



# IPv6 seen from DNS

Dr. WANG Xin, CNNIC Labs

25 Aug 2009

- Rules of Internet behavior could be reflected by domain name querying behavior to some extent.
- As a TLD Registry and National Internet Registry (NIR), CNNIC is tracing the development and deployment of IPv6 resources and applications from the DNS point of view.

1. Queries to .CN cc-TLD root name servers during 24 hours
  - IPv4: {a,b,c,d,e}.dns.cn, ns.cernet.net
  - IPv6: {a, d}.dns.cn
2. Actively probing name servers in IPv6 network
  - *16694* authoritative name servers
  - *3453* Recursive name servers

```
C:\WINDOWS\system32\cmd.exe - nslookup
Address: 218.241.99.50

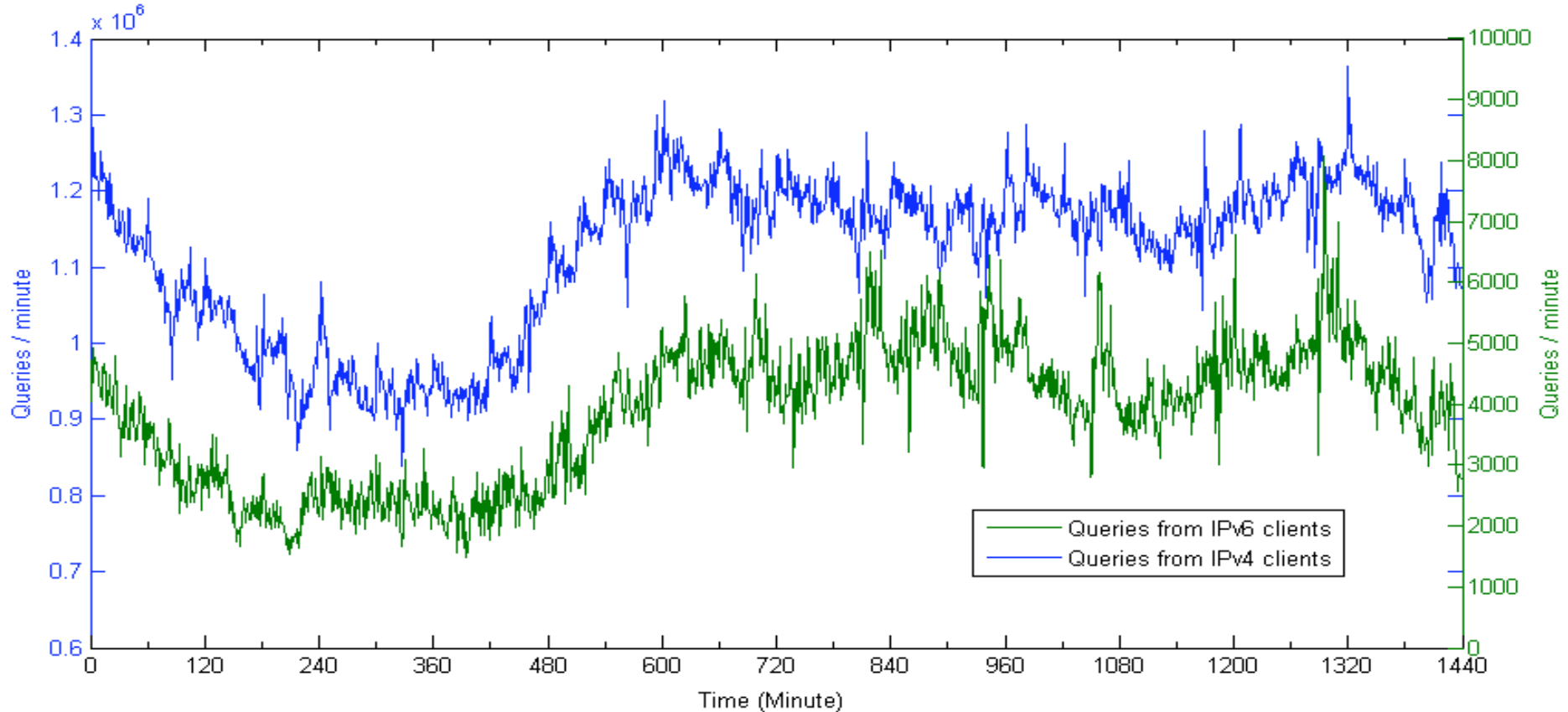
Non-authoritative answer:
cn      nameserver = d.dns.cn
cn      nameserver = ns.cernet.net
cn      nameserver = a.dns.cn
cn      nameserver = b.dns.cn
cn      nameserver = c.dns.cn
cn      nameserver = e.dns.cn

cn      nameserver = e.dns.cn
cn      nameserver = d.dns.cn
cn      nameserver = ns.cernet.net
cn      nameserver = a.dns.cn
cn      nameserver = b.dns.cn
cn      nameserver = c.dns.cn
d.dns.cn      internet address = 203.119.28.1
d.dns.cn      AAAA IPv6 address = 2001:dc7:1000::1
ns.cernet.net internet address = 202.112.0.44
a.dns.cn      internet address = 203.119.25.1
a.dns.cn      AAAA IPv6 address = 2001:dc7::1
b.dns.cn      internet address = 203.119.26.1
c.dns.cn      internet address = 203.119.27.1
e.dns.cn      internet address = 203.119.29.1
>
```

