

Naming

Peter Lo

Namespace

- A “namespace” is a scope or region within which names identify individual objects
- Problems
 - ◆ **Uniqueness:** A naming scheme is useless if it ends up with different things having the same name. The purpose of a naming scheme is to uniquely identify individuals. The command “Shoot Bruce” needs to not be genocide!
 - ◆ **Length of list:** This requirement is less vital but nevertheless can be show stopper. The list of the names of everyone in China (apart from the duplicates) would be difficult to use.

The University

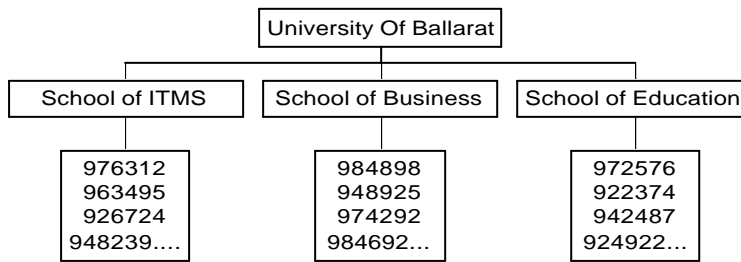
- Uniqueness is an issue
 - ◆ Student ID is guaranteed unique
 - ◆ With Student ID we can have a flat namespace
 - ◆ Not yet making any distinctions
 - ◆ No distinction between 976102 and 973814 other than the fact they are different students

The University - Courses

- Each student is enrolled in precisely one course
- Each course is “owned” by a School
- Hence each student has **ONE** School that they are principally linked to:
 - ◆ School of Business
 - ◆ School of Education

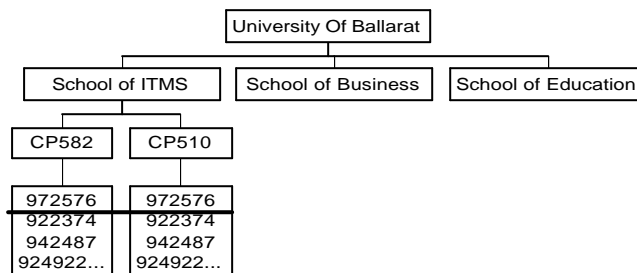
The University - Courses

- We are beginning to divide the population up into important divisions
 - ◆ We are introducing a **hierarchy**



The University - Units

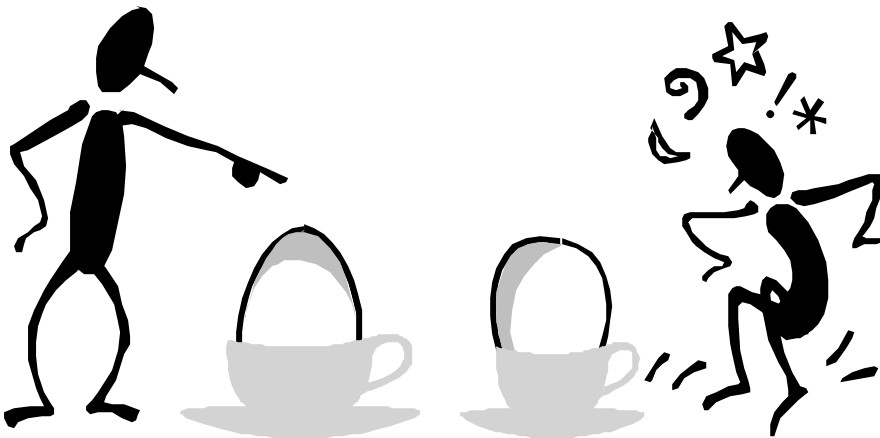
- A given student is in more than one Unit
 - ◆ Goodbye to uniqueness
 - ◆ Each student has multiple “personalities”



How do we name these students?

- 971257 in CP582 in ITMS in University of Ballarat
- 971257/CP582/ITMS/UoB
- 971257.CP582.ITMS.UoB
- UoB.ITMS.CP582.971257
-!!!!!!!

Little-Endian vs Big-Endian



Examples of Little-Endian

- Mail address
 - ◆ David Stratton
ITMS
University of Ballarat
- DNS Names
 - ◆ krause.ballarat.edu.au

Examples of Big-Endian

- File System
 - ◆ C:\DOCS\CP582\Lect10.ppt
- IP Address
 - ◆ **141.132.**192.28

Mixed examples

- Mail address in Germany (partially!)
 - ◆ Gudrun Schmidt
 - Berlin 1027
 - Fredrick Strasse 32
- URL
 - ◆ www.ballarat.edu.au/~dhs/research/papers/index.htm

What is a complete name?

