X/Open Federated Naming

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Overview

- **What is a Naming Service?**
- **What are the problems?**
- **Federated Naming**
- **Benefits to the developer and user**
- **Federated Naming in Solaris**

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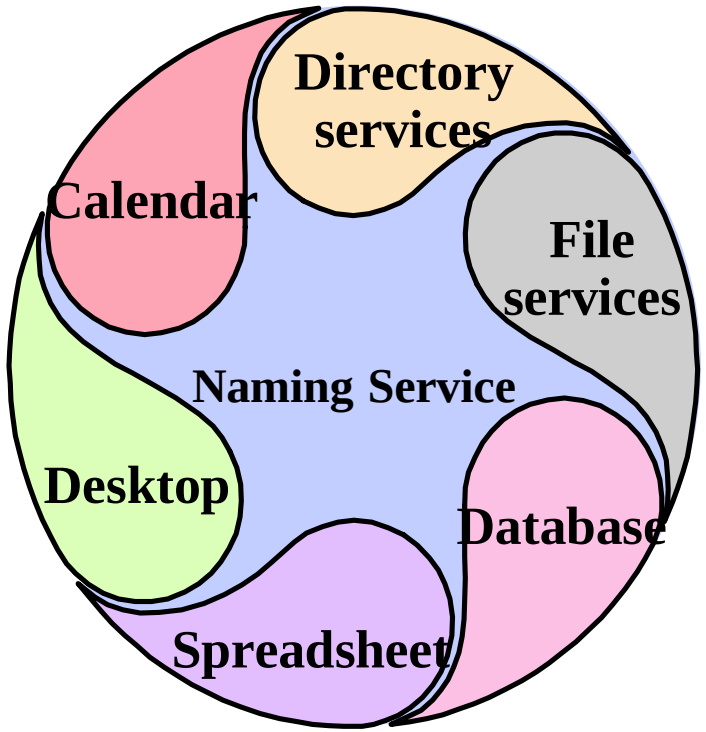
Naming Service

- **Maps human-oriented string names to objects**
- **Usually integrated with another service**
- **Examples:**
  - ✓ **Internet DNS, X.500**
  - ✓ **ONC's NIS+, DCE's CDS**
  - ✓ **Naming component of Unix file system**



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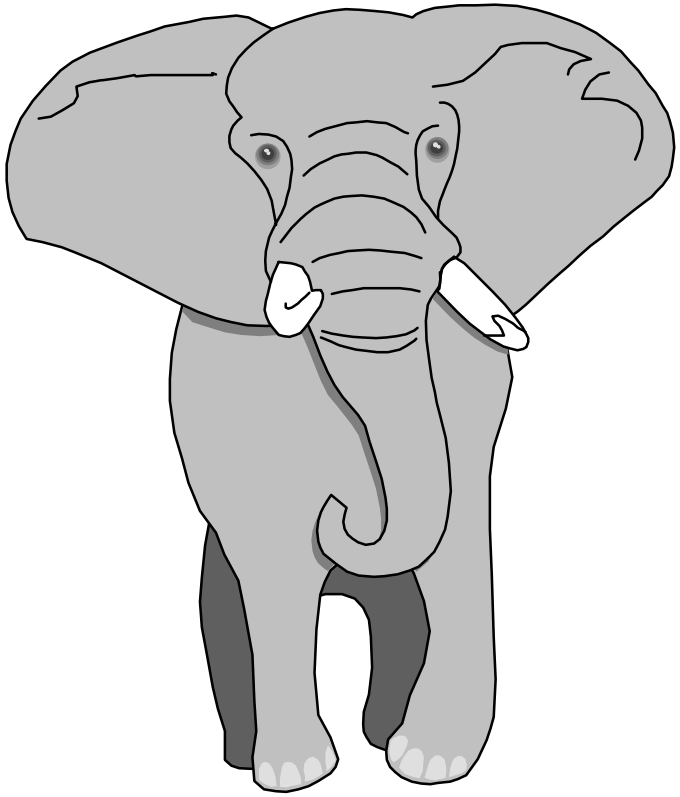
One Size Cannot Fit All

Implies a range of requirements:



- **Performance**
- **Granularity**
- **Syntax**
- **Availability**

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Heterogeneity is the Reality of Enterprise Computing

