RACF®: More Dynamic Than Ever

- Dynamic Class Descriptor Table
- RACF Router Table Enhancements
- Dynamic Templates

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Session Objectives

Things you will learn:

- RACF Class Descriptor Table
  - How it is used and updated
  - How to use the Dynamic Class Descriptor Table

New V1R6

- RACF Router Table
  - How it is used and updated
  - New support to eliminate the need to update it

New V1R6

- RACF Templates
  - How they are used and updated
  - How to use Dynamic Template support

New V1R5

Dynamic Class Descriptor Table

New in RACF V1R6

#1 requested requirement for RACF

Overview – What is the RACF CDT?

- CDT – **C**lass **D**escriptor **T**able
  - A table of all general resource classes defined to RACF
    - Examples: TERMINAL, DASDVOL, SECLABEL
  - Attributes of each class
    - Length of resource names
    - What characters can be in resource names
    - Many other processing characteristics
  - Does not include DATASET, USER, or GROUP classes

Overview – Who uses the RACF CDT?

- RACF uses it for:
  - Authorization checking
  - Commands for defining resources
    - RDEFINE, RALTER, RDELETE, PERMIT, others
- Other z/OS products
- Vendor products
- Local applications

Overview – Who updates the RACF CDT?

- RACF updates the IBM-supplied class list with new releases and sometimes in the service stream
  - ►For new RACF functions
  - ►For new functions in other z/OS products
- Some vendor products require you to add classes to the CDT to use their products
- Optionally, you add classes when adding new CICS® regions or new DB2® subsystems

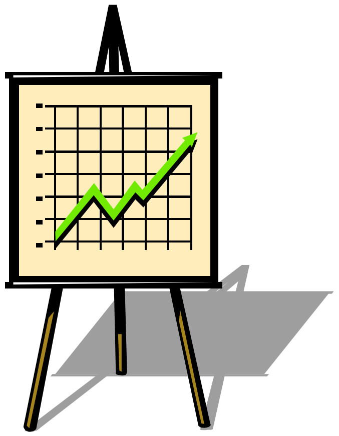
Overview of Problem and Solution

- **To update the RACF class descriptor table and router table, the installation must:**
  - ►Write assembler code
  - ►Assemble and link edit modules
  - ►IPL the system
    - –Availability problem if running 24x7 production

- **Solution in z/OS V1R6:**
  - ►Dynamic Class Descriptor Table
  - ►Router Table - update only for exceptions

Value of Dynamic CDT Support

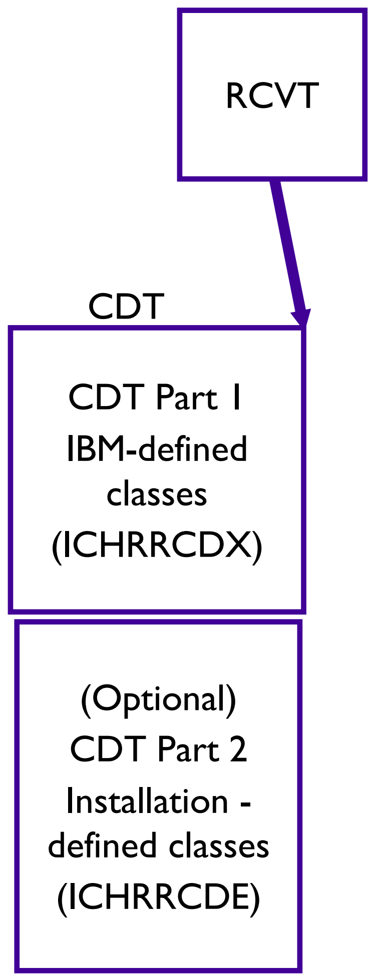
- Availability
  - No IPL necessary to add, update, or delete an installation-defined class



- Ease of Use
  - RACF commands can be used to add an installation-defined class
    - No assembler coding required

