Domain Name System (DNS)

Domain Name System

- The Internet's Directory Service
  - an Internet-wide service that provides mappings from hostnames (www.ece.ust.hk) to IP addresses (143.89.44.246)
- primarily uses services provided by UDP
- distributed database
  - resides in multiple machines
  - implemented as hierarchy of many name servers

Why not centralized?

Q: Why not run a server process on a big, well connected supercomputer?

A: Centralized systems do not scale!

- poor reliability: single point of failure
- poor performance: remote access for most users
- difficult to manage: all traffic goes to one location
- not politically feasible in a global network

DNS – a distributed service

Local name servers

- each ISP, company has local (default) name server
- host DNS query first goes to local name server

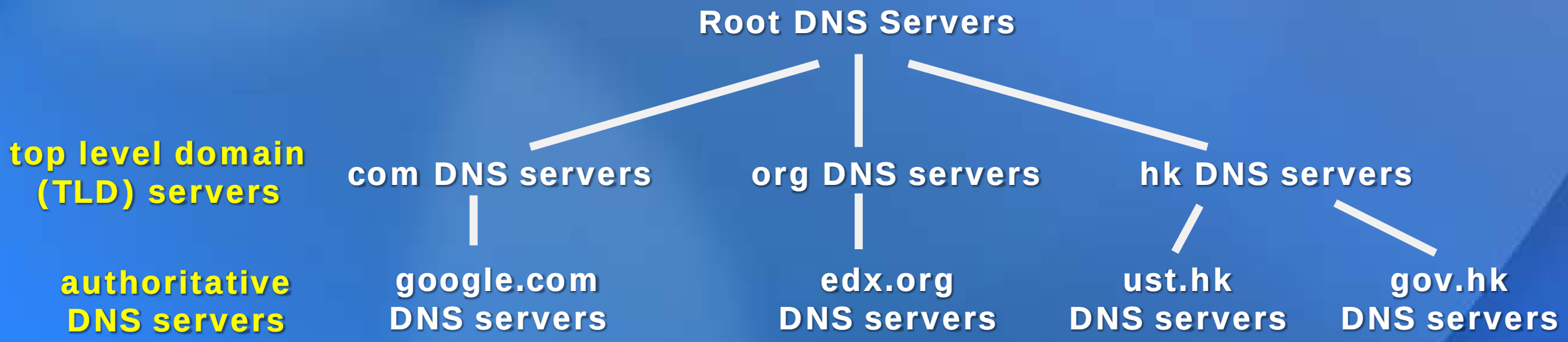
Authoritative name server

- every host is registered with at least two authoritative servers, which store that host's IP address and name

No server has all name-to-IP address mappings

What if the name is not known to the local DNS server (e.g. www.edx.org) ?

