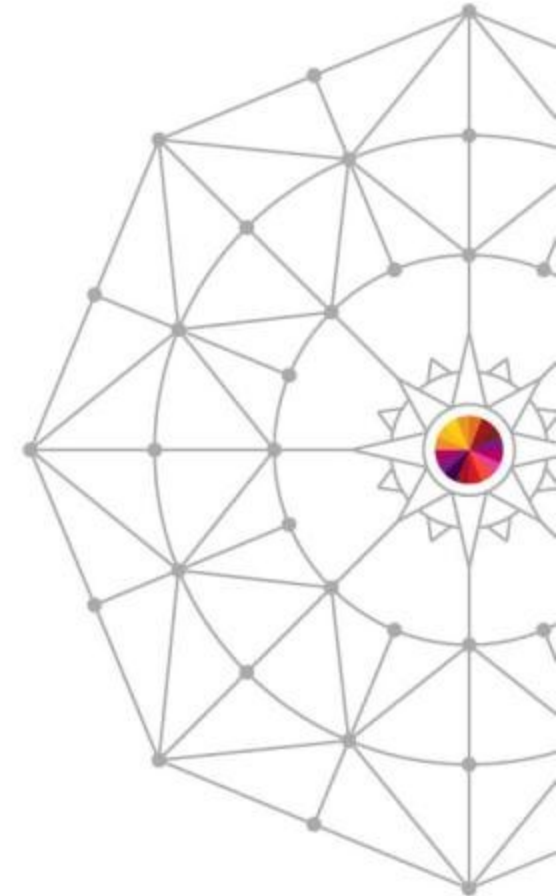


RACF and PKI Services Update

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Agenda

- **PKI Services Enhancements:**
 - Extended Validation Certificates
 - Granular Access Control
 - TKDS Support
 - CA Path length
 - CRL Notification
 - DB2 Custom Columns
- **RACF Statement of general direction**
- **RACDCERT Enhancements:**
 - RACDCERT ADD update for certificate chains
 - RACDCERT LISTCHAIN new command
 - RACDCERT CHECKCERT update
 - RACDCERT GENREQ help
- **Common Criteria Evaluation Update**
- **RRSF**
 - Support for TCP/IP V6
 - Comments in the RACF parameter library
 - TLS 1.2 cipher suite support
- **New and improved RACF Health Checks**
 - RACF_AIM_STAGE
 - RACF_AUTOUID
 - RACF_CERTIFICATE_EXPIRATION
 - RACF_SENSITIVE_RESOURCES
- Certificate issuer distinguished name, subject distinguished names and signature algorithms, in IRRDBU00 output
- &RACUID in home directory path name
- Access controls for JES2/JES3 job classes

PKI Services Overview

Digital Certificate support on z/OS

- Two main components delivering Digital Certificate support:
 - **RACF:**
 - **RACDCERT Commands** – Provides basic Digital Certificate generation and Key Ring management
 - **R_DataLib SAF Callable Service** – Provides API for accessing certificates in SAF Key rings
 - **z/OS PKI Services:**
 - Provides a fully functional Certificate Authority
 - Much more robust than a simple certificate utility like RACDCERT

PKI Services

Certificate Authority on z/OS



- PKI Services provides a full functioning **Certificate Authority**
 - Allows a organization to issue certificates signed by their own trusted CA certificate
- Provides for the full certificate life cycle:
 - End users can create a certificate **request**
 - PKI Administrators can **approve / modify / reject** requests
 - Certificates can be **revoked**
 - Certificates can be **renewed**



