Directory Services on OS/390

Using the LDAP Server on OS/390

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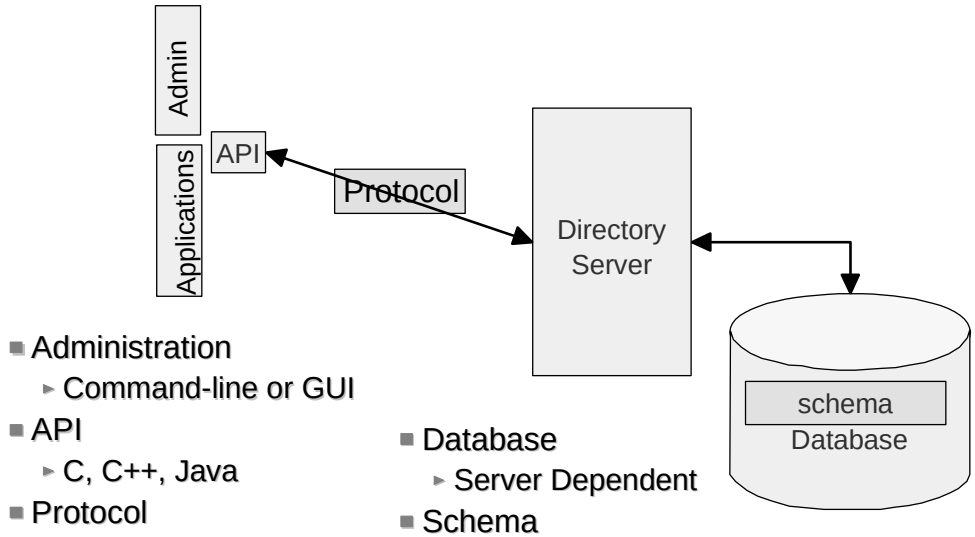
What are we going to talk about?

- Directory Services and LDAP
- Configuration of the OS/390 LDAP server
- LDAP services available on OS/390
- LDAP and RACF
- Authentication to the LDAP server
- SSL within the LDAP environment
- LDAP access control lists
- Password Encryption Support

Directory Services and LDAP

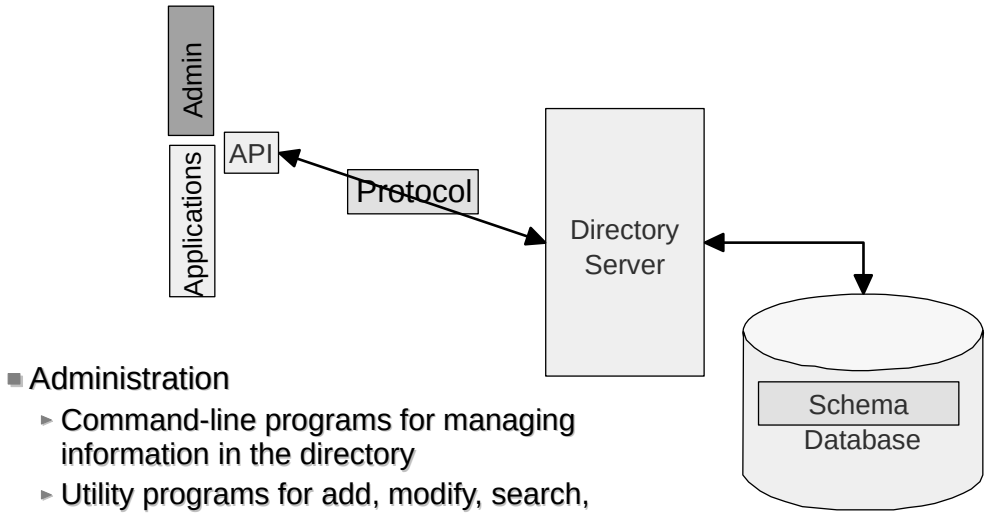
- LDAP - Lightweight Directory Acces Protocol
- Directory Server - a program that stores information in "directory format"
- Directory Service - a distributed set of Directory Servers which, together, give the illusion of a single Directory Server.
- Directory "format" is based on an X.500 data model:
  - Directory Service contains a hierarchy of entries
  - Each entry contains attributes
  - Each attribute contains 1 or more values
- The format of entries is defined by the Directory Schema.

Directory Services and LDAP



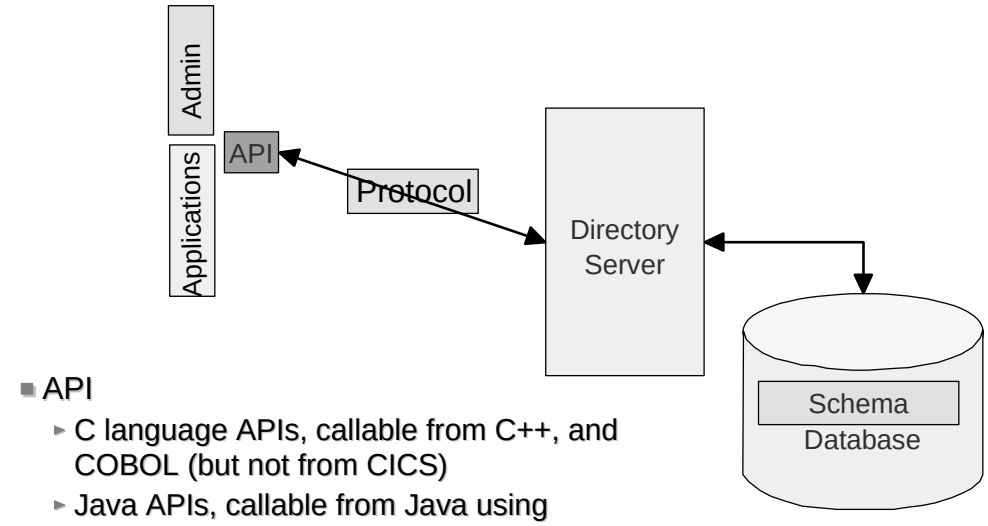
- Administration
  - Command-line or GUI
- API
  - C, C++, Java
- Protocol
  - LDAP
- Database
  - Server Dependent
- Schema
  - Database Dependent