# The .CN root query logs tell us...

# Query rates fluctuation from IPv4 and IPv6 clients

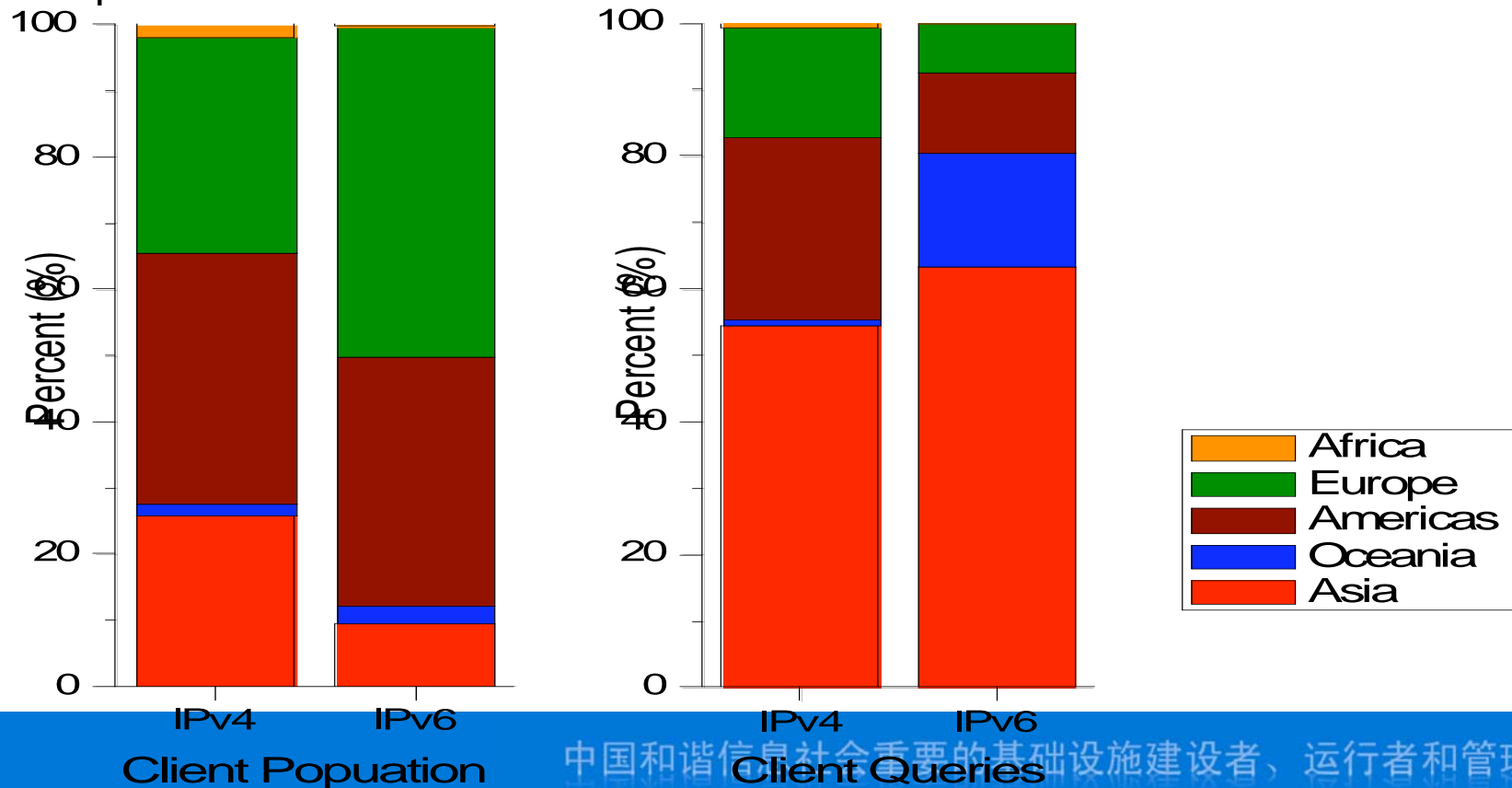
- Similar shapes and trends.
- Similar user behavior patterns.