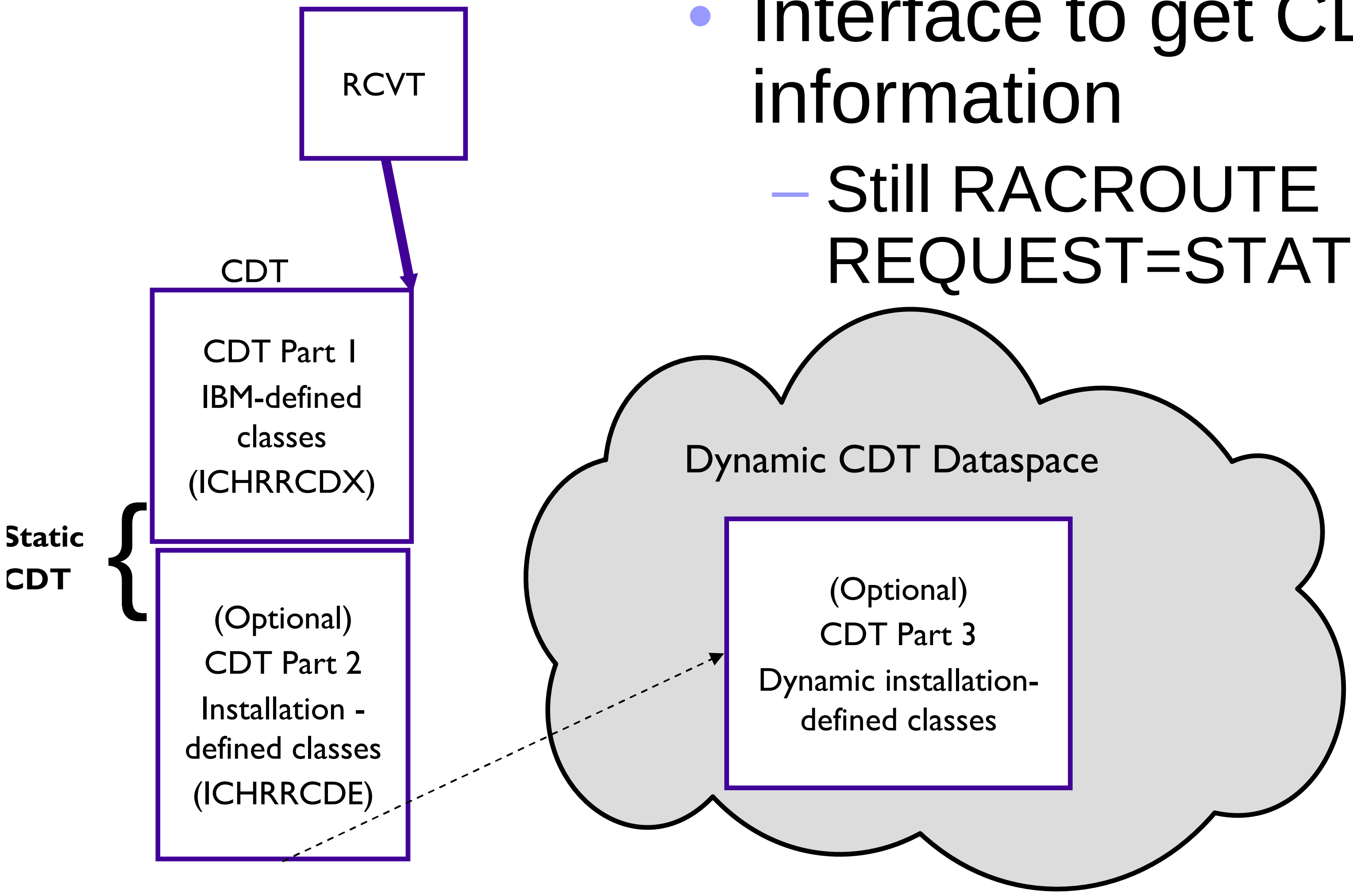
  - No update to RACF router table required when adding an installation-defined class
  - Easier to change attributes of a class

How CDT works today



- Interface to get CDT information
  - RACROUTE REQUEST=STAT macro
- Unintended interface
  - RCVTCDTP pointer
- Stabilized interface
  - RACSTAT macro