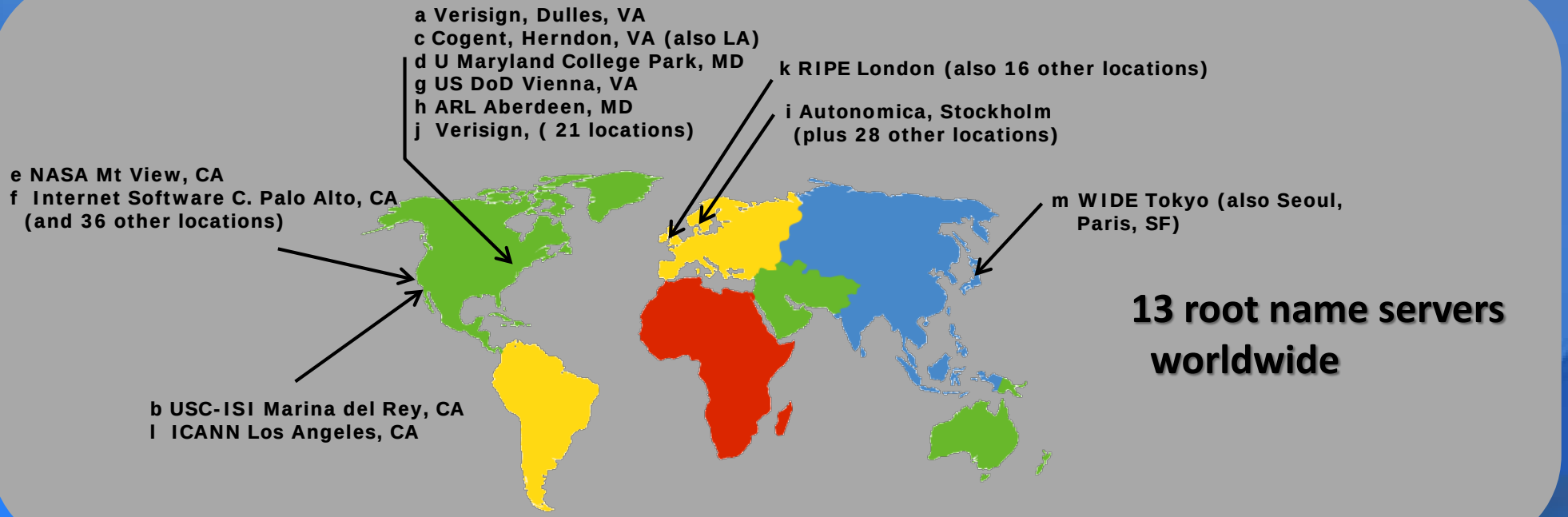
Distributed, Hierarchical Database



Client wants IP for “www.edx.org”

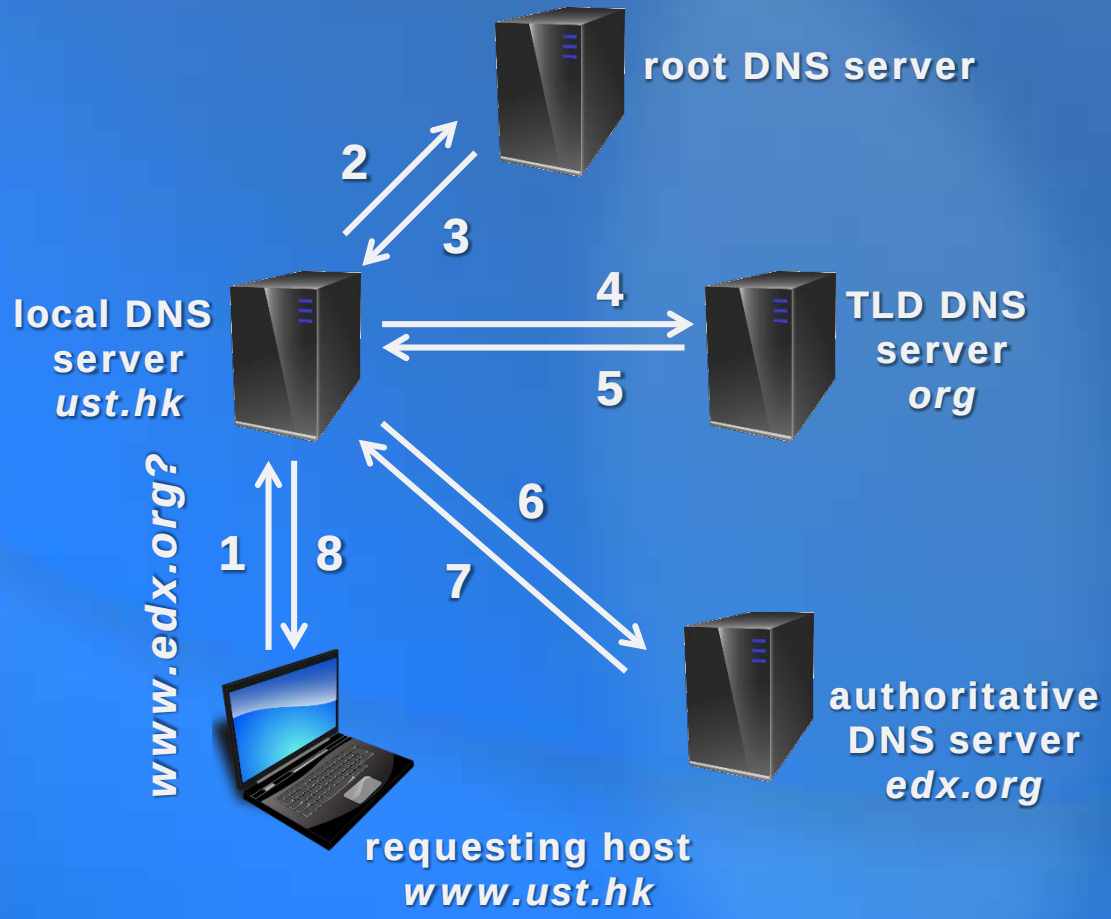
- client queries “root server” to find “org DNS server”
- client queries “org DNS server” to get “edx.org DNS server”
- client queries “edx.org DNS server” to get IP address for “www.edx.org”

