



# RACF® z/OS® V1R11 Update

## Carolina RACF Users Group

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## Agenda

### What's new with z/OS V1R10 RACF

- Custom Fields
- Password Phrase Exploitation
- More Granularity in Allowing Password Reset
- Enhanced RACF Health Checks

### ... and V1R11

- Program Object Signature Verification
- Logon Statistics Suppression
- Identity Propagation
- R\_admin extract for General Resource
- Change logging for General Resource
- Automatic assignment of UID and GID to users of Unix System Services
- Profile name in Authorization Exits
- IRRADU00 support for WAS and TKLM
- RACDCERT multi-byte character improvements
- PKI Private Key recovery
- PKI Web Pages
- PKI Support for SHA256 with RSA signature algorithm

## z/OS Version 1 Release 10 RACF

## z/OS V1R10: Password Phrase Exploitation

### ■ Password phrase exploitation

- ▶ TSO/E
- ▶ z/OS UNIX® rlogin, BPX1PWD, BPX1SEC, BPX1TLS
- ▶ z/OS UNIX su and passwd commands
- ▶ z/OS Kerberos
- ▶ z/OS LDAP for z/OS SDBM backend
- ▶ OpenSSH (IBM Ported Tools for z/OS)

```

----- TSO/E LOGON -----
Enter LOGON parameters below:          RACF LOGON parameters:
Userid  ==> IBMUSER
Password ==> _
Procedure ==> RACFR1B                Group Ident ==>
Acct Nbr ==>
Size    ==>
Perform ==>
Command ==>

Enter an 'S' before each option desired below:
-New Password  -Nomail  -Nonotice  -Reconnect  -OIDcard
PF1/PF13 ==> Help  PF3/PF15 ==> Logoff  PA1 ==> Attention  PA2 ==> Reshow
You may request specific help information by entering a '?' in any entry field
  
```

## z/OS V1R10: Password Reset Granularity

- **More granularity for Password Reset and LISTUSER**
  - ▶ Before V1R10: The FACILITY resource IRR.PASSWORD.RESET allowed password resets for users without the SPECIAL, OPERATIONS, AUDITOR, or PROTECTED attribute. Access to the IRR.LISTUSER resource allowed the listing of a USER profile base segment.
- **With V1R10, the authority to reset a password can be granted based on profile ownership or group-tree ownership using FACILITY class profiles:**
  - ▶ IRR.PWRESET.OWNER.owner-of-user
    - Grants authority based on the user or group that owns the user
  - ▶ IRR.PWRESET.TREE.owner-of-group-tree
    - Grants authority based on group tree scope
    - That is, if “owner of group tree” owns the user being reset, or owns a group that owns the user, or owns a group that owns a group that ...

## z/OS V1R10: Password Reset Granularity...

- **With V1R10, the authority to issue the LISTUSER command can be granted based on profile ownership or group-tree ownership using FACILITY class profiles:**
  - ▶ IRR.LU.OWNER.owner-of-user
    - Grants authority based on the user or group that owns the user
  - ▶ IRR.LU.TREE.owner-of-group-tree
    - Grants authority based on group tree scope
- **Users can be excluded password reset or LISTUSER with “exclusion” profiles:**
  - ▶ IRR.PWRESET.EXCLUDE.*excluded-user*
  - ▶ IRR.LU.EXCLUDE.*excluded-user*

## z/OS V1R10: Custom Fields

- **With Custom Fields you can create your own fields in the RACF database by defining profiles!**
  - ▶ No assembler programming required
  - ▶ No ICHEINTY, RACROUTE experience required!
- **You define the contents of the fields**
  - ▶ Field name (1-8 characters)
  - ▶ Field Type: Character, Numeric, Hexadecimal, Flag (Yes/No)
  - ▶ Heading for LISTUSER or LISTGRP command
  - ▶ Help text
  - ▶ Maximum field length
  - ▶ For character fields: Character restrictions for first and remaining characters, Mixed case or uppercase
  - ▶ For numeric fields: Minimum value, Maximum value
- **Other field customization can be performed in a field validation exit (IRRVAF01) which is under the control of the MVS dynamic exit facility**