How Dynamic CDT works



- Interface to get CDT information
  - Still RACROUTE REQUEST=STAT macro

Dynamic CDT Usage & Invocation

- Defining a dynamic class
- Putting a dynamic class in the CDT
- Using a dynamic class
- Task shift for defining new RACF classes
- Considerations for existing installation-defined classes
- RACROUTE REQUEST=STAT enhancement

Defining a Dynamic Class

- Use IBM class named CDT to create a class definition – a profile to represent a dynamic class
- Use new segment CDTINFO to define class attributes

RDEFINE CDT *dyn-class-name* UACC(NONE) CDTINFO(*class-attribute-1 class-attribute-2 ...*)

RDEFINE CDT HORSES8 UACC(NONE) CDTINFO(DEFAULTUACC(NONE) FIRST(ALPHA) MAXLENGTH(200) OTHER(ALPHA,NUMERIC) POSIT(301) RACLIST(REQUIRED))

Defining a Dynamic Class…

- CDTINFO keyword on RDEFINE and RALTER has 18 keywords for defining class attributes

CASE	KEYQUALIFIERS	OTHER
DEFAULTRC	MACPROCESSING	POSIT
DEFAULTUACC	MAXLENGTH	PROFILESALLOWED
FIRST	MAXLENX	RACLIST
GENLIST	MEMBER	SECLABELSREQUIRED
GROUP	OPERATIONS	SIGNAL

- Command keywords correspond to keywords on ICHERCDE macro (used for static CDT)

