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 versus 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/lhp/tmp/foo → (server, fileid)
- Users
  - Larry Peterson → lhp@cs.princeton.edu

Examples (cont)

- Mailboxes
  - 2
  - User
    - Name server
    - 192.12.69.5
  - Mail program
    - 192.12.69.5
- Services
  - nearby ps printer with short queue and 2MB

Domain Naming System

- Hierarchy
- Name
  - chinstrap.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: 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

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)
(ww.princeton.edu, helios.ww.princeton.edu, NS, IN)
(helios.ww.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)

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/usrllp/tmp/foo
  Windows: f:/usrllp/tmp/foo
- Transparency by Convention
  – NFS: /usrllp/tmp/foo
  – Or Not: /afs/fac5llp/tmp/foo
- Transparency by Architecture
  – Sprite: /usrllp/tmp/foo
- Private versus Shared
  – ASF: /usrllp/tmp/foo versus /afs/shared

Example

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