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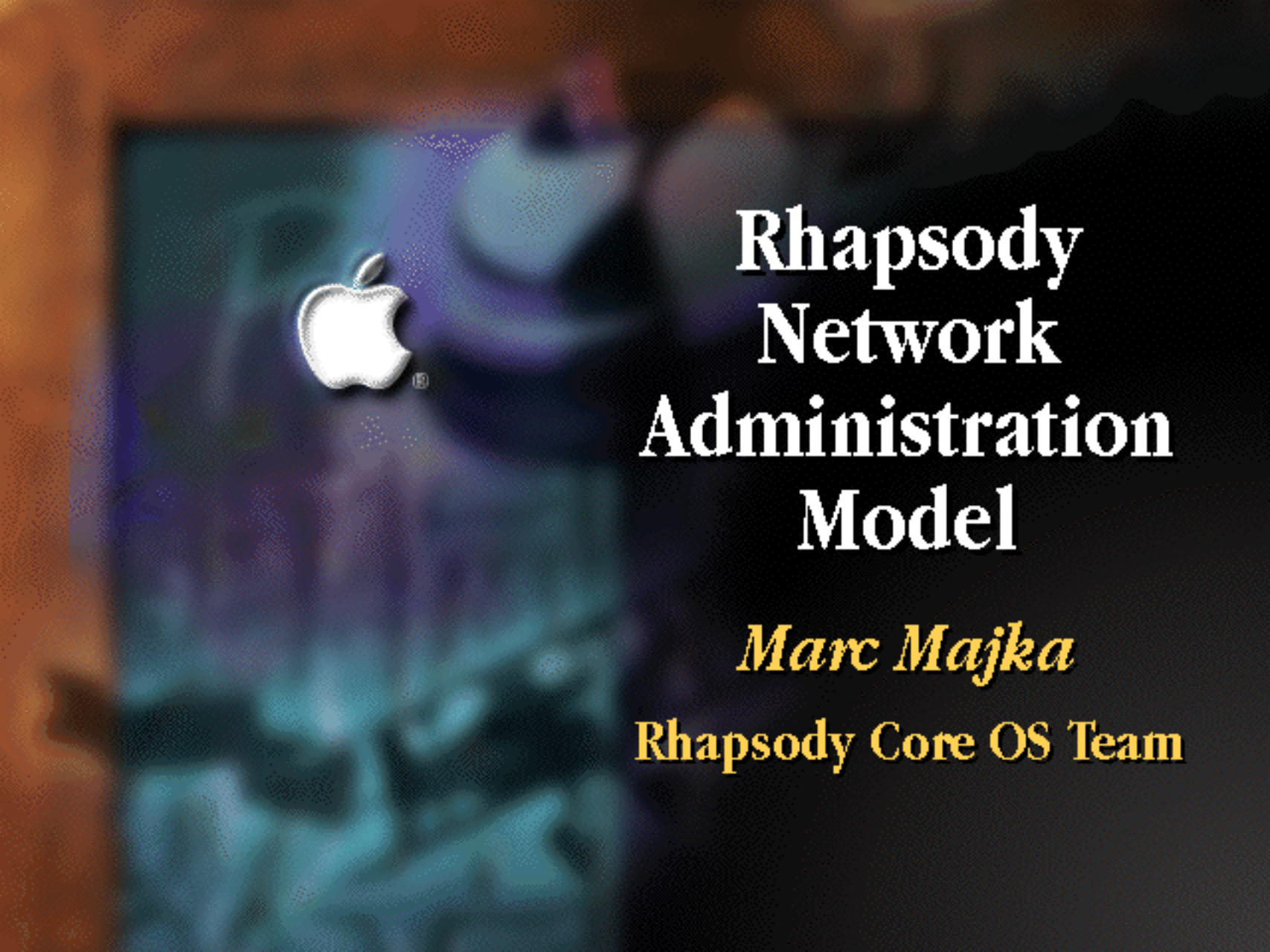