LDAP Services on OS/390



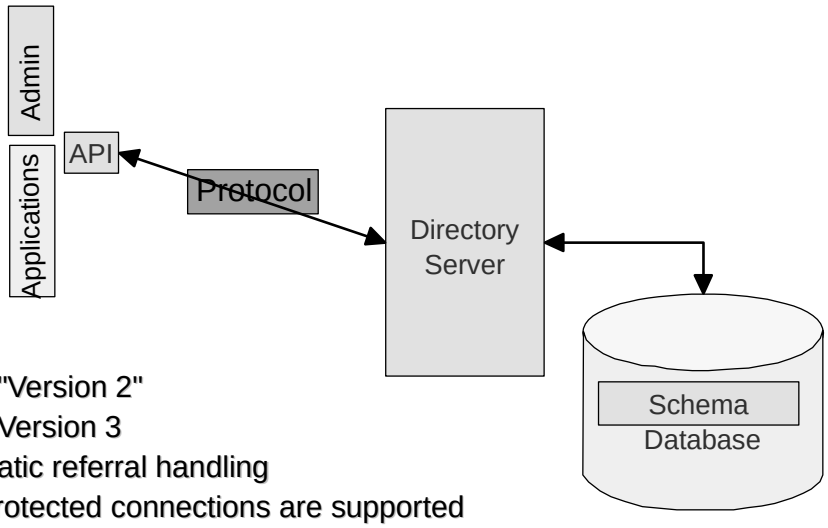
- Administration
  - Command-line programs for managing information in the directory
  - Utility programs for add, modify, search, delete of directory content

LDAP Services on OS/390



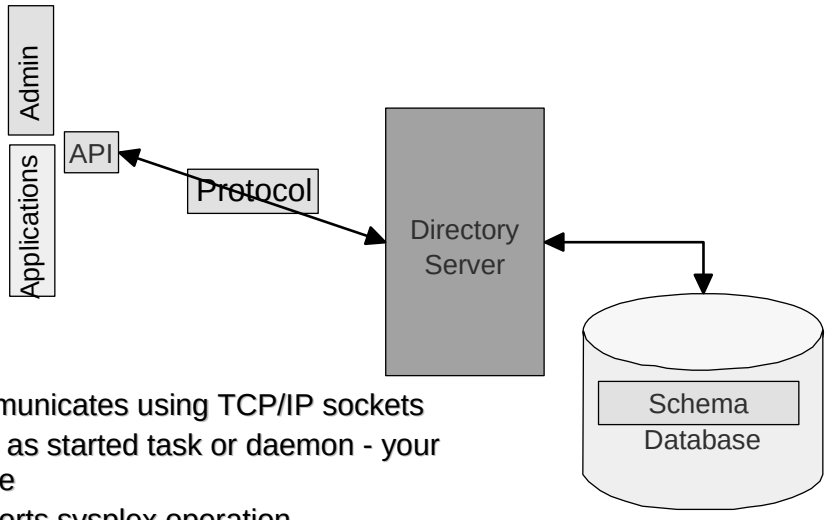
- API
  - C language APIs, callable from C++, and COBOL (but not from CICS)
  - Java APIs, callable from Java using JavaSoft's JNDI programming interface

LDAP Services on OS/390



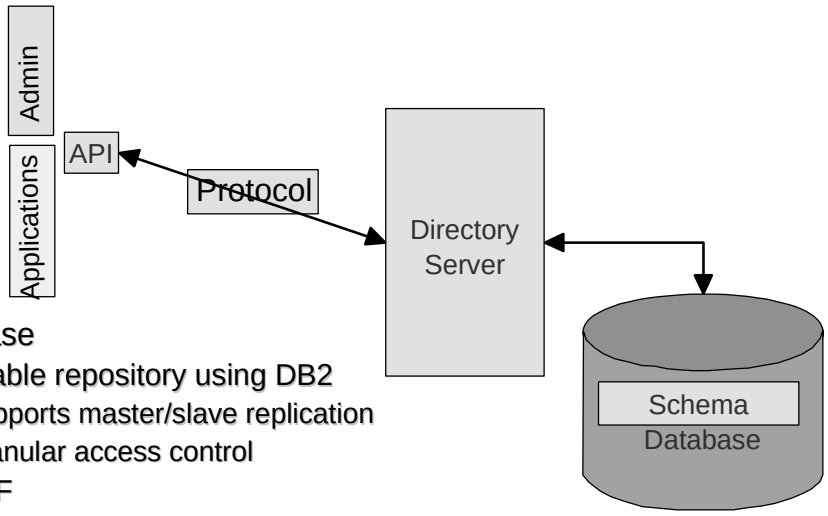
- Protocol
  - LDAP "Version 2"
  - LDAP Version 3
  - Automatic referral handling
  - SSL-protected connections are supported

LDAP Services on OS/390



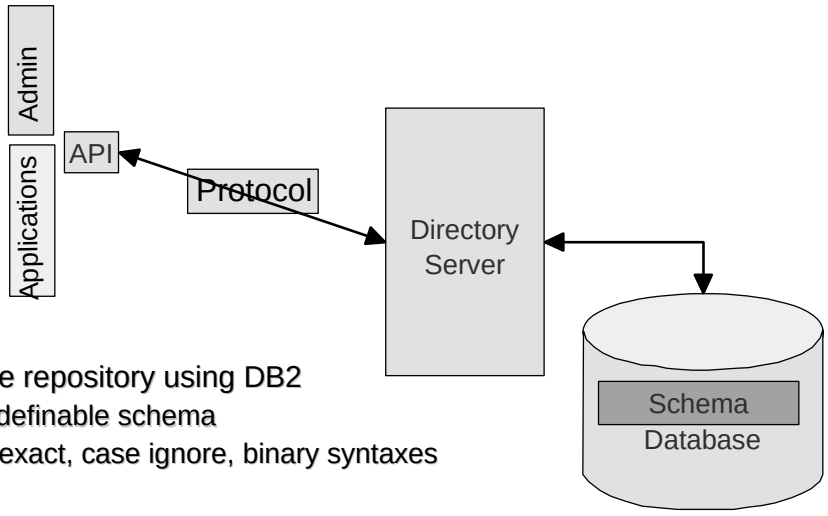
- Server
  - Communicates using TCP/IP sockets
  - Runs as started task or daemon - your choice
  - Supports sysplex operation