## z/OS V1R10: Custom Fields...

- **Custom fields for USER and GROUP profiles**
  - ▶ Field semantics (names and data formats) defined as profiles in the new CFIELD general resource class
  - ▶ New CSDATA segments in USER and GROUP profiles hold the data
  - ▶ FIELD class (“field level access”) can be used to control access
  - ▶ Can be processed from
    - RACF commands
    - RACF ISPF panels
    - LDAP SDBM
    - R\_admin
    - Database Unload

## z/OS V1R10: Custom Fields...

- **The profile name in CFIELD class defines the field name**
  - ▶ USER.CSDATA.<field\_name>
  - ▶ GROUP.CSDATA.<field\_name>
- **CFDEF (Custom Field DEFINition) segment for CFIELD class profiles defines the characteristics of the field**
  - ▶ Keyword is on RDEFINE, RALTER, RLIST commands
  - ▶ Sub-operands define the custom field attributes

```
RDEFINE CFIELD USER.CSDATA.HOMEADDR CFDEF(TYPE(CHAR) MAXLEN(200)      +
FIRST(ANY) OTHER(ANY) MIXED(YES)                                     +
LISTHEAD('HOME ADDRESS = ')                                         +
HELP('EMPLOYEE HOME ADDRESS, UP TO 200 CHARACTERS. INCLUDE STREET  +
ADDRESS, CITY, STATE, ZIP CODE, COUNTRY.')
```

## z/OS V1R10: Custom Fields...

- **CSDATA (CuStom DATA) segment for USER and GROUP profiles**

- Keyword is on ADDUSER, ALTUSER, LISTUSER, ADDGROUP, ALTGROUP, LISTGRP commands
- Sub-operands are YOUR custom fields!
  - ALTUSER SHANNON CSDATA(HOMEADDR('14 Main Street, Anywhere, NY 12345, USA'))

- **The LISTUSER command shows**

```
LU SHANNON NORACF CSDATA
USER=SHANNON

CSDATA INFORMATION
-----
HOME ADDRESS = 14 Main Street, Anywhere, NY 12345, USA

READY
```

- **RACF panels can be used with Custom Fields**

## z/OS V1R10: Custom Fields...

```

. . . . .
                RACF - USER PROFILE SERVICES          ENTER REQUIRED FIELD
. . . . .

SELECT ONE OF THE FOLLOWING:

      1  ADD          Add a user profile
      2  CHANGE       Change a user profile
      3  DELETE       Delete a user profile
      4  PASSWORD     Change your own password and related information
      5  AUDIT        Monitor user activity (Auditors only)

      D or 8  DISPLAY  Display profile contents
      S or 9  SEARCH   Search the RACF data base for profiles

ENTER THE FOLLOWING INFORMATION:

USER      ==>> SHANNON      Userid

OPTION ==>> 2
F1=HELP   F2=SPLIT   F3=END   F4=RETURN   F5=RFIND   F6=RCHANGE
F7=UP     F8=DOWN    F9=SWAP  F10=LEFT   F11=RIGHT  F12=RETRIEVE
```

## z/OS V1R10: Custom Fields...

```

. . . . .
RACF - CHANGE USER SHANNON
. . . . .

OWNER      _____ Userid or group name
USER NAME  _____
DEFAULT GROUP _____ Group name

_ Change PASSWORD related information
s Add or Change OPTIONAL information

TO ASSIGN A USER ATTRIBUTE, ENTER YES, TO CANCEL, ENTER NO

_____ GROUP ACCESS          _____ SPECIAL
_____ ADSP                    _____ OPERATIONS
_____ OIDCARD                 _____ AUDITOR
_____ NO-PASSWORD            _____ RESTRICTED

CHANGE OR DELETE THE MODEL PROFILE USED FOR USER DATA SETS (OPTIONAL):

NEW MODEL  _____
DELETE    _____ YES if no model is to be used
COMMAND ==>
F1=HELP   F2=SPLIT   F3=END     F4=RETURN   F5=RFIND   F6=RCHANGE
F7=UP     F8=DOWN    F9=SWAP    F10=LEFT    F11=RIGHT  F12=RETRIEVE

