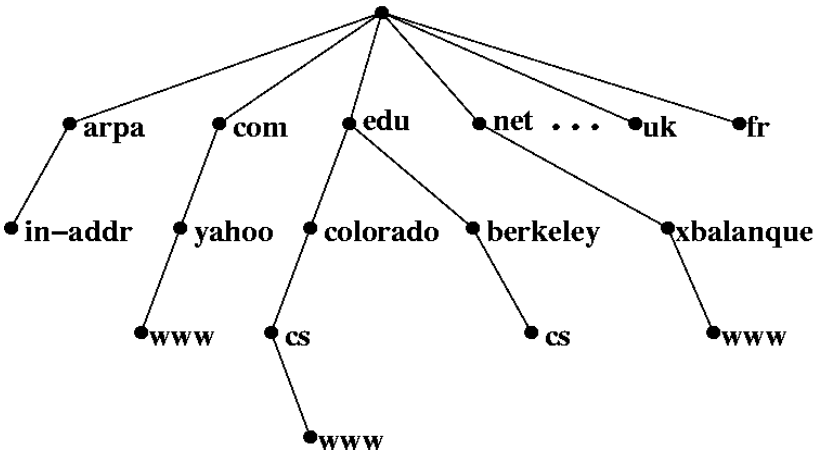
LDAP

(Lightweight Directory Access Protocol)

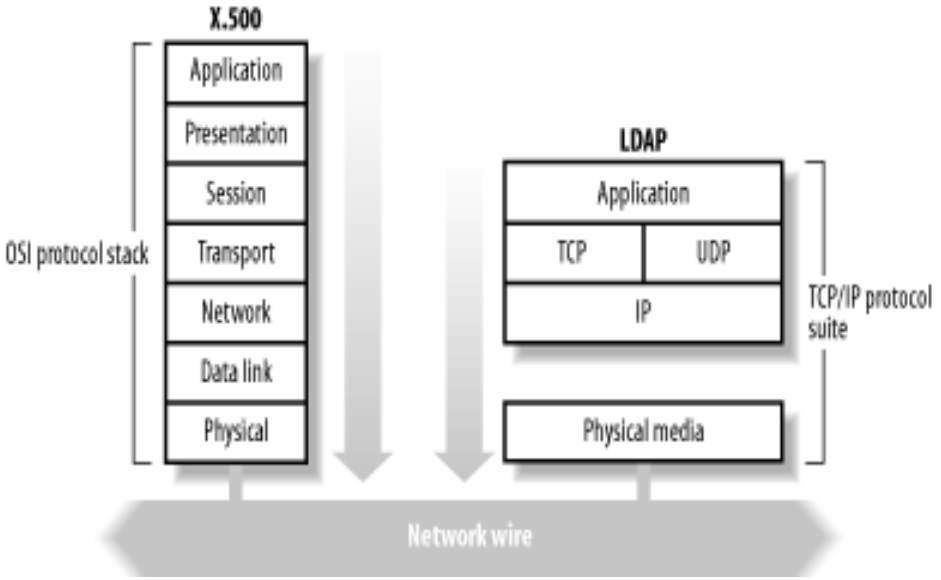
What is Directory Service?

- What is Directory Service (名錄服務)
  - A directory service is highly optimized for reads.
  - A directory service implements a distributed model for storing information.
  - A directory service can extend the type of information stores.
  - A directory service has advanced search capabilities.
  - A directory service has loosely consistent replication among directory servers.
- Domain Name Service