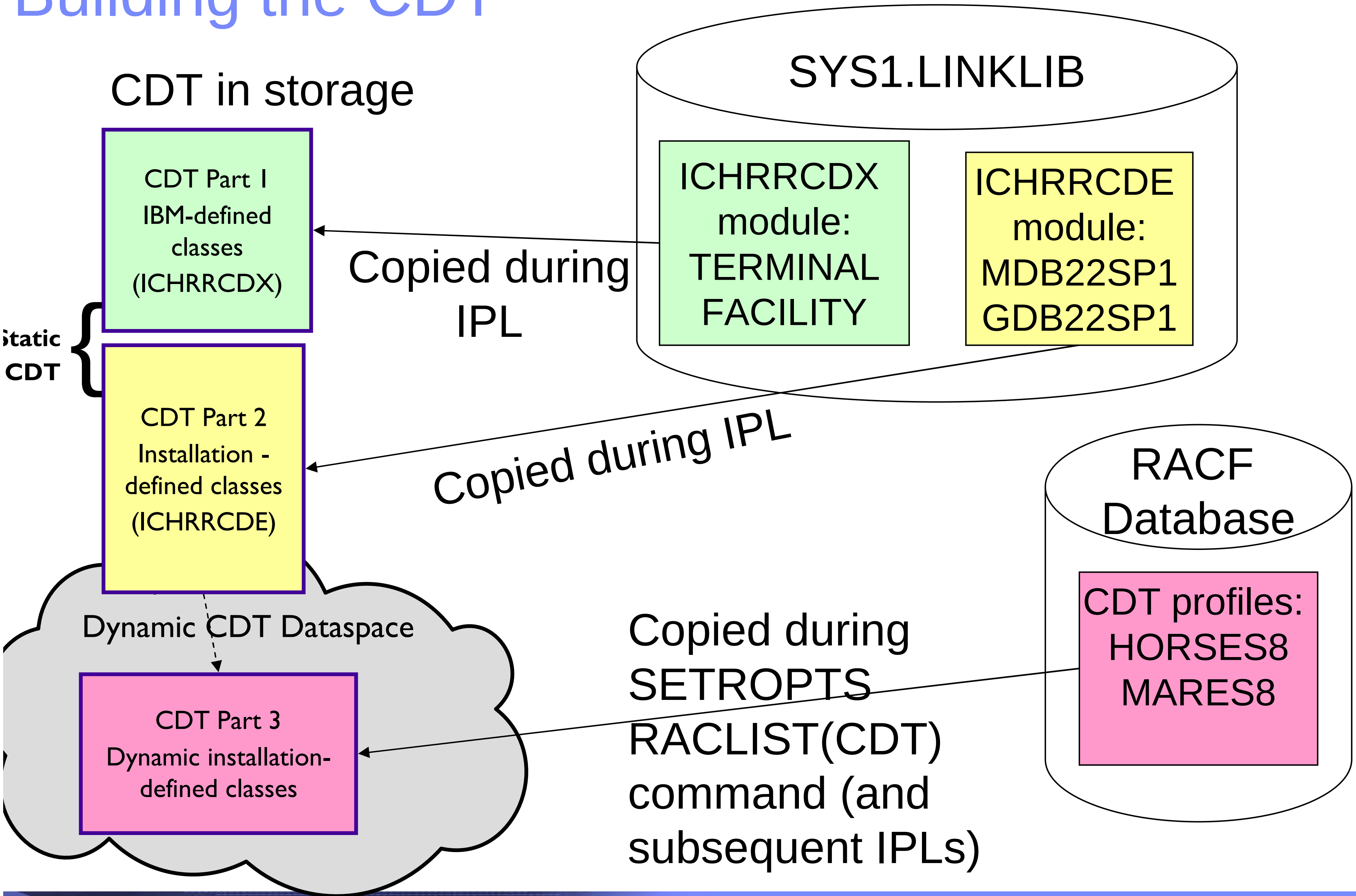
Putting a Dynamic Class into the CDT

- Use SETROPTS RACLIST command to build the Dynamic CDT

  SETROPTS CLASSACT(CDT) RACLIST(CDT)

  - This allows the HORSES8 class to be recognized as a RACF general resource class.
  - This does not refresh any other RACLISTed classes
- Data space is created for Dynamic CDT which is a logical extension of the static CDT
- Next IPL, RACF remembers CDT class was RACLISTed
  - Dynamic CDT is built during RACF initialization

Building the CDT


CDT in storage
CDT Part I
IBM-defined classes
(ICHRRCDX)
Static CDT
CDT Part 2
Installation - defined classes
(ICHRRCDE)
Dynamic CDT Dataspace
CDT Part 3
Dynamic installation-defined classes
SYS1.LINKLIB
ICHRRCDX module: TERMINAL FACILITY
ICHRRCDE module: MDB22SP1 GDB22SP1
Copied during IPL
Copied during IPL
RACF Database
CDT profiles: HORSES8 MARES8
Copied during SETROPTS RACLIST(CDT) command (and subsequent IPLs)

Using a Dynamic Class

- Use existing RACF commands which accept a general resource class name

RDEFINE RALTER RLIST RDELETE

SEARCH SETROPTS PERMIT

ADDSD FCLASS(class-name)

ALTDSD FCLASS(class-name)

RVARY INACTIVE NOCLASSACT(class-namelist)

ADDUSER CLAUTH(class-name)

ALTUSER CLAUTH(class-name)

- Examples

RDEFINE HORSES8 HORSEY1 UACC(NONE)

SEARCH CLASS(HORSES8)

SETROPTS CLASSACT(HORSES8) RACLIST(HORSES8)

Summary of Steps to Create a Dynamic Class

1. Define class attributes – profile in CDT class

   ```
   RDEFINE CDT HORSES8 UACC(NONE) CDTINFO(
   DEFAULTUACC(NONE) FIRST(ALPHA) MAXLENGTH(200)
   OTHER(ALPHA,NUMERIC) POSIT(301) RACLIST(REQUIRED) )
   ```

2. Build the Dynamic CDT

   ```
   SETROPTS CLASSACT(CDT) RACLIST(CDT)
   ```

   Or Rebuild the Dynamic CDT

   ```
   SETROPTS RACLIST(CDT) REFRESH
   ```

3. Use new class in existing RACF commands

   ```
   RDEFINE HORSES8 HORSEY1 UACC(NONE)
   SEARCH CLASS(HORSES8)
   SETROPTS CLASSACT(HORSES8) RACLIST(HORSES8)
   ```

Task Shift for Defining New RACF Classes

- Defining new RACF classes was previously a system programmer task
- Security administrators now have authority to define new RACF classes
  - Commands can be issued by users with RACF SPECIAL attribute
  - Authority can be delegated
    - CLAUTH to CDT class
    - Field level access to CDTINFO segments

Considerations for Existing Installation-defined Classes

- You can migrate your existing installation-defined classes (in ICHRRCDE) to the Dynamic CDT
  - Program is available on the RACF website to help translate definitions from ICHRRCDE module into commands to create dynamic classes
    - CDT2DYN EXEC (written in REXX)
  - For this migration, a 'duplicate' class is allowed to exist in ICHRRCDE and Dynamic CDT
    - Dynamic class definition takes precedence

What is Not Changing?