Root name servers

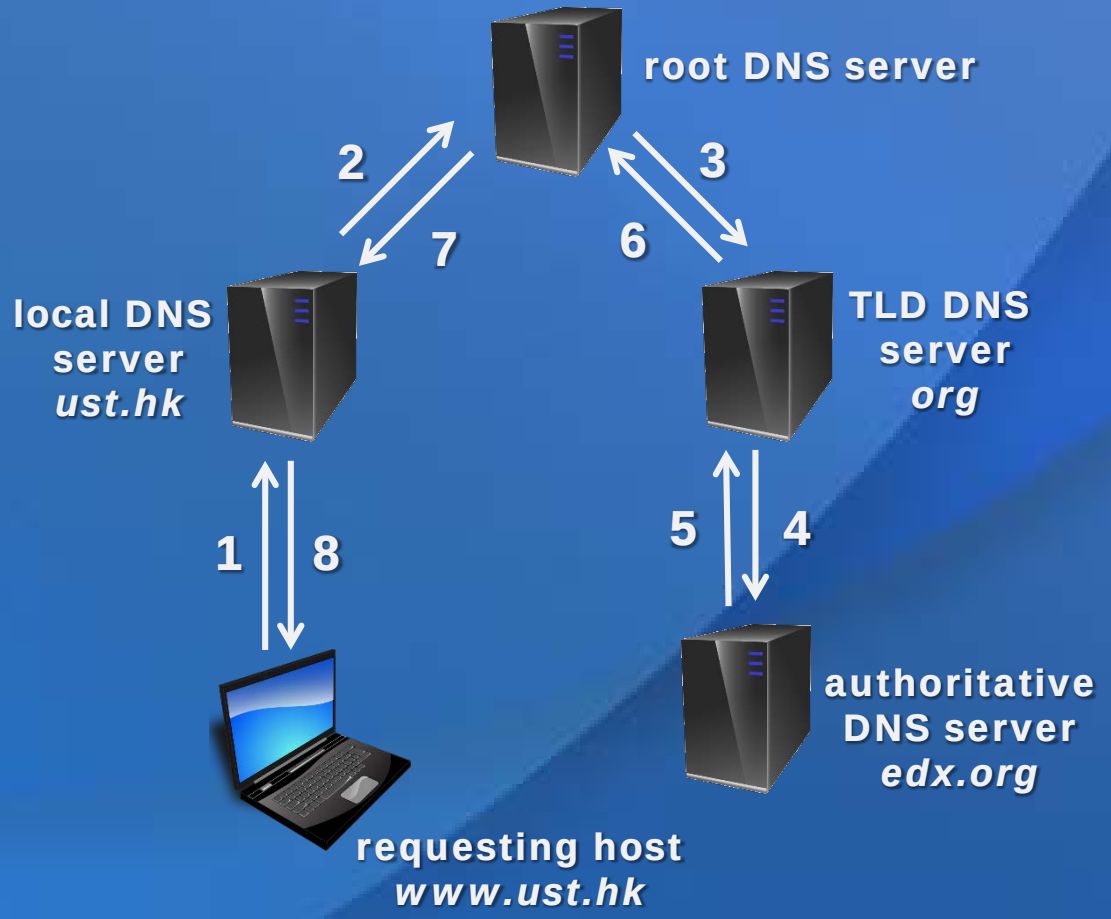


DNS name resolution

iterated query



recursive query



Record caching and updating

once (any) name server learns mapping, it caches the mapping

- cache entries timeout (disappear) after some time
- TLD servers typically cached in local name servers
  - Thus root name servers not often visited