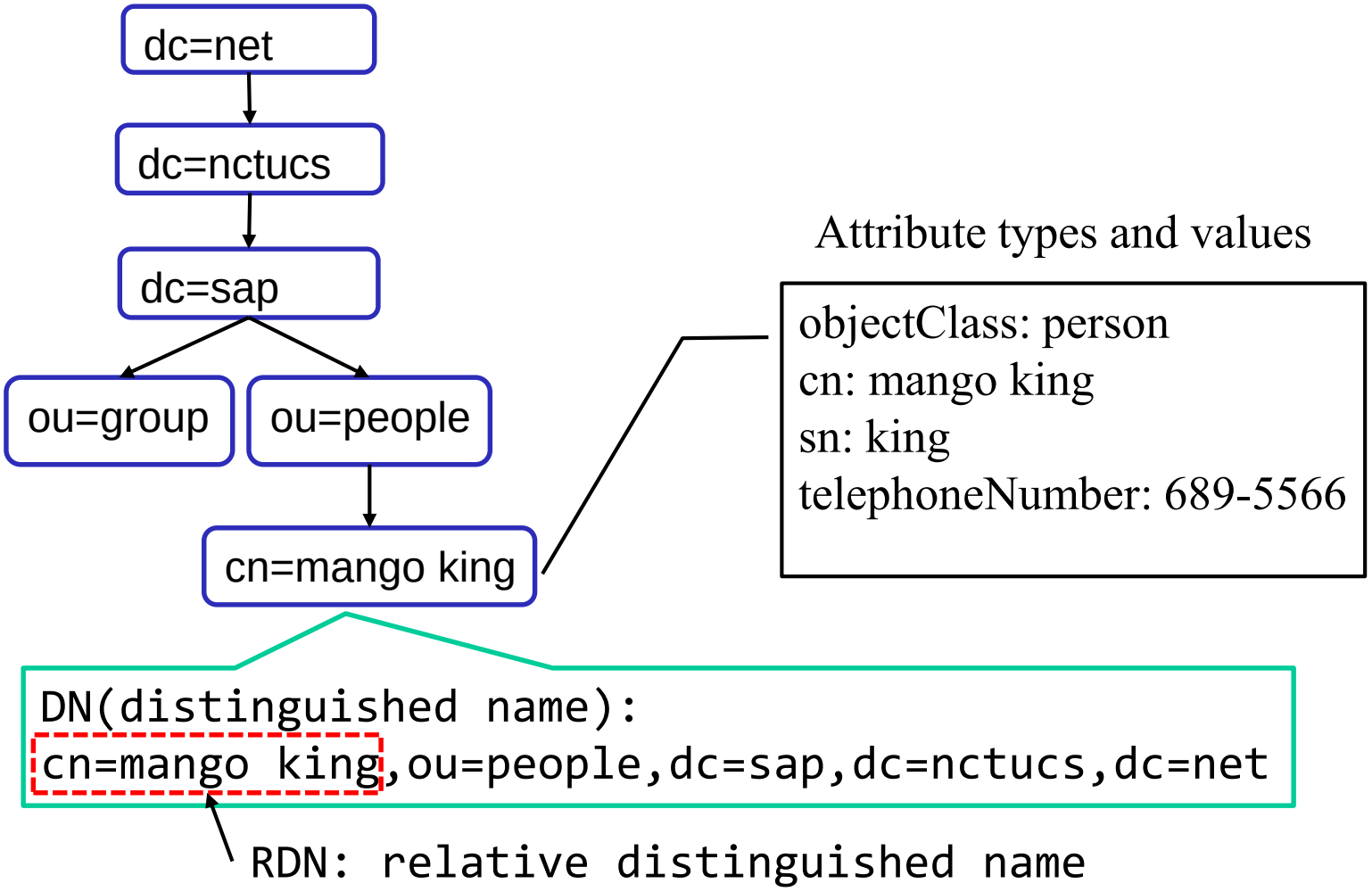


What is LDAP

- Lightweight Directory Access Protocol (LDAP)
  - LDAP v3: RFC 3377
  - RFC 2251-2256, 2829, 2830, 3377
- Why LDAP is lightweight
  - subset of X.500
  - X.500 base on OSI stack
  - LDAP base on TCP/IP
  - LDAP omits many X.500 operations that are rarely used
  - Providing a smaller and simpler set of operations



LDAP Directory Information Tree (DIT)



