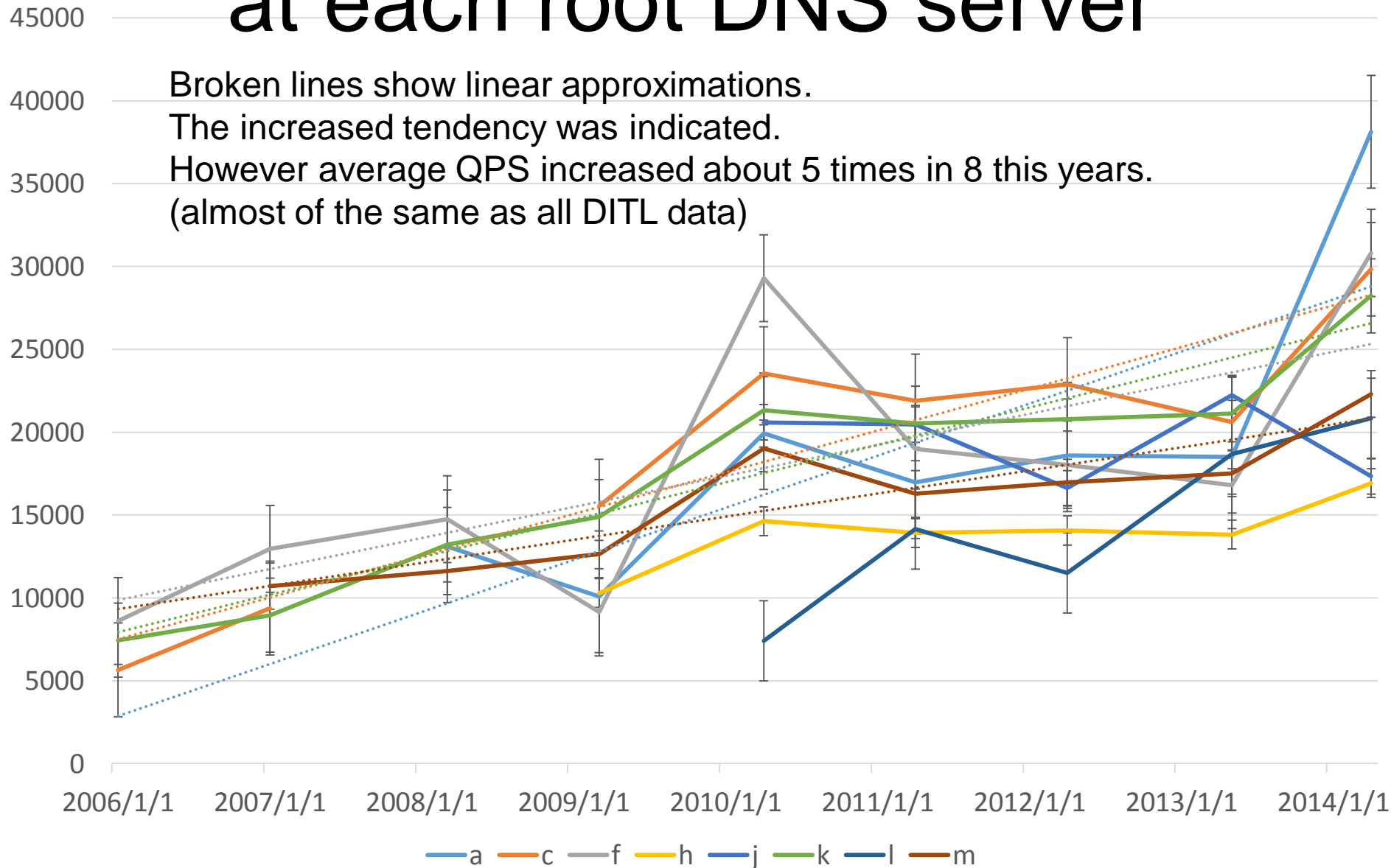
Average QPS (queries/sec) seen at Root DITL data sets (48 hours)



Broken lines show linear approximations.
The increased tendency was indicated.
However average QPS increased about 5 times in 8 this years.

