RACF® z/OS® V1R12 Update

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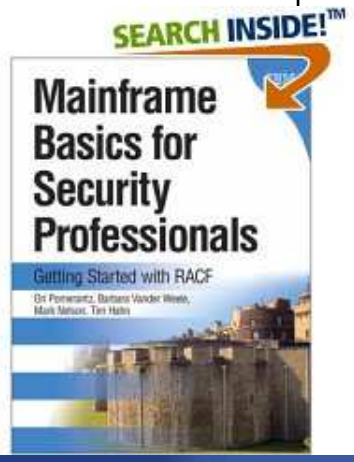

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Agenda

What's new with z/OS V1R12 RACF?

- Generic Profile Loading
- SAFTRACE filtering by user ID or general resource class
- "Ghost" Generics
- Caller's Address in RACXTRT work area
- Support for ICSF

What's new with Digital Certificate Support?

- Support for elliptic curve cryptography (ECC)
- Longer RSA keys
- DSA key types
- Extended certificate validity
- Certificate Management protocol support
- Configurable maintenance window

Agenda…

What's new with z/OS V1R11 RACF

- 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

A Quick Reminder of What's new in z/OS V1R10

z/OS V1R12

z/OS V1R12: Generic Profile Load Performance

- **RACF caches up to 4 sets of generic profile names per address space to speed up authorization checks for resources which are covered by generic profiles.**
  - Known as **GATE**s (**G**eneric **A**nchor **T**able **E**ntries).
  - One per data set HLQ or general resource class that is neither SETROPTS RACLISTed, RACLISTed using RACROUTE REQUEST=LIST,GLOBAL=YES, or SETROPTS GENLISTed
- **If an address space uses more than 4 sets of profiles RACF discards the least recently used list of generic profiles**
- **If a deleted HLQ or class is referenced, the list is built again, which can result in thrashing**
- **Prior to V1R12 what could you do?**
  - Split the RACF database
  - Physically rename data sets to reduce the number of generic profiles under a single HLQ
  - Doing an analysis of the existing generic profiles to try to reduce their numbers
  - Implementing a RACF Naming Convention Table

z/OS V1R12: Generic Profile Load Performance…

- **With V1R12, you can configure the number of sets of profiles!**
  - Specified using the RACF SET command
  - Can be set system wide or by job name
  - Minimum: 4; Maximum: 99
  - A new TRACE operand has been added to the SET command to capture data about the caching of generic profiles to assist IBM support in diagnosing problems.
- **RACF has reorganized the way that GATEs are processed:**
  - Now in 64-bit storage (instead of ELSQA)
  - No longer searched linearly

z/OS V1R12: Generic Profile Load Performance…

- **The SET Command:**

```
SET …
        [ GENERICANCHOR(
        {SYSTEM | JOBNAME(jobname ...) }
        {COUNT( number ) | RESET })
        ]
```

- **SYSTEM** increases the number of generic profile caches system wide, for all jobs which do not have an overriding value

- **JOBNAME i**ncreases the number of generic profile caches for all jobs which match the value specified. “*” may be used as a “don’t care” character at the end

- Additional tracing can be activated using this SET command:
  - **SET … [TRACE (…{ GENERICANCHOR..})**

z/OS V1R12: Generic Profile Load Performance…

- **The SET LIST Command shows the status:**

```
RACFR12 IRRH005I (@) RACF SUBSYSTEM INFORMATION:
TRACE OPTIONS - IMAGE
- NOAPPC
- SYSTEMSSL
- RACROUTE
  2 5 9
- NOCALLABLE
- NOPDCALLABLE
- NODATABASE
- GENERICANCHOR (or NOGENERICANCHOR)
...
PASSWORD SYNCHRONIZATION IS *NOT* ALLOWED
AUTOMATIC DIRECTION OF APPLICATION UPDATES IS *NOT*
ALLOWED
GENERICANCHOR:
 SYSTEM: COUNT(nn)
 JOBNAME: job1 COUNT(nn)
 job2* COUNT(nn)
```

z/OS V1R12: Generic Profile Load Performance…

- **ICHEINTY macro now supports returning multiple generic profile names:**
  - New keyword: INDEX=MULTIPLE
  - Must come from the same L1 index block
  - Must have the same HLQ or class name
  - Returned in a workarea that is provided by the caller which must be at least 4K in size
    - Each profile that is returned is prefixed with a one-byte length

z/OS V1R12: SAFTRACE Filtering

- **The SAFTRACE facility, allows an in-depth analysis of the calls made from resource managers to RACF**
  - Can trace at the RACROUTE, callable service, or ICHEINTY level
  - Cannot instruct SAFTRACE to only trace for a specific class or specific user ID
  - Trace records are written to GTF and formatted with IPCS
  - Intended for use under the direction of RACF's service team
  - SET Syntax:

```
SET TRACE(… add existing syntax here…)
```

z/OS V1R12: SAFTRACE Filtering by Class

- **With V1R12, you can control SAFTRACE records for RACROUTE and database (ICHEINTY) access by class:**

```
SET TRACE(CLASS(class … |*)      |
          IFCLASS(class …|*)     |
          NEVERCLASS(class …|*) |
          NOCLASS)
```

