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How-to Access RACF From Distributed Platforms

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Agenda

- Why RACF from Distributed?
- LDAP Primer
- Intro to TDS for z/OS
- RACF Authentication from Distributed
- RACF Authorization from Distributed
- RACF Audit Records from Distributed
- Retrieving RACF Profile Data from Distributed
- Summary
- Additional References

Why RACF from Distributed?

- Heavily invested in RACF for securing z-Specific resources
- Enterprise is becoming more diverse
  - Cost of Securing heterogeneous enterprises can increase if deploying many different security solutions for different platforms
    - New Skills
    - New Software/Hardware
- Centralization of security on z and RACF can be cost effective alternative
  - Leverage existing Security Related procedures/skills
- LDAP facilitates the centralization of enterprise wide security in RACF

What is LDAP?

- Directory – data repository
  - Data stored in Entries managed in a hierarchical fashion, e.g., entries have parent entries
  - Commonly used to store user repository data
    - Also used to store application specific configuration data
  - Each entry contains 1 or more attributes
    - Every entry has a Distinguished Name attribute – unique identifier of the entry
    - Other attributes include password, native ID, etc..
- Lightweight Directory Access Protocol
  - A standard protocol for accessing/managing Directory data over TCP/IP
    - Add, delete, modify entries…
    - Search entries
- Can be key to an enterprises IT security infrastructure
  - Authentication of user
  - Authorization

Directory Server for z/OS

- Tivoli Directory Server is a LDAP server implementation fully optimized for z/OS
  - **Not** a port of distributed TDS server to z/OS
- Supports standard LDAP V3 protocol
- z/OS specific capabilities include
  - Full sysplex support
  - System SSL, ICSF, CTRACE, WLM, ARM, DB2, etc… support
  - LDAP based access to RACF data
    - RACF still responsible for authorization
- LDAP-RACF relationship allows
  - LDAP based remote authentication to be done by RACF
  - Limited LDAP based access to RACF user, resource, and custom profiles
  - LDAP plugin allows for remote RACF audit and authorization services.

Key LDAP Terms

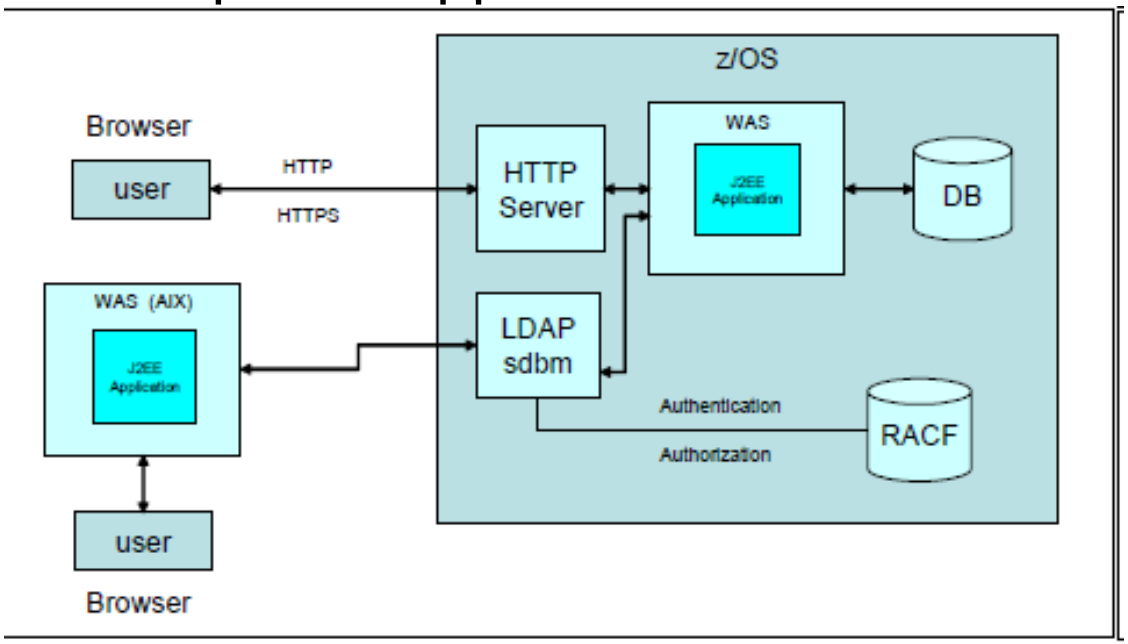
- Distinguished Name (DN) – Attribute in LDAP entry that uniquely identifies any given entry in the directory
  - Made up attribute=value pairs separated by commas
  - Format of DN is recursive, i.e., DN = RDN/Parent's DN
    - RDN consist of attribute-value pairs within the entry
- Bind – LDAP server authenticates a user
  - Distinguished Name/Password or Passphrase
  - Kerberos
  - X.509 Certificate