- IBM-defined classes will not be dynamic
  - If IBM updates the IBM-defined classes, a new ICHRRCDX is shipped, and an IPL is still required
    - Usually other code is shipped which supports the new classes

RACROUTE REQUEST=STAT Enhancement

- NEXT= keyword allows sequential search of classes in CDT

```
RACROUTE REQUEST=STAT,
 NEXT=CLAS_NAME, COPY=CDT_INFO,
 COPYLEN=COPY_LEN, RELEASE=7709
```

RACF Router Table Enhancements

New in RACF V1R6

RACF Router Table Today

- For RACROUTE calls, the RACF router table determines if RACF is called
  - Based on the CLASS, REQSTOR, and SUBSYS keywords
- Router Table entry was required:
  - For each class in the CDT
  - For each combination of REQSTOR/SUBSYS
- To update the Router Table you must:
  - Code, assemble and link edit module ICHRFR01
  - IPL the system !
- Router table is still not dynamic, but……

RACF Router Table Changes

- Default behavior changed
  - If no router table entry found, RACF is called
- Router table entry not required for:
  - Installation-defined classes
  - REQSTOR/SUBSYS combinations
  - Dynamic classes
  - IBM classes (ICHRFR0X no longer shipped)
- Installation-defined Router table still allowed
  - Only required if you need to specify ACTION=NONE so that RACF calls are bypassed for a class or a SUBSYS/REQSTOR combination
  - Still requires assembly and link edit of ICHRFR01
  - Still requires IPL

Dynamic Templates

New in RACF V1R5

RACF Template Overview

- Map how profiles are written on the RACF database.
- Are updated to add new segments or fields for line items, either at a release boundary or in a PTF.
- Exist in three places:
  - The latest version shipped with RACF (IRRTEMP1)
  - The version on the database, written there by utility IRRMIN00
    - PARM=NEW   initialize new database
    - PARM=UPDATE   update the templates on existing database
  - The in-storage version
    - Built by RACF Initialization and used when accessing profiles
    - **Can only be updated via IPL**

Template Issues

- Install a new release or PTF with template changes. If IRRMIN00 not run
  - **RE-IPL** required.
- IRRMIN00 requires correct IRRTEMP1 source. Latest level not obvious.

```
$/VERSION HRF7707
$/VERSION OA01234
```

  - If wrong level used **RE-IPL** required
- Apply a PTF with template changes
  - **RE-IPL** required even if no modifications in PTF require IPL
- Could mistakenly run IRRMIN00 to initialize the active database rather than update it, **wiping out database.**

New Template Support

- The templates shipped with RACF:
  - Are no longer shipped in source format as IRRTEMP1
  - Are shipped as a module in compiled format as IRRTEMP2.
  - Contain the release and APAR level so RACF can determine the latest level of the templates:

$/VERSION FMID/APAR# rrrrrrrr.aaaaaaaa

```
➢ $/VERSION HRF7708 00000010.00000000
➢ $/VERSION OA01234 00000010.00000010
➢ $/VERSION OA01567 00000010.00000020
➢ $/VERSION HRFxxxx 00000023.00000020
```

- SET LIST operator command displays the in-storage template level and the dynamic parse level in effect on the system.

```
RACF STATUS INFORMATION:
    TEMPLATE VERSION            - HRF7708 00000010.00000000
    DYNAMIC PARSE VERSION       - HRF7708
```

RACF Initialization

During IPL, RACF Initialization puts the templates in storage

- If the Master Primary database template level is higher or the same as RACF Initialization template level, it builds them from the database
- Otherwise, it builds the in-storage templates from RACF initialization template level and issues message

```
ICH579E RACF TEMPLATES ON DATABASE ARE DOWNLEVEL:
    HRF7708 00000000.00000000; USING TEMPLATES AT LEVEL
    HRF7708 00000010.00000000 FROM IRRTEMP2.
    RUN IRRMIN00 PARM=UPDATE
```

- Result – Highest level of templates are used by RACF automatically
  - Re-IPL is not necessary!