Certificate Life Cycle

• User Requests Certificate

• User Renews Certificate

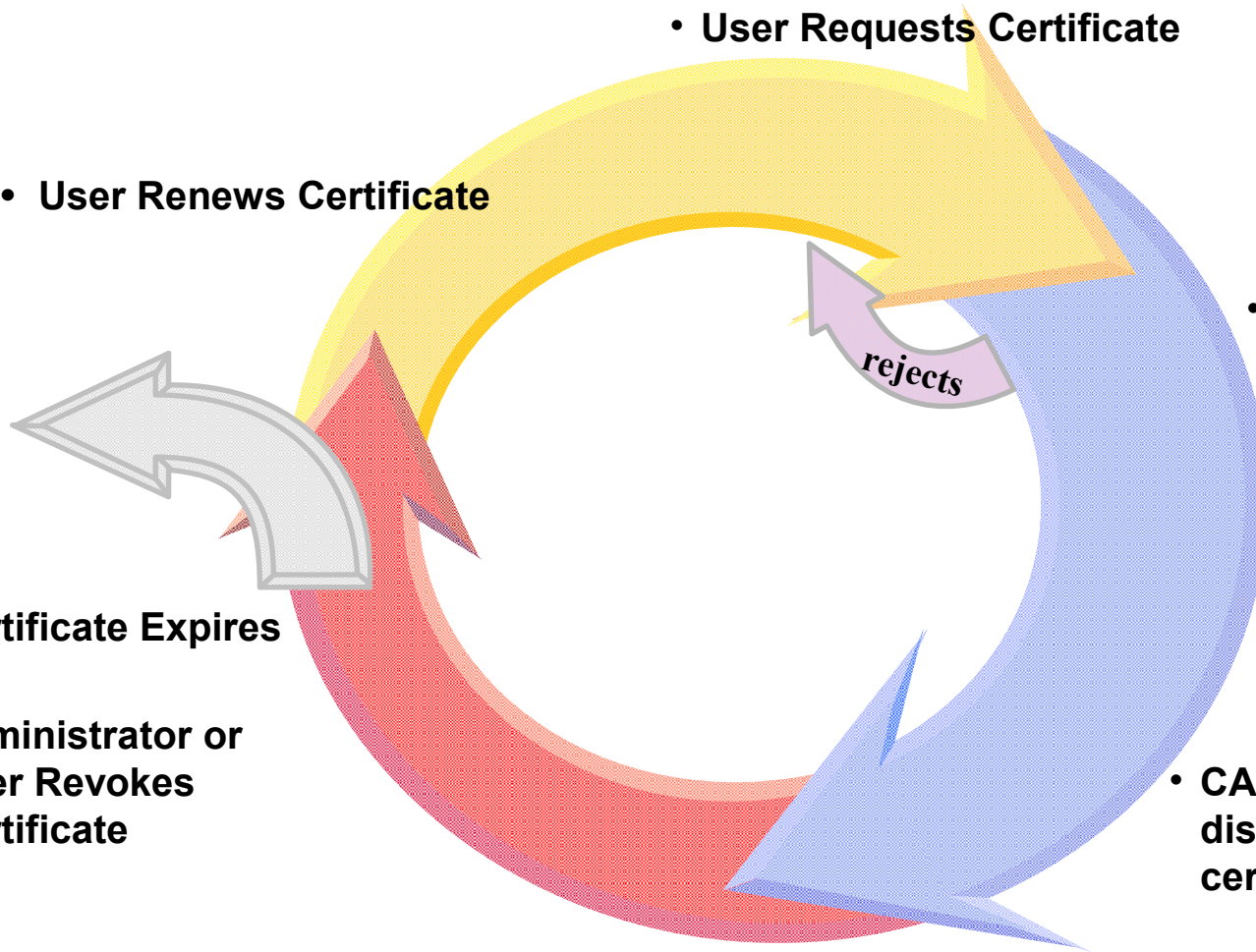
• Administrator Approves the request

rejects

• CA Generates and distributes certificate

• Owner uses the certificate

• Certificate Expires
Or
• Administrator or User Revokes Certificate



Why PKI Services on z/OS?



- **Feature rich:**
 - Responsive to customer requirements
- **Cost effective:**
 - Not a priced product - Licensed and integrated within z/OS
 - Alternative to purchasing third party certificates
- **Scalable:**
 - Scalable and available with z/OS Sysplex exploitation
 - Customers issue thousands and millions of certificates
- **Secure:**
 - CA's private key can be protected using System z Crypto hardware
 - Authority checking and Auditing through a SAF callable service - R_Pkiserv



z/OS PKI Services Hands-on Lab



- Try PKI Services out yourself at the PKI Services Hands-on Lab
 - **Date:** Thursday, March 13, 2014
 - **Time:** 6:00 PM - 7:00 PM
 - **Session:** 14964
 - **Location:** Platinum Ballroom Salon 7



PKI Services Enhancements

PKI Services

Extended Validation Certificates

- An Extended Validation Certificate (EV) is an X.509 certificate issued according to a specific set of identity verification criteria.
- These criteria require extensive verification of the requesting entity's identity by the certificate authority (CA).
- In V2R1 PKI Services is adding support for the relative distinguished names (RDN) that are required by Extended Validation certificates.
- RDNs needed for an EV certificate:
 - **businessCategory** (2.5.4.15) - Required
 - **jurisdictionOfIncorporationCountryName** (1.3.6.1.4.1.311.60.2.1.3) - Required
 - **jurisdictionOfIncorporationStateOrProvinceName** (1.3.6.1.4.1.311.60.2.1.2) - Optional
 - **jurisdictionOfIncorporationLocalityName** (1.3.6.1.4.1.311.60.2.1.1) - Optional

PKI Services

Extended Validation Certificates

- PKI Services configuration file (pkiserv.conf) updates:
 - Make sure the file has these new entries under the OID section:
 - **BUSINESSCATEGORY=2.5.4.15**
 - **JURISDICTIONCOUNTRY=1.3.6.1.4.1.311.60.2.1.3**
 - **JURISDICTIONSTATEPROV=1.3.6.1.4.1.311.60.2.1.2**
 - **JURISTDICTIONLOCALITY=1.3.6.1.4.1.311.60.2.1.1**
- PKI Services template files (pkiserv.tmpl, pkitmpl.xml) updates:
 - Use the new template - 2-Year EV SSL Server Certificate

PKI Services

Granular Administrative Access Control

- Prior to V2R1, all PKI Administrators have full control over a single PKI CA domain.
- Starting in V2R1, PKI Services adds granular administration authorization control:
 - Enables multiple PKI Services administrators to perform different actions on different types of certificates within a domain.
 - An administrator can be authorized to approve a server digital certificate, but not be authorized to approve a SCEP digital certificate.
- Authorization is based on the **domain**, **action** and the **template**:
 - A switch is provided to turn on this granular check
 - A new class **PKISERV** is created for resources used by different types of administration functions
 - If granular checking is on, these resources will be checked, **in addition to** the existing authority check on the administrative functions
 - Example:
 - READ access to
 - **MYDOMAIN.QUERYREQS.1YBSSL** and **MYDOMAIN.QUERYCERTS.1YBSSL**
 - Allow the administrator to perform QUERYREQS and QUERYCERTS on the requests and certificates respectively, created with the '1-Year PKI SSL Browser Certificate' template in domain named MYDOMAIN.