LDAP Services on OS/390



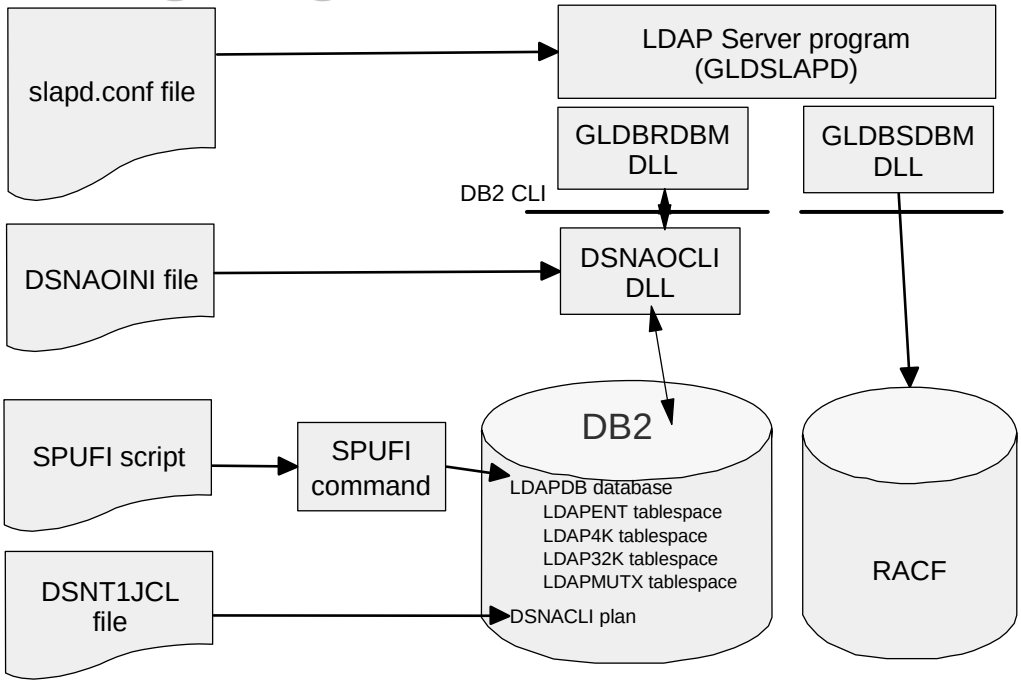
- Database
  - Scalable repository using DB2
    - supports master/slave replication
    - granular access control
  - RACF
    - add, modify, delete users and groups
    - bind (authenticate to RACF)

LDAP Services on OS/390

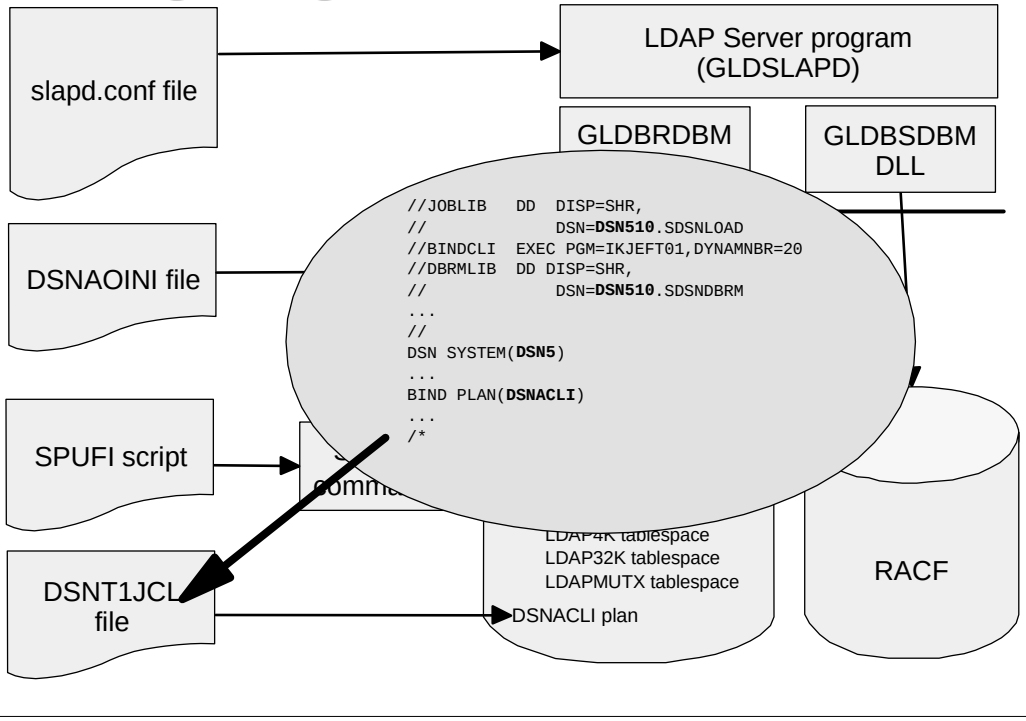


- Schema
  - Scalable repository using DB2
    - user-definable schema
    - case exact, case ignore, binary syntaxes
  - RACF
    - fixed schema based on RACF
    - most attributes are case-insensitive strings