Rhapsody Network Administration Model

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Rhapsody Core OS Team

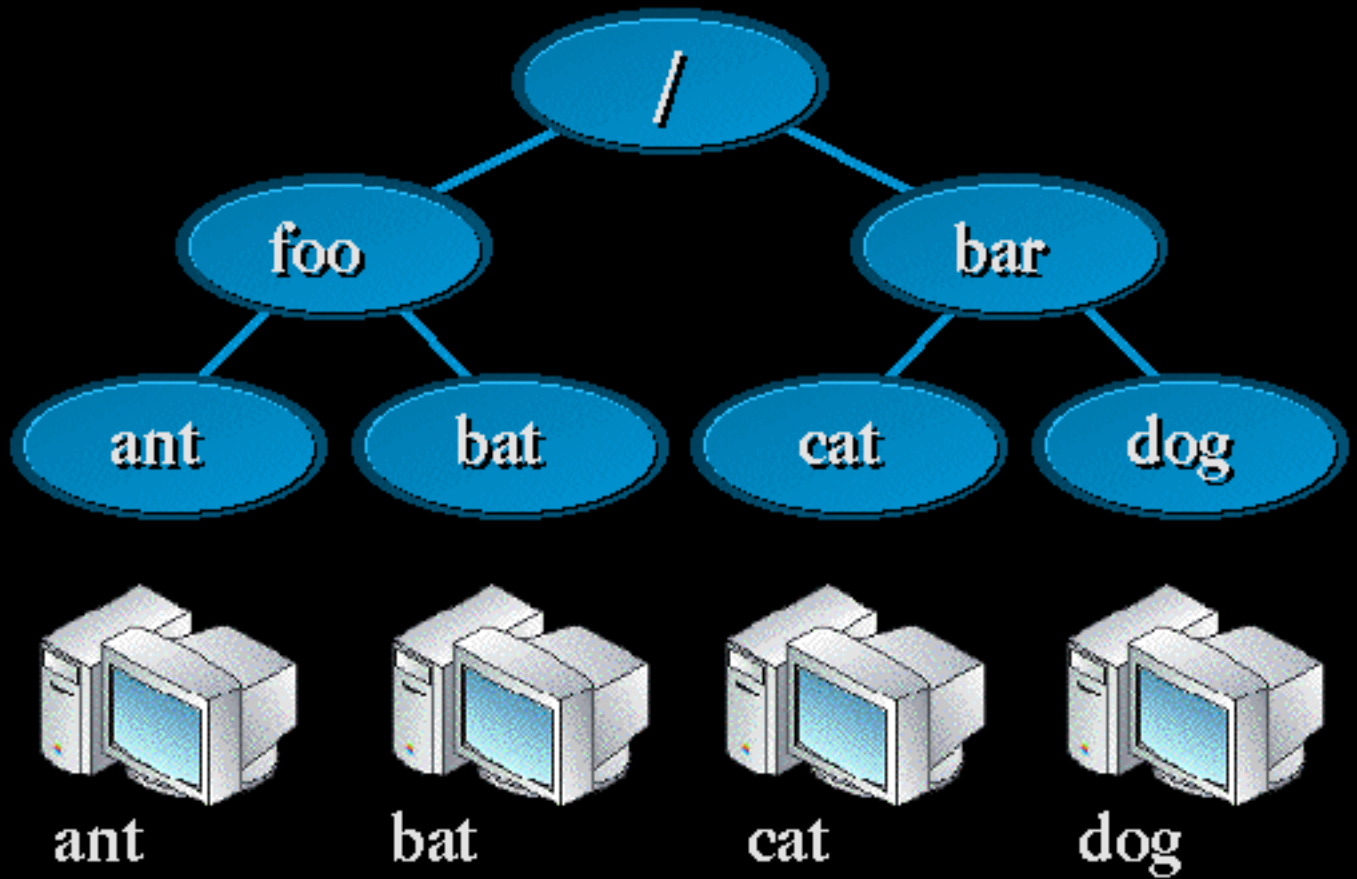
Administration = Information + Services

- Rhapsody supports several Information systems
  - NIS, DNS, LDAP, local files
- Primary Information system is NetInfo
- These systems just store data—various servers do the real work
- Today's presentation from the developer's point of view

NetInfo Overview

- A reliable distributed data store for network and system administration
- Contains records describing users, printers, mailing lists, and etc.
- Also stores configuration settings, server and resource locations

