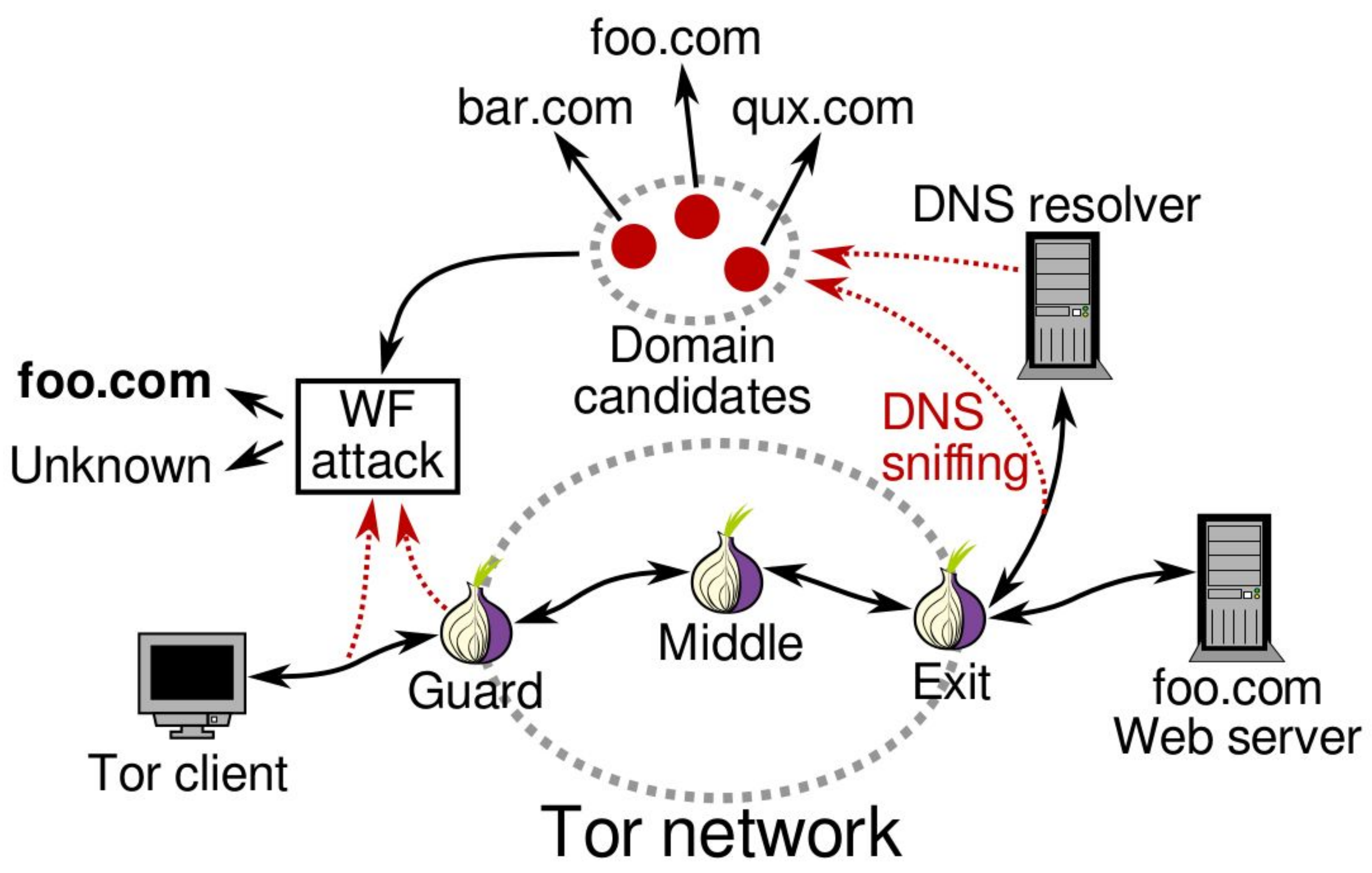