Key LDAP Terms cont…

- SDBM
  - AN LDAP front-end to RACF Database
    - Data is NOT duplicated in TDS
  - Allows LDAP clients to retrieve profile data (user, group, resource)
  - Allows TDS to have RACF perform authentication
    - TDS sends RACF ID + password/passphrase to RACF to authenticate
- Native Authentication
  - Standard LDAP user entries in TDS + a native user ID attribute
  - TDS calls RACF to authenticate native user ID and password or passphrase

RACF Authentication

- Goal: RACF serves as Authentication Authority
- Use passwords/passphrases, Kerberos, or X.509 Certificates to authenticate
- Consider WebSphere Application Server Environment +SDBM



RACF Authentication cont…

- Setup TDS: ds.conf (SDBM)

```
#---------- GLOBAL ------------
adminDN cn=admin
adminPW secret
listen ldap://:1492
listen ldaps://:1493
audit on
audit all,modify+delete+add+search+connect+disconnect+modifydn+bind+unbind+compare
schemaPath /home/suimgwi/ldap/test/r11db/schema
logfile /home/suimgwi/ldap/test/conf.log
#---------- SDBM ----------------
database sdbm GLDBSD31/GLDBSD64 mysdbm
suffix cn=myracf
enableResources on
```

RACF Authentication cont…

- Ds.conf cont… (TDBM+native Auth)

#---------- TDBM ----------

database tdbm GLDBTD31/GLDBTD64 TDBM1

suffix o=sample

extendedgroupsearching on

pwencryption sha

dbuserid DBUSR101

dsnaoini SUIMGWI.PRIVATE.EZCONFIG(DSNAOINI)

useNativeAuth all

nativeAuthSubtree o=sample

RACF Authentication cont…

- Setup WAS

In the administrative console go to **Security → Global security → User registries → LDAP** and supply the values shown in Table 4-1.

Table 4-1 User registry settings

Property	**Value** (*description*, actual)
Server user ID	*Master Administrators' RACF user ID*
Server user password	*Master Administrators' password*
Type	Custom
Host	*IP address or URL of LPAR where LDAP is listening*
Port	*LDAP listen port as specified in slapd.conf*
Base distinguished name (DN)	*suffix as in slapd.conf (without the quotes)*
Bind distinguished name (DN)	racfid=*BDNracid*,profiletype=user,*suffix*
Bind password	*password of BDNracid*

Table 4-2 Filters for Advanced LDAP user registry settings

property	**value**
User filter	racfid=%v
Group filter	racfid=%v
User ID map	*:racfid
Group ID map	*:racfid
Group member ID map	racfconnectgroupname:racfgroupuserids

ICTX: Remote RACF Authorization/SMF

- ICTX – a TDS for z/OS plug-in that add supports for remote RACF authorization and auditing over LDAP protocol
- Originally shipped with Enterprise Indentity Manager for z/OS as of V1R8.
- Now shipped with TDS for z/OS starting in V2R1
- DS.conf update:
  plugin clientOperation GLDBIC31/GLDBIC64 ICTX_INIT “CN=ICTX”