PKI Services

Granular Administrative Access Control

- Enabling Granular Administrative Access Control:
- Set up new protection profiles in the new PKISERV class
- If setting up a new instance of PKI Services, update the IKYSETUP set up script:
 - PKI Services IKYSETUP (A REXX script to set up authorization for PKI)
 - Specify **AdminGranularControl** equals 1 to set up granular control
 - Provide the template nick names you want to act on and assign the corresponding administration groups for setting up new profiles in the **PKISERV** class
- PKI Services configuration (pkiserv.conf):
 - Specify T for the **AdminGranularControl** entry in the PKI Services configuration file, to enable granular control:

AdminGranularControl = T

PKI Services DB2 Custom Columns

- PKI Services certificate requests and issued certificates are stored in either VSAM or optionally DB2.
- Prior to V2R1, PKI Services installations are unable to add custom columns to the PKI DB2 tables.
- In V2R1 PKI Services is enhanced to allow installations to add custom columns to the PKI DB2 tables.
 - This capability was restricted by the SQL processing in the PKI Services daemon
 - Enhance the SQL processing on the backend tables to facilitate DB2 customization
- Enables customers who uses DB2 as the PKI backend stores to add their own customized columns in the tables which are used by PKI internal processing

PKI Services

CA Path Length Enforcement

- PKI Services can issue intermediate Certificate Authority certificates. All CA Certificates must contain the Basic Constraints extension, which identifies:
 - Whether the certificate is a CA (required)
 - The maximum depth of the certification path (optional)
- PKI Services only created the CA indication field, but not the path length value. Although it is optional, many customers would like to have that value set to control the number of CAs that can follow.
- Starting in V2R1 PKI Services can optionally create the path length value in the Basic Constraints extension.
- This allows a CA to restrict a subordinate CA from signing another subordinate CA through the path length constraint value.

PKI Services

CA Path Length Enforcement

- PKI Service configuration (pkiserv.conf):
 - Specify T for the **EnablePathLenConstraint** entry to verify it meets path length constraint requirements and enables the setting of the **pathLenConstraint** field in the Basic Constraints extension of intermediate CA certificates created by this CA
 - Specify the length for the **PathLength** to be included in the Basic Constraints extension of intermediate CA certificates created by this CA

[CertPolicy]

...

EnablePathLenConstraint=T

PathLength=1

PKI Services

CRL Notification

- PKI Services can create Certificate Revocations Lists (CRLs) on regular intervals and post them to LDAP or an HTTP server.
- Starting in V2R1 PKI Services can be configured to optionally issue console message when CRL processing ends:
 - **IKYP044I** CRL number *crl-serial-number* processing for CA domain ca-domain completed successfully
 - **IKYP045I** CRL number *crl-serial-number* processing for CA domain ca-domain failed
 - CRL Notification console messages are optional
- A console message for CRL completion can act as a trigger for some automation processing, eg. CRLs can be saved for either legal reasons or a matter of policy

PKI Services CRL Notification

- PKI Service configuration (pkiserv.conf):
 - Specify '**file**' for the **CRLWTONotification** entry in the PKI Services configuration file, pkiserv.conf to enable CRL notification
 - This keyword will be ignored if large CRL posting support is disabled (EnableLargeCRLPosting=F) or no HTTP protocol CRL distribution point URI is defined

[CertPolicy]

...

CRLWTONotification=file

PKI Services & RACF Secure TKDS Support

Secure TKDS Support

- Unlike the keys stored in the Public Key Data Set (PKDS), the keys stored in the Token Key Data Set (TKDS) are clear keys, not secure keys.
- “**Secure Key**” means that sensitive key material is always wrapped under a master key.
- In Web Deliverable #12, ICSF supports secure key in TKDS.
- To enable the applications to use the secure key in TKDS, RACF, PKI Services and System SSL need to be updated accordingly.

PKI Services

Secure TKDS Support

- PKI Services can issue certificates with key pairs created in ICSF and with the private key stored in the TKDS.
- Starting in V2R1, PKI Services can create **secure** keys in the TKDS during certificate creation and return a PKCS#12 package containing the secure key to the requestor
 - Through new / updated **System SSL APIs** to envelop the secure key to be exported
- Allows PKI Services to issue certificates with hardware-protected keys in the token
- Provides better security on the key generation capability in PKI Services

PKI Services

Secure TKDS Support - Configuration

- PKI Services IKYSETUP (A REXX script to set up authorization for PKI):
 - Update the script to pick the desired secure TKDS key to generate the CA certificate
 - key_type=8: Secure RSA in TKDS
 - key_type=9: Secure NISTECC in TKDS
 - key_type=10: Secure BPECC in TKDS
- PKI Service configuration (pkiserv.conf):
 - Specify T for the **SecureKey** entry in the PKI Services configuration file to enable secure key generation:

```
[SAF]
```

```
...
```

```
TokenName=PKISRVD.PKIToken
```

```
SecureKey=T
```

RACF

Secure TKDS Support

- RACDCERT can create a secure key on a specified PKCS#11 token on TKDS during certificate creation
- The R_datalib callable service can return this label from RACF
- This new support allows RACDCERT to issue and use of certificates with hardware-protected keys in a PKCS#11 TKDS token.
- **Note:** RACDCERT EXPORT can not export any secure key neither from PKDS nor TKDS
- Details:
 - A label referencing this secure key will be stored in RACF in this format:
'=' || <tkds-object-handle> || <spaces-padded-to-make-length-equal-64>
 - The '=' sign indicates it is a label to a TKDS secure key

RACF

Secure TKDS Support

- RACDCERT GENCERT / REKEY command and panels:
 - New sub keyword TOKEN is added to indicate the generation of secure TKDS key. For example:
 - Generate a certificate with RSA key stored in a token called MY.PKCS11.TOKEN1 in TKDS
 - RACDCERT GENCERT SUB(CN('Company A')) WITHLABEL('New RSA cert')
RSA(**TOKEN(MY.PKCS11.TOKEN1)**)
 - Generate a certificate with NISTECC key stored in a token called MY.PKCS11.TOKEN2 in TKDS
 - RACDCERT GENCERT SUB(CN('Company A')) WITHLABEL('New ECC cert')
NISTECC(**TOKEN(MY.PKCS11.TOKEN2)**)
- R_datalib callable service:
 - For the existing private key type X'00000002' - ICSF key token label, if the first character is an '=' sign, it is a key token from the TKDS, otherwise it is from the PKDS.
 - New private key types will be handled by functions DataGetFirst and DataGetNext
 - X'0000000B' RSA key token label in the TKDS
 - X'0000000D' ECC key token label in the TKDS
 - X'0000000E' DSA key token label in the TKDS