LDAPv3 overview – LDIF

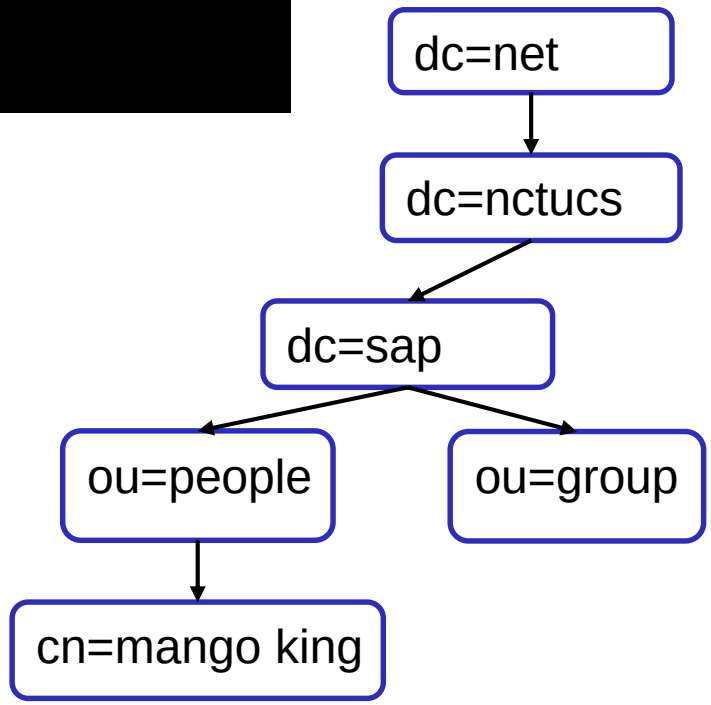
- LDAP Interchange Format (LDIF)
  - Defined in RFC 2849
  - standard text file format for storing LDAP configuration information and directory contents
  - An LDIF file is
    1. A collection of entries separated from each other by blank lines
    2. A mapping of attribute names to values
    3. A collection of directives that instruct the parser how to process the information
  - The data in the LDIF file must obey the schema rules of your LDAP directory

LDAPv3 overview – LDIF

- Sample LDIF

```
# sample entry
dn: cn=mango king,ou=people,dc=sap,dc=nctucs,dc=net
objectClass: person
cn: mango king
sn: king
telephoneNumber: 689-5566
```

dc: domain component
ou: organizational unit
cn: comman name
dn: distinguished name
rdn: relative dn



LDAPv3 overview - objectClass

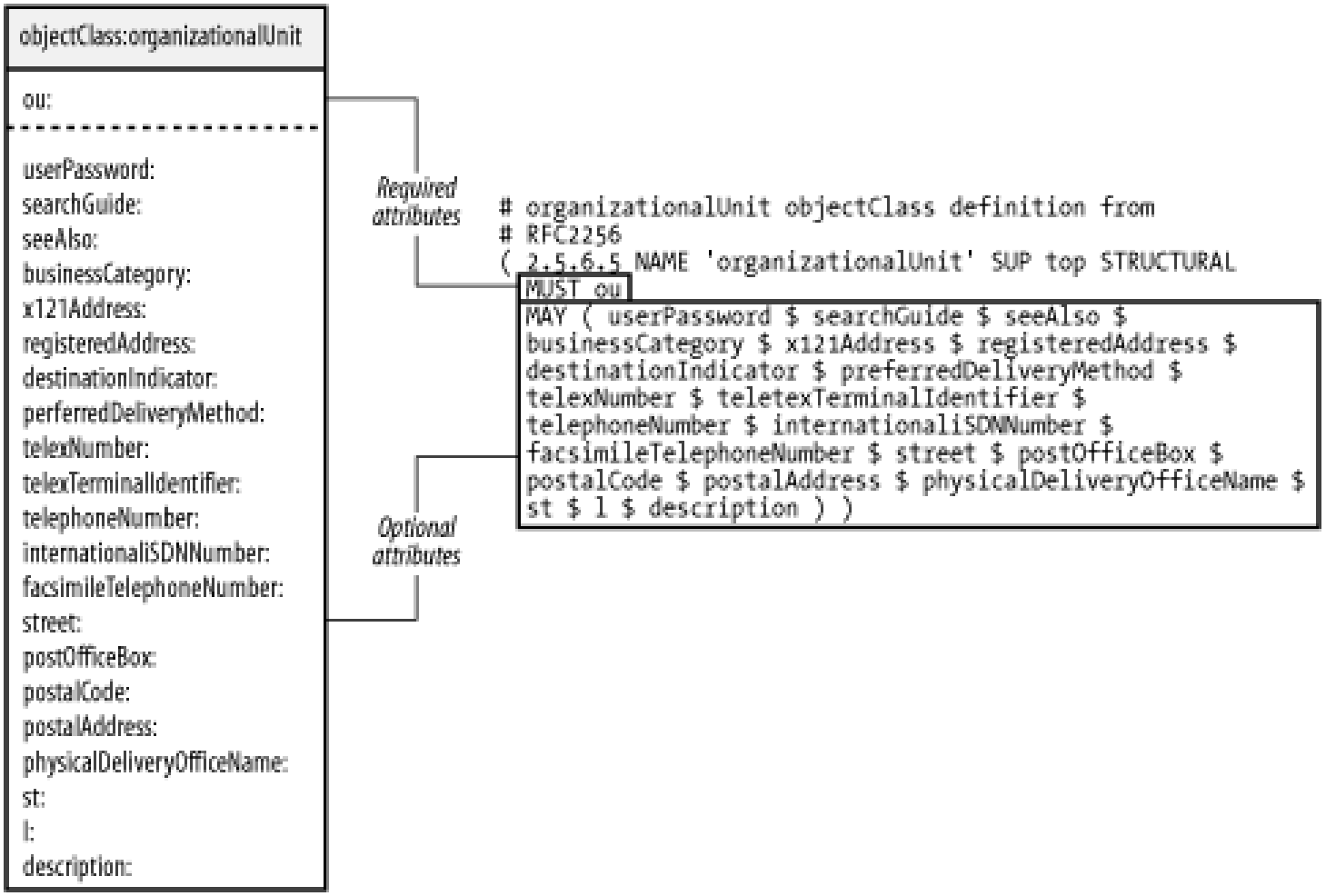
- /usr/local/etc/openldap/schema/core.schema

```
objectclass ( 2.5.6.6 NAME 'person'
        DESC 'RFC2256: a person'
        SUP top STRUCTURAL
        MUST ( sn $ cn )
        MAY ( userPassword $ telephoneNumber $ seeAlso $ description ) )
```

```
ObjectClassDescription = "(" whsp
        numericoid whsp      ; ObjectClass identifier
        [ "NAME" qdescrs ]
        [ "DESC" qdstring ]
        [ "OBSOLETE" whsp ]
        [ "SUP" oids ]       ; Superior ObjectClasses
        [ ( "ABSTRACT" / "STRUCTURAL" / "AUXILIARY" ) whsp ]
                ; default structural
        [ "MUST" oids ]      ; AttributeTypes
        [ "MAY" oids ]       ; AttributeTypes
        whsp ")"
```

