Naming

- Outline
  - Terminology
  - Domain Naming System
  - Distributed File Systems

Overview

- What do names do?
  - identify objects
  - help locate objects
  - define membership in a group
  - specify a role
  - convey knowledge of a secret
- Name Space
  - defines set of possible names
  - consists of a set of name to value *bindings*
- Properties
  - names verus addresses
  - location transparent versus location-dependent
  - flat versus hierarchical
  - global versus local
  - absolute versus relative
  - by architecture versus by convention
  - unique versus ambiguous

Examples

- Hosts

  `cheltenham.cs.princeton.edu` → `192.12.69.17`
  `192.12.69.17` → `80:23:A8:33:5B:9F`

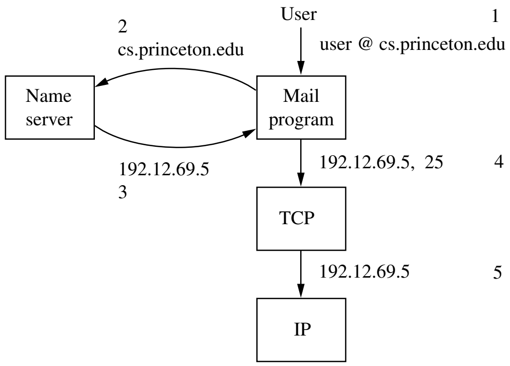
- Files

  `/usr/llp/tmp/foo` → `(server, fileid)`

- Users

  `Larry Peterson` → `llp@cs.princeton.edu`

- Mailboxes

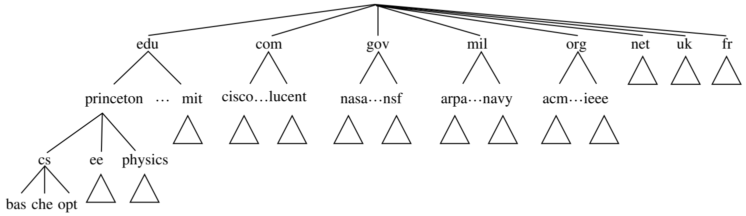


- Services

  `nearby ps printer with short queue and 2MB`

Domain Naming System

- Hierarchy

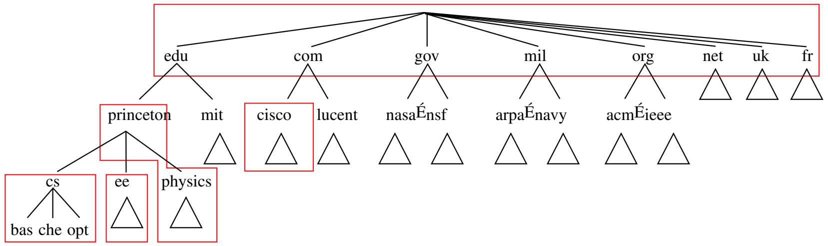


- Name

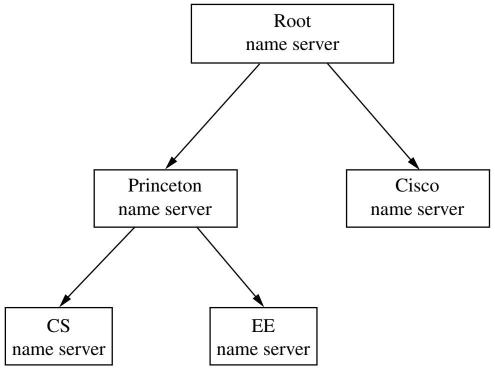
  `cheltenham.cs.princeton.edu`

Name Servers

- Partition hierarchy into *zones*



- Each zone implemented by two or more *name servers*



Resource Records

- Each name server maintains a collection of *resource records*

  ⟨`Name, Value, Type, Class, TTL`⟩
- `Name/Value`: not necessarily host names to IP addresses
- `Type`
  - `NS`: the `Value` field gives the domain name for a host running a name server that knows how to resolve names within the specified domain.
  - `CNAME`: the `Value` field gives the canonical name for a particular host; it is used to define aliases.
  - `MX`: the `Value` field gives the domain name for a host running a mail server that accepts messages for the specified domain.
- `Class`: allow other entities to define types
- `TTL`: how long the resource record is valid

Root Server

⟨`princeton.edu, cit.princeton.edu, NS, IN`⟩
⟨`cit.princeton.edu, 128.196.128.233, A, IN`⟩

⟨`cisco.com, thumper.cisco.com, NS, IN`⟩
⟨`thumper.cisco.com, 128.96.32.20, A, IN`⟩

...

Princeton Server

⟨`cs.princeton.edu, optima.cs.princeton.edu, NS, IN`⟩
⟨`optima.cs.princeton.edu, 192.12.69.5, A, IN`⟩

⟨`ee.princeton.edu, helios.ee.princeton.edu, NS, IN`⟩
⟨`helios.ee.princeton.edu, 128.196.28.166, A, IN`⟩

⟨`jupiter.physics.princeton.edu, 128.196.4.1, A, IN`⟩
⟨`saturn.physics.princeton.edu, 128.196.4.2, A, IN`⟩
⟨`mars.physics.princeton.edu, 128.196.4.3, A, IN`⟩
⟨`venus.physics.princeton.edu, 128.196.4.4, A, IN`⟩

...

CS Server

⟨cs.princeton.edu, optima.cs.princeton.edu, MX, IN⟩

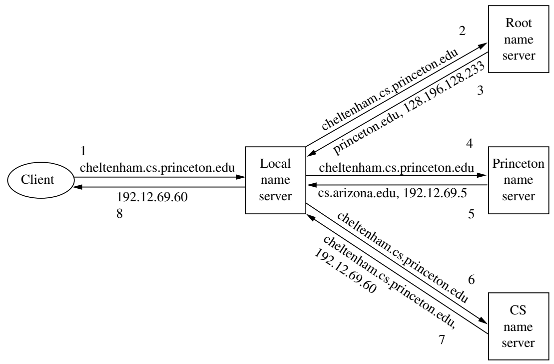
⟨cheltenham.cs.princeton.edu, 192.12.69.60, A, IN⟩
⟨che.cs.princeton.edu, cheltenham.cs.princeton.edu, CNAME, IN⟩

⟨optima.cs.princeton.edu, 192.12.69.5, A, IN⟩
⟨opt.cs.princeton.edu, optima.cs.princeton.edu, CNAME, IN⟩

⟨baskerville.cs.princeton.edu, 192.12.69.35, A, IN⟩
⟨bas.cs.princeton.edu, baskerville.cs.princeton.edu, CNAME, IN⟩

...

Name Resolution



- Strategies
  - forward
  - iterative
  - recursive
- Local server
  - need to know root at only one place (not each host)
  - site-wide cache

Distributed File Systems

- No Transparency

  Global AFS: `/cs.princeton.edu/usr/llp/tmp/foo`
  Windows: `f:/usr/llp/tmp/foo`

- Transparency by Convention

  NFS: `/usr/llp/tmp/foo`
  Or Not: `/n/fs/fac5/llp/tmp/foo`

- Transparency by Architecture

  Sprite: `/usr/llp/tmp/foo`

- Private versus Shared

  AFS: `/usr/llp/tmp/foo` vs `/afs/shared`

Stupid Naming Tricks

- Symbolic links
- Mount points
- Union mounts
- Per-User name spaces
- Logical name spaces
- Computed directories