Queries from IPv4 Clients vs. Queries from IPv6 Clients

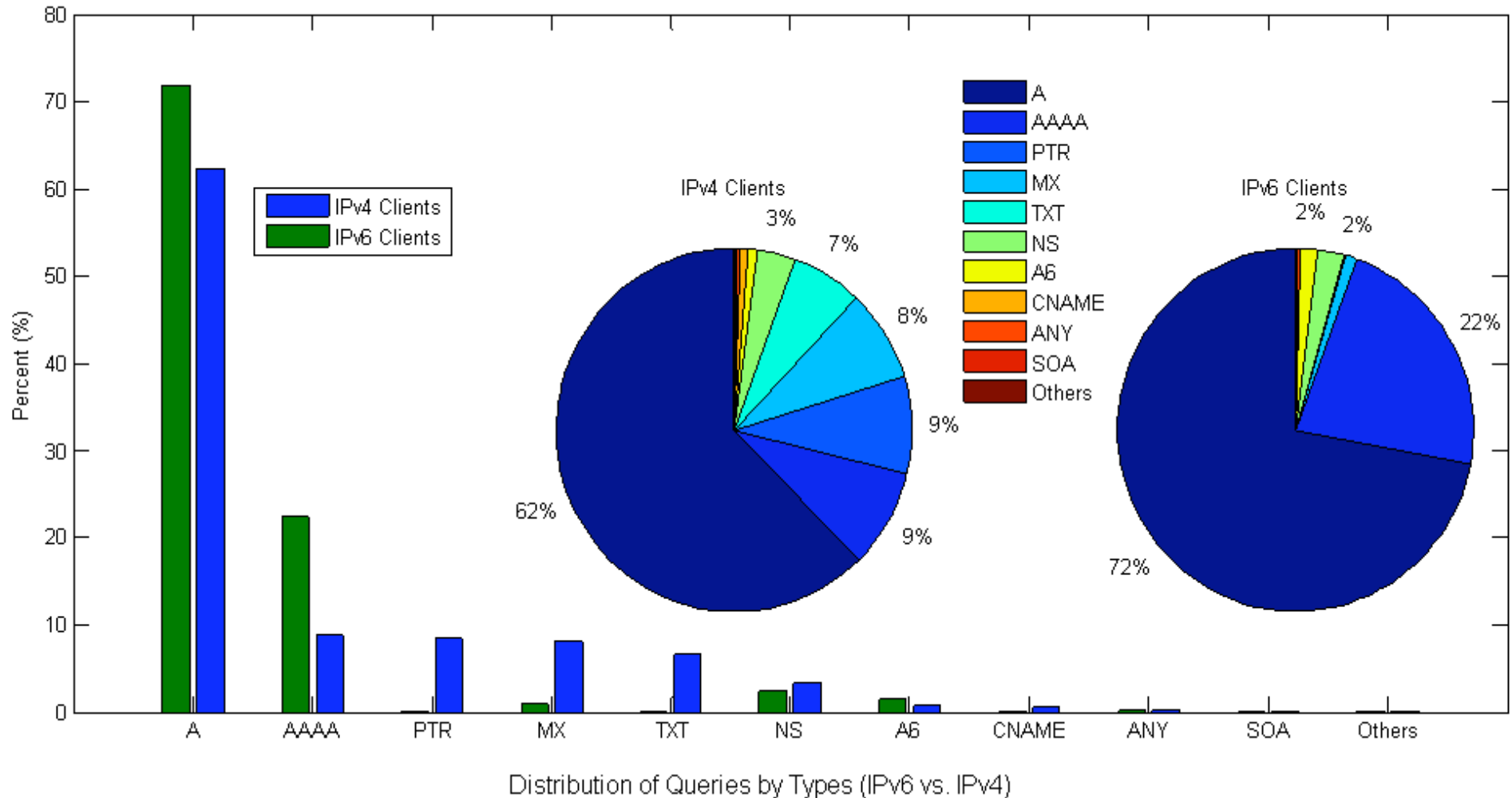
# Continent distribution of IPv6 queries