http://www.openldap.org/doc/admin23/schema.html

LDAPv3 overview - objectClass



http://www.openldap.org/doc/admin23/schema.html

LDAPv3 overview - Attribute

```
attributetype ( 2.5.4.20 NAME 'telephoneNumber'
        DESC 'RFC2256: Telephone Number'
        EQUALITY telephoneNumberMatch
        SUBSTR telephoneNumberSubstringsMatch
        SYNTAX 1.3.6.1.4.1.1466.115.121.1.50{32} )
```

Matching rules

Type

Server should support values of this length

Table 8.3: Commonly Used Syntaxes

Name	OID	Description
boolean	1.3.6.1.4.1.1466.115.121.1.7	boolean value
directoryString	1.3.6.1.4.1.1466.115.121.1.15	Unicode (UTF-8) string
distinguishedName	1.3.6.1.4.1.1466.115.121.1.12	LDAP DN
integer	1.3.6.1.4.1.1466.115.121.1.27	integer
numericString	1.3.6.1.4.1.1466.115.121.1.36	numeric string
OID	1.3.6.1.4.1.1466.115.121.1.38	object identifier
octetString	1.3.6.1.4.1.1466.115.121.1.40	arbitary octets

http://www.openldap.org/doc/admin23/schema.html

Comparison with relational databases

- It is tempting to think that having a RDBMS backend to the directory solves all problems. However, it is a pig.

- This is because the data models are very different. Representing directory data with a relational database is going to require splitting data into multiple tables.