Hardware	OS	Network Computing Platforms

No single Naming/Directory service for the enterprise

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Lack of Common API

- **Many interfaces, often obscured**
- **No basic naming API that any naming service can support**

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Lack of Policies

- **Need to express relationships**
  - ✓ **associate resources with users, machines, sites, ...**
- **Proliferation of ad hoc policies**

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Examples

✓*Unix® rcp*	**bigtop:/usr/bin/spec4**
✓*DCE file name*	**/.../Wiz.COM/fs/user/jsmith/.cshrc**
✓*Solaris® Automounter*	**/net/bigtop/public/info**
✓*Solaris® User's files*	**/home/jsmith/.cshrc**
✓*User's calendar*	**jsmith@bigtop**
✓*User's mail address*	**joan.smith@admin**
✓*Microsoft Excel®*	**HardDisk:Finance:Budgets:Fiscal1992!B4**

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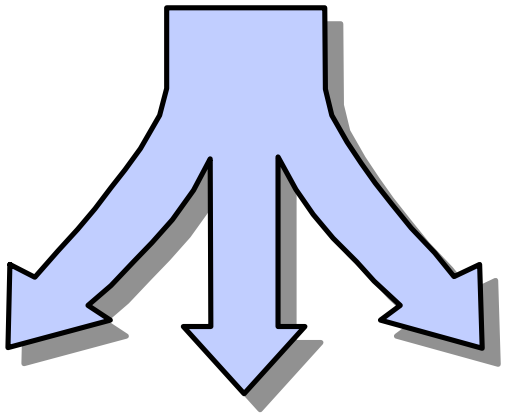
Consequences

- Heterogeneity of naming systems
- No common basic naming API
- Lack of policies



Poor Portability

No Interoperability

Program Complexity

Incoherence

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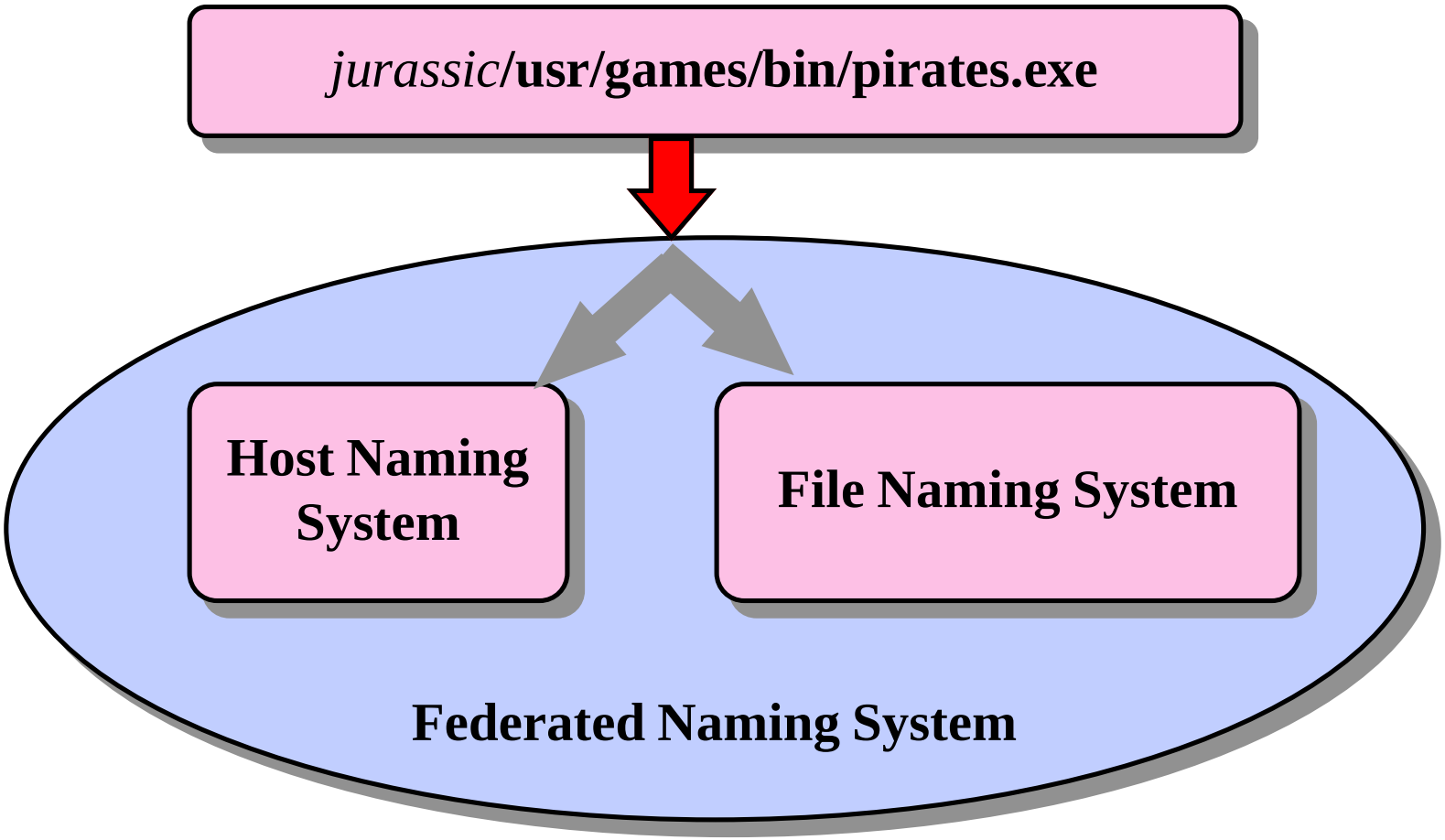
Requirements of the Solution

