

IDN query trends seen at JP and Root

Kazunori Fujiwara, JPRS

fujiwara@jprs.co.jp

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Is IDN use increasing ?

- It is said that IDN is important for non-English speakers
- IDN implementations are deployed
 - Most of web browsers have implemented
 - Many TLDs support IDN registrations
- We need to know the effect of IDN
 - As a first step, an evaluation of IDN query trends is easy and may be useful

DNS-OARC's 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/>
 - 48 hours packet capture at root DNS servers and other DNS servers
 - 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

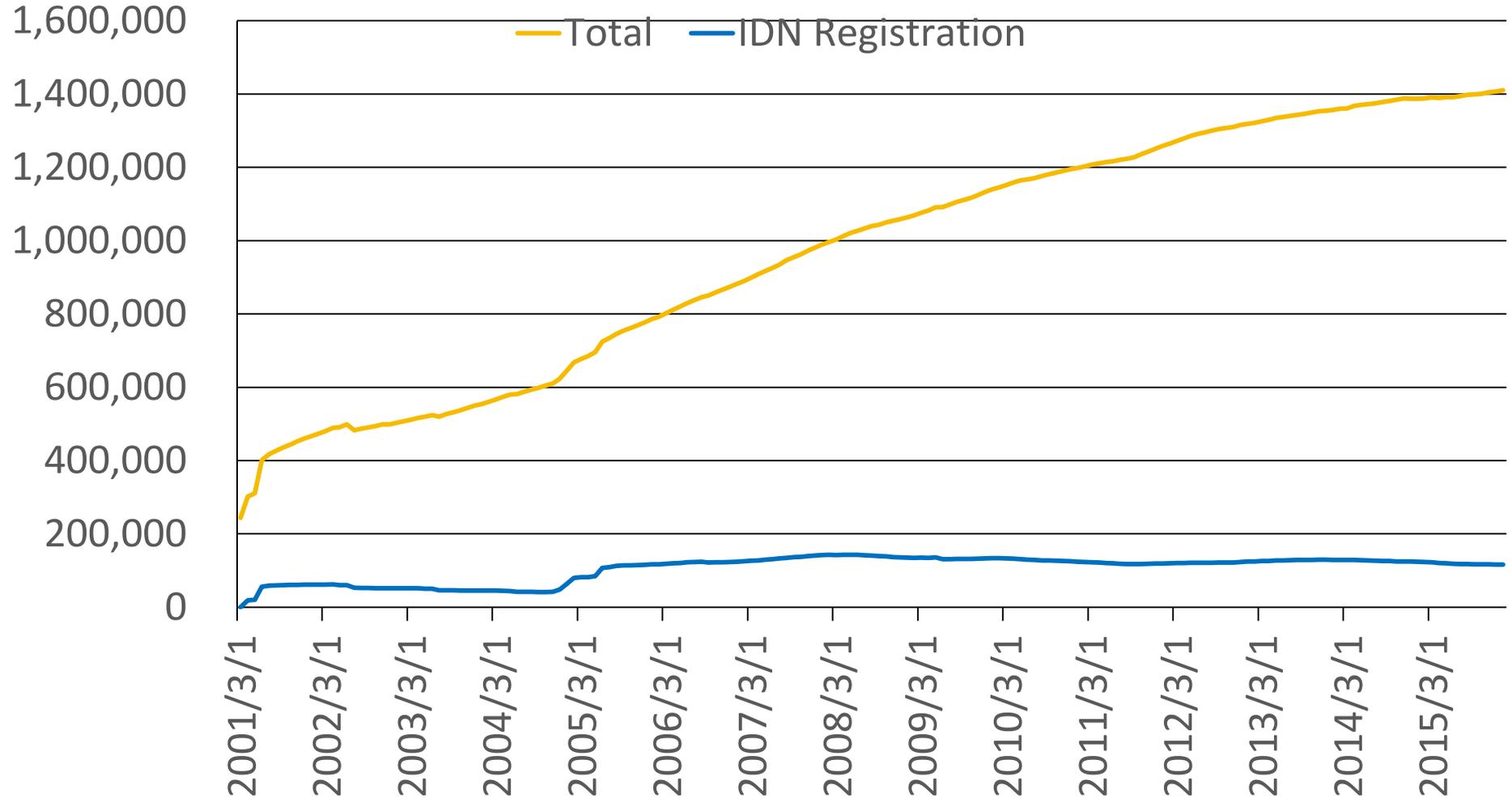
- .JP has 1,417,317 registered domain names on March 1, 2016
- JP DNS servers serve approx. 1.6 billion queries per day
- Two datasets
 - Packet captures of all JP DNS servers, around the same time as DNS-OARC’s DITL event (and more) since 2009
 - Query logs of 2 (A and G) JP DNS servers, every day, for 13 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

Evaluation indexes

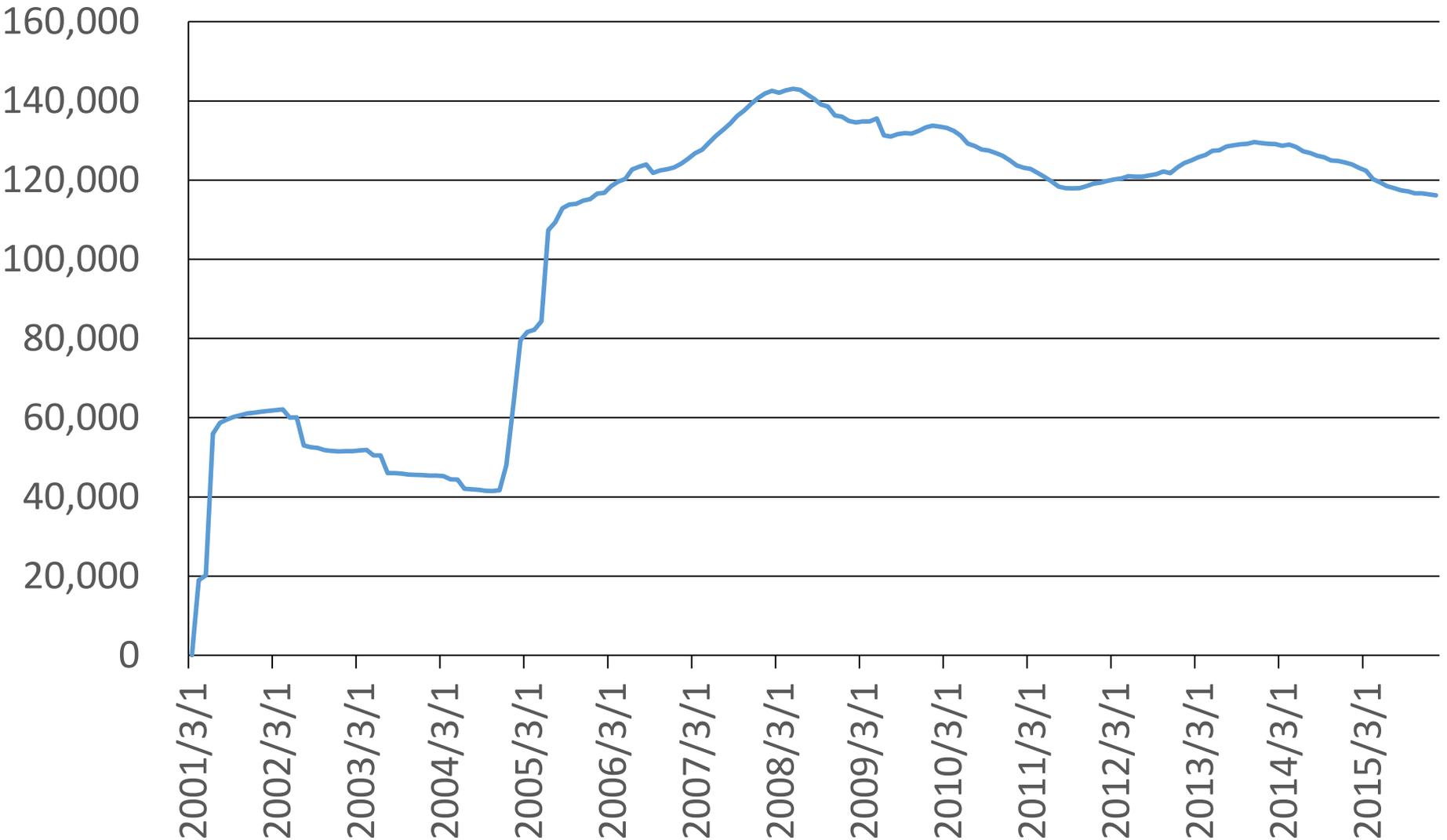
- Number of registered IDN domain names (JP)
- Query ratio of IDN (JP, Root)
- Ratio of IP addresses that sent IDN queries (JP, Root)