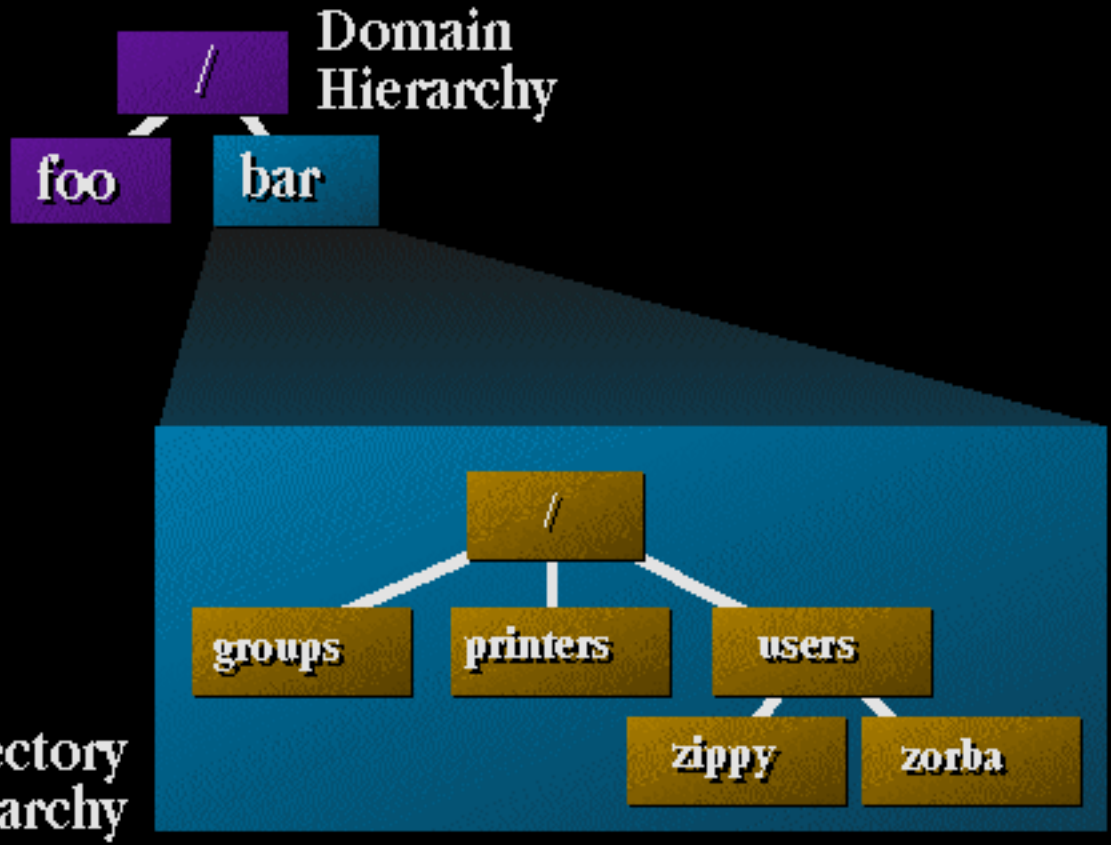
A Three-Level Hierarchy



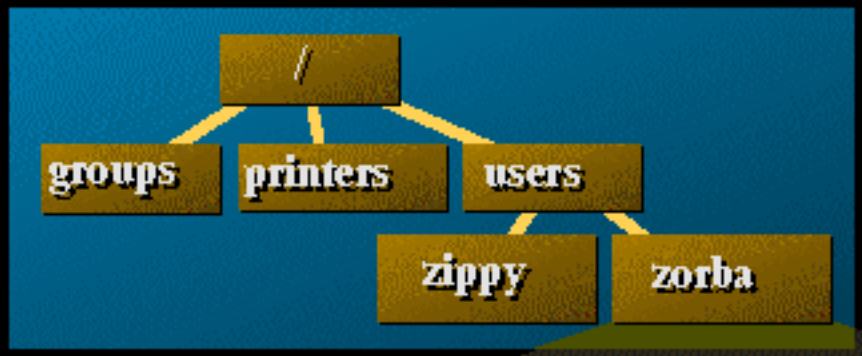
NetInfo Namespace

- A tree-structured namespace
- A hierarchy of domains
- Each domain stores a hierarchy of directories
- Directories are data bearing objects

Domains and Directories



Property List



Directory Hierarchy

Property List

name:	zorba
realname:	Zorba The Geek
passwd:	pg5nMizy/WeOs
uid:	12345
gid:	123
home:	/Users/zorba
shell:	/bin/csh
_writers_passwd:	zorba

Storing Data

- A directory contains a list of properties
- Each property has one ASCII key and any number of ASCII values
- Directories in certain categories (e.g., users) have required properties
- New properties may be added on the fly

Access Control

- NetInfo is world-readable
- All data is writable by “root” user
- Write ACLs per directory and per property