ICTX: Remote RACF Authorization/SMF cont…

1. Client must bind to TDS for z/OS
   - Native Auth
   - SDBM bind
   - RACF mapping Enabled
     - Kerberos
     - X.509 SASL External bind
2. Client must BER Encode ICTX Request and send to TDS for z/OS
3. Client must BER Decode ICTX Response to check results

Remote RACF Authorization

- TDS issues RACROUTE REQUEST=AUTH SAF
- RACF Required Defines:
  RDEFINE FACILITY IRR.LDAP.REMOTE.AUTH UACC(NONE)
  PERMIT IRR.LDAP.REMOTE.AUTH CLASS(FACILITY) ID(*BINDUSER*)
  ACCESS(UPDATE))
  SETROPTS RACLIST(FACILITY) REFRESH
- BER Encoding/Decoding
  - Client must have code that encodes parameters in BER Encoded block
  - Client must have code that decoded BER encoded response

Remote RACF Authorization

- Authorization Request ASN.1

```
requestValue ::= SEQUENCE {
        requestVersion INTEGER,
        itemList SEQUENCE of
                item SEQUENCE {
                        itemVersion INTEGER,
                        itemTag INTEGER,
                        userOrGroup OCTET STRING,
                        resource OCTET STRING,
                        class OCTET STRING,
                        access INTEGER,
                        logString OCTET STRING
                }
        }
}
```

Remote RACF Authorization

- Authorization Response ASN.1

```
responseValue ::= SEQUENCE {
        responseVersion INTEGER,
        responseCode INTEGER,
        itemList SEQUENCE of
                item SEQUENCE {
                        itemVersion INTEGER,
                        itemTag INTEGER,
                        majorCode INTEGER,
                        minorCode1 INTEGER,
                        minorCode2 INTEGER,
                        minorCode3 INTEGER
                }
        }
}
```

Simple Remote RACF Authorization

1. User requests a distributed Application to access a resource in the enterprise
   - Resource may have a profile in RACF or
   - Application may need to map resource to an existing profile name in RACF (could use LDAP to manage mappings)
2. Distributed Application binds to TDS for z/OS, using user's credentials.
3. Distributed Application encodes the ICTX Authorization Request and sends to TDS for z/OS
4. Distributed Application decodes response
5. If success, the application grants access

Remote RACF Audit

- TDS issues r_auditx (IRRSAX00) SAF callable service
- **SMF Record Type 83 subtype 4 records**
  - Unload using the IRRADU00 utility
  - RACF controls determine if record written
- RACF Required Defines:
  RDEFINE FACILITY IRR.RAUDITX UACC(NONE)
  PERMIT IRR.RAUDITX CLASSS(FACILITY) ID(LDAPSRV) ACCESS(READ))
  SETROPTS RACLIST(FACILITY) REFRESH
- BER Encoding/Decoding
  - Client must have code that encodes parameters in BER Encoded block
  - Client must have code that decoded BER encoded response

Remote RACF Audit

- Audit Request ASN.1

```
requestValue ::= SEQUENCE {
        requestVersion INTEGER,
        itemList SEQUENCE of
                item SEQUENCE {
                        itemVersion INTEGER,
                        itemTag INTEGER,
                        linkValue OCTET STRING SIZE(8),
                        violation BOOLEAN,
                        event INTEGER,
                        qualifier INTEGER,
                        class OCTET STRING,
                        resource OCTET STRING,
                        logString OCTET STRING,
                        dataFieldList SEQUENCE of
                        dataField SEQUENCE {
                        type INTEGER,
                        value OCTET STRING
                }
        }
}
```

Remote RACF Audit

- Audit Response ASN.1

```
responseValue ::= SEQUENCE {
        responseVersion INTEGER,
        responseCode INTEGER,
        itemList SEQUENCE of
                item SEQUENCE {
                        itemVersion INTEGER,
                        itemTag INTEGER,
                        majorCode INTEGER,
                        minorCode1 INTEGER,
                        minorCode2 INTEGER,
                        minorCode3 INTEGER
                }
        }
}
```