Number of registered JP domain names



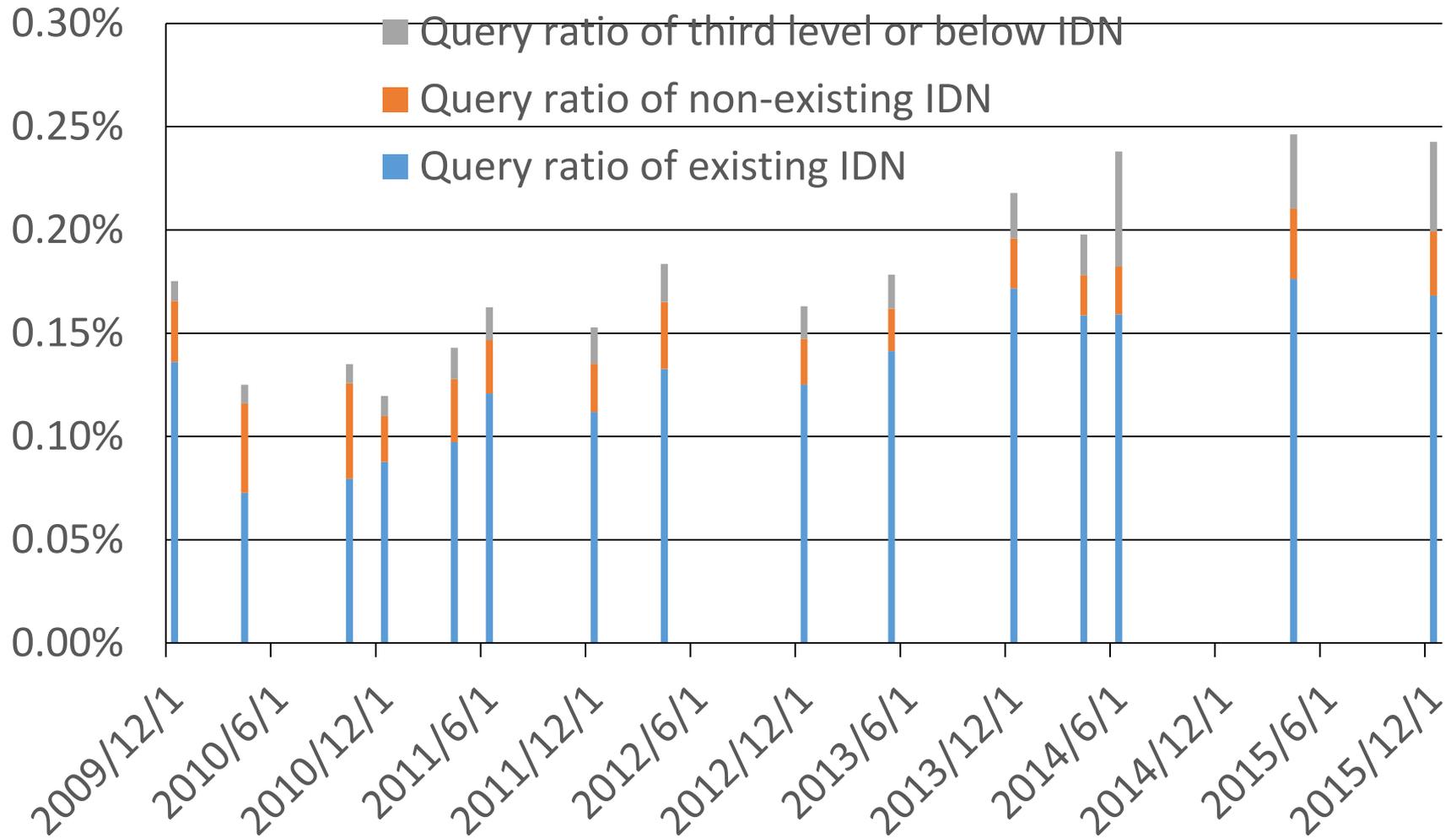
Number of JP domain names are increasing gradually

Number of IDN registrations in JP



Number of IDN registration in JP is not increasing now

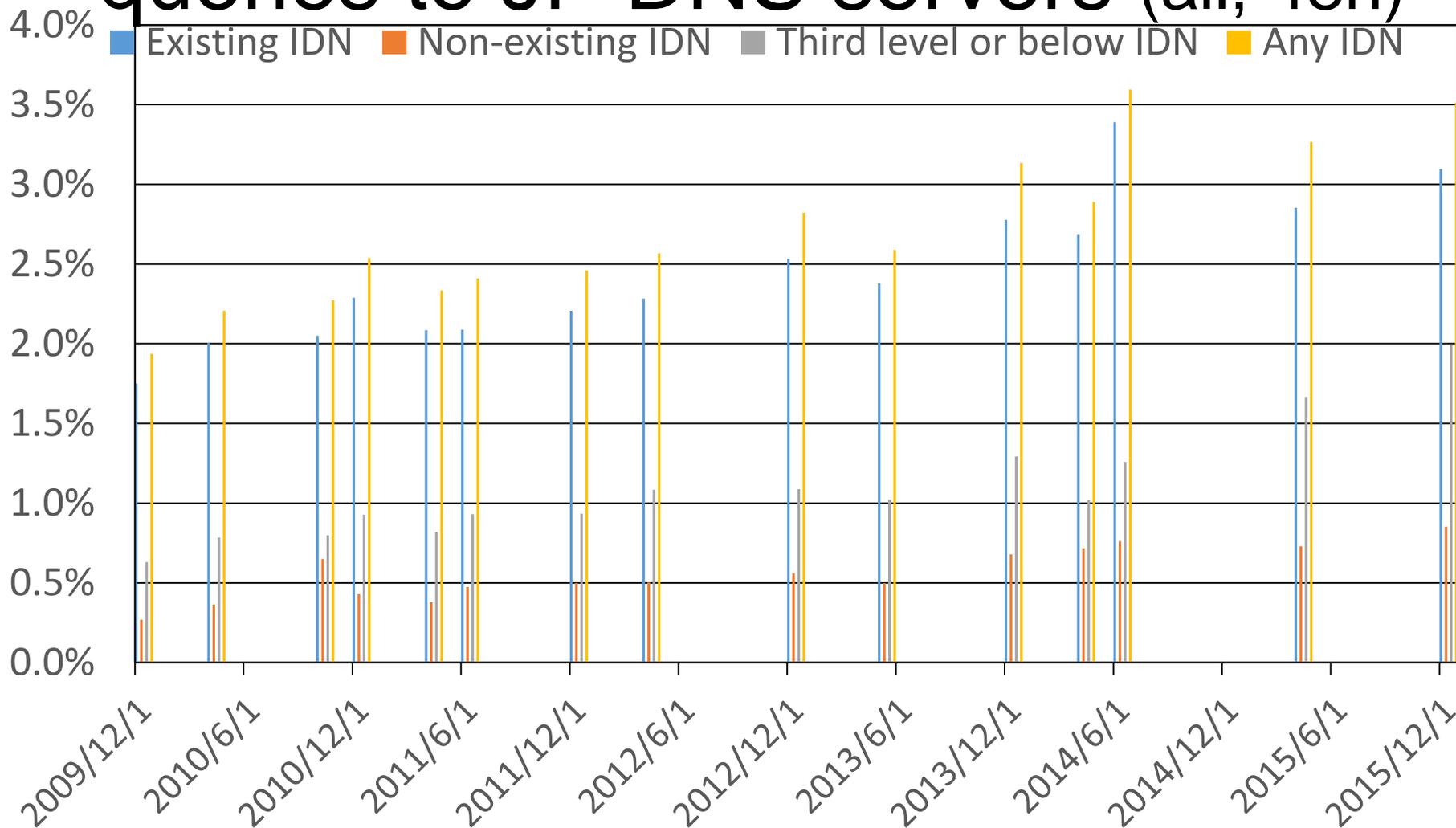
Query ratio of IDN at JP DNS (all, 48h)