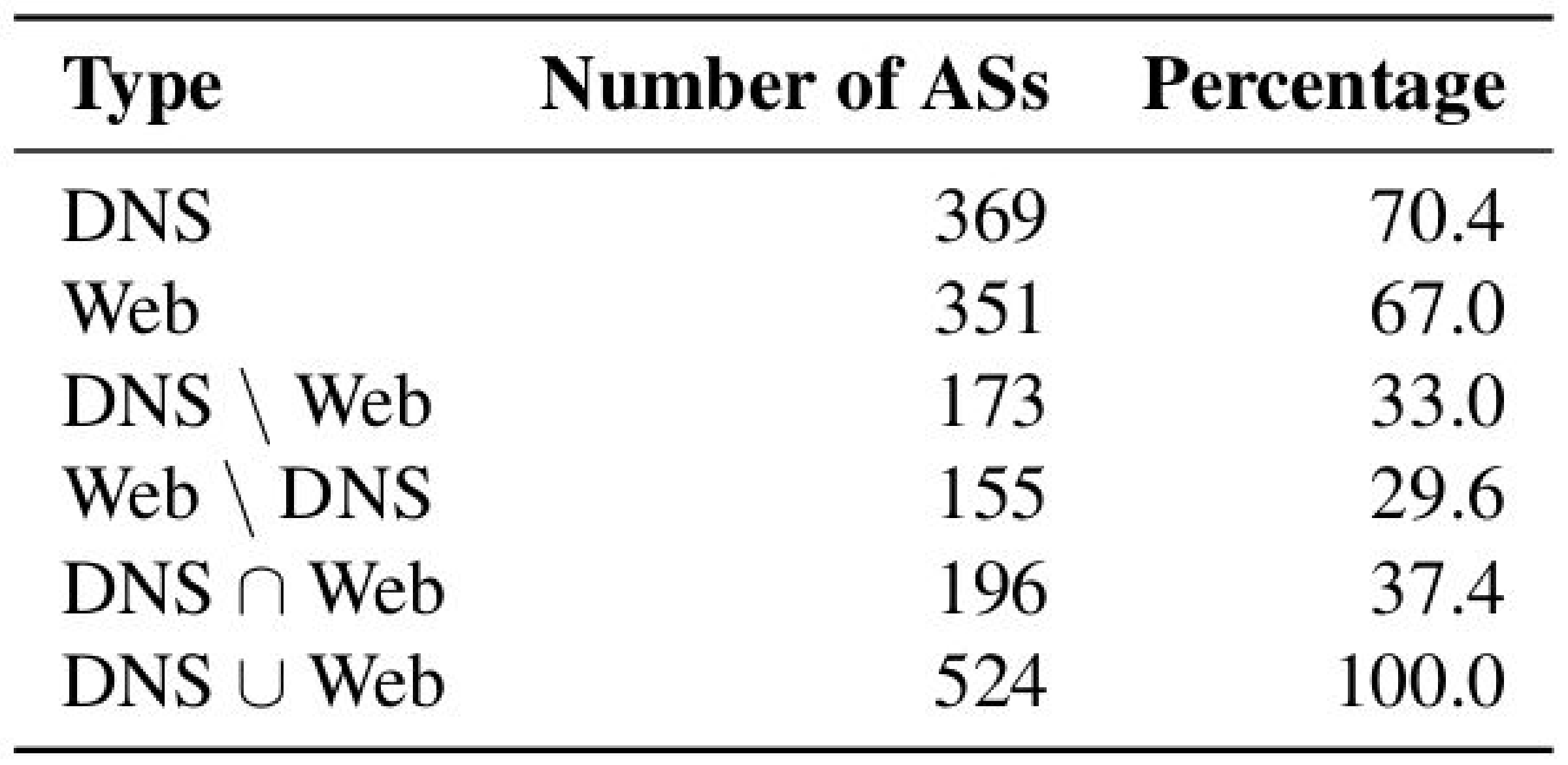
DNS-based Traffic Correlation Attacks