Simple Remote RACF Audit

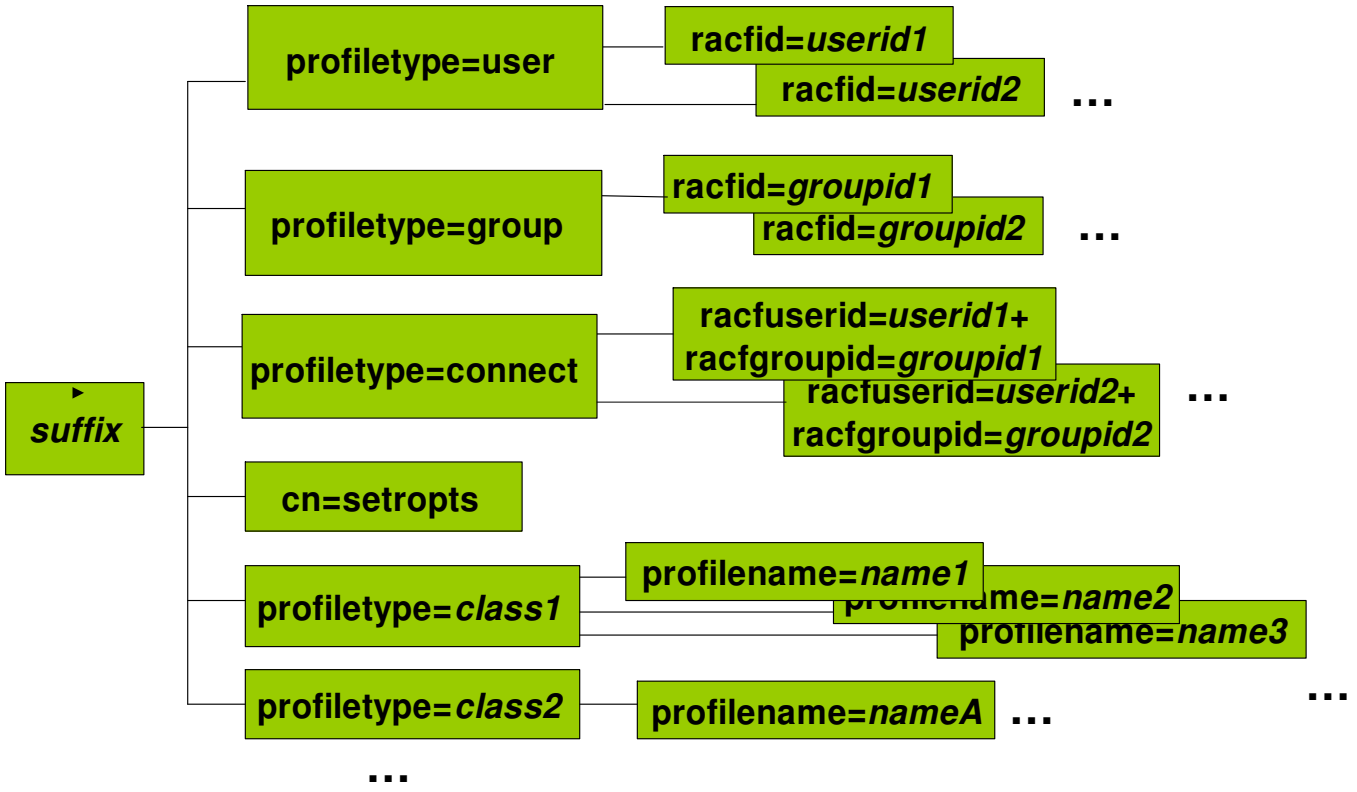
1. Administrator defines profiles for different operations in an application
2. Distributed Application binds to TDS for z/OS
   - May have a single/long living TDS connection for remote audit
3. Distributed Application encodes the ICTX Audit Request and sends to TDS for z/OS
4. Distributed Application decodes response
5. If RACF controls set correctly, audit record will be written

SDBM: RACF Data and LDAP

- Add, modify, delete RACF users, groups, and general resources
- Add, modify, and delete user connections to groups
- Add and remove users and groups in general resource profiles
- Modify SETROPTS options that affect classes
- Retrieve RACF information for users, groups, connections, general resources, and class options
- Retrieve RACF user password and password phrase envelopes