Queries that contain xn- label is now about 0.25%
 IDN queries seems to be increasing a little
 Non-existing IDN queries are small at JP

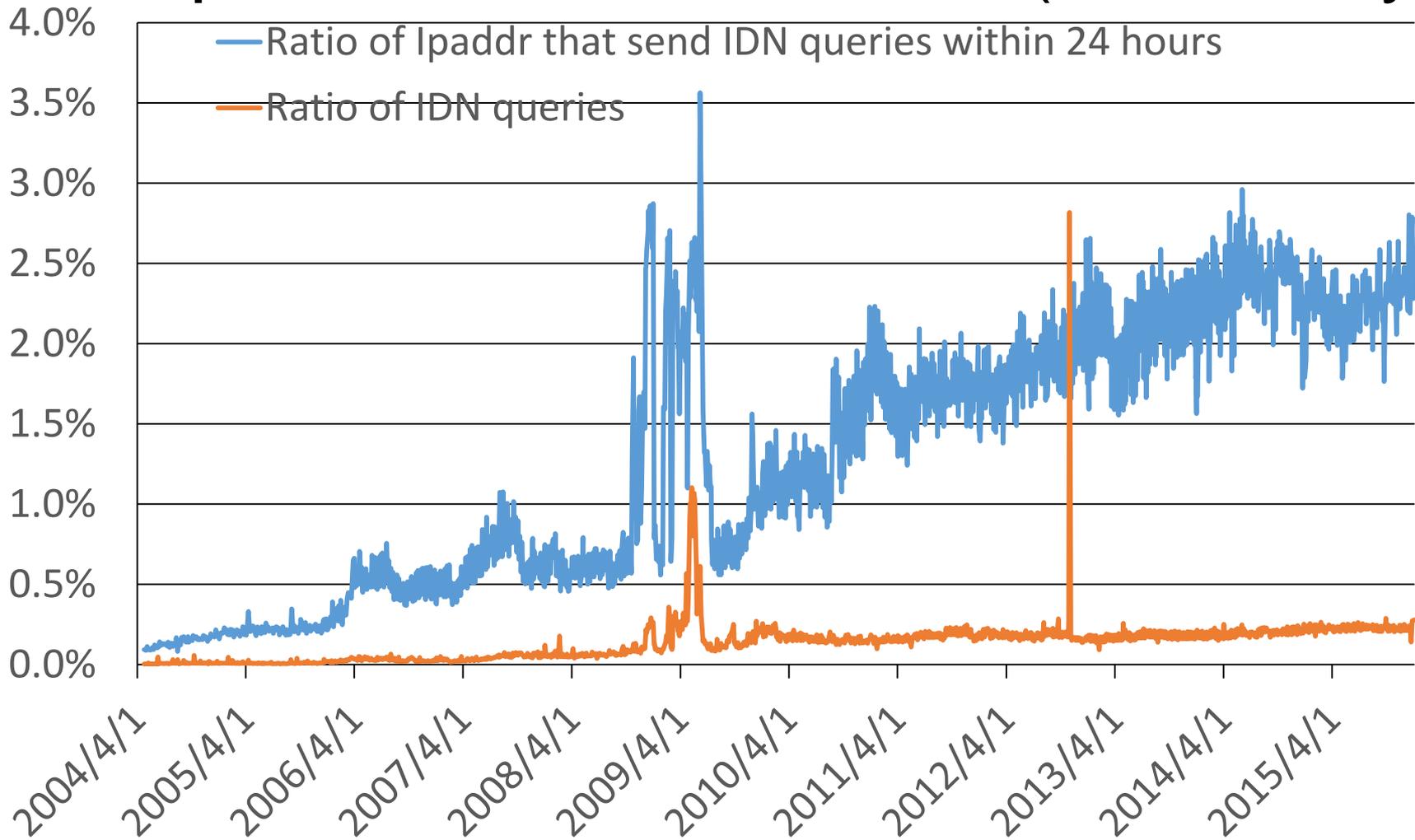
IP address ratio that sent IDN

queries to JP DNS servers (all, 48h)