OpenLDAP

- Installation
  - pkg install openldap-server
  - cd /usr/ports/net/openldap-server24 ; make install clean
- slap.conf
  - Blank lines and lines beginning with a pound sign (#) are ignored
  - Parameters and associated values are separated by whitespace characters
  - A line with a blank space in the first column is considered to be a continuation of the previous one.

slap.conf

```
include         /usr/local/etc/openldap/schema/core.schema
pidfile         /var/run/openldap/slapd.pid
argsfile        /var/run/openldap/slapd.args
logfile /var/log/ldap/slapd.log
loglevel 256
modulepath      /usr/local/libexec/openldap
moduleload      back_mdb
database        mdb
maxsize         1073741824
suffix          "dc=mango,dc=hot"
rootdn          "cn=Manager,dc=mango,dc=hot"
rootpw          secret
directory       /var/db/openldap-data
# Indices to maintain
index   objectClass     eq
```

Directory ACL

```
access to dn.base="cn=Manager,dc=mango,dc=hot"
        by peername.IP="127.0.0.1" auth
        by users none
        by anonymous none
        by * none

access to attrs=userPassword
        by self write
        by anonymous auth
        by dn.base="uid=mangoking,ou=People,dc=mango,dc=hot" write
        by * none

access to attrs=englishname,birthdate
        by self write
        by users read
        by anonymous read
        by * read
```

Directory ACL

Level	Privileges	Description
none =	0	no access
disclose =	d	needed for information disclosure on error
auth =	dx	needed to authenticate (bind)
compare =	cdx	needed to compare
search =	scdx	needed to apply search filters
read =	rscdx	needed to read search results
write =	wrscdx	needed to modify/rename
manage =	mwrscdx	needed to manage

Enable slapd

- Edit /etc/rc.conf
  - slapd_enable="YES"
  - slapd_flags for specific options
- service slapd start

http://www.openldap.org/doc/admin24/runningslapd.html

Slapd tools

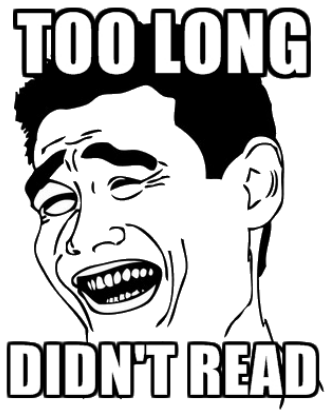
- slapcat
  - This tool reads records from a slapd database and writes them to a file or standard output
- slapadd
  - This tool reads LDIF entries from a file or standard input and writes the new records to a slapd database
- slapindex
  - This tool regenerates the indexes In a slapd database
- slappasswd
  - This tool generates a password hash suitable for use as an Lq in slapd.conf

LDAP tools

- ldapsearch
  - This tool issues LDAP search queries to directory servers
- ldapadd, ldapmodify
  - These tools send updates to directory servers
- ldapcompare
  - This tool asks a directory server to compare two values
- ldapdelete
  - This tool deletes entries from an LDAP directory

ldap.conf

- ldapsearch -x -b “dc=mango,dc=hot” \
  -H “ldap://sahome.mango.hot” “uid=mangoking”



- Edit /usr/local/etc/openldap/ldap.conf

```
# See ldap.conf(5) for details
# This file should be world readable but not world writable.
BASE    dc=mango,dc=hot
URI     ldap://sahome.mango.hot
```

=> ldapsearch -x “uid=mango”

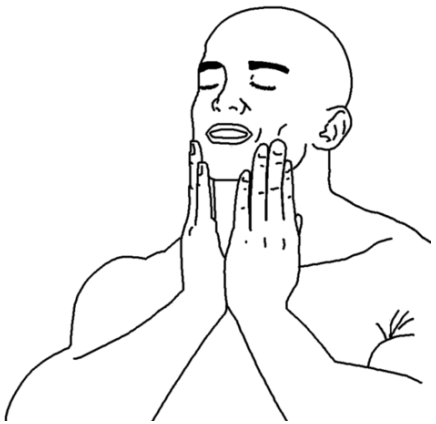
LDAP authentication

- pkg install nss-pam-ldapd
- Edit /usr/local/etc/nslcd.conf
- Edit /etc/nsswitch.conf
- Edit /etc/pam.d/system

LDAP authentication

- Edit /usr/local/etc/nslcd.conf
  - Just like ldap.conf

```
# The user and group nslcd should run as.
uid nslcd
gid nslcd
uri ldap://sahome.mango.hot
base dc=mango,dc=hot
```



LDAP authentication

- Edit /etc/nsswitch.conf

https://www.freebsd.org/doc/en/articles/ldap-auth/client.html

```
# nsswitch.conf(5) - name service switch configuration file
# $FreeBSD: releng/10.1/etc/nsswitch.conf 224765 2011-08-10
#
group: files ldap
passwd: files ldap
```