```

## z/OS V1R10: Custom Fields...

```

. . . . .
RACF - CHANGE USER SHANNON
. . . . .

COMMAND ==>

To add or change the following information, enter any character.

_ CLASS AUTHORITY                _ KERB PARAMETERS
_ INSTALLATION DATA            _ LDAP PROXY PARAMETERS
_ SECURITY LEVEL or CATEGORIES   _ ENTERPRISE IDENTITY MAPPING
_ SECURITY LABEL                 s CSDATA PARAMETERS
_ LOGON RESTRICTIONS
_ NATIONAL LANGUAGES
_ DFP PARAMETERS
_ TSO PARAMETERS
_ OPERPARM PARAMETERS
_ CICS PARAMETERS
_ WORK ATTRIBUTES
_ OMVS PARAMETERS
_ NETVIEW PARAMETERS
_ DCE PARAMETERS
_ OVM PARAMETERS
_ LNOTES PARAMETERS
F1=HELP   F2=SPLIT   F3=END     F4=RETURN   F5=RFIND   F6=RCHANGE
F7=UP     F8=DOWN    F9=SWAP    F10=LEFT    F11=RIGHT  F12=RETRIEVE

```

## z/OS V1R10: Custom Fields...

```

. . . . .
          Set Custom Fields for USER SHANNON          ROW 1 TO 1 OF 1
COMMAND INPUT ==>                                SCROLL ==> PAGE

```

Delete ALL CSDATA information (NOCSDATA) \_\_\_ YES or blanks.

Select one or more custom fields. Use d to delete, h for help,  
u to undo changes made during this session, or x to set/edit a field.  
Hit ENTER to continue.

```

SEL FieldName Description                               Value
s HOMEADDR HOME ADDRESS                               14 Main Street, Anywh
***** Bottom of data *****

```

```

F1=HELP      F2=SPLIT      F3=END      F4=RETURN      F5=RFIND      F6=RCHANGE
F7=UP        F8=DOWN        F9=SWAP      F10=LEFT       F11=RIGHT      F12=RETRIEVE

```

## z/OS V1R10: Custom Fields...

```

. . . . .
          RACF - CUSTOM KEYWORD DATA for SHANNON
COMMAND ==>                                SCROLL ==> PAGE

```

Field Name: HOMEADDR

Description: HOME ADDRESS

14 Main Street, Anywhere, NY, 12528, USA

---

(Enter changes. Hit ENTER to save, PF3 to CANCEL)

```

F1=HELP      F2=SPLIT      F3=END      F4=RETURN      F5=RFIND      F6=RCHANGE
F7=UP        F8=DOWN        F9=SWAP      F10=LEFT       F11=RIGHT      F12=RETRIEVE

```





## z/OS V1R10: RACF Health Checks...

- **The current RACF checks examine key elements of the z/OS infrastructure, but:**
  - The checks look at the resources IBM thinks are important
    - Unless you wrote your own check you can't examine the protection of your data resources
- **With z/OS V1R10, you can check the protection of the resources you want simply by defining profiles and registering your check with the IBM Health Checker for z/OS**

## z/OS V1R10: RACF Health Checks...

- **Defining your own resource check takes these three steps:**
  1. Defining a RACF profile in the new RACFHC general resource class. This profile contains the list of resources that you want to check
  2. Define a PARMLIB entry that defines your check using the IBM Health Checker for z/OS Dynamic Registration
  3. Activate your PARMLIB entry