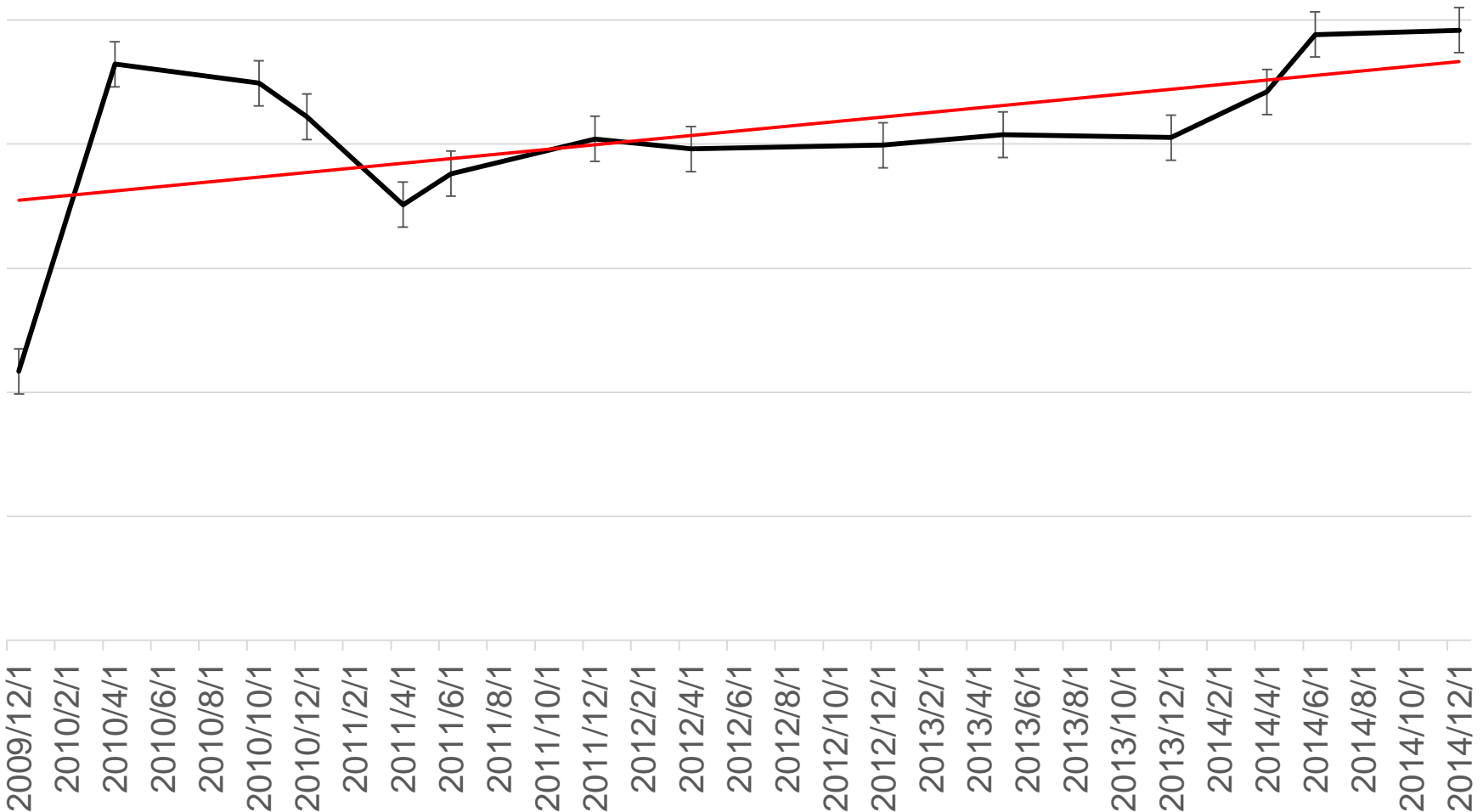
Average QPS seen at each root DNS server

Broken lines show linear approximations.
 The increased tendency was indicated.
 However average QPS increased about 5 times in 8 this years.
 (almost of the same as all DITL data)



Num. of queries seen at JP (all JP DNS, 48 hours, 5 years)