Secure TKDS Support Clear Key Restriction

- ICSF can now restrict use of TKDS clear keys:
 - With WD#12, ICSF checks a new RACF resource profile in the CRYPTOZ class to restrict the use of clear keys in the PKCS#11 services
 - CLEARKEY.<token-label>
- Insufficient access to CLEARKEY.<token specified in pkiserv.conf> will cause unexpected result on key generation from PKI Services even if no configuration update is made to have the new secure key support
- Insufficient access to CLEARKEY.SYSTOK-SESSION-ONLY will cause the failure on the generation of clear TKDS key from RACDCERT

Note: SYSTOK-SESSION-ONLY is an ICSF predefined temporary token name

RACDCERT Enhancements

RACDCERT ADD enhancement

- Starting in V2R1 RACF is adding some new functionality to help manage certificate chains.
- **RACDCERT ADD** certificate chain enhancement:
 - When importing a **PKCS#12** or **PKCS#7** certificate chain using the RACDCERT ADD command, only the end entity certificate can be named using a specified label.
 - RACDCERT generates labels for the rest of the certificates in the chain, but previously **did not display what labels** had been added.
 - Starting in V2R1, RACDCERT will **display the generated labels** of any certificates in the chain that were added.

```
RACDCERT ID(COOPER) ADD('COOPER.CERTS.MYPKCS12') WITHLABEL('MyCert')
```

```
Certificate with label 'MyCert' is added under ID COOPER
```

```
Certificate with label 'LABEL00000002' is added under CERTAUTH
```

```
Certificate with label 'LABEL00000003' is added under CERTAUTH
```

RACDCERT LISTCHAIN

- Starting in V2R1 RACF is adding the ability to list a certificate chain with the introduction of the RACDCERT LISTCHAIN command.
- **RACDCERT LISTCHAIN Syntax:**
RACDCERT [ID(certificate-owner)| SITE | CERTAUTH]
LISTCHAIN (LABEL('label-name'))
- Information provided:
 - Certificate details for the specified certificate
 - Details for each issuing certificate which is in RACF
 - Summary of the Chain:
 - Number of certificates in the chain
 - Whether RACF contains the complete chain
 - – *chain is complete*
 - – *chain is incomplete*
 - Indication of expired certificate(s), if any
 - – *chain contains expired certificate(s)*
 - List of rings that all certificates in chain share

RACDCERT LISTCHAIN Example

```
RACDCERT LISTCHAIN(LABEL('samplecert'))
```

Certificate 1:

```
Digital certificate information for user CHOI:
```

```
Label: samplecert
```

```
...
```

```
Ring Associations:
```

```
Ring Owner: COOPER
```

```
Ring:
```

```
>testring<
```

Certificate 2:

```
Digital certificate information for CERTAUTH:
```

```
Label: sampleCA
```

```
...
```

```
Ring Associations:
```

```
Ring Owner: COOPER
```

```
Ring:
```

```
>testring<
```

Certificate 3:

```
Digital certificate information for CERTAUTH:
```

```
Label: MasterCA
```

```
...
```

```
Ring Associations:
```

```
Ring Owner: COOPER
```

```
Ring:
```

```
>testring<
```

Chain information:

```
Chain contains 3 certificate(s), chain is complete
```

```
Chain contains ring in common: COOPER/testring
```

RACDCERT CHECKCERT

- RACDCERT CHECKCERT enhancement:
 - LISTCHAIN is used to list certificates in RACF, while CHECKCERT is to list certificates in a dataset (which is going to be an input to the RACDCERT ADD)
 - Enhancements similar to LISTCHAIN were added to the display text of RACDCERT CHECKCERT, when displaying information on a certificate in a dataset.

RACDCERT GENREQ Help

- Generating a Certificate Request (CSR) from RACDCERT GENREQ requires an existing certificate in RACF with a private key (usually a self signed certificate created with GENCERT).
- Don't delete that cert!
 - A common issue encountered by RACDCERT users, is deleting the original certificate from RACF after the CSR has been generated... erroneously concluding that the certificate had no use.
 - If the original certificate is deleted from RACF after the CSR is created, the private key is also deleted, rendering any signed certificate based on this CSR useless (oops!).
- We can help!
 - Starting in V2R1 RACDCERT will prevent the deletion of a certificate that has been used for generating a request with GENREQ.
 - Force override mechanism is provided to delete this certificate when needed

RACF

Statement of general direction

RACF

Statement of general direction

- **Enhanced RACF® password encryption algorithm:**
 - In the future, an enhanced RACF password encryption algorithm is planned. This support will be designed to provide improved cryptographic strength in RACF password algorithm processing. This will be intended to help protect RACF password data in the event that a copy of a RACF database becomes inadvertently accessible.