David Stratton
ITMS
University of Ballarat
Victoria
Australia
The Earth
The Solar System
The Milky Way
The Universe
Reality.....

Context

- If Context = University of Ballarat what is my address?
David Stratton,ITMS
- If Context = Solar System what is my address?
David Stratton,ITMS,University of Ballarat,Victoria,Australia,The Earth

Context....

- Some names are Partial and some are Complete
 - ◆ If Context = My C: Drive
 - ◆ C:\DOCS\CP582\Lect11.ppt
 - This is Complete - unique on my computer
 - ◆ If Context = C:\DOCS
 - ◆ CP582\Lect11.ppt
 - This is partial
 - What about C:\OLD_DOCS\CP582\Lect11.ppt?
 - In general:
 - ◆ Complete name = Context + Partial name
 - ◆ "C:\DOCS\" + "CP582\Lect11.ppt" =

Syntax

- Apart from deciding little/big endian we need:
 - ◆ A separator
 - ◆ Period, comma, forward slash, back slash.....
 - ◆ A “Complete Name” tag of some kind
 - ◆ \DOCS\CP582\Lect11.ppt
 - ◆ Indicates “root” of naming system
 - ◆ Name is said to be “Fully Distinguished”

Separators

- DOS File System
 - ◆ Backslash
 - ◆ \DOCS\CP582
- UNIX File System
 - ◆ Forward slash
 - ◆ /DOCS/CP582
- DNS Name
 - ◆ Period
 - ◆ krause.edu.au

“Root” indicator

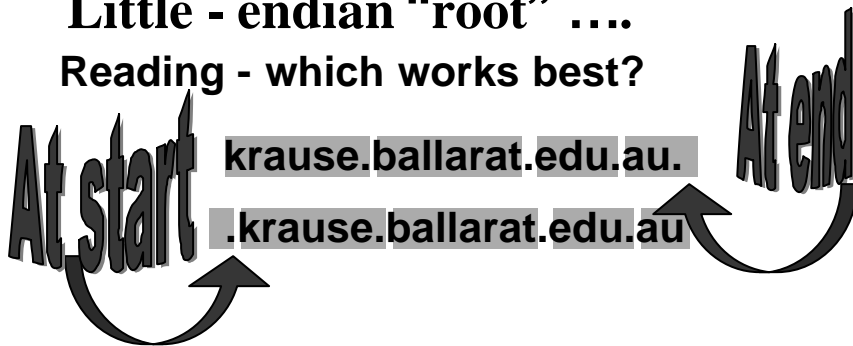
- Makes sense when we are big-endian
 - ◆ Name begins at root
 - ◆ Indicator at start of name

\DOCS\CP582\Lect11.ppt

- Seems strange when we are little-endian
 - ◆ Name ends at root
 - ◆ Indicator at start or end of name?

krause.ballarat.edu.au.

Little - endian “root”
Reading - which works best?



Writing

**Left to right always but
what goes on in your head?**

Going up a level

- Some more syntax
- A symbol that means “move up one level from my context”
- DOS File System
 - ◆ “..”
- UNIX File System
 - ◆ “..”

A Global Namespace - X.500

- Aim
 - ◆ To be able to name anyone in the world
- Why?
 - ◆ Standardise email addressing
 - ◆ Use global directory to find physical email address
 - ◆ This is a “pointer” to the MTA that can handle the message
- Who dunnit?
 - ◆ CCITT
 - ◆ Comité Consultatif International Télégraphique et Téléphonique

Design of a Global Namespace

- Little-Endian
 - ◆ Makes it like DNS
- Separator
 - ◆ Comma
- Top level
 - ◆ Root == The World

Design of a Global Namespace

- First level
 - ◆ Country (C)
- Second level
 - ◆ Organisation (O)
- Third level
 - ◆ Organisational Unit (OU)
- Fourth level
 - ◆ People, computers....
 - ◆ What do these have in common?
 - ◆ “Common Name” (CN)