- **CLASS is an inclusive setting**
  - Trace records which match CLASS are recorded.
  - Trace records which do not match CLASS() *may* be recorded if they match another setting, like ASID or JOBNAME.
- **IFCLASS is an exclusive setting**
  - Trace records which do not match IFCLASS are always discarded, even if they match other trace setting, like ASID or JOBNAME.
- **NEVERCLASS** discards all trace records whose class names match, regardless of other settings

z/OS V1R12: SAFTRACE Filtering by User ID

- **With V1R12, you can also control SAFTRACE records created for RACROUTE traces by user ID:**

```
SET TRACE(USERID(userid ... |*) |
          IFUSERID(userid …|*) |
          NEVERUSERID(userid …|*) |
          NOUSERID)
```

- **USERID is an inclusive setting:**
  - Trace records which match the user id are recorded
  - Trace records which do not match USERID() *may* be recorded if they match another setting, like CLASS or JOBNAME
- **IFUSERID is an exclusive setting:**
  - Trace records which do not match IFUSERID are always discarded.even if they match other trace setting, like CLASS or JOBNAME
- **NEVERUSERID** discards all trace records whose user id names match, regardless of other settings

z/OS V1R12: “Ghost” Generics

- **RACF requires that SETROPTS GENERIC is in effect for a class before generic profiles are defined in the class**
  - If not, the profile is created as a discrete profile which contains generic characters, such as “*”, “&”, or “%”
  - Profiles such as these are:
    - Not involved in access control decisions
    - Not what you intended
    - Displayed by SEARCH, RLIST, and LISTDSD without the “(G)” after the name
    - Require that you turn generics and GENCMD off for the class, delete the profile, SETROPTS GENERIC the calss (which also turns GENCMD on), and redfine the profile
    - Annoyances to security administrators, systems programmers, and auditors

z/OS V1R12: “Ghost” Generics…

- **With V1R12, RACF now issues a warning message when creating a profile which contains generic characters (*,% or &) in a non-generic class**

```
ICH10321I The profile name profile_name contains
 genericcharacters, but generics are not enabled for class
 class_name.  A discrete profile has been created.
```

- **The message is suppressed for profiles in the RACFVARS class, in which discrete profiles with generic characters are intentionally created**

z/OS V1R12: “Ghost” Generics…

- **The RLIST command does not show existing ghost generic profiles, unless '*' is specified for the profile name**
- **The SEARCH command does display ghost generic profiles**
- **Both commands will now label ghost generic profiles as '(UNUSABLE)' in their output**

```
RLIST FACILITY T*

CLASS NAME
  ----- ----
  TIMS T* (UNUSABLE)  <--- ghost generic indicator
  ...
  CLASS NAME
  ----- ----
  TIMS T* (G)  <-- Standard generic indicator
  ...
```

z/OS V1R12: “Ghost” Generics…

- **NOGENERIC keyword added to the RDELETE command to facilitate the deletion of ghost generic**

```
RDELETE FACILITY T* NOGENERIC
```

- **Specifies that you want RACF to delete the discrete profile**
  - If a generic profile with the same name exists, it will be unaffected.
- **SAF callable service R_admin also updated such that the Delete function supports a GENERIC=N flag**
- **RACF panels also support NOGENERIC processing**

z/OS V1R12: Caller's Address in EXTRACT Area

- **Applications for which RACF gets storage on a RACROUTE REQUEST=EXTRACT are required to free this storage when the application is finished with the data**
- **Ill-behaved applications which don't free this area can cause an out-of-storage condition**
  - It's difficult to identify the offending application/request as there is no information which ties the application to the storage
- **With V1R12, the callers ASID and return address are placed in the returned work area to assist in identifying the application which create the REQUEST=EXTRACT work area**
- **Mapped in EXTWKEA in IRRPRXTW**

z/OS V1R12: RACF Enhancements for ICSF

- **New ICSF segment on CSFKEYS, GCSFKEYS, XCSFKEY, and GXCSFKEY profiles allows the specification of controls on high performance secure keys**
  - **SYMCPACFWRAP([YES|NO])** Can this High Performance Secure key be exported?
  - **ASYMUSAGE([NO]SECUREEXPORT [NO]HANDSHAKE):** Defines allowable usages of the asymmetric key(s) covered by this profile
  - **SYMEXPORTABLE(BYANY | BYLIST | BYNONE | NOSYNEXPORTABLE)**: When can the symmetric be exported? When BYLIST is chosen, the key can only be exported by an asymmetric key contained in one of the following lists.
  - **SYMEXPORTCERTS(cert-label1, cert-label2, …):** Identifies the certificates whose keys may be used to export the symmetric key. These certificates must exist within the certificate container (SAF key ring or PKCS#11 token) defined to ICSF via an ICSF setting. “*” means any certificate in the container may be used.
  - **SYMEXPORTKEYS(key-label1, key-label2, …):** Identifies the PKDS labels of keys which may be used to export the symmetric key. “*” means any key in the PKDS may be used.