Common Criteria Update

Common Criteria Update

- **Recent Common Criteria Evaluations of Interest:**
 - z/OS V1.13, EAL4+, 12 September, 2012
 - z/OS V1.13/RACF, EAL5+, 27 February 2013
 - z/VM Version 6 Release 1, EAL4+, 20 February, 2013
 - PR/SM for IBM zEnterprise EC12 EAL5+, 19 February 2013

RRSF

RRSF

Quick TCP/IP Review

- **Starting with z/OS V1.13, you can link RRSF nodes using TCP/IP instead of APPC! This means that you can now:**
 - Manage your RRSF network using the same skills as the rest of your TCP/IP network.
 - Ensure that the same network security policy (IDS, IPS, etc.) is in place for your RRSF network as in place for the rest of your z/OS TCP/IP network.
 - Utilize the encryption and peer-node authentication of AT-TLS
 - Convert a node from using APPC to TCP/IP without stopping communication
 - **Keep up with improvements in z/OS Communications Server Security.**

RRSF IPv6 Support



- **Starting with z/OS V2.1, RACF supports the use of TCP/IP V6 for communications between/among your RRSF nodes**
 - Once the z/OS Communications Server on your local node is configured for IPv6:
 - IPv6-format addresses will be displayed
 - You do not have to migrate to IPv6 all at once: Some “remote” nodes can be IPv4 and some IPv6.



RRSF IPv6 Addresses

Description	IPv4	IPv6
Address length	32 bits long (4 bytes)	128 bits long (16 bytes). 64 bits for network number, 64 bits for host number
Total addresses	4,294,967,296 (about 4.3 billion)	About 3.4×10^{38}
Address format in text	nnn.nnn.nnn.nnn Where $0 \leq nnn \leq 255$	xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx Where x is hex number. Double colon (::) designates any number of 0 bits
Example	9.127.42.144	2001:0db8:85a3:0000:0000:8a2e:0370:7334
Equivalent addresses	10.120.78.40	::ffff:10.120.78.40 IPv4-mapped IPv6 address
Unspecified address	0.0.0.0	:: (128 0 bits)

RRSF TARGET LIST (V1.13)

```
NODE1 <target list node(node1)
NODE1 IRRM010I (<) RSWJ SUBSYSTEM PROPERTIES OF LOCAL RRSF NODE NODE1:
STATE - OPERATIVE ACTIVE
DESCRIPTION - <NOT SPECIFIED>
PROTOCOL - APPC
    LU NAME - MF1AP001
    TP PROFILE NAME - IRRRACF
    MODENAME - <NOT SPECIFIED>
    LISTENER STATUS - ACTIVE
PROTOCOL - TCP
    HOST ADDRESS - 0.0.0.0
    IP ADDRESS - 9.57.1.243
    LISTENER PORT - 18136
    LISTENER STATUS - ACTIVE
TIME OF LAST TRANSMISSION TO - <NONE>
TIME OF LAST TRANSMISSION FROM - <NONE>
WORKSPACE FILE SPECIFICATION
    PREFIX - "NODE1.WORK"
    WDSQUAL - <NOT SPECIFIED>
    FILESIZE - 500
    VOLUME - TEMP01
    FILE USAGE
        "NODE1.WORK.NODE1.INMSG"
            - CONTAINS 0 RECORD(S)
            - OCCUPIES 1 EXTENT(S)
        "NODE1.WORK.NODE1.OUTMSG"
            - CONTAINS 0 RECORD(S)
            - OCCUPIES 1 EXTENT(S)
```

1st line indicates 'default' – not specified on TARGET.
2nd line is resolved address, if different than specified.

RRSF TARGET LIST (V2.1)

```
NODE1 <target list node(node1)
NODE1 IRRM010I (<) RSWJ SUBSYSTEM PROPERTIES OF LOCAL RRSF NODE NODE1:
STATE          - OPERATIVE ACTIVE
DESCRIPTION    - <NOT SPECIFIED>
PROTOCOL     - APPC
                LU NAME          - MF1AP001
                TP PROFILE NAME  - IRRRACF
                MODENAME         - <NOT SPECIFIED>
                LISTENER STATUS  - ACTIVE
PROTOCOL     - TCP
                HOST ADDRESS     - ::                               <<< IPv6 default
                IP ADDRESS       - ::FFFF:9.57.1.243                 <<< IPv6 address
                LISTENER PORT    - 18136
                LISTENER STATUS  - ACTIVE
TIME OF LAST TRANSMISSION TO   - <NONE>
TIME OF LAST TRANSMISSION FROM - <NONE>
WORKSPACE FILE SPECIFICATION
  PREFIX          - "NODE1.WORK"
  WDSQUAL         - <NOT SPECIFIED>
  FILESIZE        - 500
  VOLUME          - TEMP01
  FILE USAGE
    "NODE1.WORK.NODE1.INMSG"
      - CONTAINS 0 RECORD(S)
      - OCCUPIES 1 EXTENT(S)
    "NODE1.WORK.NODE1.OUTMSG"
      - CONTAINS 0 RECORD(S)
      - OCCUPIES 1 EXTENT(S)
```

If IPv6 is enabled, addresses
Are displayed in IPv6 format

RRSF

Comments in Parameter Library

- Prior to z/OS V2.1, blank lines or whole-line comments would result in an IRRC003I (“COMMAND xxxxx IS NOT VALID”) error message
- With z/OS V2.1, blank lines and whole-line comments are allowed
 - A whole-line comment begins with “//” in any column
 - Continuation characters at the end of a whole-line comment does not continue the comment
 - Whole-line comments or blank lines may not be placed within a continued command
 - Down-level systems will continue to flag whole-line and blank lines as errors
 - Examples of valid whole-line comments:
 - //This is a comment line
 - // This is a comment line
 - // define the local node with a socket listener