End-to-end correlation attacks

- Adversary seeks to control **both ends** of low-latency anonymity network, e.g., Tor
- Then, simple **packet counting** techniques allow **deanonymization**
- Past work focused on client-to-server TCP stream, **ignoring** DNS's distributed nature



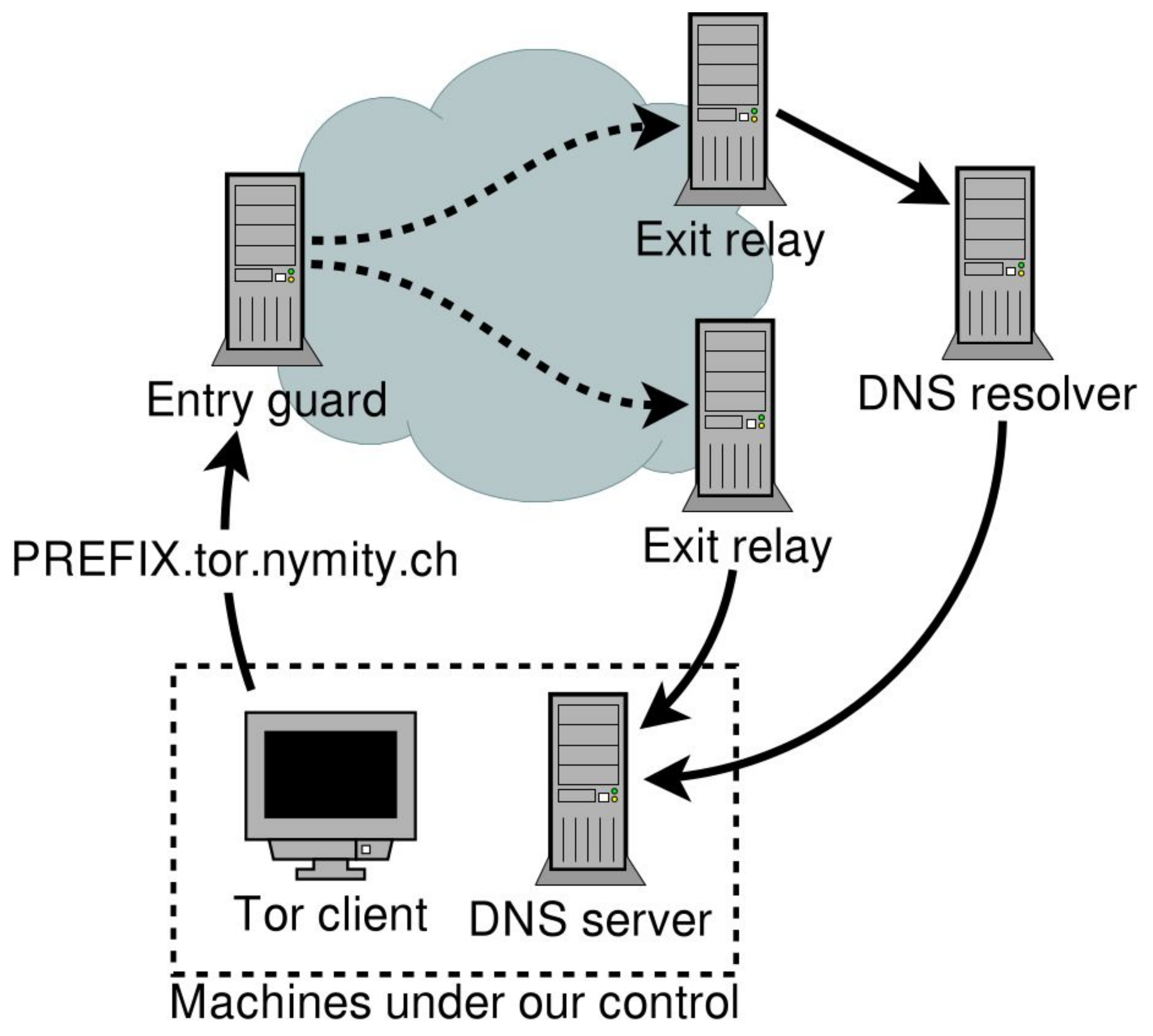


Type	Number of ASs	Percentage
DNS	369	70.4
Web	351	67.0
DNS \ Web	173	33.0
Web \ DNS	155	29.6
DNS ∩ Web	196	37.4
DNS ∪ Web	524	100.0

Table 2: *The set relations between unique traversed ASs for DNS and unique traversed ASs for Web.*

Why is DNS an issue?

- Iterative queries **traverse many paths** in addition to point-to-point TCP connection
- Third-party resolvers (e.g., 8.8.8.8) shouldn't learn **what Tor users do**
- Tor's DNS resolution is entirely up to exit relays. Here be dragons.