z/OS V1R12: RACF Enhancements for ICSF…

- **ICSF segment fields may be extracted using RACROUTE REQUEST=EXTRACT,BRANCH=YES**
- **Mapping of in-storage ICSF segment information is in ICHPISP SAF mapping macro**
  - ICSF segment information is available to REQUEST=FASTAUTH for locally RACLISTed profiles and to REQUEST=FASTAUTH exits
- **ICSF segment is unloaded by IRRDBU00 as record type 05G0**
- **RACF panels are populated with initial values for the ICSF segment**
  - … as long as the user is authorized to list the fields and is allowed to use the R_admin interface, which requires READ authority to IRR.RADMIN.RLIST in the facility class

z/OS V1R12: Digital Certificate Enhancements

- **Support for elliptic curve cryptography (ECC) when creating certificates and when processing certificates created using ECC**
  - Complete SHA2 support (SHA224, SHA256, SHA384, SHA512)
  - Support for RACDCERT BIND and IMPORT on ECC keys
  - Support for ECC certificates and ECC keys from RACF key rings and PKCS#11 tokens using the R_datalib callable service
- **Support for RSA keys up to 4096 bits**
- **Support for DSA key types**

z/OS V1R12: Digital Certificate Enhancements…

- **Support for long issuer distinguished names**
  - Current limitation is 246 characters for the issuer's distinguished name
  - Supported by RACDCERT ADD and GENCERT, R-datalib, InitACEE, and PKI Services
  - Rolled back to z/OS V1R10 and V1R11
    - RACF APAR: OA30560
    - PKI APAR: OA30952
- **Extend certificate validity date beyond its current limit** (PKI Services:2038, RACF:2041)
  - RACF: Until the year 9999, PKI Services: For 9999 days)
  - Supported by RACDCERT ADD, IMPORT, GENCERT, REKEY, LIST, and CHECKCERT and PKI Services
  - Rolled back to V1R10 add V1R11
    - RACF APAR: OA30560 (except RACDCERT GENCERT and REKEY)
    - PKI APAR: OA30952 (requires LE PTF UK47654 (V1R10), UK47655 (V1R11)

z/OS V1R12: PKI Services Enhancements

- **Support for certificate management protocol (CMP)**
  - CMP is the protocol that is used to manage X.509 certificates within a PKI-infrastructure. The support of these CMP in accordance with RFC 4210/4211 allows greater interoperability of z/OS PKI Services:
    - Certificate Request Message, type 2 (cr)
    - Certificate Response Message, type 3 (cp)
    - PKCS10 Certificate Request Message, type 4 (p10cr)
    - Revocation Request Message, type 11 (rr)
    - Revocation Response Message, type 12 (rp)
    - Error Message, type 23 (error)
- **Support for custom X.509 certificate extensions**
- **Support for the posting of certificates and certificate revocation lists (CRLs) to LDAP at any time**
- **Configurable maintenance task execution time**

z/OS V1R11

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 accidently 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 abut 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**

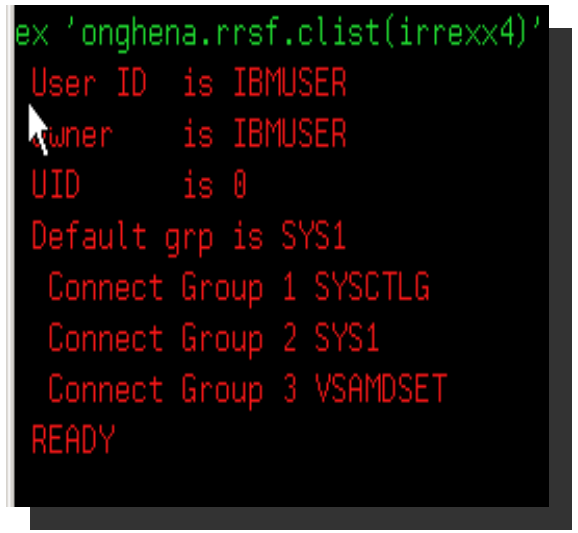
z/OS V1R11: LDAP Change Logging of General Resources

- **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.CGROUP.0
       say " Connect Group "i" "RACF.BASE.CGROUP.i
    end
  end
```



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

z/OS V1R10 RACF

Agenda

A Quick Reminder of what's in z/OS V1R10

- Custom Fields
- Password Phrase Exploitation
- More Granularity in Allowing Password Reset
- Enhanced RACF Health Checks
- Group Authorization Check Added to EIM Remote Authorization Service.