RRSF

TLS 1.2 Cipher Suite Support

- **RRSF uses Application Transparent Transport Layer Security (AT-TLS) to encrypt data between RRSF nodes**
 - AT-TLS supports more cryptography suites in z/OS V2.1
 - Certificates are used in AT-TLS to provide secure connections between RRSF systems using TCP/IP
 - In z/OS V2R1, ECC certificates with stronger encryption may be used
 - All cryptography suites in Transport Layer Security (TLS) Protocol Version 1.2 are supported
- **When a connection is established between 2 RRSF systems, here is an example of the informational message issued by RACF:**
 - `IRRI027I (>) RACF COMMUNICATION WITH TCP NODE NODE1 HAS BEEN SUCCESSFULLY ESTABLISHED USING CIPHER ALGORITHM C026 TLS_ECDH_ECDSA_WITH_AES_256_CBC_SHA384.`

Health Check Updates

Health Checks

New and Updated Checks

- **RACF supports these new checks in z/OS V2.1:**
 - RACF_AIM_STAGE
 - RACF_UNIX_ID
 - RACF_CERTIFICATE_EXPIRATION
- **RACF_AIM_STAGE and RACF_UNIX_ID are intended to assist you in migrating from BPX.DEFAULT.USER, which, as announced, is being withdrawn with z/OS V2.1**
 - These two checks rolled back to z/OS V1.12 and z/OS V1.13 with OA37164
- **Automatic start for the Health Checker address space at IPL time**

Health Checks

RACF_AIM_STAGE

- **The RACF_AIM_STAGE Health Check examines your application identity mapping (AIM) setting and flags as an exception if you are at a stage less than stage 3.**
 - Stage 0: No AIM support; only mapping profiles are used
 - Stage 1: Mapping profiles are used; alternate index created and managed, but not used
 - Stage 2: Alternate index create, managed, and used; mapping profiles maintained.
 - Stage 3: Only alternate index maintained and used. Mapping profiles deleted.
- **Moving from each stage requires the execution of the IRRIRA00 utility.**
- **AIM stage 2 or stage 3 is needed for certain RACF functions**

Health Checks

RACF_AIM_STAGE (OK)

```
Display Filter View Print Options Search Help
-----
SDSF OUTPUT DISPLAY RACF_AIM_STAGE          LINE 0          COLUMNS 02- 81
COMMAND INPUT ===>                          SCROLL ===> HALF
***** TOP OF DATA *****
CHECK (IBMRACF,RACF_AIM_STAGE)
START TIME: 05/11/2012 14:36:29.892717
CHECK DATE: 20110101  CHECK SEVERITY: MEDIUM

IRRH500I The RACF database is at the suggested stage of application
identity mapping (AIM). The database is at AIM stage 03.

END TIME: 05/11/2012 14:36:29.893680  STATUS: SUCCESSFUL
***** BOTTOM OF DATA *****
```


Health Checks

RACF_AIM_STAGE (Exception)

```
Display Filter View Print Options Search Help
-----
SDSF OUTPUT DISPLAY RACF_AIM_STAGE          LINE 0          COLUMNS 02- 81
COMMAND INPUT ===>                          SCROLL ===> HALF
***** TOP OF DATA *****
CHECK (IBMRACF,RACF_AIM_STAGE)
START TIME: 05/17/2012 16:42:53.891503
CHECK DATE: 20110101  CHECK SEVERITY: MEDIUM

* Medium Severity Exception *

IRRH501E The RACF database is not at the suggested stage of application
identity mapping (AIM). The database is at AIM stage 00.

Explanation:  The RACF_AIM_STAGE check has determined that the RACF
database is not at the suggested stage of application identity
mapping (AIM). Your system programmer can convert your RACF database
using the IRRIRA00 conversion utility. See z/OS Security Server RACF
System Programmer's Guide for information about running the
IRRIRA00 conversion utility.

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

Health Checks

RACF_UNIX_ID

- **The RACF_UNIX_ID Health Check determines whether RACF will automatically assign unique z/OS UNIX System Services identities when users without OMVS segments use certain UNIX services**
 - If you are not relying on RACF to assign UIDs and GIDs, the check informs you that you must continue to assign z/OS UNIX identities
 - If you are relying on the BPX.DEFAULT.USER support, the check issues an exception
 - If you are relying on the BPX.UNIQUE.USER support, the check will verify requirements and indicate if any exceptions are found
 - FACILITY class profile BPX.UNIQUE.USER must exist
 - RACF database must be at Application Identity Mapping (AIM) stage 3
 - UNIXPRIV class profile SHARED.IDS must be defined
 - UNIXPRIV class must be active and RACLISTed
 - FACILITY class profile BPX.NEXT.USER must be defined and its APPLDATA field must contain valid ID values or ranges
 - *Note: The check only lists the APPLDATA content, it does not validate it.*

Health Checks

RACF_UNIX_ID (OK)

```
Display Filter View Print Options Search Help
-----
SDSF OUTPUT DISPLAY RACF_UNIX_ID          LINE 0          COLUMNS 02- 81
COMMAND INPUT ===>                        SCROLL ===> HALF
***** TOP OF DATA *****
CHECK (IBMRACF,RACF_UNIX_ID)
START TIME: 05/18/2012 13:56:53.321238
CHECK DATE: 20110101  CHECK SEVERITY: MEDIUM

IRRH504I RACF is not enabled to assign UNIX IDs when users or groups
that do not have OMVS segments use certain z/OS UNIX services. If you
choose not to define UNIX IDs for each user of UNIX functions, you can
enable RACF to automatically generate unique UNIX UIDs and GIDs for you.

END TIME: 05/18/2012 13:56:53.322242  STATUS: SUCCESSFUL
***** BOTTOM OF DATA *****

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

Health Checks

RACF_UNIX_ID (OK)

***** TOP OF DATA *****

CHECK (IBMRACF,RACF_UNIX_ID)

START TIME: 05/18/2012 14:12:18.914396

CHECK DATE: 20110101 CHECK SEVERITY: MEDIUM

IRRH502I RACF attempts to assign unique UNIX IDs when users or groups that do not have OMVS segments use certain z/OS UNIX services.