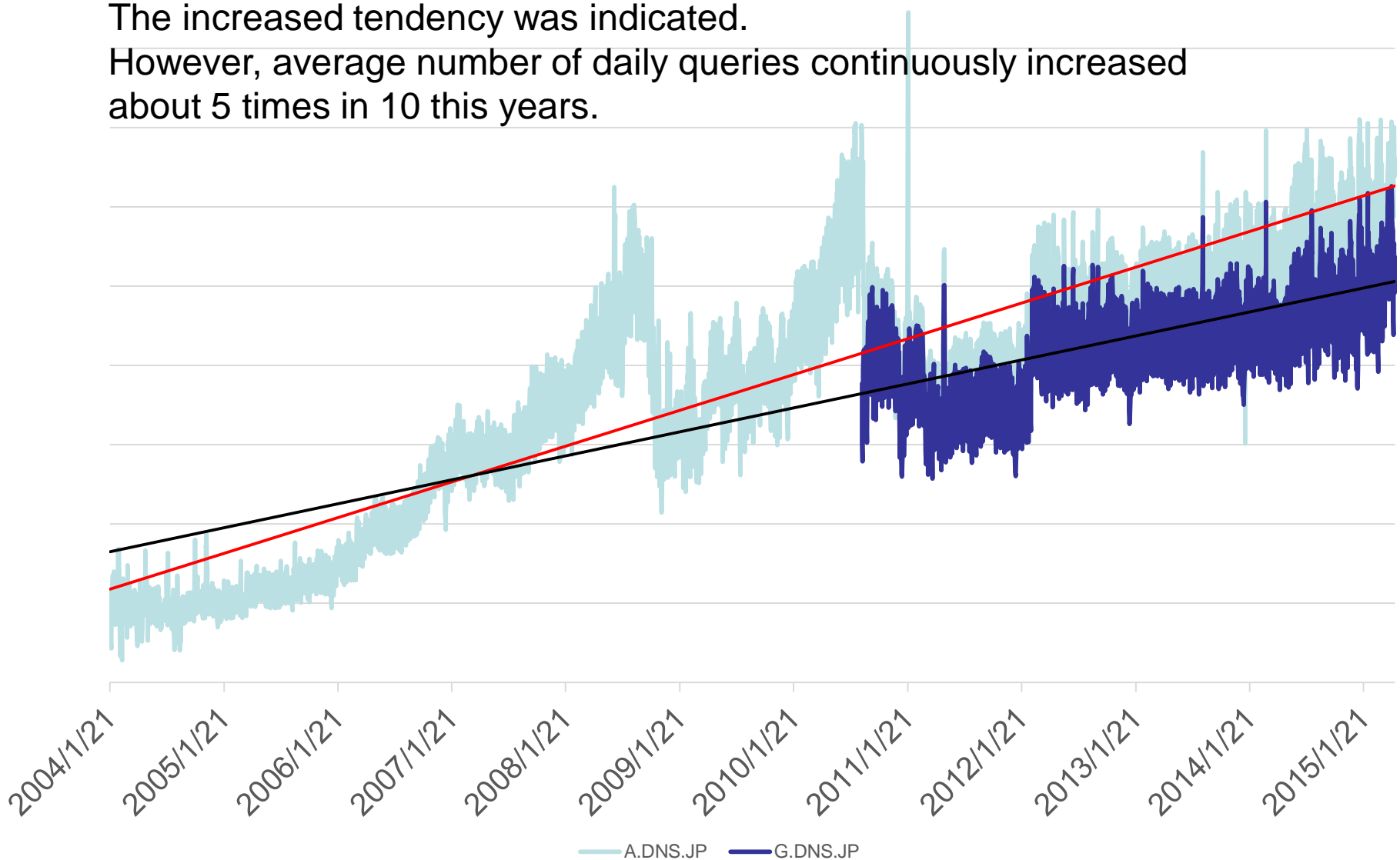
The increased tendency was indicated.
However, it is slightly lower than Root



Number of daily queries seen at A.DNS.JP and G.DNS.JP (jp)

The increased tendency was indicated.

However, average number of daily queries continuously increased about 5 times in 10 this years.



Fluctuations of Data

- Fluctuations of data come from differences
 - DoS attacks
 - Daily / Weekly changes
 - Days of a week are different on each DITL data capture
 - Captured number of roots changes
 - The difference in the load tendencies by configuration changes (Anycast, adding NS, ...)

Conclusion

- Queries to root DNS servers and JP DNS servers are continuously increasing
 - Average QPS seen at Root increased about 5 times in this 8 years
 - Average QPS seen at JP increased about 5 times in this 10 years
- However, the increase ratio of DNS queries is smaller than the increase of the Internet traffic trends (shown by IX operators and broadband operators)
- The increase of DNS queries seen at Root and JP is limited
 - Except to DoS attacks

Next steps

- I would like to know the DNS query trends seen at other edges
 - TLDs
 - Full-resolvers at ISPs
 - Auth. Servers of popular web sites
- Please show DNS traffic trends observed by your organizations and discuss the future DNS traffic trends

Acknowledgements

- DNS-OARC as the data source of Root dataset