IRRMIN00 Enhancements – Database Initialization

- Will no longer use the SYSTEMP data set, which typically pointed to SYS1.MODGEN(IRRTEMP1).
  - Instead uses templates in IRRMIN00 load module
- Will fail PARM=NEW if the output database is active on the system where IRRMIN00 is invoked.
- Will not apply downlevel templates to a database.
- Will make templates active dynamically for the new PARM=ACTIVATE invocation when the templates on the active master primary database are a higher level than the in-storage templates.

IRRMIN00 Parameters

- PARM=NEW
  - formats a non-VSAM DASD data set as a RACF database. It divides the database into 4K blocks, or records, and initializes them
    - will now fail if invoked against an active database on the system where IRRMIN00 is invoked.
- PARM=UPDATE
  - Writes new templates to the database
    - Will fail if new templates are not at higher level than ones in database
- PARM=ACTIVATE
  - If the active master primary database has higher level templates than those in storage, they are copied to storage

Dynamic Templates Summary

- RACF Initialization builds the in-storage templates automatically from the latest level
- IRRMIN00 PARM=NEW and PARM=UPDATE automatically writes the latest level of templates to the database
- IRRMIN00 PARM=UPDATE will not down-level the templates on the database
- IRRMIN00 PARM=ACTIVATE will dynamically ‘activate’ new templates by replacing the in-storage templates with the new templates
- IRRMIN00 PARM=NEW will not allow an existing, active database to be newly initialized (from the system on which the database is active)

Session Summary

More updates in RACF can be made without an IPL!

- RACF Dynamic Class Descriptor Table
  - How to update the RACF CDT without an IPL
- RACF Router Table Enhancements
  - New support to eliminate the need to update it
- RACF Dynamic Templates
  - How to update RACF Templates without an IPL

New V1R6

New V1R6

New V1R5

Questions???

Appendix

- Websites
  - RACF website: http://www.ibm.com/servers/eserver/zseries/zos/racf/
  - RACF downloads (for CDT2DYN EXEC): http://www.ibm.com/servers/eserver/zseries/zos/racf/goodies.html
- Publications References
  - ►SA22-7683 Security Server RACF Security Administrator's Guide
    - ►New chapter on Dynamic CDT
  - ►SA22-7687 Security Server RACF Command Language Reference
    - ►New CDTINFO keyword on RDEFINE, RALTER, RLIST commands
  - ►SA22-7687 Security Server RACF RACROUTE Macro Reference
    - ►New NEXT= keyword on RACROUTE REQUEST=STAT
    - ►Coding example to retrieve all classes in CDT
  - ►SC26-993 DB2 Universal Database for OS/390® and z/OS Administration Guide

Terminology

CDT: Abbreviation for Class Descriptor Table.

Class descriptor table: A table in RACF which defines general resource class names and attributes. When this term is used without a preceding ‘dynamic’ or ‘static’, it refers to a combination of the static class descriptor table and the dynamic class descriptor table, if it exists.

Dynamic CDT: An optional dynamic portion of the RACF class descriptor table which contains class entries built from the CDT general resource class. It does not contain class entries from the IBM-supplied class descriptor table (ICHRRCDX) nor class entries from the installation-defined class descriptor table (ICHRRCDE, if it exists). The dynamic CDT is treated as a logical extension of the static CDT.

IBM-supplied CDT: The class descriptor table that IBM ships with the RACF product. The module shipped is ICHRRCDX. The classes defined here are not to be modified except by IBM.

Installation-defined CDT: An optional additional portion of the CDT which is customized by an installation. The module name is ICHRRCDE. The function provided by this module can now be replaced with the dynamic CDT function.

Static CDT: The (non-dynamic) portion of the class descriptor table that is coded in the IBM-supplied CDT (ICHRRCDX) and the Installation-defined CDT (ICHRRCDE).