Who we are

At Princeton	At Karlstad	At KTH
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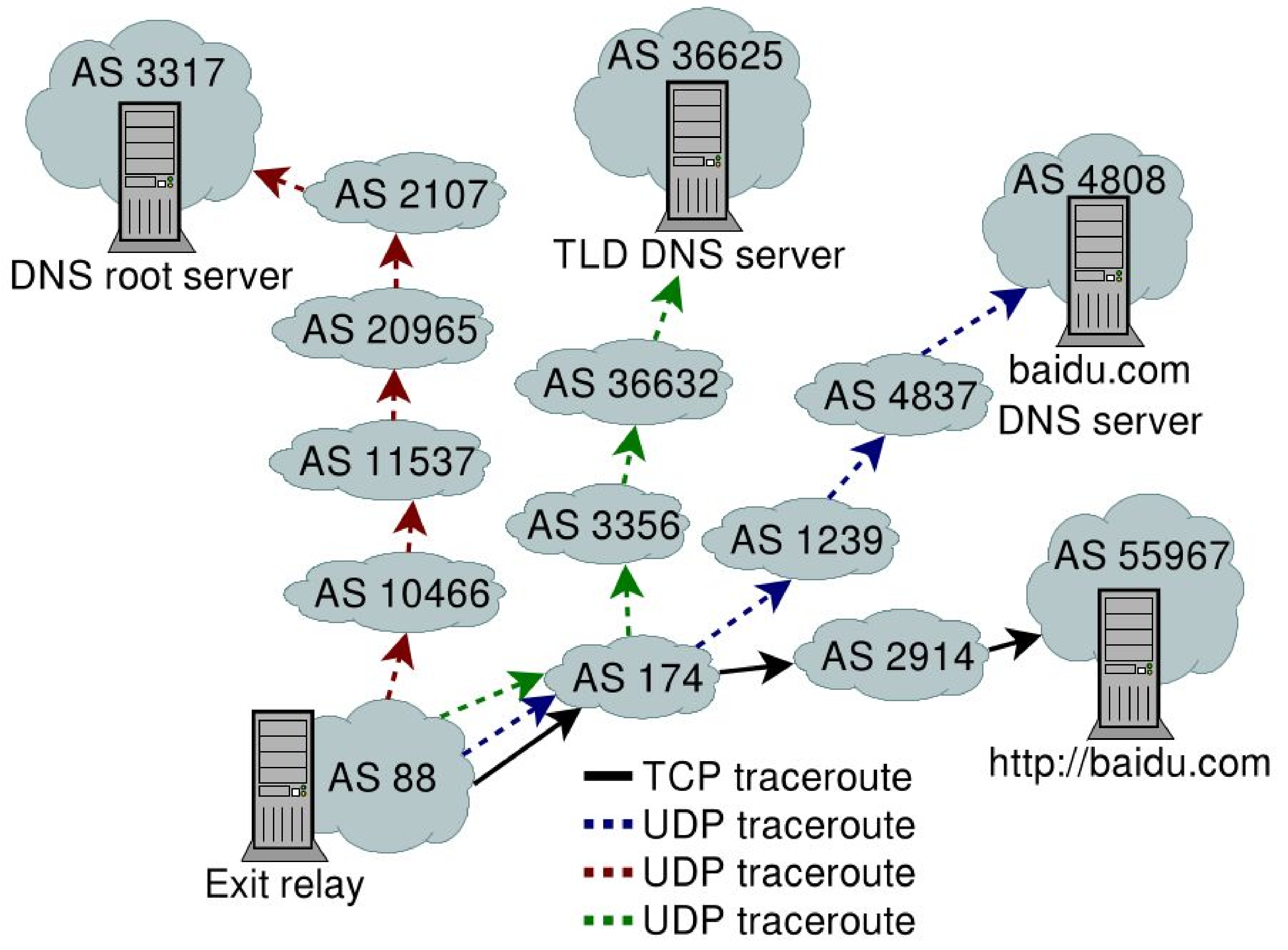
More information:

https://nymity.ch/dns-traffic-correlation/



Preliminary results

- Google gets to see **~25%** of DNS requests exiting Tor (bad)
- 12% of DNS requests come from self-hosted resolvers (good...?)
- Most exit relay resolvers use **0x20 encoding** and **random source ports** (good)
- DNS traffic traverses **more ASs** than Web traffic (bad)
- ~33% of exit resolvers don't validate DNSSEC (bad)