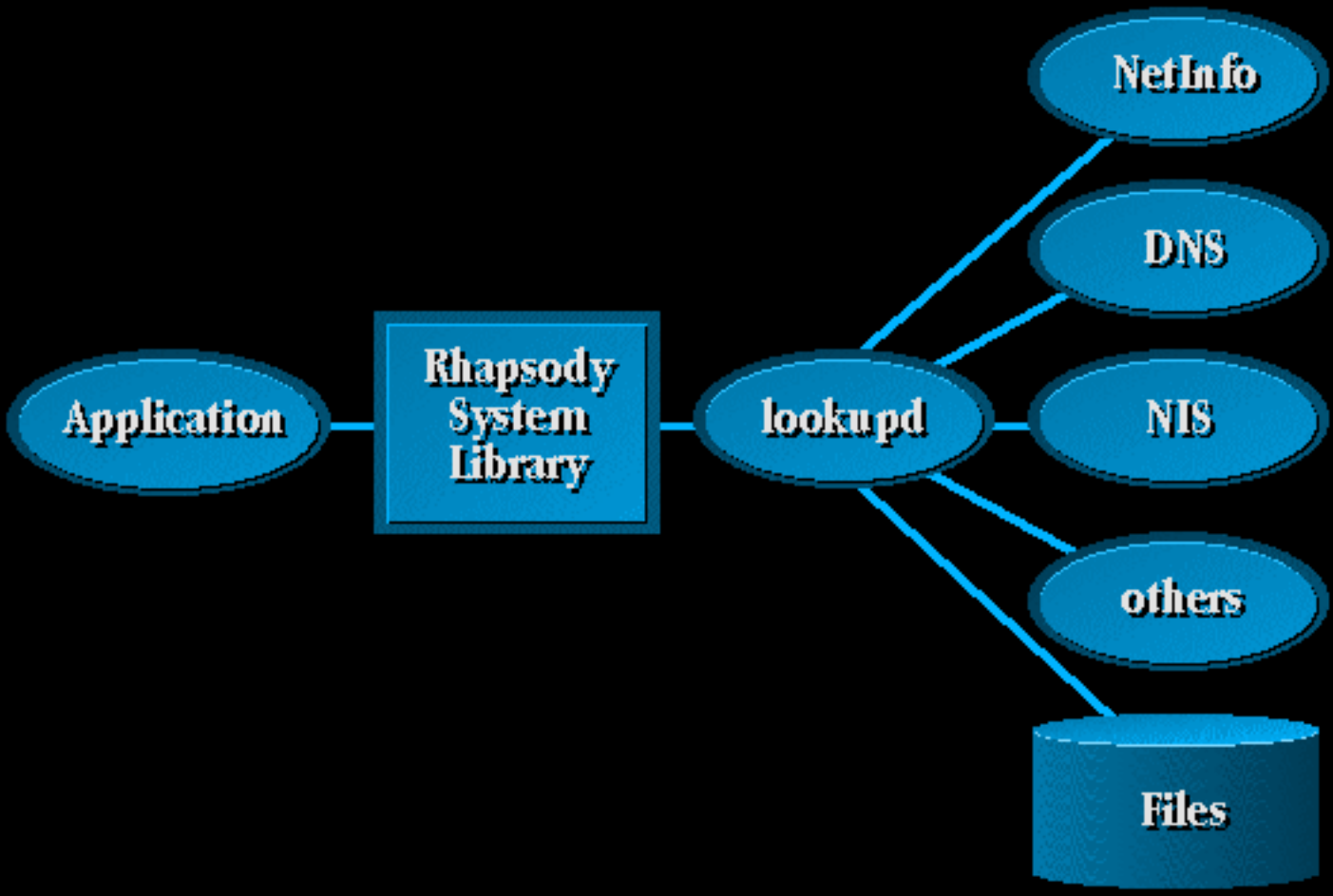
Reliability

- Each domain has a master server
- A domain may have any number of clone servers
- Write operations always go to the master
- Several master/clone synchronization mechanisms
- Clients automatically reconnect in case of failure

NetInfo Clients

- Most common lookups go through the System Library
- System Library uses lookupd to find things
- lookupd is the system's main NetInfo client
- Any program may be a NetInfo client

System Look-up Path



lookupd

- System's "Information Clearinghouse"
- Client of NetInfo, NIS, DNS, etc.
- Cache for improved system performance
- When consulting NetInfo, climbs from local domain to root domain

Talking to NetInfo

- Through System Libraries and lookupd
- Primitive ONC-RPC protocol
- “C” client library
- Objective-C API (NIAccess framework)
- Integrated directory services API planned

System Libraries

- gethostbyname(), getpwnam(), and etc.
- Limited set of categories (users, printers, hosts, etc.)
- Limited set of properties for each category—no data for nonstandard keys in NetInfo

ONC-RPC Protocol

- Tedious in the extreme
- No documentation

C Client Library

- Fairly simple open, search, read, write —style routines
- Data Structures galore
- On-line documentation

NIAccess Framework

- Objective-C API on top of C client library
- Classes for Domain, Directory, etc.
- On-line documentation

What Can I Do with NetInfo?

- Create new Network and System Administration applications and management utilities
- Reliable data store
- Location broker and rendezvous for network applications
- Extend existing data to support your code (e.g., “security_clearance” property for a user)

What Shouldn't I Do with NetInfo

- Poor performance on write operations
- Best performance for small (<=512 byte) records

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