- **Composable names**
- **Simple but powerful naming interface**
- **Policy for the enterprise namespace**

Federated Naming Service

Two or more naming systems that "cooperate"



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What is XFN?

- X/Open Federated Naming
- Support for composite names
- A simple base naming API
- A simple base attribute API
- Policies for the global enterprise
- XFN protocols

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XFN Naming Model

- ***context*** **contains name-to-reference *bindings***
- **Operations for**
  - ✓ ***Resolving*** **names to objects**
  - ✓ ***Associating*** **(or binding) names with objects**
  - ✓ ***Listing*** **names, etc**
- **A context can contain bindings to other contexts**
- **All names are resolved relative to a context**

XFN Attribute Model

- **Attributes can be associated with a named object**
- **Each attribute has**
  - ✓ **a unique attribute identifier**
  - ✓ **an attribute syntax**
  - ✓ **a set of attribute values**
- **Operations for**
  - ✓ **retrieving attributes**
  - ✓ **updating attributes**

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XFN Composite Names

- **An ordered list of name components**
- **Components come from one or more naming systems**
- **Canonical string form defined**
  - ✓ **slash-separated left-to-right**
  - ✓ **syntax of component name preserved**

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Examples

- .../Wiz.COM/_fs/pub/products.txt
- _orgunit/ssi.eng/_service/fax
- _user/Clarke/_service/calendar

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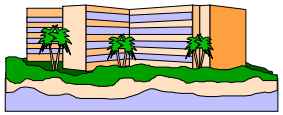
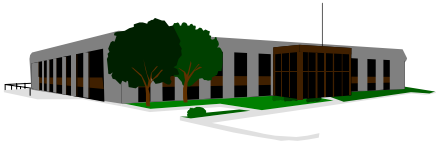
Policy Design Principles