- Most IPv4 and IPv6 queries are from Asia (more specifically, China); (right plot)
- However, large proportions of IPV6 addresses observed are from America and Europe. (left plot)
- Compared IPv4, smaller proportion of IPv6 clients issued larger proportion of queries.

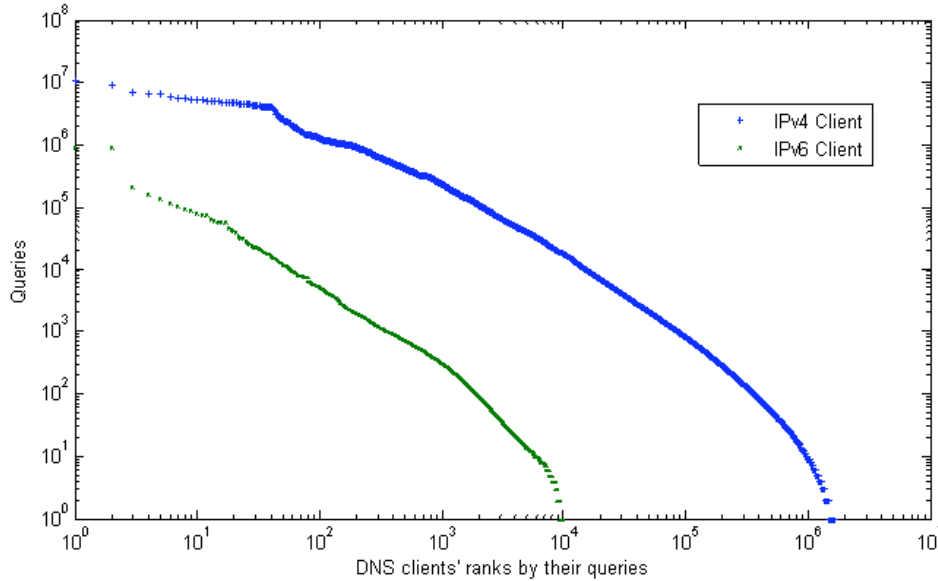


# Query types from IPv6 and IPv4 sources

- IPv6 queries concentrated on A and AAAA.
- Limited types of applications deployed in IPv6 network.



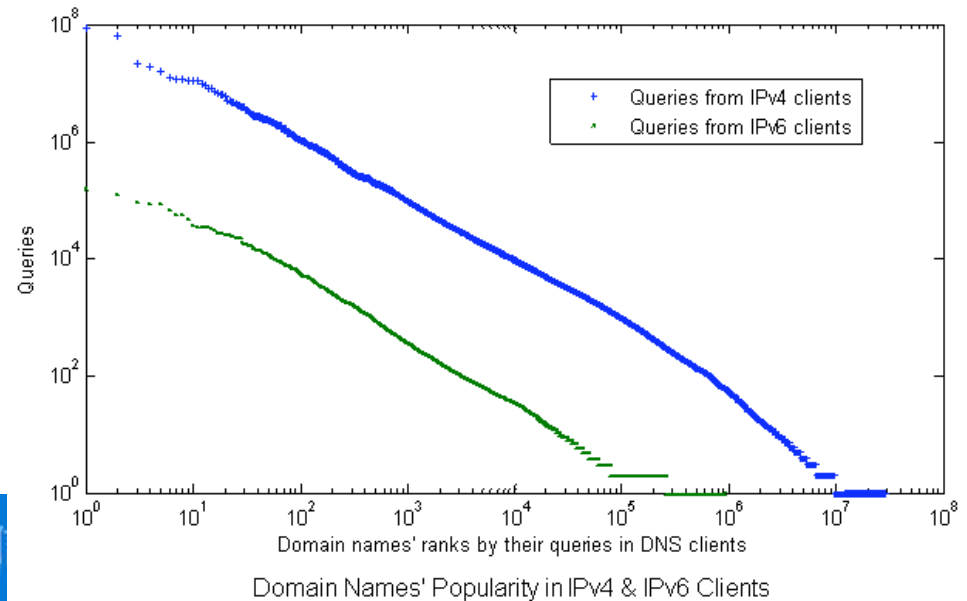
# Distributions of client and target query load