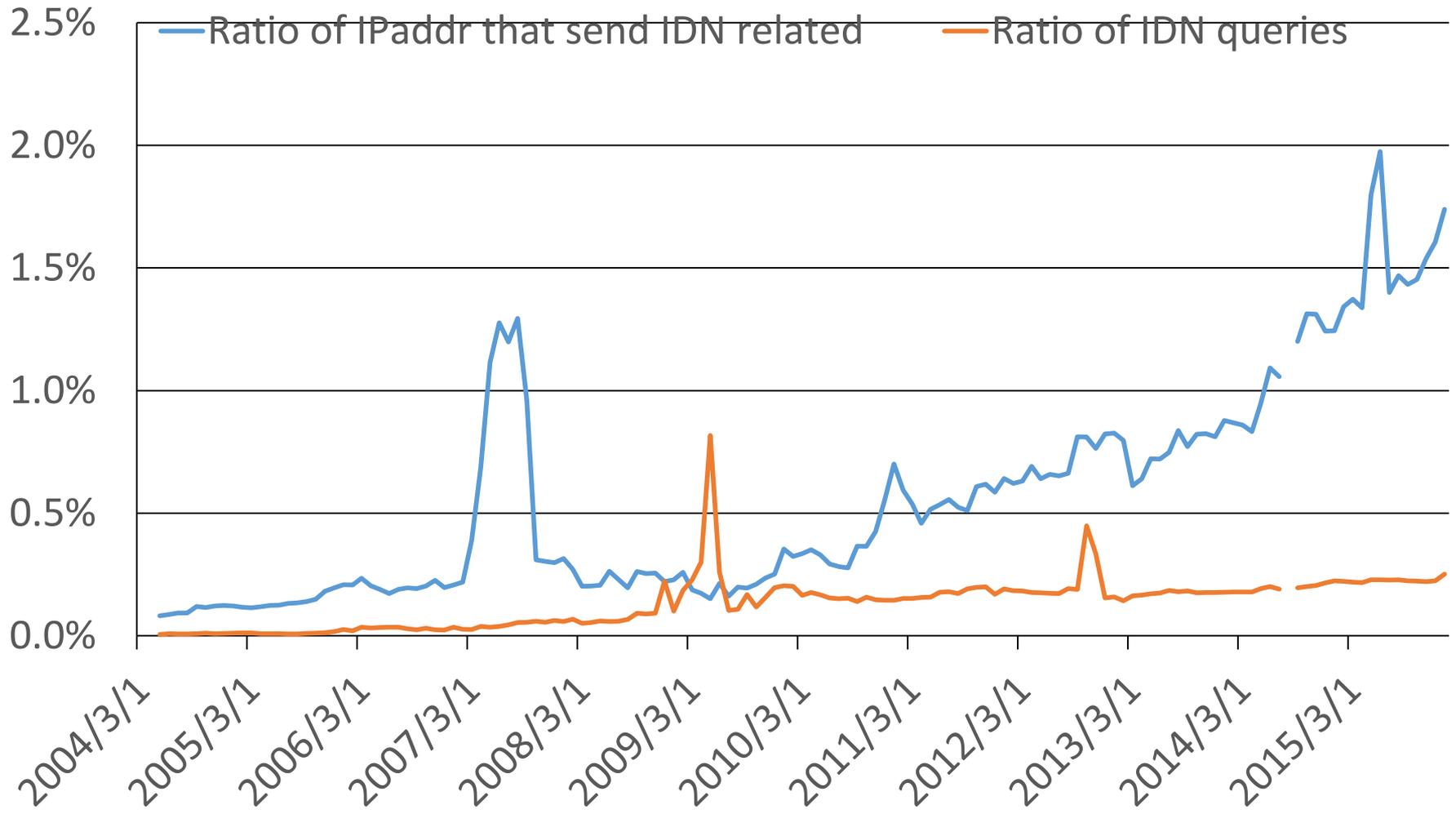
- Now, 3 % of IP addresses send IDN queries at JP
- Ratio of IP addresses that send IDN queries may increasing (It is not clear)

Long term trends of IDN queries at part of JP DNS servers (A, G, daily)



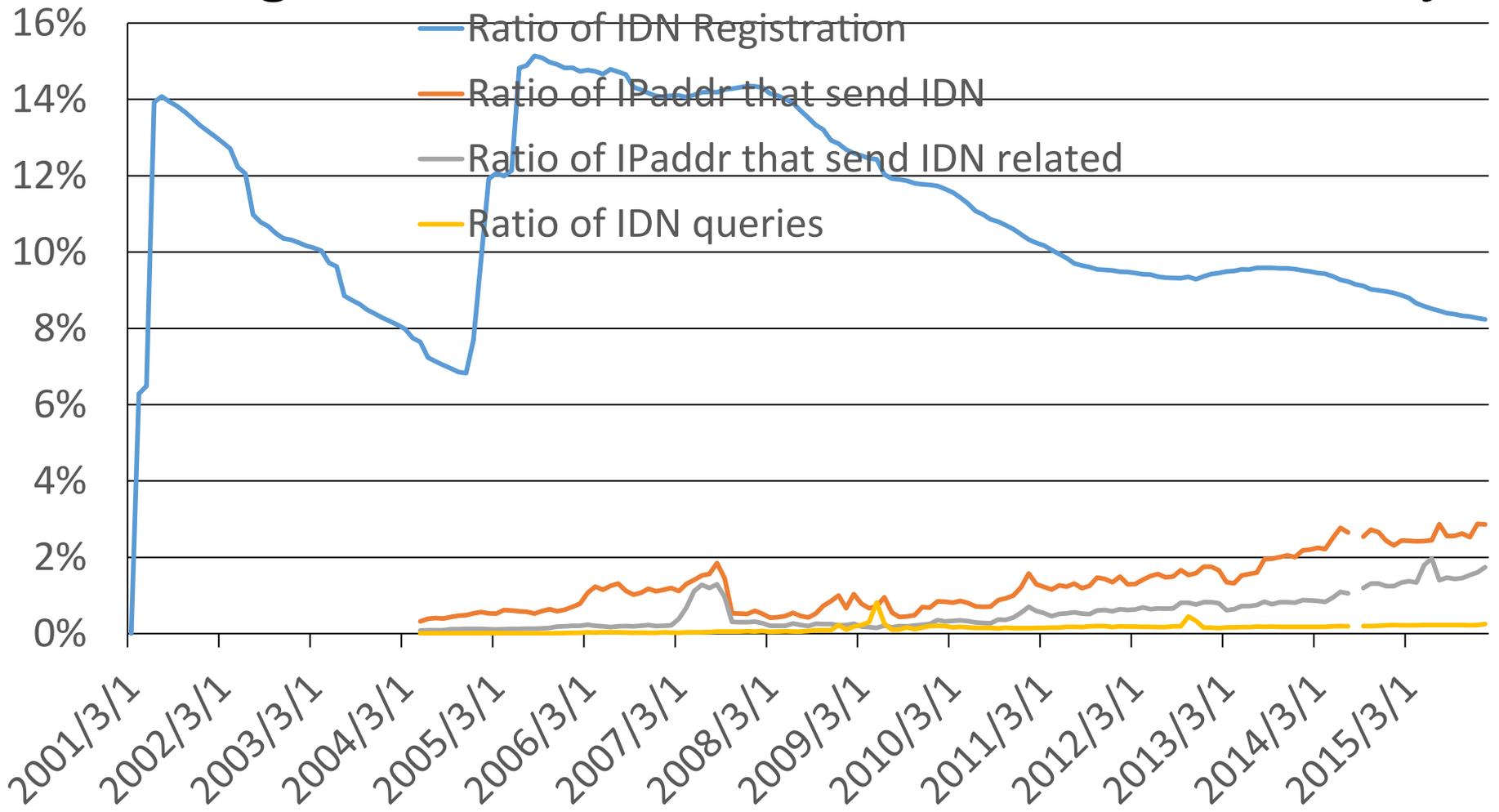
The graph shows increasing tendency, however, irregular data is larger.
 Recently, IDN queries are 0.2% and 2.5% of IP addresses send IDN queries

Long term trends of IDN queries seen at part of JP DNS servers (A, G, monthly)



- Ratio of IP addresses that sent IDN queries may increasing, 2% (It is not clear)
- Ratio of IDN queries may be increasing (very small, 0.2% now)