- **Uniformity**
- **Useful contexts**
- **Composibility**

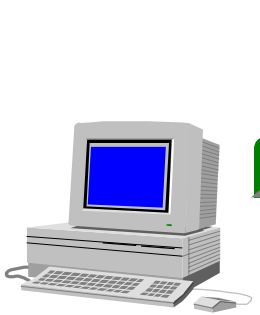
Levels of Policy

Global

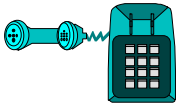


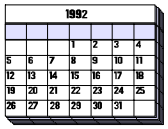


Enterprise



Application





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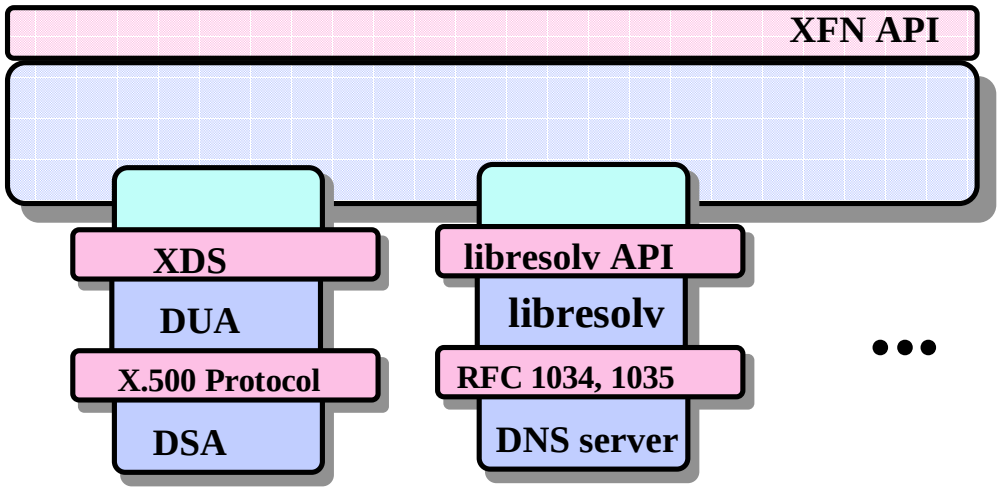
XFN Global Policy

- **DNS**
  - ✓ **.../wiz.com/_user/mjones/_service/printer**
- **X.500**
  - ✓ **.../c=ca/o=ubc/_orgunit/physics/_service/fax**



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XFN Enterprise Policy

- **What are the objects being supported?**
  - ✓ **organizations, users, hosts, services and files**
- **What are the relationships among these objects?**
  - ✓ **users, hosts, services and files associated with organizations**
  - ✓ **services and files associated with users, hosts, organizations**
- **How does resolution of a name begin?**
  - ✓ **bindings in the Initial Context**

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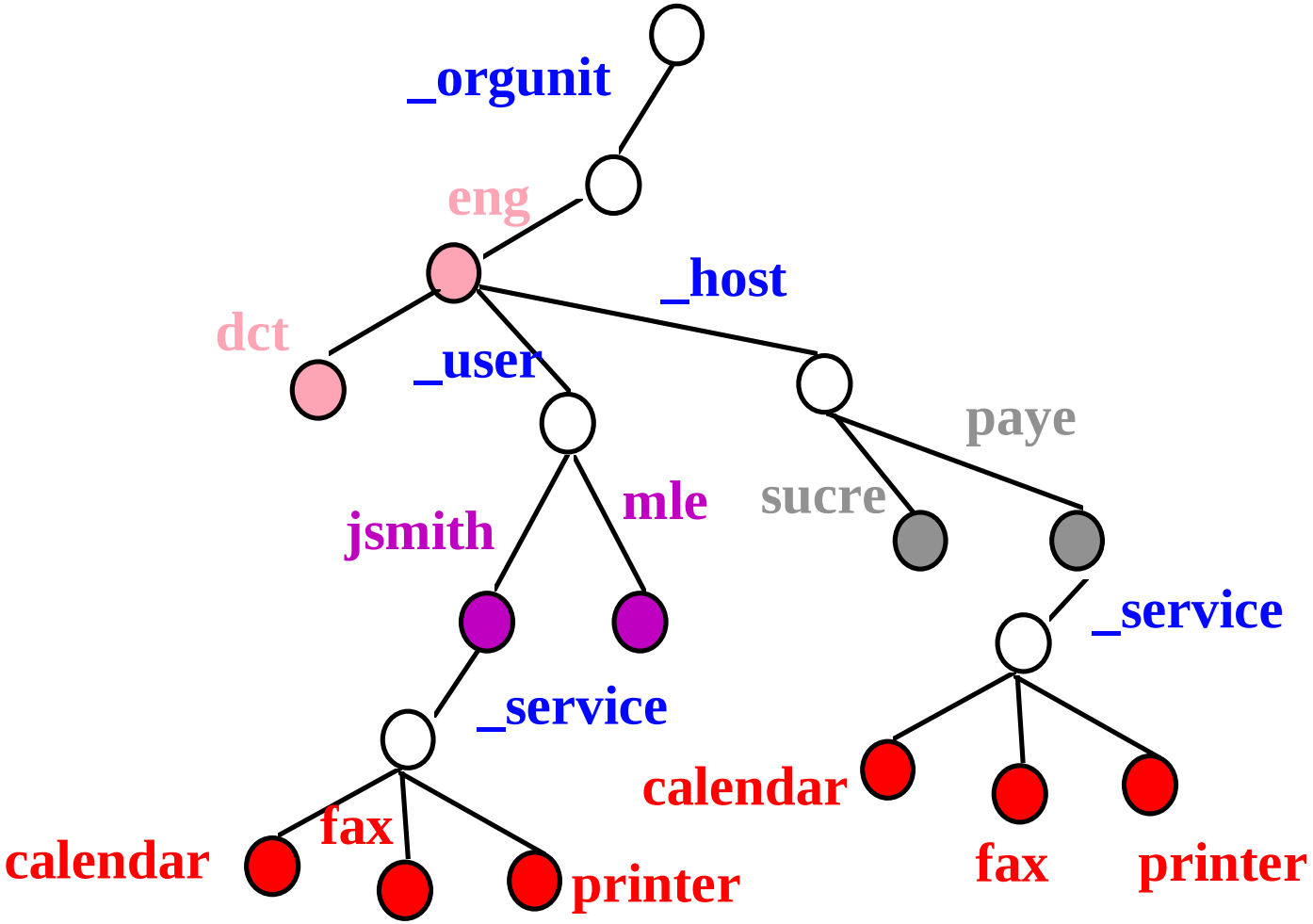
XFN Enterprise Namespace Example