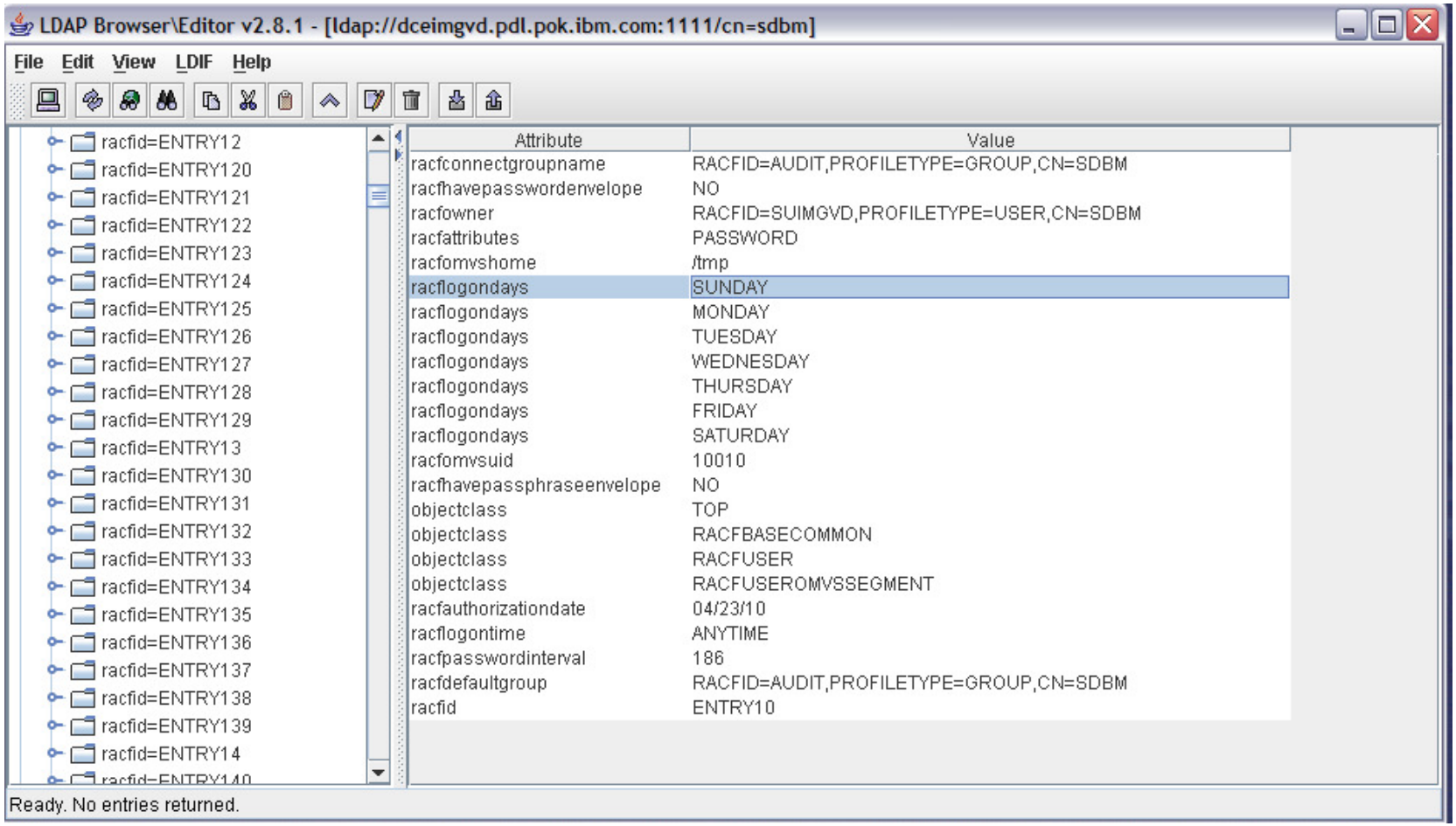
SDBM: RACF Data and LDAP

SDBM Backend Directory Hierarchy



Example DN: racfid=jon,profiletype=user,cn=sdbm

SDBM: RACF Data and LDAP



Common SDBM Commands

- Add a RACF user entry
- Create a file, u1234.ldif, containing an entry to be added:

```
dn: racfid=u1234,profiletype=user,cn=sdbm
objectclass: racfUser
objectclass: racfUserOmvsSegment
racfid: u1234
racfdefaultgroup: group1
racfowner: radmin
racfattributes: special
racfomvsuid: 1234
racfomvshome: /home/u1234
```

- Invoke the ldapadd utility:
  - ldapadd -D “racfid=radmin,profiletype=user,cn=sdbm” -w radminpw -f u1234.ldif
- SDBM executes under the context of bound (radmin) user:
  - ADDUSER u1234 OWNER(radmin) DFLTGRP(group1) SPECIAL OMVS(UID(1234) HOME(/home/u1234))

Common SDBM Commands

- Display a RACF user-group connection:
  - ldapsearch -L -D “racfid=radmin,profiletype=user,cn=sdbm” -w radminpw -b “racfuserid=u1234+racfgroupid=group1,profiletype=connect,cn=sdbm” “objectclass=*”
- SDBM executes under the context of bound (radmin) user: LISTUSER U1234 and returns group info for GROUP1

Common SDBM Commands: Search Results

dn:
racfuserid=U1234+racfgroupid=GROUP1,profiletype=CONNECT,cn=sdbm
racfuserid: U1234
racfgroupid: GROUP1
racfconnectauthdate: 02/08/10
racfconnectowner: RACFID=RADMIN,PROFILETYPE=USER,CN=SDBM
racfconnectgroupauthority: USE
racfconnectgroupuacc: NONE
racfconnectcount: 0
objectclass: TOP
objectclass: RACFBASECOMMON
objectclass: RACFCONNECT

Common SDBM Commands

- Refresh the FACILITY class
- Create file, refresh.ldif, containing the modification to the cn=setropts entry:

```
dn: cn=setropts,cn=sdbm
changetype: modify
replace: racfsetroptsattributes
racfsetroptsattributes: REFRESH
-
replace: racfraclist