Configuring the LDAP Server



Configuring the LDAP Server



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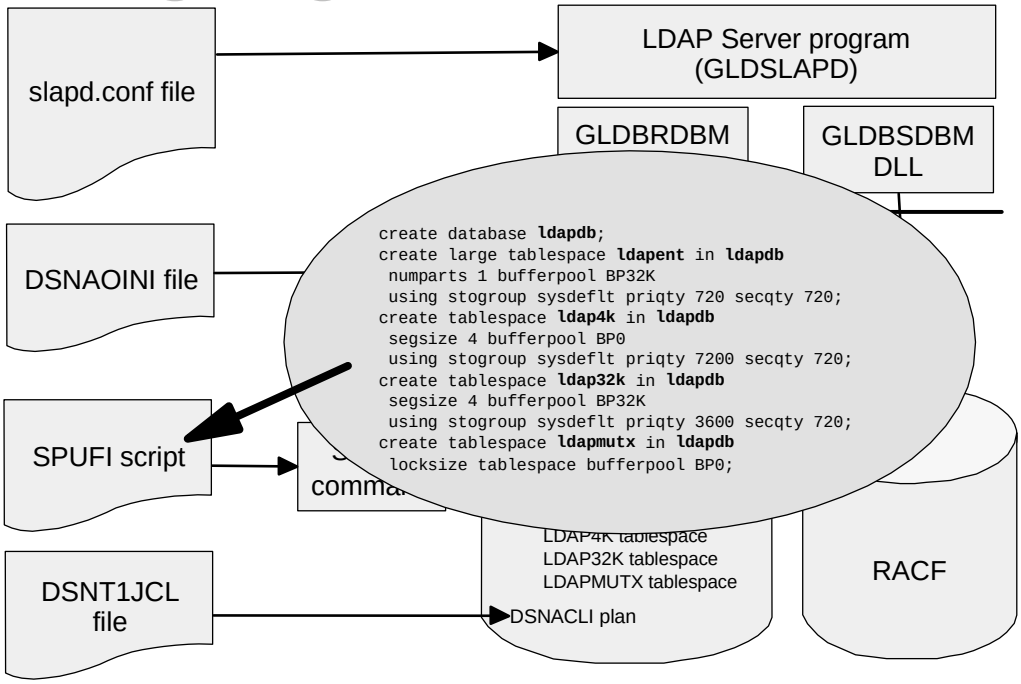

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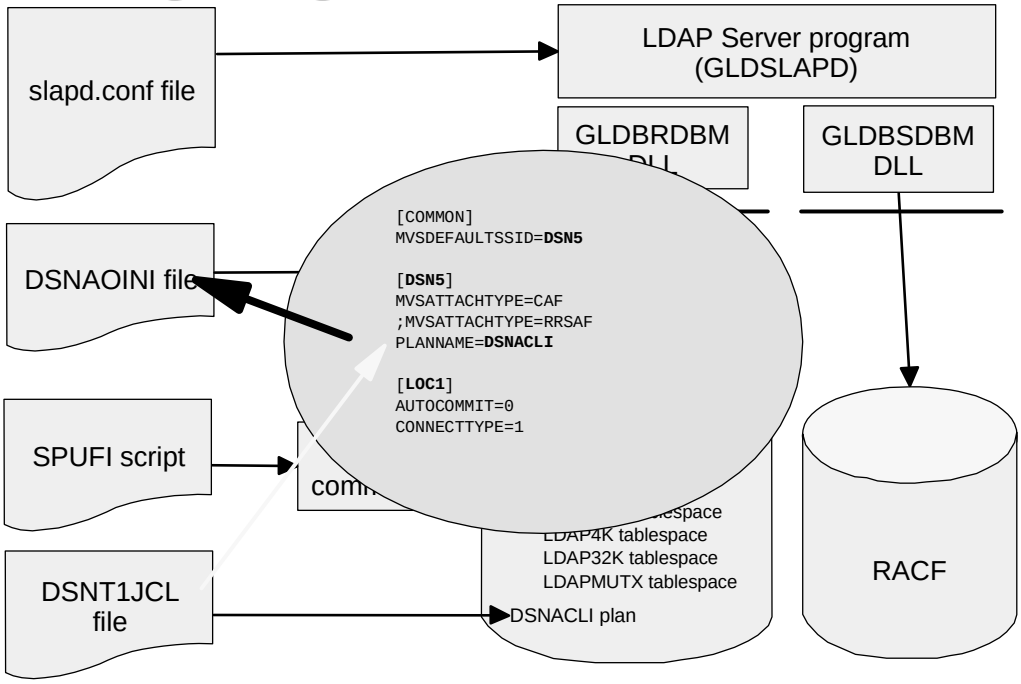

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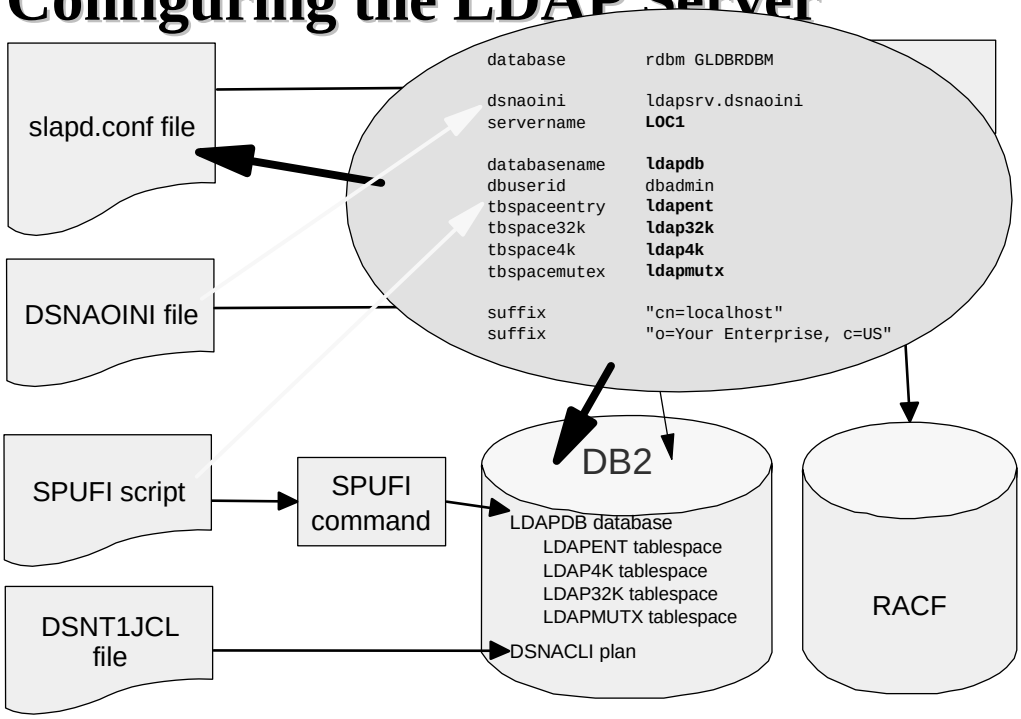