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XFN Protocol

- **Provides network access to different naming services in a generic way**
- **Simplifies applications that need to access XFN service**
- **Presently defined for**
  - ✓ **ONC RPC**
  - ✓ **DCE RPC**

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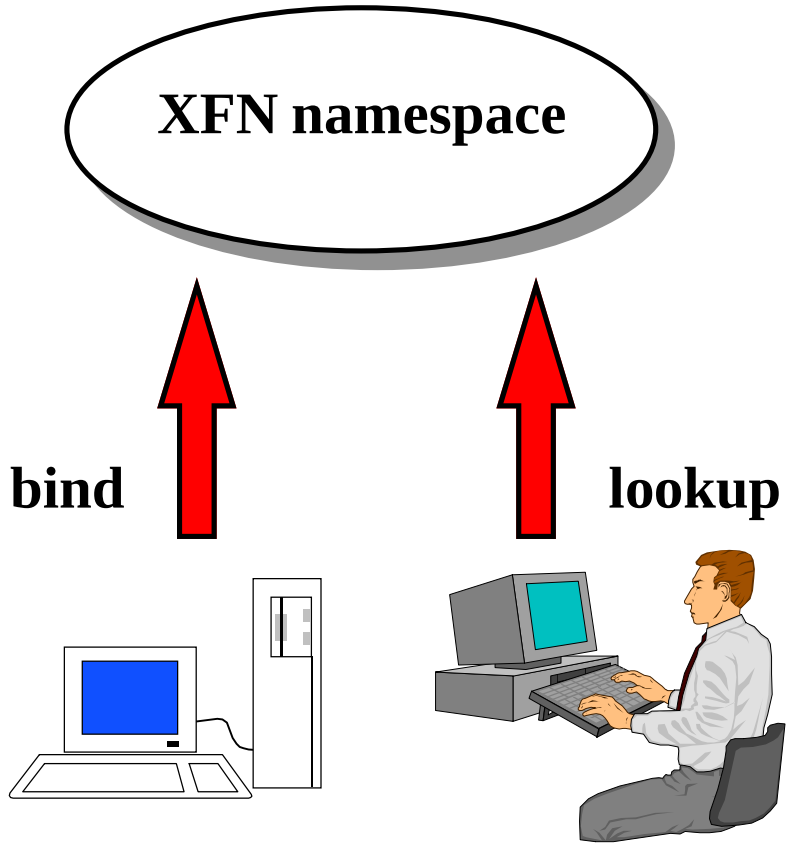
XFN and Applications