racfraclist: profiletype=FACILITY,cn=sdbm
```

- Invoke the ldapmodify utility:
  - ldapmodify -D “racfid=radmin,profiletype=user,cn=sdbm”-w radminpw -f refresh.ldif
- SDBM executes under the context of bound (radmin) user:
  - SETROPTS REFRESH RACLIST(FACILITY)

Common SDBM Commands

- The ldapmodify utility can be used to change RACF password or password phrase
- Via SDBM backend:

  dn: racfid=u1234,profiletype=user,cn=sdbm
  replace: racfPassword
  racfPassword: anewpw

- Via LDBM or TDBM with native authentication:

  dn: cn=jon,o=ibm,c=us
  delete: userPassword
  userPassword: racfpw
  -
  add: userPassword
  userPassword: mynewpw

- Note: replace: userPassword is not supported when changing the RACF password with native authentication

SDBM Limitations

- SDBM uses the **R_admin** "run command" interface to implement many RACF related operations
  - Output for search related operations have limits
    - R_admin limits output to 4096 records
- LDAP wildcard searching not fully supported for SDBM
- LDAP attribute names are pre-defined and cannot be changed
  - racfPassword for password cannot be customized
- SDBM subtree searching does not return all attributes
  - Must do subtree search to retrieve DNs then a base level search for each DN to retrieve all the attributes

Conclusion

- TDS for z/OS+RACF allows for consolidation of IT security on System z, regardless of platform
  - Existing skills and procedures can continue to be used
- Distributed Applications can
  - Use RACF to perform all authentication
  - Use RACF to perform all authorization
  - Use RACF for centralized Auditing facility
  - New as of V2R1: Use ICSF and System z crypto hardware, to manage/use cryptographic objects and keys

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