## z/OS V1R10: RACF Health Checks...

- The RACFHC class contains profiles which have the resources you want to check. The RDEFINE command to add a profile is:

```
RDEFINE RACFHC MY_RESOURCE_LIST
      ADDMEM(DATASET/PROD.VALUABLE.DATA/ZDR17B/NONE
            DATASET/SEC.FILING.FORMS//NONE
            RACFHC/MY_RESOURCE_LIST//NONE)
```

- The ADDMEM field defines the resources that you want checked. The format is:

className/resourceName/volume/maximumPublicAccess

- className is any valid RACF class
- resourceName is a resources name within the class
- Volume is the volume serial for a DATASET resource, otherwise no value should be specified
- maximumPublicAccess is the access level which if exceeded results in an exception. Valid values are NONE, READ, UPDATE, and CONTROL.

## z/OS V1R10: RACF Health Checks...

- In addition to defining resources in the ADDMEM value, you can specify one or more IBM-defined report sets. These report sets are:

- ▶ IRR\_APFLIST: APF data set list
- ▶ IRR\_LINKLIST: Current link list data set list
- ▶ IRR\_PARMLIB: Current PARMLIB data set list
- ▶ IRR\_RACFDB: Data sets which comprise the RACF data base
- ▶ IRR\_SYSREXX: System REXX data set
- ▶ IRR\_ICHAUTAB: ICHAUTAB entries

- Sample profile definition for a pre-defined set of resources

```
RDEFINE RACFHC MY_SYSTEM_STUFF
      ADDMEM(DATASET/SYS1.SAMPLIB//READ
            IRR_APFLIST
            IRR_RACFDB)
```

## z/OS V1R10: RACF Health Checks...

- A Health Checker PARMLIB statement is used to define your check, set its characteristics (such as the interval, severity), and associate the check with the RACFHC profile which contains the resources you want checked

```
ADD CHECK(USER01,MY_INSTALLATION_HEALTH_CHECK)
    CHECKROUTINE(IRRHCR00)
    MESSAGETABLE(IRRHCM00)
    ENTRYCODE(100)
    PARM('USER(USER01) RESOURCELIST(MY_RESOURCE_LIST)')
    DATE(yyyymmdd)
    REASON('My sensitive resources')
    GLOBAL
    ACTIVE
    SEVERITY(HIGH)
    INTERVAL(08:00)
```

## z/OS V1R10: RACF Health Checks...

- The final step is to activate your check. After adding it to a member (HZSPRMMN in this example) activate the PARMLIB entry using the MVS modify command for the Health Checker address space:

```
F HC,ADD,PARMLIB=MN
```

- Your check is now registered with the IBM Health Checker for z/OS!

Display Filter View Print Options Help

```
-----
SDSF HEALTH CHECKER DISPLAY RACFR1B                               LINE 38-53 (92)
NP  NAME                                                    CheckOwner      State           Status
   MY_INSTALLATION_HEALTH_CHECK                          USER01          ACTIVE(ENABLED) EXCEPT
   PDSE_SMPDSE1                                           IBMPDSE        ACTIVE(ENABLED) EXCEPT
   RACF_FACILITY_ACTIVE                                   IBMRAF        ACTIVE(ENABLED) SUCCES
   RACF_GRS_RNL                                           IBMRAF        ACTIVE(DISABLED) ENV N/
```

## z/OS V1R10: RACF Health Checks...

```
CHECK(USER01,MY_INSTALLATION_HEALTH_CHECK)
START TIME: 02/27/2008 16:16:22.678052
CHECK DATE: 20070425 CHECK SEVERITY: HIGH
CHECK PARM: USER(USER01) RESOURCELIST(MY_RESOURCE_LIST)
```

Resource List from MY\_RESOURCE\_LIST

S	Resource Name	Class	Vol	UACC	Warn	ID*	User
V	PROD.VALUABLE.DATA	DATASET	ZDR17B				
V	SEC.FILING.FORMS	DATASET					
V	PUBLIC.REPORTS	DATASET	REGVOL				
	MY_RESOURCE_LIST	RACFHC		None	No	****	

\* High Severity Exception \*

...  
...  
...