Requirements for this support:

S Requirement

FACILITY class profile BPX.UNIQUE.USER is defined
RACF database is at the required AIM stage:
 AIM stage = 03
UNIXPRIV class profile SHARED.IDS is defined
UNIXPRIV class is active
UNIXPRIV class is RACLISTed
FACILITY class profile BPX.NEXT.USER is defined
BPX.NEXT.USER profile APPLDATA is specified (not verified):
 APPLDATA = 1000/100

IRRH506I The RACF UNIX identity check has detected no exceptions.

END TIME: 05/18/2012 14:12:18.921241 STATUS: SUCCESSFUL

Health Checks

RACF_UNIX_ID (Exception)

```
Display Filter View Print Options Search Help
-----
SDSF OUTPUT DISPLAY RACF_UNIX_ID          LINE 0          COLUMNS 02- 81
COMMAND INPUT ==>                          SCROLL ==> HALF
***** TOP OF DATA *****
CHECK(IBMRA CF,RACF_UNIX_ID)
START TIME: 05/17/2012 16:45:01.400010
CHECK DATE: 20110101  CHECK SEVERITY: MEDIUM

IRRH502I RACF attempts to assign unique UNIX IDs when users or groups
that do not have OMVS segments use certain z/OS UNIX services.

Requirements for this support:

S Requirement
-----
FACILITY class profile BPX.UNIQUE.USER is defined
E RACF database is not at the required AIM stage:
  AIM stage = 00
E UNIXPRIV class profile SHARED.IDS is not defined
E UNIXPRIV class is not active
E UNIXPRIV class is not RA CLISTed
E FACILITY class profile BPX.NEXT.USER is not defined

* Medium Severity Exception *

IRRH503E RACF cannot assign unique UNIX IDs when users or groups that
do not have OMVS segments use certain z/OS UNIX services. One or more
requirements are not satisfied.

Explanation: The RACF UNIX identity check has determined that you
want RACF to assign unique UNIX IDs when users or groups without
OMVS segments use certain z/OS UNIX services. However, RACF is not
able to assign unique UNIX identities for z/OS UNIX services because
one or more of the following requirements are not satisfied:
```

Health Checks

RACF_UNIX_ID (Exception)

***** TOP OF DATA *****

CHECK (IBMRACF,RACF_UNIX_ID)

START TIME: 05/18/2012 14:22:52.066301

CHECK DATE: 20110101 CHECK SEVERITY: MEDIUM

* Medium Severity Exception *

IRRH505E The BPX.DEFAULT.USER profile in the FACILITY class indicates that you want RACF to assign shared default UNIX IDs when users or groups that do not have OMVS segments use certain z/OS UNIX services.

Explanation: The RACF UNIX identity check has found the BPX.DEFAULT.USER profile in the FACILITY class. The presence of this profile indicates an intent to have RACF assign shared default UNIX UIDs and GIDs when users without OMVS segments access the system to use certain UNIX services.

Reference Documentation:

z/OS Security Server RACF Security Administrator's Guide

Automation: None.

Check Reason: Unique UNIX identities are recommended.

END TIME: 05/18/2012 14:22:52.067783 STATUS: EXCEPTION-MED

Health Checks

RACF_CERTIFICATE_EXPIRATION

- **The RACF_CERTIFICATE_EXPIRATION health check finds the certificates in the RACF database expired or about to expire**
 - Expiration window is an installation-defined value with a default of 60 days.
 - Valid expiration window values are 0-366 days
- **For each certificate, the check displays:**
 - The certificate “owner” ('SITE', 'CERTAUTH', or 'ID(*user_id*)')
 - The certificate label
 - The end date
 - The trust status
 - The number of rings to which the certificate is connected
- **The check only flags as exceptions those certificates which are TRUSTED.**

Health Checks

RACF_CERTIFICATE_EXPIRATION (OK)

```
CHECK (IBMRACF,RACF_CERTIFICATE_EXPIRATION)
START TIME: 01/23/2012 08:10:01.603497
CHECK DATE: 20111010 CHECK SEVERITY: MEDIUM
```

Certificates Expiring in 60 Days

S	Cert Owner	Certificate Label	End Date	Trust Rings
-	-----	-----	-----	-----

```
IRRH277I No exceptions are detected. Expired certificates that are not
trusted or are associated with only a virtual key ring are not
exceptions.
```

```
END TIME: 01/23/2012 08:10:01.643285 STATUS: SUCCESSFUL
```


Health Checks

RACF_CERTIFICATE_EXPIRATION (Exception)



```
CHECK (IBMRACF,RACF_CERTIFICATE_EXPIRATION)
START TIME: 02/28/2013 09:23:37.747549
CHECK DATE: 20111010 CHECK SEVERITY: MEDIUM
```

Certificates Expiring within 60 Days

S	Cert Owner	Certificate Label	End Date	Trust	Rings
E	CERTAUTH	VERISIGN CLASS 1 INDIVIDUAL	2008-05-12	Yes	0
E	ID (MARKN)	MARK-001	2012-11-11	Yes	0
E	ID (MARKN)	MARK0001	2012-11-05	Yes	0
	ID (CERTAUTH)	START_OFF_M001__END_OFF_M001	2012-01-25	No	0
	ID (MARKN)	START_OFF_M001__END_OFF_M001	2012-01-25	No	0
	ID (SITE)	START_OFF_M001__END_OFF_M001	2012-01-25	No	0
	CERTAUTH	START_OFF_M365__END_OFF_M001	2012-01-25	No	0
	ID (CERTAUTH)	START_OFF_M365__END_OFF_M001	2012-01-25	No	0
	CERTAUTH	ICP-Brasil CA	2011-11-30	No	0
	CERTAUTH	MICROSOFT ROOT AUTHORITY - 01	2002-12-31	No	0
	CERTAUTH	VERISIGN CLASS 3 PUBLIC	2004-01-07	No	0
	CERTAUTH	VERISIGN CLASS 2 PUBLIC	2004-01-06	No	0

* Medium Severity Exception *

IRRH276E One or more certificates expired or are expiring within the warning period.