- **Access the federation of naming systems using composite names and the XFN API**
- **Can depend on XFN policies**
- **Can generate names on behalf of users**

Calendar Service: A Client/Server Application

- **Server**
  - ✓ **Maintains database of calendars**
  - ✓ **Binds name of calendars it serves to own RPC address**
- **Client**
  - ✓ **Calendar viewer**
  - ✓ **Looks up the address of the calendar server for a particular object**



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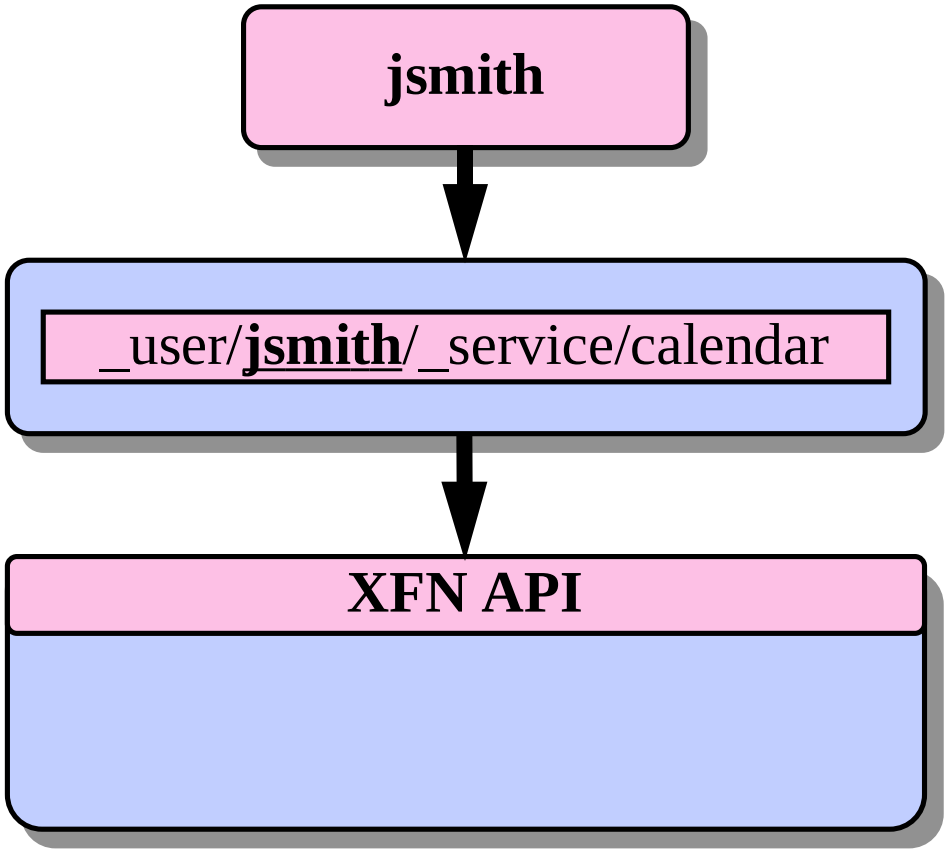
XFN and Applications



End User Input

Application

Federation of Naming Systems

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Benefits to Applications

- **Portability**
- **Simplicity**
- **Coherence**
- **Scope and flexibility**
  - ✓ **_user/jsmith**
  - ✓ **.../c=us/o=Wiz/_user/jsmith**

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XFN and End-Users

- **Experience through applications**
- **Coherence is the overall view that applications collectively provide**

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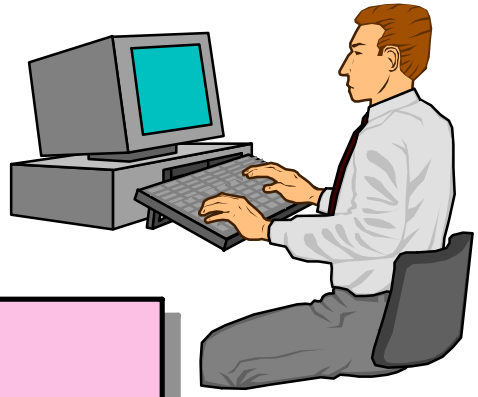
XFN and End-Users