## z/OS V1R10: PKI Services

- **RACDCERT: Allow 4096 bit RSA keys through software**
- **PKI services – additional Distinguished Name attribute types**
  - ▶ **Distinguished Name Qualifier** – Additional disambiguation information added to the relative distinguished name. Useful when merging data from multiple sources.
  - ▶ **Domain Component** – Specifies a single component of a domain name, like 'www' or 'com'
  - ▶ **User ID** – System login name associated with a subject
- **The RACF R\_PKIServ service is updated to accept these new attributes in the Subject Distinguished Name.**

## z/OS Version 1 Release 11

### z/OS V1R11: Program Object Signature Verification

- **Allows the signing of program objects and the verification of the signature of program objects when the objects are loaded into storage**
  - ▶ BINDER: Creates signatures by calling RACF when the SIGN option has been specified
  - ▶ RACF: Stores the information (certificates, keys, and options) necessary for the signature generation and validation, calculates the signatures, performs the validations, and logs the results.
  - ▶ LOADER: Calls RACF when program objects are loaded
- **You can sign your own code and vendors can sign theirs**

## z/OS V1R11: Program Object Signature Verification...

### ▪ Why sign code?

- ▶ “Belts and suspenders” or “defense in depth”: This support is intended to be used in conjunction with existing security mechanisms .
- ▶ Digitally signing code can help increase the reliability and security of the system by adding an additional layer of controls on executable programs running on the system.
  - Digitally signing code makes it possible to detect changes to programs due to tampering or corruption.
  - Requiring that certain code be signed makes it easier to enforce change control procedures and protect against accidental changes to program code libraries. This helps avoid errors such as accidentally placing 'test' code on a 'production' system.

## z/OS V1R11: Program Object Signature Verification...

### ▪ RACF profiles are used to control program signing:

- ▶ Key ring associated with the user performing the signing
  - Contains the information appropriate for program signing (private key, X.509 certificates (signing, CertAuth) which themselves must be appropriately signed
- ▶ IRR.PROGRAM.SIGNING profile(s) in the FACILITY class
  - Used to associate the key ring owner, key ring name, and message digest algorithm used in the signature generation and validation process.

## z/OS V1R11: Program Object Signature Verification...

- **RACF profiles are used to control program verification:**
  - ▶ IRR.PROGRAM.SIGNATURE.VERIFICATION profile in the FACILITY class
    - Used to associate the key ring owner and key ring name of the key ring which contains the signature verification key ring
  - ▶ Profiles in the PROGRAM class
    - Contains information options that specify the actions to be taken during verification process:
      - SIGREQUIRED: Is a signature required for this program? (YES,NO)
      - FAILLOAD: Under what conditions should the load fail? (ANYBAD, BADSIGONLY, NEVER)
      - SIGAUDIT: What should be logged? (ALL, SUCCESS, ANYBAD, BADSIGONLY, NONE)

## z/OS V1R11: Program Object Signature Verification...

- **Considerations:**
  - ▶ Only program objects (which must reside in in PDSEs) can be signed and verified.
    - Code in PDS or z/OS Unix System Services file system, or non Program Object code cannot be signed and verified. However, z/OS UNIX programs can 'link' to signed executables in PDSEs.
  - ▶ If a signed program is zapped (executable code changed), its signature is no longer valid.
  - ▶ IBM ships portions of the System SSL product as signed code.
  - ▶ Support is new for z/OS R11 and has been rolled back to z/OS R10.
  - ▶ Any installation or software provider can use these services to sign their own code.
  - ▶ Program objects are not encrypted