IPv6 Clients vs. IPv4 Clients in their Query Load Distribution

Client Query load  
 Log-log scale  
 Busiest client first  
 Queries are not evenly distributed among clients

- Target domain query load
- Log-log scale
- Most frequently queried domain first
- Zipf's-like distribution

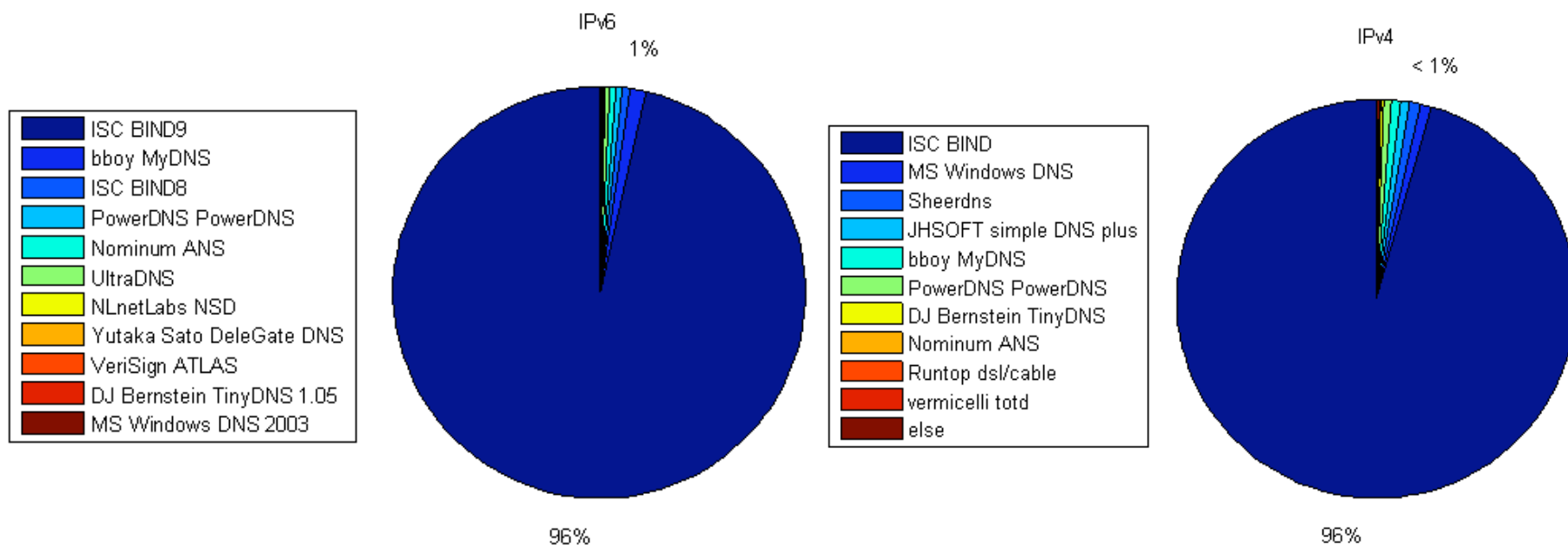


Domain Names' Popularity in IPv4 & IPv6 Clients

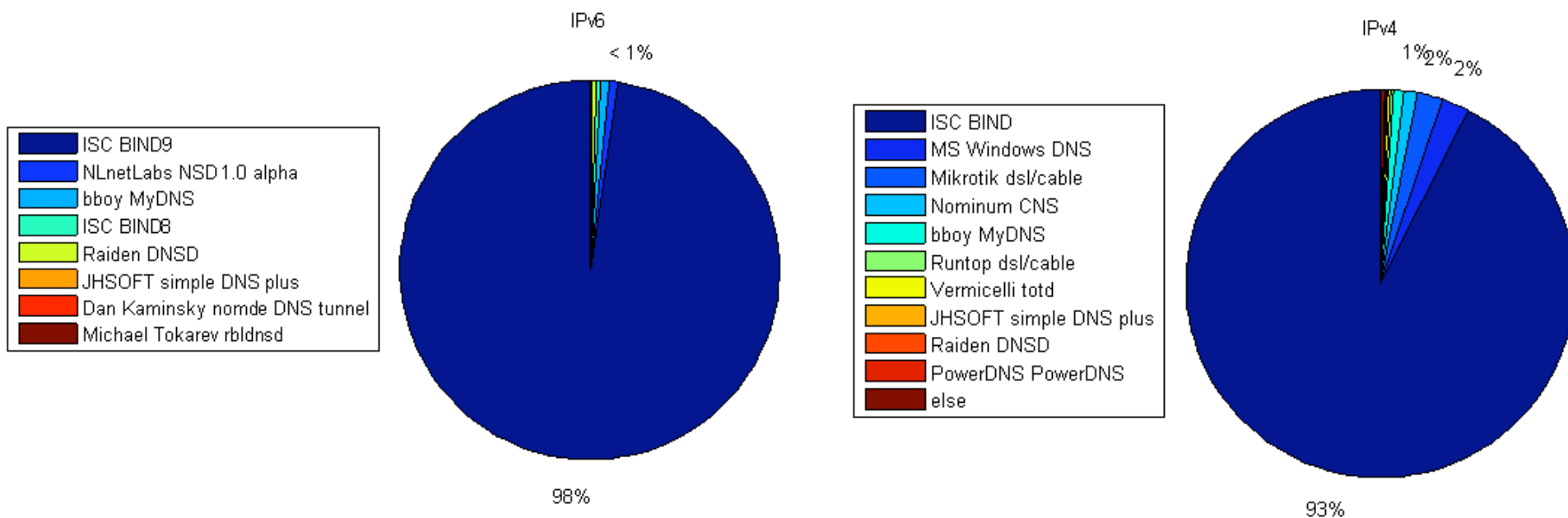


