

Naming

Outline

- Terminology
- Domain Naming System
- Distributed File Systems

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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*

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Properties

- Names versus addresses
- Location transparent versus location-dependent
- Flat versus hierarchical
- Global versus local
- Absolute versus relative
- By architecture versus by convention
- Unique versus ambiguous

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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`

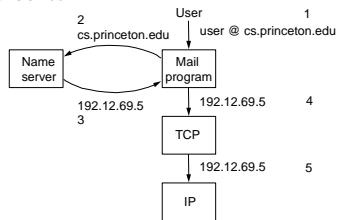
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Examples (cont)

- Mailboxes



- Services

`nearby ps printer with short queue and 2MB`

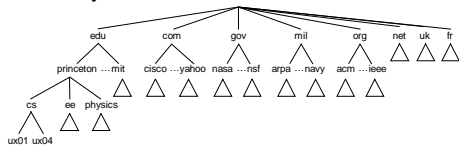
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Domain Naming System

- Hierarchy



- Name

`chinstrap.cs.princeton.edu`

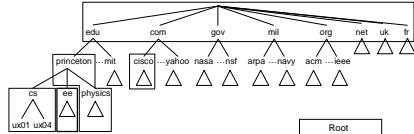
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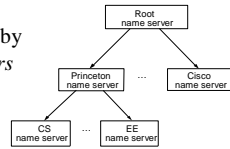
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Name Servers

- Partition hierarchy into *zones*



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



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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: Value gives domain name for host running name server that knows how to resolve names within specified domain.
 - CNAME: Value gives canonical name for particle host; used to define aliases.
 - MX: Value gives domain name for host running mail server that accepts messages for specified domain.
- Class: allow other entities to define types
- TTL: how long the resource record is valid

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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)
```

...

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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)
```

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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)
```

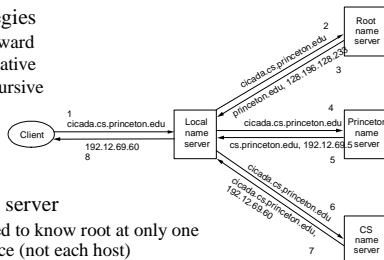
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Name Resolution

- Strategies
 - forward
 - iterative
 - recursive



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

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Distributed File Systems

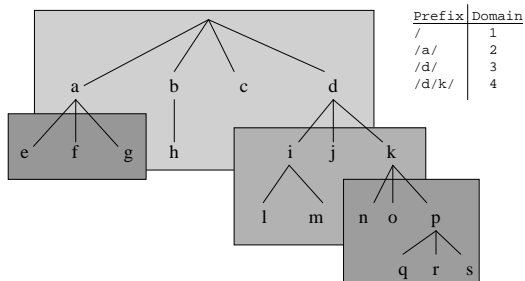
- No Transparency
Global AFS: `/cs.princeton.edu/usr/llp/tmp/foo`
Windows: `f:/usr/llp/tmp/foo`
- Transparency by Convention
 - NFS: `/usr/llp/tmp/foo`
 - Or Not: `/n/Es/fac5/llp/tmp/foo`
- Transparency by Architecture
 - Sprite: `/usr/llp/tmp/foo`
- Private versus Shared
 - ASF: `/usr/llp/tmp/foo` versus `/afs/shared`

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Example



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Stupid Naming Tricks

- Symbolic links and mount points
- Per-User and logical name spaces
- Computed directories
- Load balancing and content distribution
- Attribute-based names
- Hash-based schemes

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