## z/OS V1R11: Logon Statistics Suppression

- **Allows you to specify which applications should only record on the first system access of a day**
  - ▶ Why? Reduced I/O and lower the impact of serialization on the RACF dataset.
- **APPL profiles are used to specify which applications are taking advantage of logon statistics suppression**
  - ▶ Specify "RACF-INITSTATS(DAILY)" anywhere in the APPLDATA
  - ▶ APPL class must be active and RACLISTed

## z/OS V1R11: Identity Propagation

- **Prior to z/OS V1R11, clients using distributed server applications which used a common server or application identity for transaction executing on z/OS would not be able to pass the identity of the end user to z/OS for logging**
- **With z/OS V1R11, applications can pass the distributed identity information about the end user (distinguished name and realm) into z/OS where it will be used for logging**
  - ▶ Exploited by CICS TS 4.1
- **The distributed identity can be mapped to a RACF identity at:**
  - ▶ the distributed application server (as is often done today) or
  - ▶ the execution point on z/OS, using the new RACMAP support

```

RACMAP [ID(mapped-to-userID)]
MAP
  USERDIDFILTER(NAME('distributed-identity-username-filter'))
  REGISTRY(NAME('distributed-identity-registryname'))
  [WITHLABEL('label-name')]
| DELMAP[(LABEL('label-name'))]
| LISTMAP[(LABEL('label-name'))]

```

## z/OS V1R11: R\_admin Enhancements

- **R\_admin can now be used to extract information about general resources**
  - ▶ Extract specified profile - ADMN\_XTR\_RESOURCE (X'1F')
  - ▶ Extract next profile - ADMN\_XTR\_NEXT\_RESOURCE (X'20')
- **Authorization required for problem state callers:**
  - ▶ At least READ access to the IRR.RADMIN.RLIST resource in the FACILITY class
  - ▶ Users are limited to seeing only the information that would be displayed by an RLIST command
    - For example , audit settings will be suppressed if caller does not have the AUDITOR attribute
- **Supervisor callers can request either, both, or no check**
  - ▶ Command authority enforced by default

## z/OS V1R11: R\_admin Enhancements...

- **R\_admin SETROPTS option extraction (ADMN\_XTR\_SETR (X'16')) may now be called from problem state**
- **Authorization required for problem state caller:**
  - ▶ At least READ access to IRR.RADMIN.SETROPTS.LIST in the FACILITY class
  - ▶ Authority as enforced by the SETROPTS command
    - For example, audit settings will be suppressed if caller does not have the AUDITOR attribute
- **No changes required to existing programs other than to remove MODESET into supervisor state**

## z/OS V1R11: LDAP Change Logging of General Resources

- You can now tell RACF to create change log entries for changes to general resources by defining the profile NOTIFY.LDAP.*class-name* in the RACFEVNT class and activate the class
- Events which are logged:
  - ▶ Resource additions made using the RDEFINE command
  - ▶ Resource modifications made using the RALTER command
  - ▶ Changes to the resource's access list using the PERMIT command
  - ▶ Resource deletions made using the RDELETE command
- ICHEINTY/RACROUTE applications can create their own change log entries using R\_proxyserv (IRRSPY00)

## z/OS V1R11: REXX Interface to R\_admin Extract Functions

- IRRXUTIL allows you to extract information from the RACF database using the REXX programming language
- Data is returned as stem variables

```

/* REXX */
myrc=IRRXUTIL("EXTRACT","USER","IBMUSER","RACF")
if (word(myrc,1)=0) then do
  say "User ID is "RACF.PROFILE
  say "Owner   is "RACF.BASE.OWNER.1
  say "UID     is "RACF.OMVS.UID.1
  say "Default grp is "RACF.BASE.DFLTGRP.1
  do i=1 to RACF.BASE.CGROU.P.0
    say " Connect Group "i" "RACF.BASE.CGROU.P.i
  end
end