## Probing DNS name servers in IPv6 network...

# Software installations on Authoritative name servers

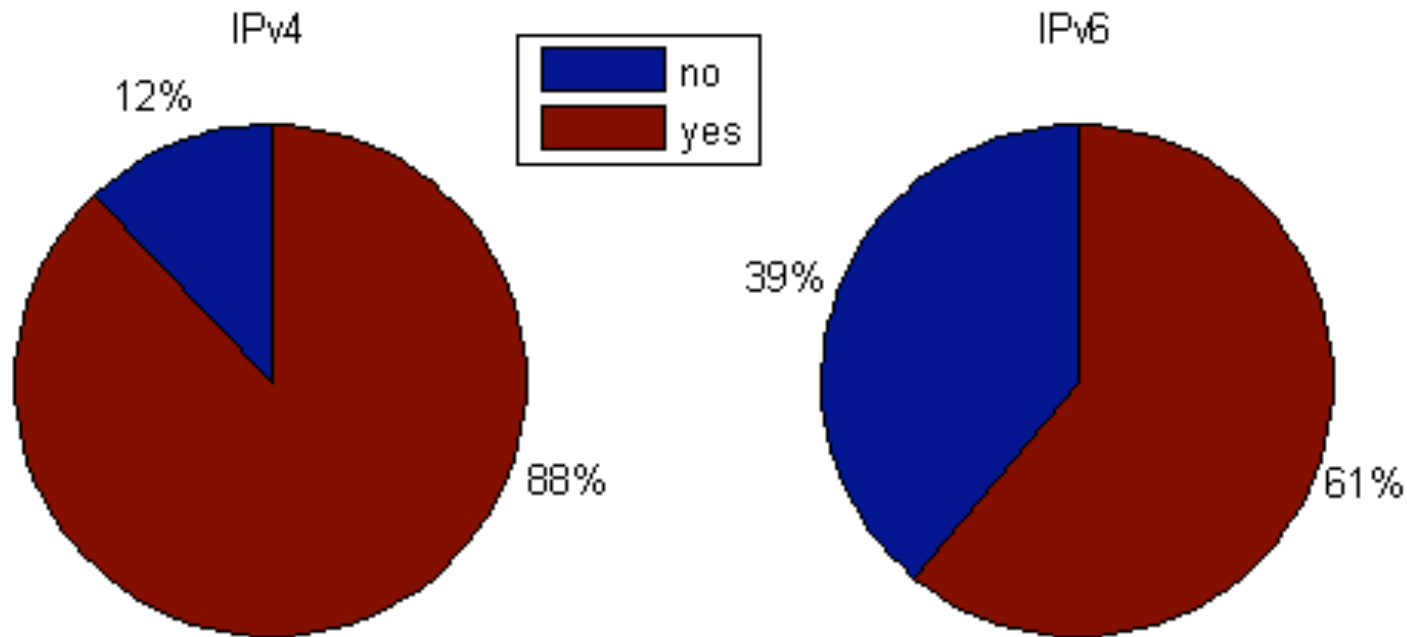


# Software installations on recursive name servers



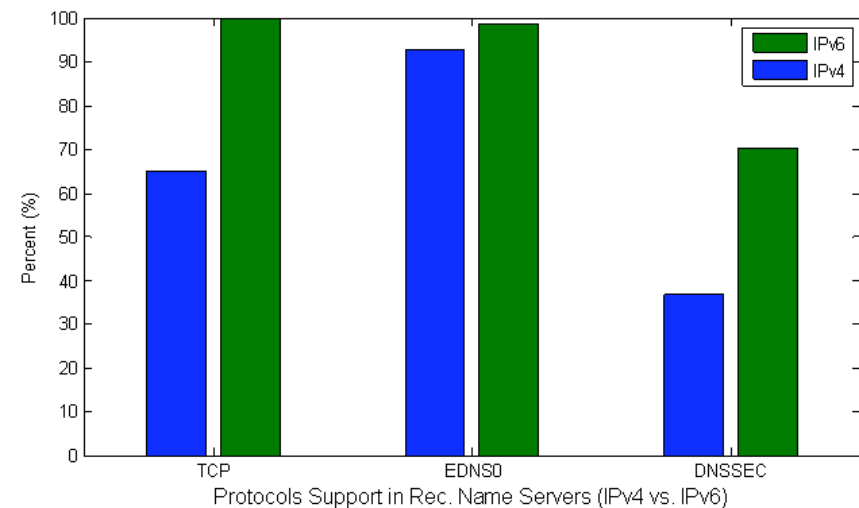
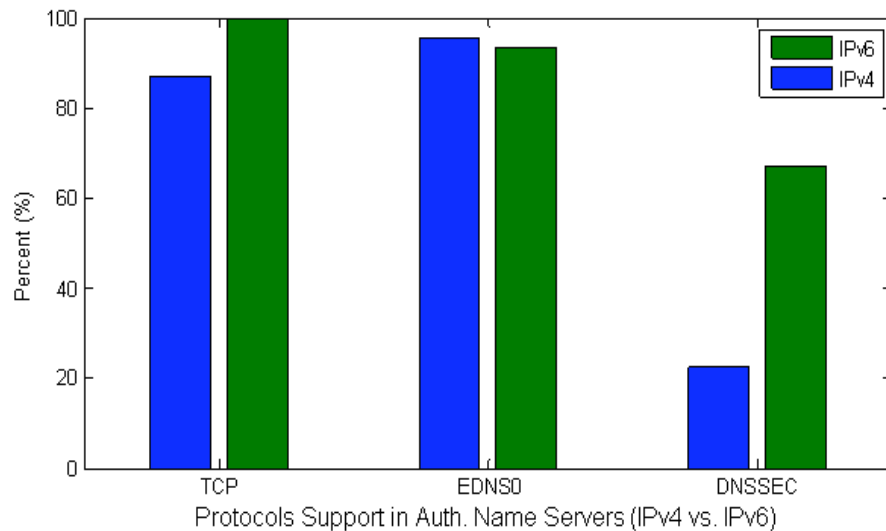
## Recursion Desired flags of authoritative servers

- For authoritative servers, this flag should be disabled.
- IPv6 servers are better configured.



Recursive Open (Y/N) in Auth. Name Servers (IPv4 vs. IPv6)

- Protocols are better supported by name servers in IPv6 network.
- IPv6 deployed later, and therefore more prepared.



## From our study...

- IPv6 is developing steadily
- Still in its early age
  - Users
  - Deployment of resources and applications

中国和谐信息社会重要的基础设施建设者、运行者和管理者

## Thanks & Discussions

中国和谐信息社会重要的基础设施建设者、运行者和管理者