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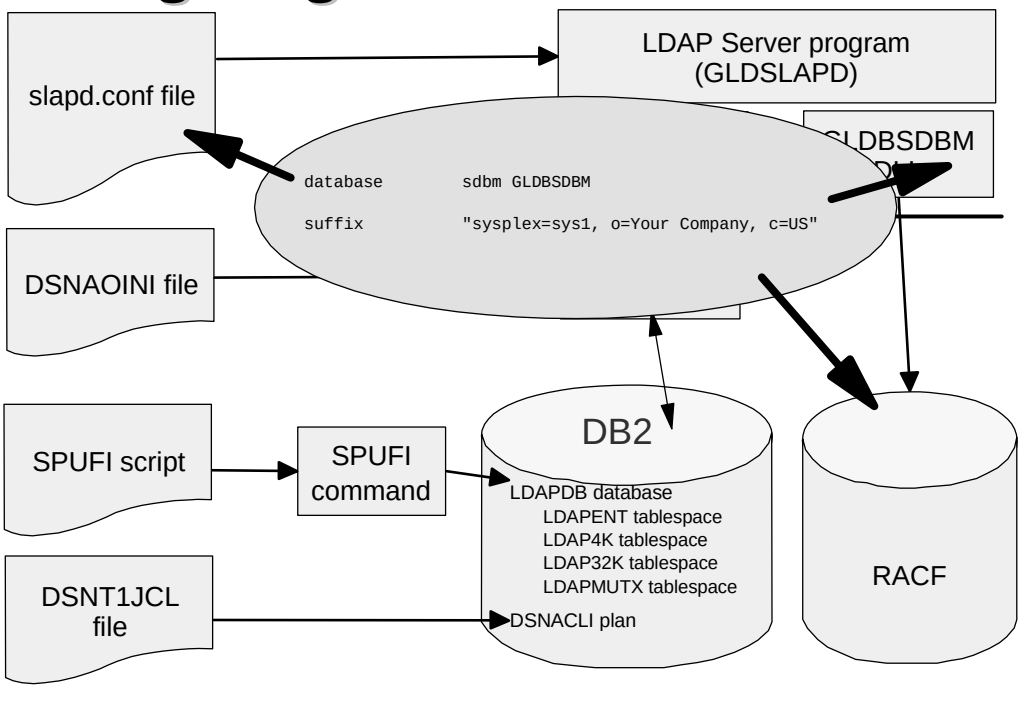