XFN Namespace Navigation Tool

Calendar Tool

File Tool

Printer Tool

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Benefits to End-Users

- **Coherence**
  - ✓ **_user/jsmith/_fs/.cshrc**
  - ✓ **_user/jsmith/_service/calendar**
  - ✓ **_user/jsmith/_service/mailbox**
- **Composibility**
  - ✓ **_orgunit/advanced.engineering/_service/calendar**
  - ✓ **_user/jsmith/_service/calendar**
- **Scope**
  - ✓ **e.g. X.500, DNS, spreadsheets**

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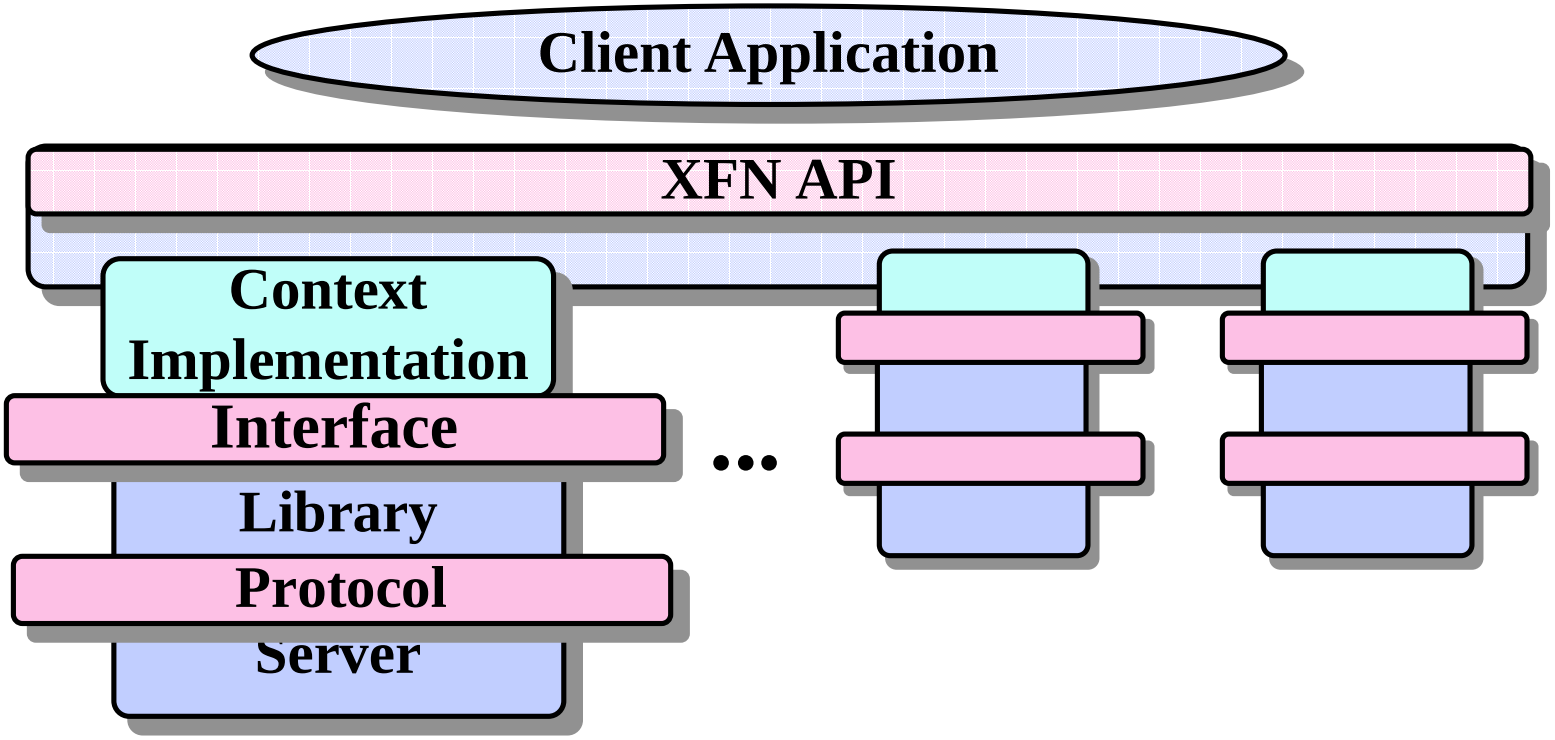
XFN and New or Existing Naming Systems



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Benefits to Naming Systems

- **Integration**
  - ✓ **Federate own naming system in a seamless way**
- **Scope**
  - ✓ **Application namespaces made more accessible**

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XFN in Solaris

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What is FNS?