An example

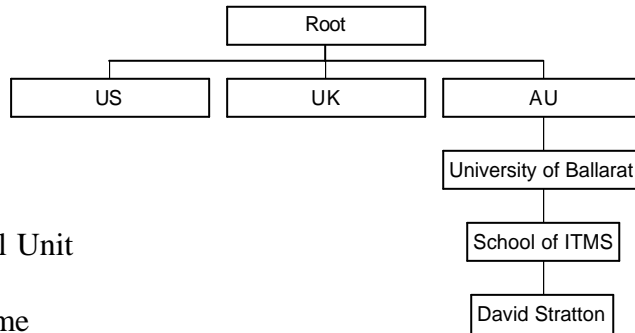
The World

Country

Organisation

Organisational Unit

Common Name



A problem

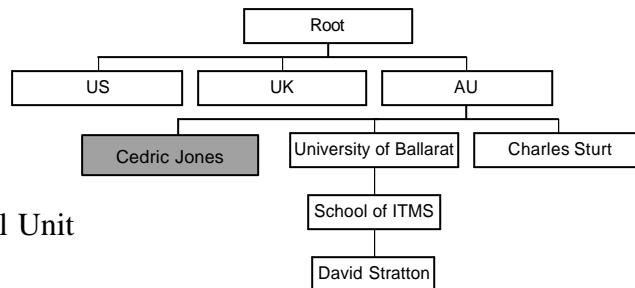
The World

Country

Organisation

Organisational Unit

Common Name



Typeful Naming

- In order to permit “out of place” objects X.500 names include the type at each level
 - ◆ `cn=David Stratton,ou=ITMS,o=UoB,c=AU`
 - ◆ `cn=Cedric Smith,o=UoB,c=AU`

Distinguished Names

- DN
- “Root” indicator required
 - ◆ `{cn=Cedric Smith,o=UoB,c=AU}`
- Partial names known as RDNs
 - ◆ Relative Distinguished Name

Some X.500 Acronyms

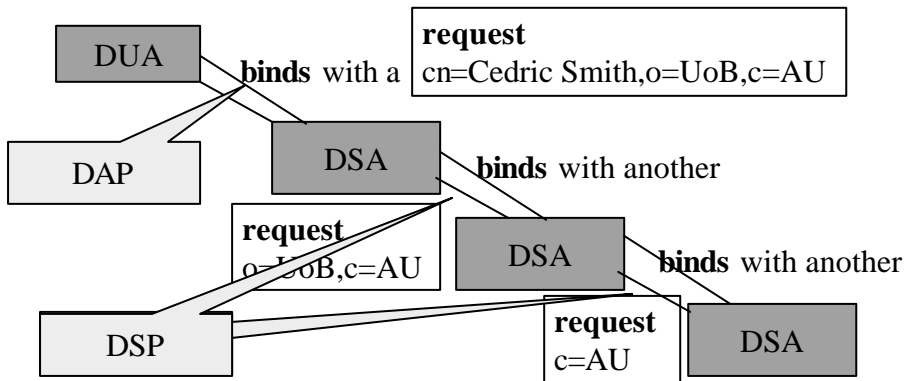
- The client
 - ◆ DUA - Directory User Agent
- The server
 - ◆ DSA - Directory Service Agent
- The Tree
 - ◆ DIT - Directory Information Tree
- The Database
 - ◆ DIB - Directory Information Base

More Acronyms!

- Client-server protocol
 - ◆ DAP - Directory Access Protocol
- Server-server protocol
 - ◆ DSP - Directory Service Protocol
- These protocols use RPC
 - ◆ Like NFS

Resolving a name

- Look up a name in the worldwide X.500 database



Objects have attributes

- In case we have forgotten this is the purpose of the whole exercise
- Different types of object have different attributes
- There is a lot of data in the DIT!

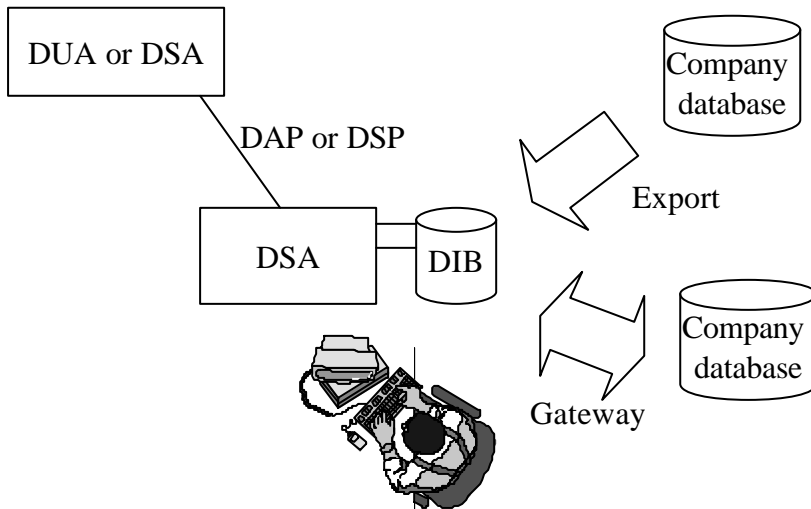
Some data is private

- Security may be applied to some data
 - ◆ eg
 - ◆ Local access only
 - ◆ Password required