Long term trends of IDN ratio, monthly

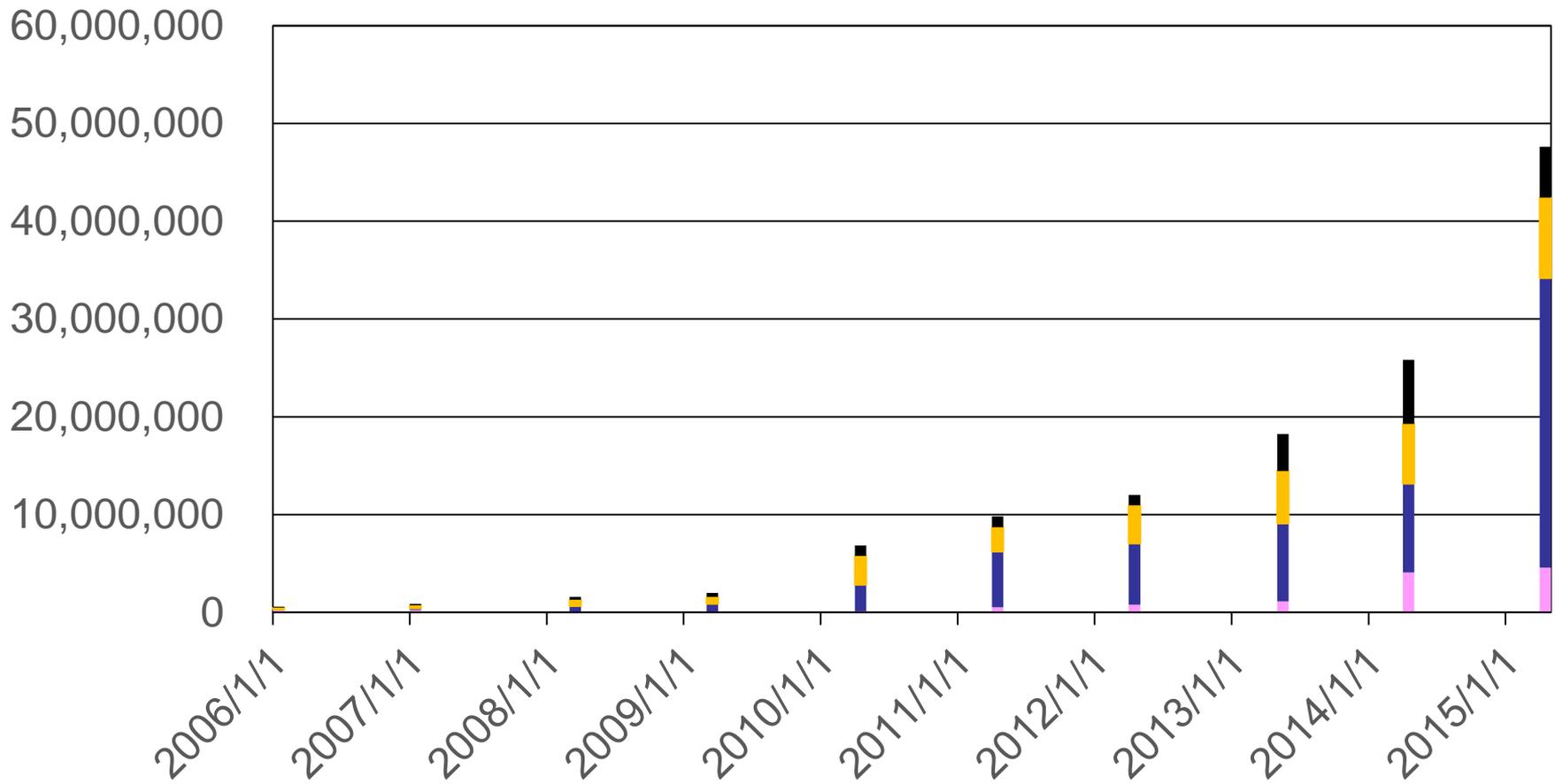


Ratio of IDN queries may be increasing (very small ratio 0.2%)

Ratio of IP addresses that sent IDN query may be increasing

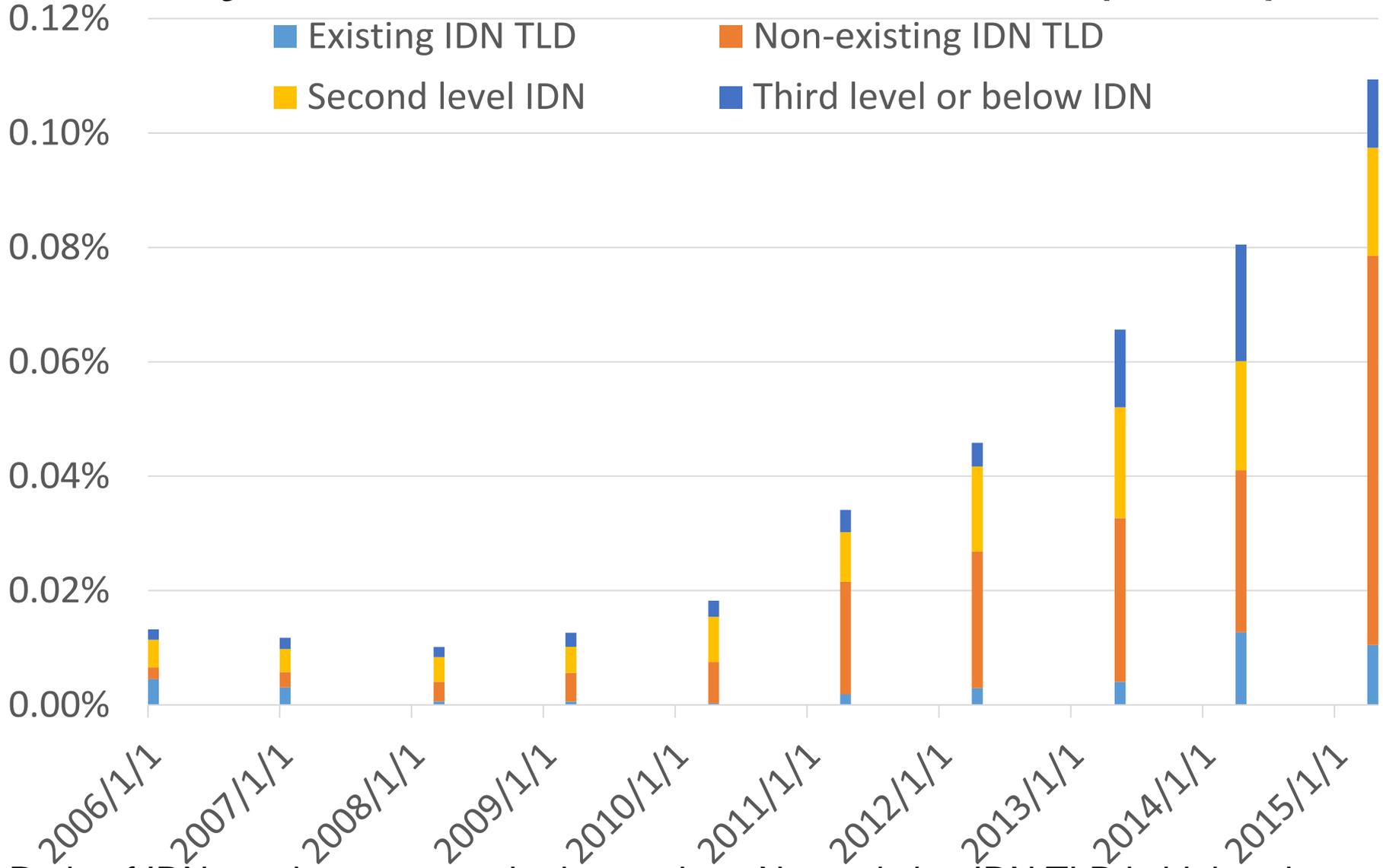
Number of IDN queries at RootiPRS (48hours)