```

```

ex 'onghena.rrsf.clist(irrex4)'
User ID is IBMUSER
Owner   is IBMUSER
UID     is 0
Default grp is SYS1
Connect Group 1 SYSCTLG
Connect Group 2 SYS1
Connect Group 3 VSAMSET
READY

```

## z/OS V1R11: Automatic UID/GID Assignment

- **z/OS UNIX System Services tasks are associated with user and group identifiers (UIDs & GIDs)**
  - ▶ Can be assigned explicitly in RACF profiles (preferred)
    - AUTOUID/AUTOGID can be specified to generate a unique UID/GID
  - ▶ Can default from BPX.DEFAULT.USER profile
- **New option to assign permanent unique UIDs/GIDs is enabled by BPX.UNIQUE.USER profile in FACILITY class. Once enabled, RACF and UNIX System Services:**
  - ▶ Create a unique UID/GID and
  - ▶ Generates an OMVS segment for the user/group if none exists
    - APPLDATA specifies a default user profile from which the other segment information is copied.
  - ▶ Uses the existing BPX.NEXT.USER processing (from AUTOUID/AUTOGID)
- **Implemented in initUSP, getUMAP, & getGMAP, which are invoked by various UNIX system services**

## z/OS V1R11: Profile Name in Authorization Exits

- **The RACROUTE REQUEST=AUTH (ICHRCX02) and REQUEST=FASTAUTH(ICHRFX02,ICHRFX04) exits have always received a pointer to the profile which was used in the access control decision**
  - ▶ Profile is one which allowed or denied the request
  - ▶ Can differ from the resource name (if a generic profile was matched)
- **With z/OS V1R11, the exits receive the name of the profile as well**
  - ▶ For REQUEST=FASTAUTH, if the profile name is generic, then the internal format of the profile name is returned
  - ▶ RACROUTE REQUEST=AUTH, the profile name is always in external format
  - ▶ A new service is provided to map the internal format of the profile name to the external format

## z/OS V1R11: SMF Unload of WAS & TKLM SMF data

- **Support for z/OS SMF repository of audit data**
  - ▶ WebSphere Application Server (WAS) V7
  - ▶ Tivoli Key Lifecycle Manager (TKLM)
- **Both WAS and TKLM create SMF Type 83 records via the z/OS JAVA class interface to the R\_auditx service**
  - ▶ Subtype 5: WebSphere
  - ▶ Subtype 6: TKLM
- **IRRADU00 unloads XML and traditional tabular-format output files of audit data**
- **LRECL of tabular IRRADU00 output is now 12288**
  - ▶ Will be adjusted automatically by IRRADU00

## z/OS V1R11: Digital Certificate Support

- **RACDCERT multi-byte character improvements**
  - ▶ Support (installation, retrieval and authentication) for certificates which contain characters which are outside the 1047 code page.
  - ▶ If a character does not map to code page 1047, the character will be represented by 6 characters in the format of U+nnnn, where nnnn is the Unicode code point of that character in hexadecimal format
  - ▶ When the certificate profile is created, the 6-character format will contribute to the profile name.
    - There is a risk of exceeding the profile name limit, which will prevent the creation of the certificate in RACF.
- **PKI Private Key recovery**
  - ▶ Prior to z/OS V1R11, PKI services did not generate private/public key pairs. In R11, key generation and key archival capabilities are being introduced. The certificate requestor will have the option to generate the public/private key pair themselves as in previous releases or have PKI Services generate the key pair.

## z/OS V1R11: Digital Certificate Support

- **PKI Web Pages**

- ▶ PKI services now provides Java server pages (JSPs) and an XML template file to create and customize the PKI Services Web application as an alternative to the existing REXX CGI support.

- **PKI Support for SHA256 with RSA signature algorithm**

- ▶ PKI Services will support the "SHA256 with RSA encryption" signature algorithm for signing certificates, certificate and authority revocation lists (CRL/ARL), and OCSP responses