Loading the DIB

- Administrative action at different levels
- May copy existing data
 - ◆ Data **exported** to DIB
 - ◆ eg Foo Bar Inc
 - ◆ Company Personell Data ▶▶ Company DIB
- May gateway existing data
 - ◆ Must translate DSP requests
 - ◆ eg XYZ Inc
 - ◆ Novell (NDS) data ▶▶ DSP gateway

Loading the data



Redundancy

- Eliminate single points of failure
- Duplicate portions of the DIT
 - ◆ Master
 - ◆ Where changes and updates are made
 - ◆ Slave
 - ◆ Replicates the master

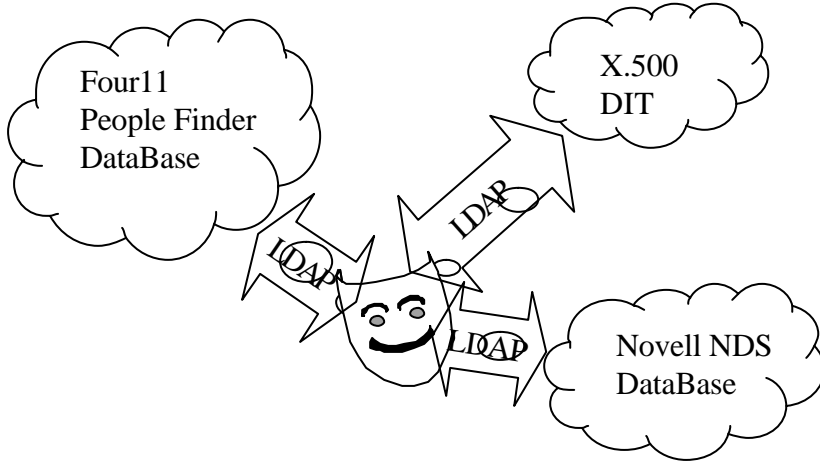
Replication

- The way that changes flow from the master to the slave
 - ◆ Master always changes first
 - ◆ Push
 - ◆ Master sends update
 - Full/incremental
 - ◆ Pull
 - ◆ Slave requests update
 - Full/incremental
 - “Since” date

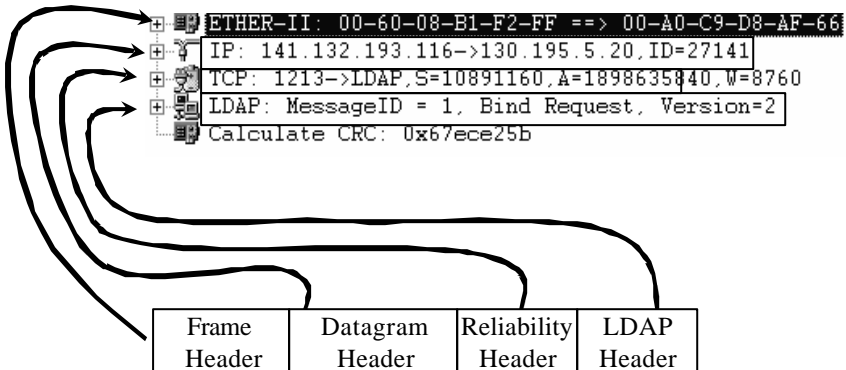
LDAP - Lightweight DAP

- Simpler
- Does not use RPC
 - ◆ Based on TCP
- Emerging standard for accessing DIT and other namespaces

LDAP glue



The NetXRay view



The LDAP Port

```
Transmission Control Protocol
  Port 1213 ---> LDAP
  Sequence Number: 10894160
  Acknowledgement Number: 1898635840
  Header Length(MSB 4 bits): 5 (32-bit word)
  Reserved(LSB 4 bits): 0
  Code: ACK,PSH,
  Window: 8760
  Checksum: 0x6D59
  Urgent Pointer: 0x0000
```

The LDAP request
is sent to a “well
known” port (389)