- Existing IDN TLD queries
- Nonexisting IDN TLD queries
- IDN SLD queries
- Third level or below IDN queries



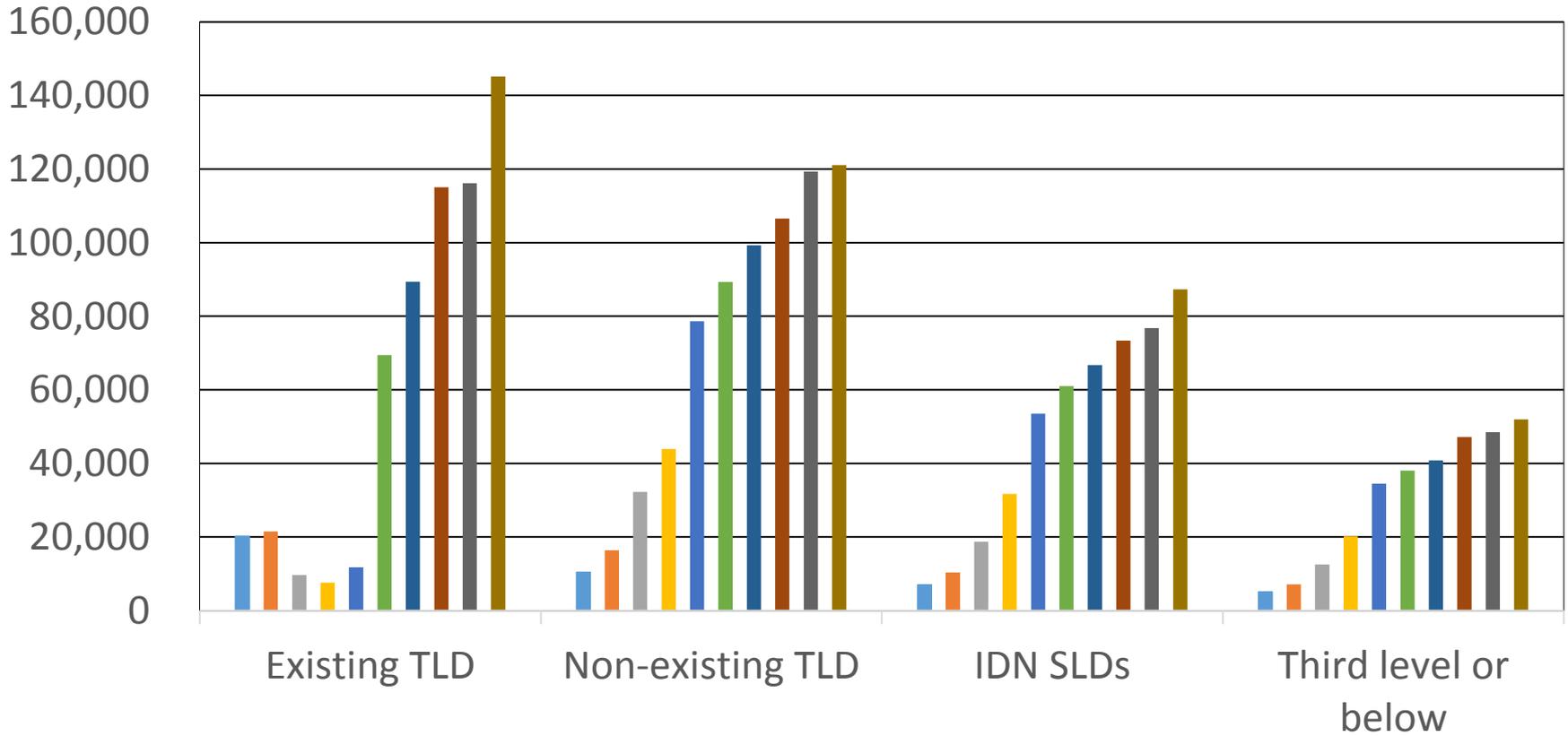
Number of IDN queries seems to be increasing

Query ratio of IDN at Root (48h)



Ratio of IDN queries seems to be increasing. Non-existing IDN TLD is high ratio.

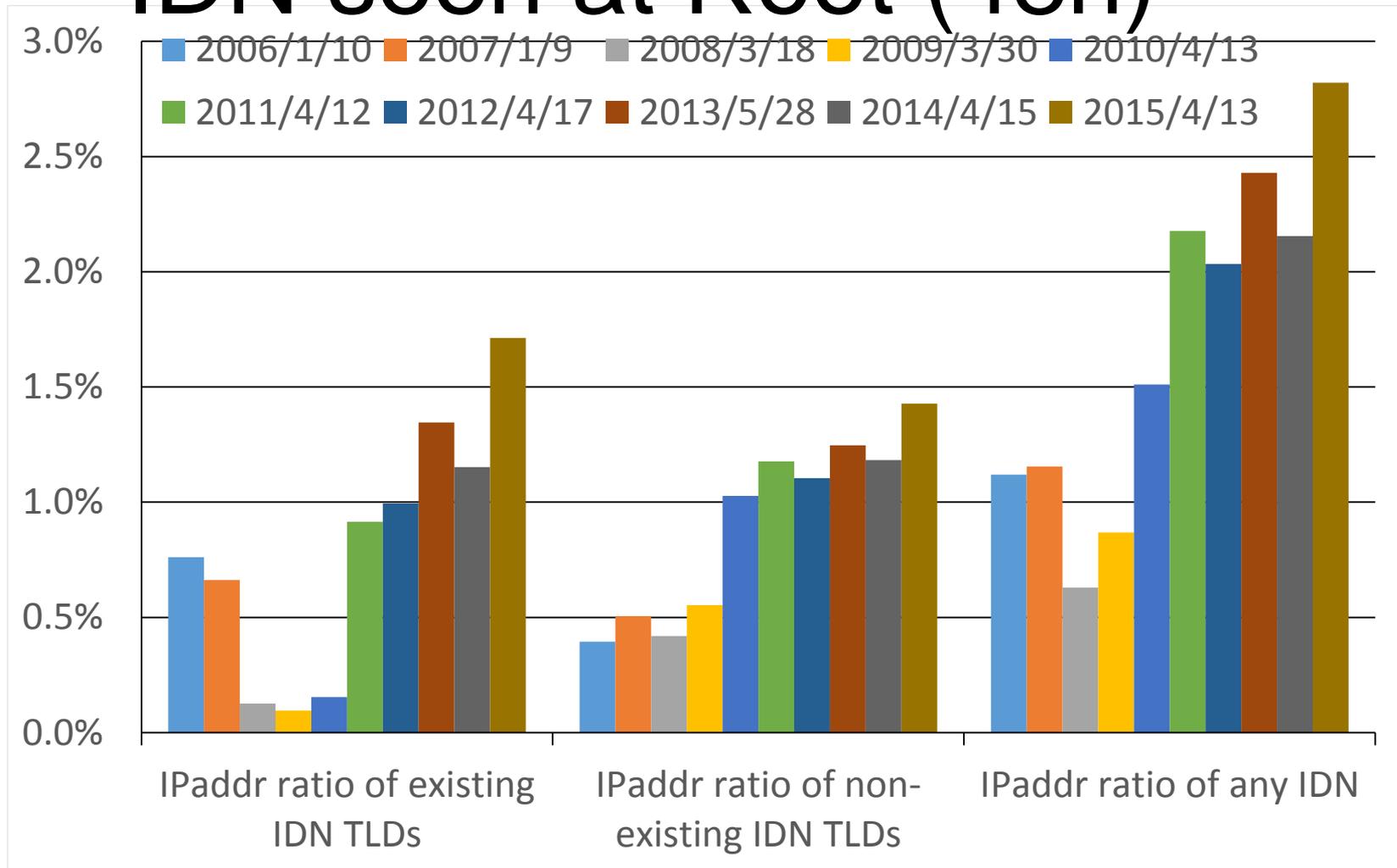
Number of IP addresses that sent IDN at Root (48h)