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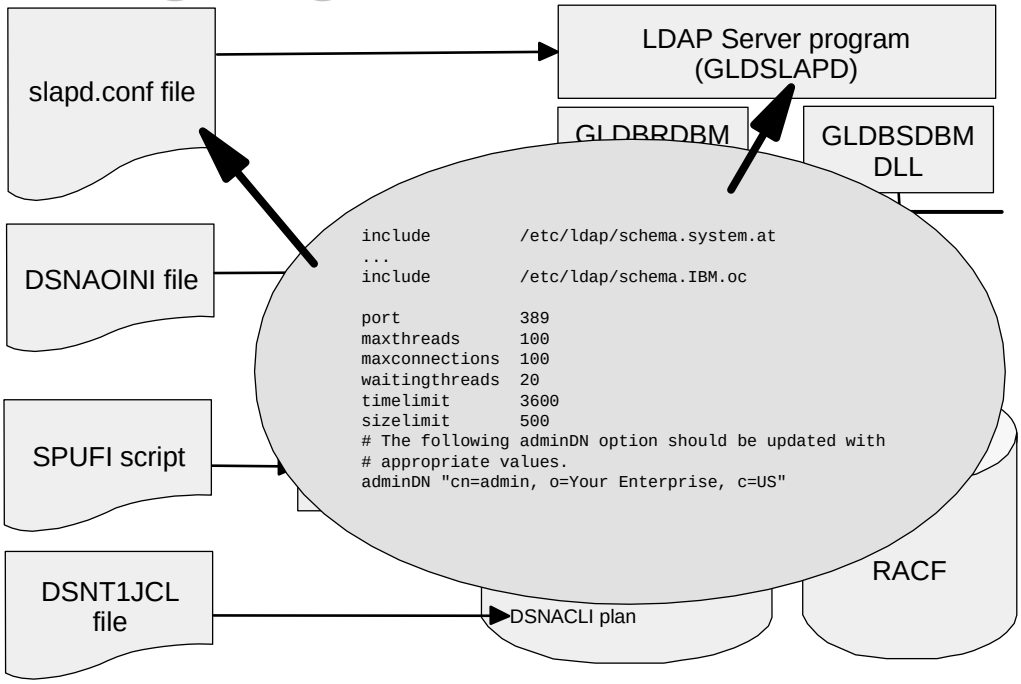
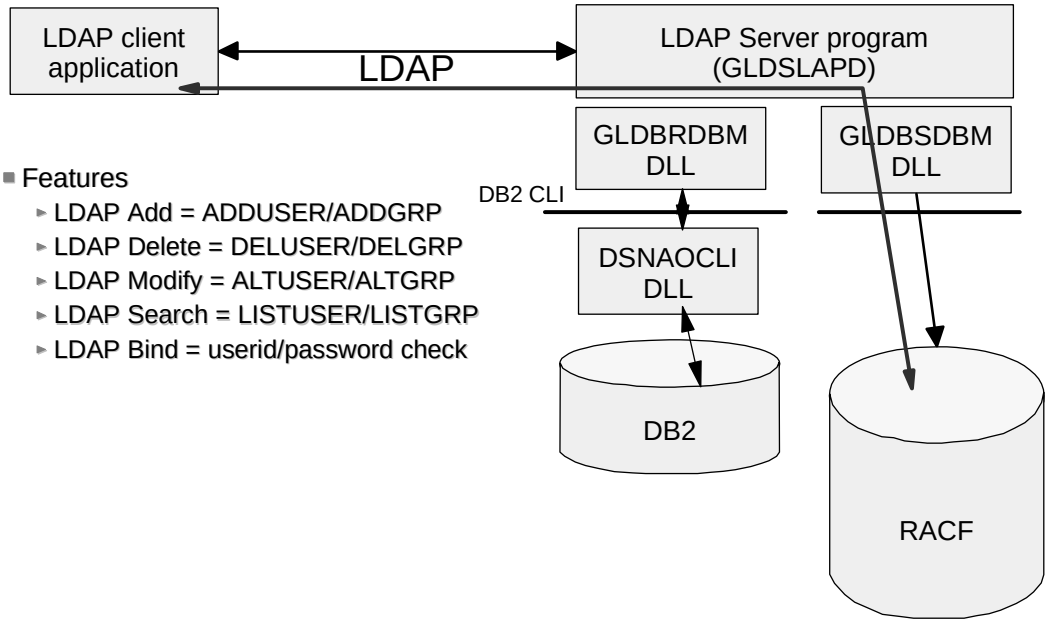
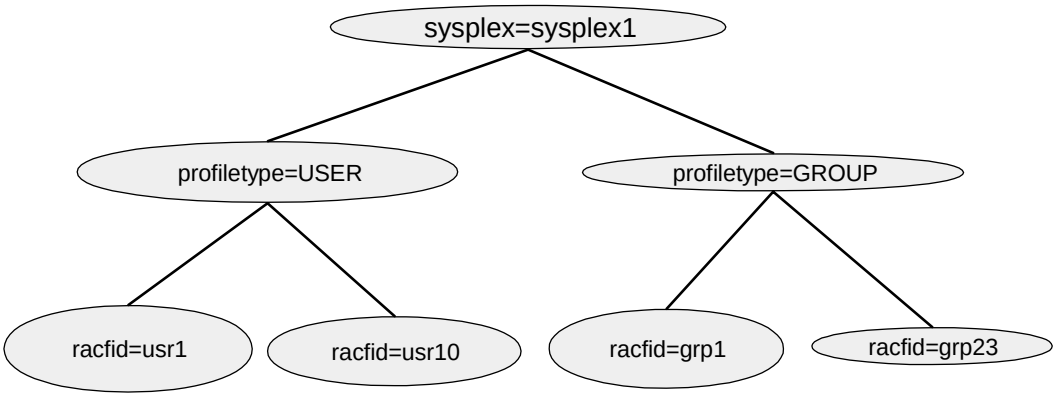


LDAP and RACF



- Features
  - LDAP Add = ADDUSER/ADDGRP
  - LDAP Delete = DELUSER/DELGRP
  - LDAP Modify = ALTUSER/ALTGRP
  - LDAP Search = LISTUSER/LISTGRP
  - LDAP Bind = userid/password check

LDAP - RACF Name-space



How to Use LDAP's RACF Support

- If suffix(Top DN) for RACF access is set to "sysplex=plex1,o=IBM,c=US", then
  - USER profiles are found under:
    - racfid=<userid>, profiletype=USER, sysplex=plex1, o=IBM, c=US
  - GROUP profiles are found under:
    - racfid=<groupid>, profiletype=GROUP, sysplex=plex1, o=IBM, c=US

How to Use LDAP's RACF Support (cont):

- A simple bind operation to userid which supplies a password is verified using the Security Server
  - RACF password can be changed if bind password is sent as "oldpw/newpw"
- A sub-tree search operation can be performed (but only to get the names of users and/or groups)
- A base search (get entry) can be performed for USER and GROUP profiles and the profile information is returned in LDAP format (type = value)

RACF Examples Using LDAP Commands

ldapmodify -h 127.0.0.1 -p 636 -D bindDN -w passwd -f mod.file

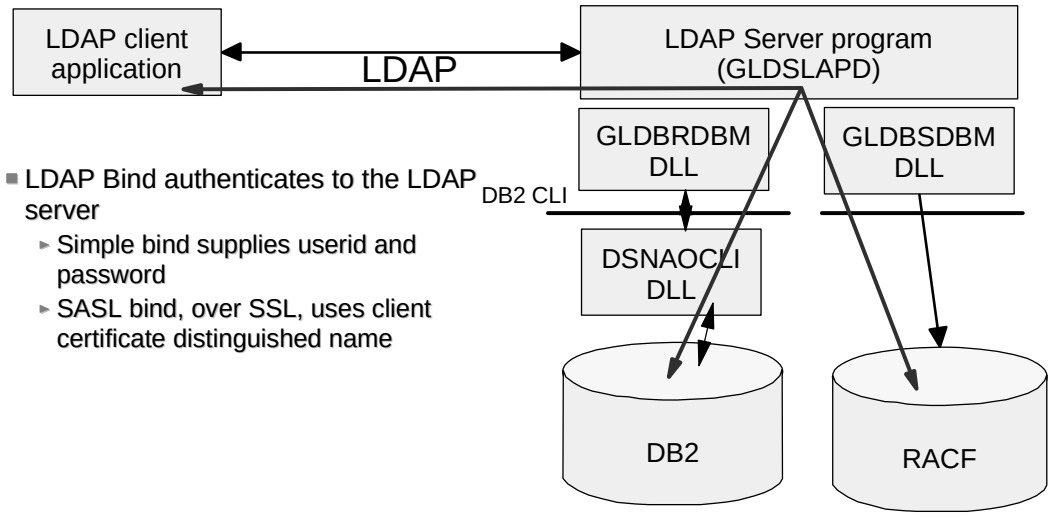
```
dn: racfid=tjh,profiletype=user,sysplex=plex1
changetype: modify
racfOmvsHome: /u/tjh
racfBuilding: 256
SAFDefaultCommand: LOGOFF
```