- **Implements XFN API and policies for Solaris 2.5**
- **Includes:**
  - ✓ **XFN client library**
  - ✓ **XFN global and enterprise policies**
  - ✓ **Context implementations for**
    - **NIS+**
    - **DNS**
    - **X.500**
    - **File system**
    - **Printing**
  - ✓ **Command line tools**

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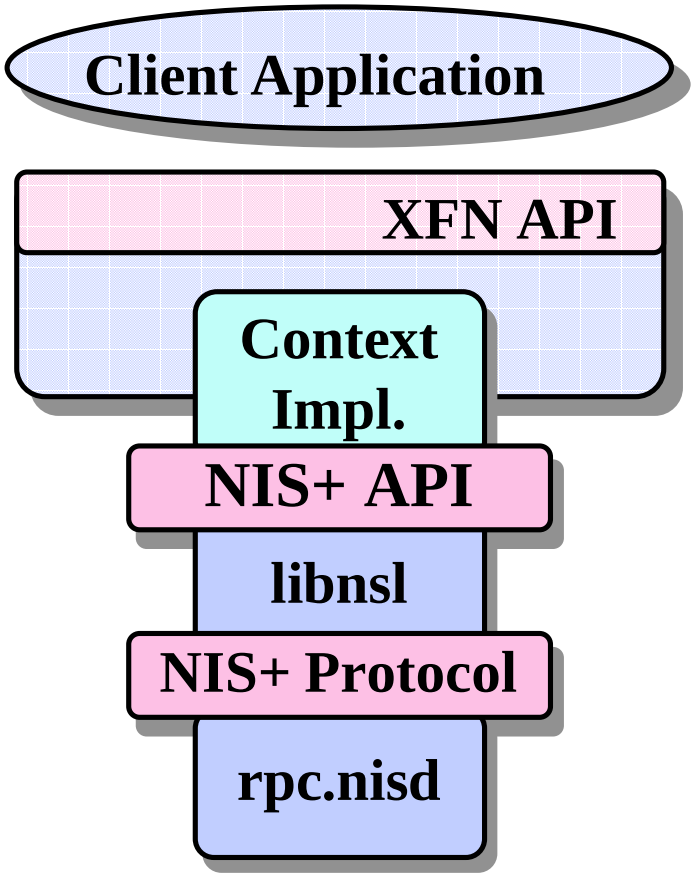
FNS and NIS+

- **Provides context implementation on NIS+**
- **Implements enterprise-level policies**
  - ✓ **provides contexts for NIS+ domains, users, hosts**



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FNS and the File System

- **Enables files to be named using FNS**
  - ✓ **/xfn/org/engineering/user/jsmith/fs/project.txt**
  - ✓ **/xfn/.../hp.com/org/sales/fs/projections.txt**
- **Provides common view of global and enterprise file namespaces across all machines**
- **Namespace shared with non-file applications**
- **Integration done through automounter**
  - ✓ **use of XFN API allows access to naming services federated in the future (e.g. X.500) automatically**

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FNS and Printing

- **Base support for New Printing Client**
- **Printer naming relative to users, hosts and organizations**
- **Centralized administration**
- **Namespace shared with other applications**
- **Portable across naming services**
- **Infrastructure for integrating printing service from NetWare, DCE, etc**

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FNS and Global Naming

- **Enables naming of objects outside of NIS+ hierarchy**
- **Context support for**
  - ✓ **DNS**
  - ✓ **X.500**

How Does XFN Address Naming Problems?

- **API provides uniform interface for all naming services**
- **Support for composite names allows naming systems to be federated easily**
- **Policies enable development of coherent applications.**
- **X/Open Specification**
  - ✓ **Actively supported by SunSoft, IBM, HP, DEC, Siemens, OSF.**

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