■ 2006/1/10 ■ 2007/1/9 ■ 2008/3/18 ■ 2009/3/30 ■ 2010/4/13
■ 2011/4/12 ■ 2012/4/17 ■ 2013/5/28 ■ 2014/4/15 ■ 2015/4/13

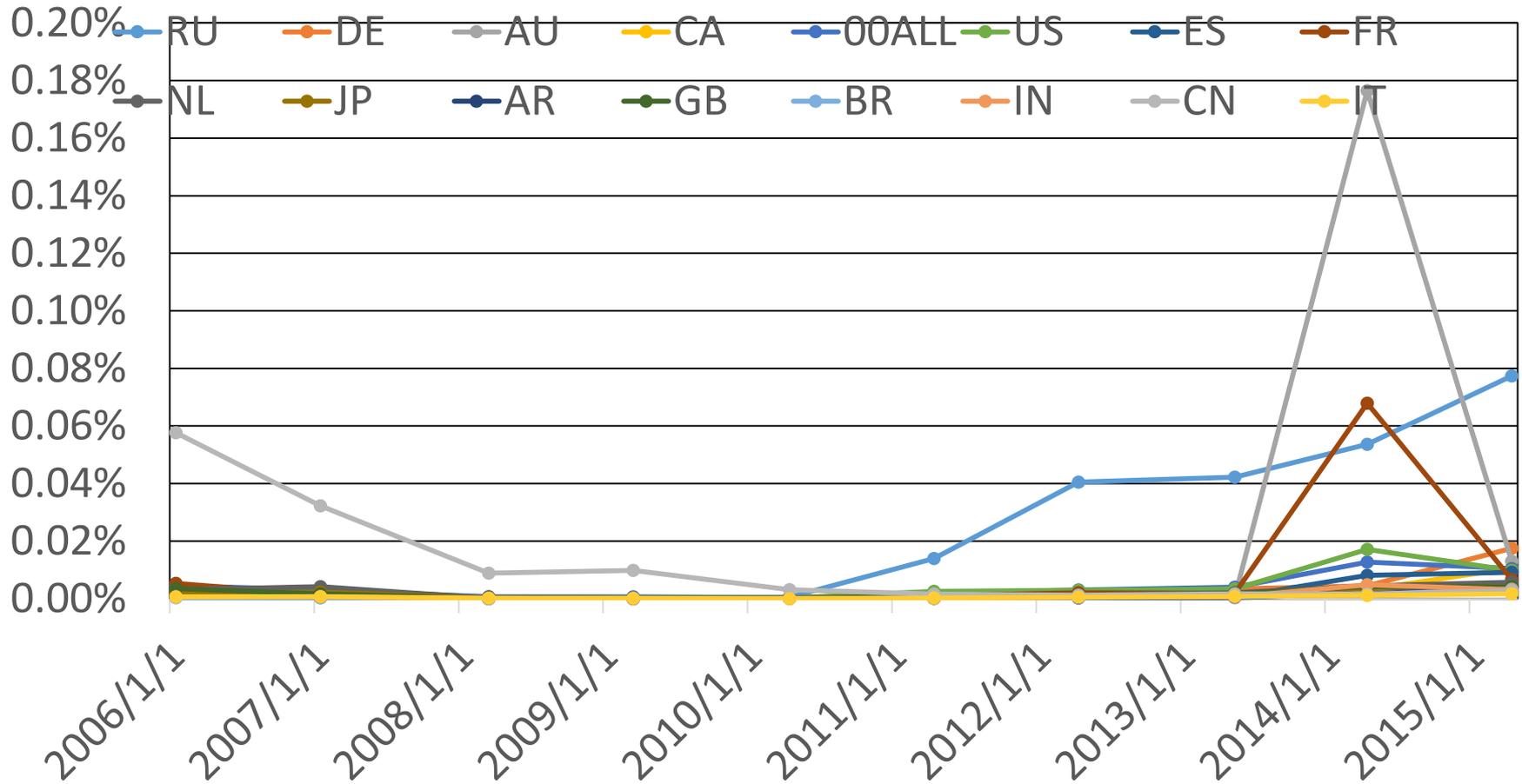
Number of IP addresses that sent IDN seems to be increasing

Ratio of IP addresses that sent IDN seen at Root (48h)



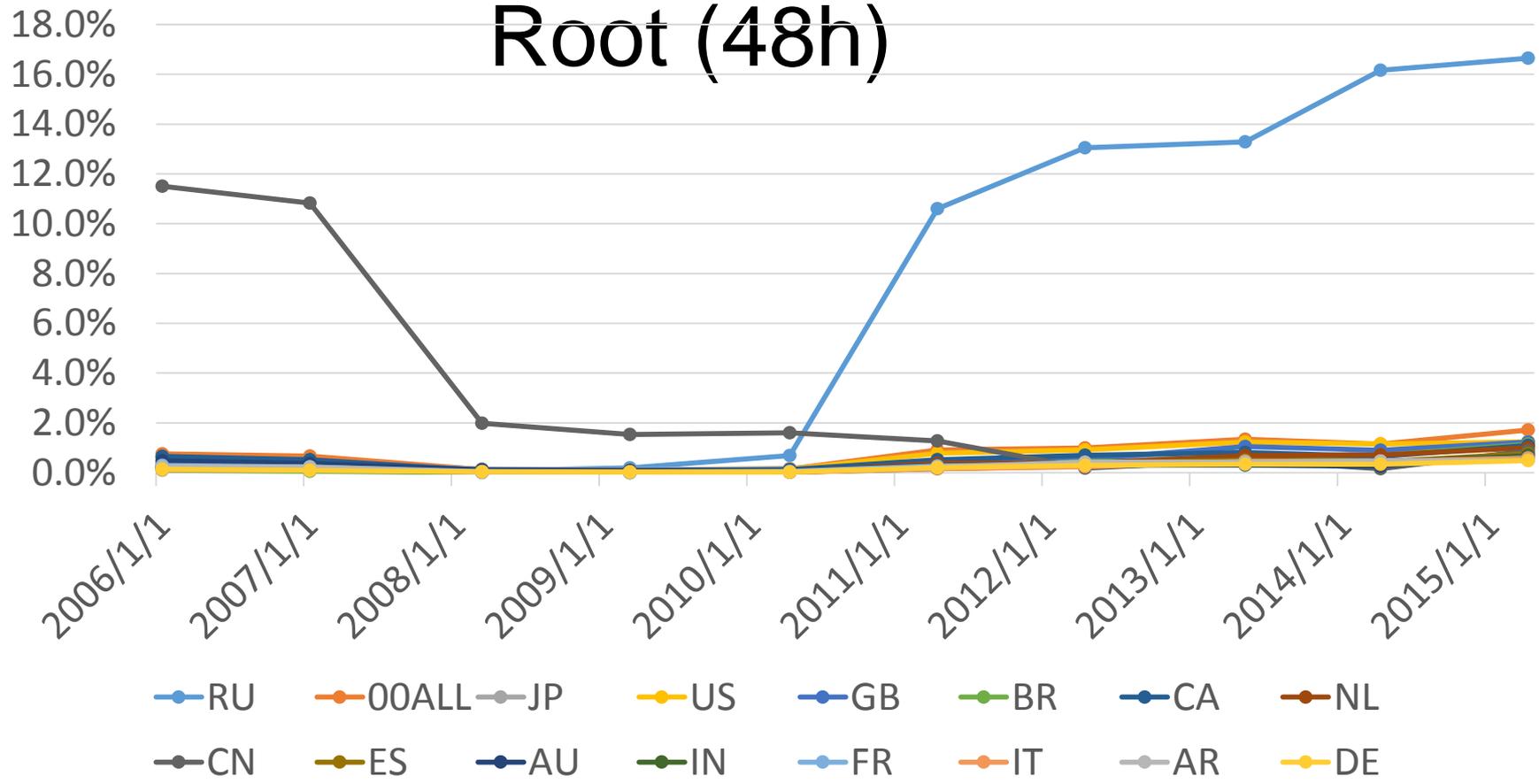
Ratio of IP addresses that sent IDN seems to be increasing and now 1.5% or 2.5%