RACF Examples Using LDAP Commands

**ldapsearch -h 127.0.0.1 -p 636 -D bindDN -w passwd **
-b "racfid=tjh,profiletype=user,sysplex=plex1" "objectclass=*"

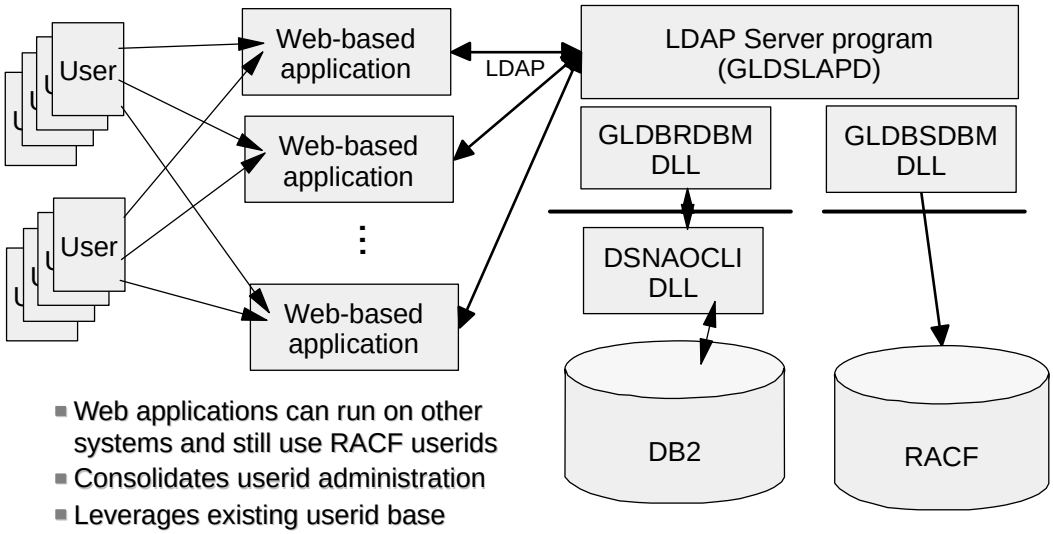
```
racfid=tjh,profiletype=USER,sysplex=plex1
objectclass=racfUser
...
racfid=kareng
racfauthorizationdate=99.134
racfdefaultgroup=racfid=GOODGUYS,profiletype=GROUP,sysplex=plex1
racfattributes =SPECIAL
racfrevokedate=NONE
safaccountnumber=75932
racfomvsuid=0
racfomvshome=/u/tjh
....
```

Authentication to the LDAP server



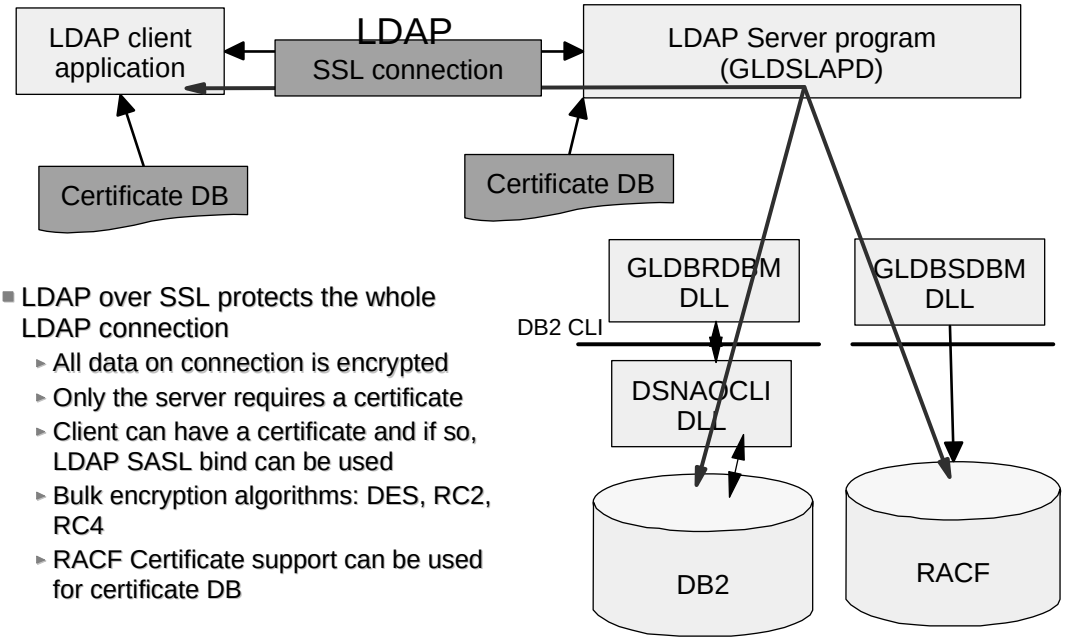
- LDAP Bind authenticates to the LDAP server
  - Simple bind supplies userid and password
  - SASL bind, over SSL, uses client certificate distinguished name

Authentication to the LDAP Server



- Web applications can run on other systems and still use RACF userids
- Consolidates userid administration
- Leverages existing userid base

SSL within the LDAP environment



- LDAP over SSL protects the whole LDAP connection
  - All data on connection is encrypted
  - Only the server requires a certificate
  - Client can have a certificate and if so, LDAP SASL bind can be used
  - Bulk encryption algorithms: DES, RC2, RC4
  - RACF Certificate support can be used for certificate DB

Certificate Bind Support

- Allows applications to use certificates generated by a CA
- Verifies both client and server are who they say they are
- Uses SystemSSL functions(part of OCSF)
- Client application indicates use of a certificate on the bind operation by specifying bind method as ’external’
- Bind DN taken from certificate

Using Certificate Bind

- Prepare server and client for SSL connections
  - Certificates in key databases
  - Mark certificates or CA’s as trusted
  - Add to LDAP Server configuration file: sslAuth serverClientAuth
- Search utility can be called using the certificate, e.g.:

```
ldapsearch -V 3 -S external -Z -K <key.db> \
-P <key.db-pw> -b "o=IBM_POK,c=US" \
"objectclass=*"
```

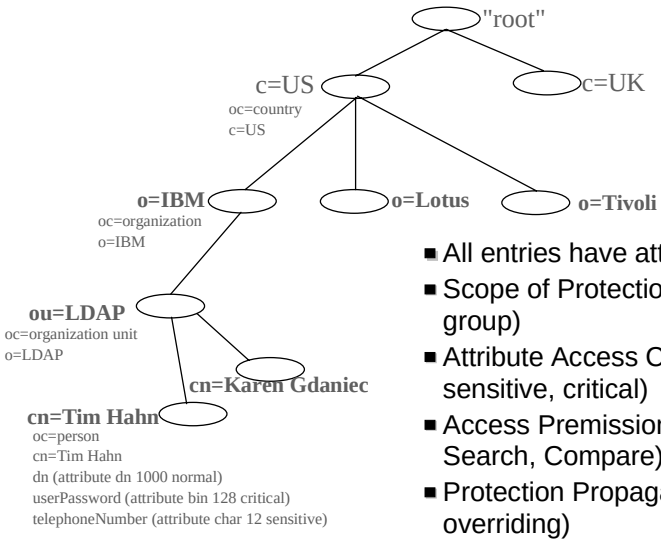
Using Certificate Bind(cont.)

- What happens:
  - SSL handshake occurs when the ssl init API is called
  - Authentication occurs during the handshake and succeeds only if authentication succeeds
  - Bind method is specified as "EXTERNAL" on the bind API call
  - Certificate from handshake is used on bind
  - Bind occurs using DN in the certificate
  - IBM servers gather group membership information based on DN naming context

Protecting the Information in the LDAP Server

- ACLs = Access Control Lists
- Control Access to Portions of the Directory or Specific Directory Entries
- Each Directory Entry has DN, Set of Attributes with Values
- ACLs and Groups Created and Managed with:
  - ldapcp
  - ldapmodify
  - ldif2db

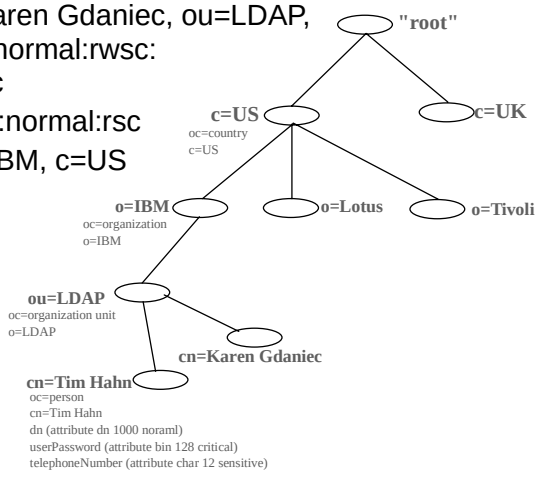
LDAP Directory Content



- All entries have attributes (and values)
- Scope of Protection (access-id or group)
- Attribute Access Class (normal, sensitive, critical)
- Access Premissions (Read, Write, Search, Compare)
- Protection Propagation (propagating or overriding)
- Owner - user or group

ACL Example

- Protection for: **ou=LDAP, o=IBM, c=US**
  - **aclPropagate:** True
  - **aclEntry:** group=LDAPfolks, o=IBM, c=US: normal:rcs:sensitive:rsc
  - **aclEntry:** access-id:cn=Karen Gdaniec, ou=LDAP, o=IBM, c=US:object:ad:normal:rwsc: sensitive:rwsc:critical:rsc
  - **aclEntry:** group=Anybody:normal:rsc
  - **aclSource:** ou=LDAP, o=IBM, c=US



Access Control and Security Server Access

- Applies to entries stored by the LDAP Server into DB2
- DN containing RACF id can be used in ACL
- Allows Security Server authentication to be extended to the LDAP entries stored in DB2
- Example:
  - dn: John James,o=ABC Company,c=US
  - access-id: racfid=G1USER,profiletype=user, sysplex=sysplex1,o=ABC Company, c=US

Creating ACL with ldif2db

Create ACL Entries for: cn=Karen Gdaniec, ou=LDAP, o=IBM, c=US

```
dn: cn=Karen Gdaniec, ou=LDAP, o=IBM, c=US
objectclass: person
cn: Karen Gdaniec
sn: Gdaniec
aclEntry: access-id:cn=Tim Hahn, ou=LDAP, o=IBM,
    c=US:normal:rwsc:sensitive:wrsc:critical:rsc
aclEntry: access-id:racfid=G1USER,profiltype=user,sysplex=plex1:
    normal:rsc
aclEntry: group:cn=SecurityAdmins, ou=Security, o=IBM,
    c=US:normal:rwsc:sensitive:rwsc:critical:rwsc
aclPropagate:  TRUE
ownerPropagate:  TRUE
```

Password Encryption Support

- For userpassword attribute
- Uses OCSF for encryption methods
- Choice of methods
  - no encryption
  - SHA
  - crypt
  - MD5
  - DES
- Use **pwencryption** configuration file option
- Use db2pwden utility to encrypt existing userpassword attributes

The Enterprise Namespace