IDN query ratio from each country seen at Root (48h)



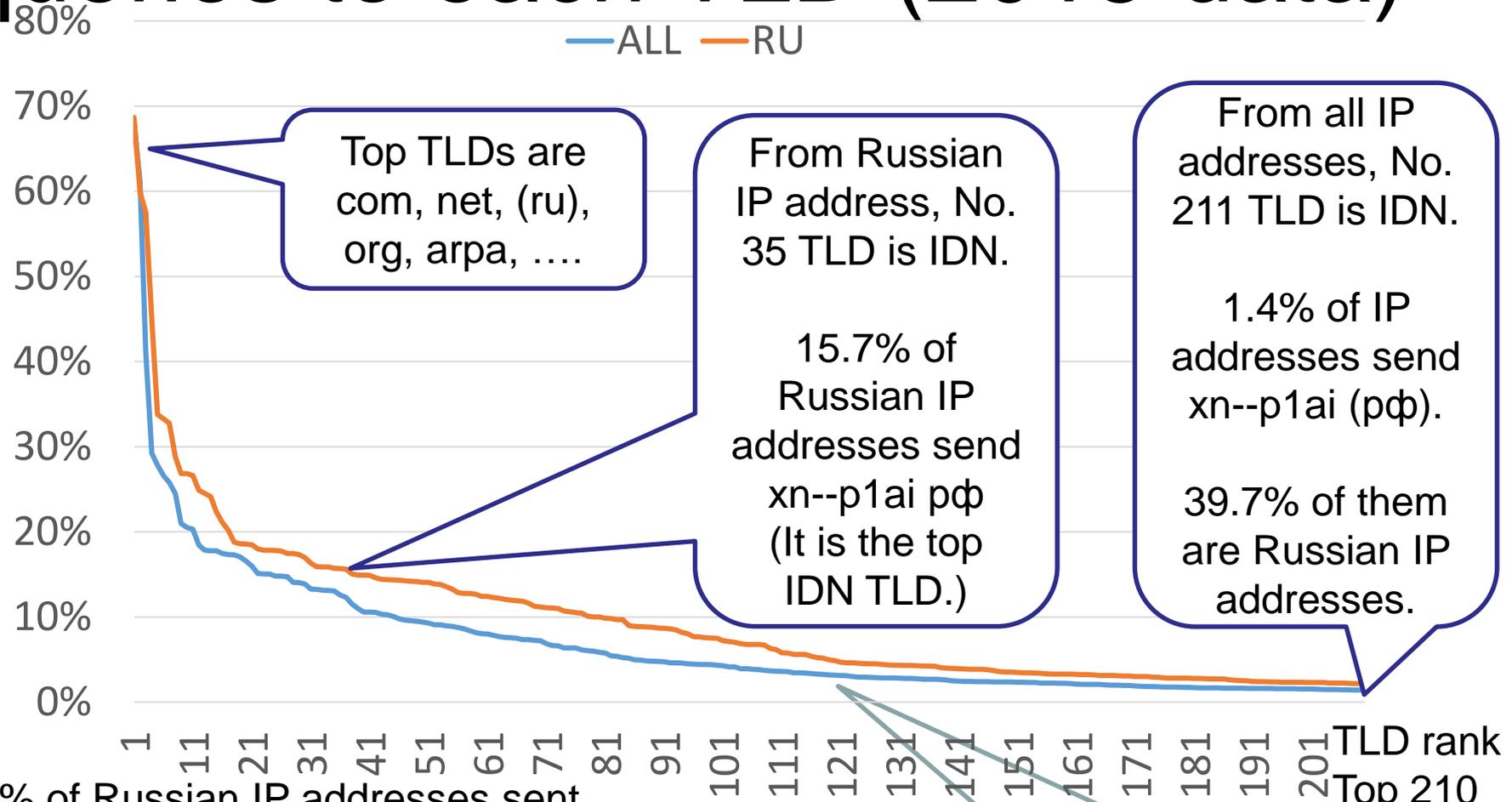
Determined by Maxmind GeoLite2 free country database
 Countries whose number of IP address is larger than 100,000 only.
 IDN query ratio from Russian IP addresses may be increasing.
 Other countries, IDN query ratio is little

Query source IP address ratio that sent IDN queries from each country seen at Root (48h)



Determined by Maxmind GeoLite2 free country database
Countries whose number of IP addresses is larger than 100,000 only.
IDN use in Russia seems to be high. (I don't know)
Other countries, IDN usage ratio is small

Ratio of IP addresses that send queries to each TLD (2015 data)



Top TLDs are com, net, (ru), org, arpa,

From Russian IP address, No. 35 TLD is IDN.
15.7% of Russian IP addresses send xn--p1ai pϕ (It is the top IDN TLD.)

From all IP addresses, No. 211 TLD is IDN.
1.4% of IP addresses send xn--p1ai (pϕ).
39.7% of them are Russian IP addresses.

15.7% of Russian IP addresses sent xn--p1ai (.pϕ, Russian TLD) queries.
Some new gTLDs are used more often than IDN TLDs

Well used new gTLDs are here club, xyz, link

Findings

- Query ratio of IDN is very low now
 - 0.2% at JP and 0.1% at Root
 - DNSSEC is higher than IDN: 5% is DS at JP
 - However, the query ratio seems to be increasing
- Ratio of IP addresses that sent IDN queries is still low.
 - 2.5%~3% at JP and 2% at Root
 - DNSSEC is higher than IDN
 - 8.7% of IP addresses send <dom>.jp DS queries
 - 5~10% of IP addresses send root DNSKEY queries
 - However, ratio of IP addresses that send IDN queries seems to be increasing
 - 15.7% of Russian address sent Russian IDN TLD queries. IDN TLD .ppf seems to be well used in Russia
- An increasing trend is observed about IDN
 - However, it is uncertain. Needs further analysis
- Deployment status: IPv6 >> DNSSEC > new gTLD, IDN ?

Acknowledgements

- DNS-OARC as the data source of Root dataset