Explanation: The RACF_CERTIFICATE_EXPIRATION check found one or more certificates that expired or are expiring within the warning period.



Health Checks

RACF_CERTIFICATE_EXPIRATION (Exception)

The RACF_CERTIFICATE_EXPIRATION check lists each certificate that has an ending date prior to the current date or that has an ending date that is prior to the current date adjusted by the warning period that the installation has specified as a parameter to the RACF_CERTIFICATE_EXPIRATION check. If a parameter is not specified, a default warning period of 60 days is used.

Only certificates that are marked as trusted result in exceptions. These certificates have an "E" in the "S" (Status) column. The trust status of the certificate is shown in the "Trust" column. The number of key rings to which the certificate is connected (other than the virtual key ring) is shown in the "Rings" column.

Use the RACDCERT LIST command to list complete information about any certificate. The RACDCERT command syntax is:

```
RACDCERT CERTAUTH    LIST(LABEL('label-name'))
                    or
RACDCERT SITE        LIST(LABEL('label-name'))
                    or
RACDCERT ID(user-id) LIST(LABEL('label-name'))
```

See z/OS Security Server RACF Security Administrator's Guide and the z/OS Security Server RACF Command Language Reference for more information about digital certificates.

System Action: The check continues processing. There is no effect on the system.

Health Checks

RACF_SENSITIVE_RESOURCES

- The RACF_SENSITIVE_RESOURCES check has been updated to check these new “static” resources names:
 - BPX.DEBUG / FACILITY
 - BPX.WLMSERVER / FACILITY
 - IEAABD.DMPAKEY / FACILITY
 - MVS.SLIP / OPERCMDMS
 - SUPERUSER.PROCESS.GETPSENT / UNIXPRIV
 - SUPERUSER.PROCESS.KILL / UNIXPRIV
 - SUPERUSER.PROCESS.PTRACE / UNIXPRIV

Health Checks

RACF_SENSITIVE_RESOURCES...

- The RACF_SENSITIVE_RESOURCES checks these new “dynamic” resources names:
 - CSVAPF.*data_set_name* / FACILITY, excluding
 - CSVAPF.MVS.SETPROG.FORMAT.DYNAMIC
 - CSVDYLPA.ADD.*module_name* / FACILITY
 - CSVDYNEX.*exit_name.function.modname* / FACILITY, excluding
 - CSVDYNEX.LIST
 - CSVDYNEX.*exit_name*.RECOVER
 - CSVDYNEX.*exit_name*.CALL
 - CSVDYNL.*Inklstname*. *Function* / FACILITY excluding
 - CSVDYNL.*Inklstname*.DEFINE CSVDYNL.*Inklstname*.UNDEFINE)
- No validation is performed on the dynamic portion of these resource names (for example *data_set_name*, *module_name*, *Inklstname*)

Health Checks

RACF_SENSITIVE_RESOURCES...

Sensitive General Resources Report

S	Resource Name	Class	UACC	Warn	ID*	User

	<existing resources>					
	BPX.WLMSEVER	FACILITY	Updt	No	****	
	CSVAPF.RACFDEV.DISCRETE.NONE.LOAD	FACILITY	None	No	****	
	CSVAPF.RACFDEV.DISCRETE.READ.LOAD	FACILITY	Read	No	****	
E	CSVAPF.RACFDEV.DISCRETE.UPDATE.LOAD	FACILITY	Updt	No	****	
	CSVAPF.RACFDEV.**.NONE.LOAD	FACILITY	None	No	****	
	CSVAPF.RACFDEV.**.READ.LOAD	FACILITY	Read	No	****	
E	CSVAPF.RACFDEV.**.UPDATE.LOAD	FACILITY	Updt	No	****	
E	CSVDYLPA.ADD.MODULE001	FACILITY	Updt	No	****	
E	CSVDYLPA.DELETE.MODULE01	FACILITY	Updt	No	****	
E	CSVDYLPA.ADD.*	FACILITY	Updt	No	****	
E	CSVDYLPA.DELETE.*	FACILITY	Updt	No	****	
	CSVDYNEX.EXITNAME_READ.MODNAME01	FACILITY	Read	No	****	
E	CSVDYNEX.EXITNAME_UPDATE.DEFINE	FACILITY	Updt	No	****	
E	CSVDYNEX.EXITNAME_UPDATE.MODNAME01	FACILITY	Updt	No	****	
E	CSVDYNEX.*.DEFINE	FACILITY	Updt	No	****	
E	CSVDYNEX.*.MODNAME01	FACILITY	Updt	No	****	
E	CSVDYNEX.*	FACILITY	Updt	No	****	
E	IEAABD.DMPAKEY	FACILITY	Read	No	****	
E	IEAABD.DMPAUTH	FACILITY	Read	No	****	

Certificate Distinguished Names in IRRDBU00 Output

IRRDBU00: Additional Certificate Information

- **The RACF Database Unload Utility (IRRDBU00) unloads basic information about digital certificates into the 0560 (“General Resource Certificate Data Record”). This record contains:**
 - The record type (“0560”)
 - The name of the general resource profile which contains the certificate
 - The class (“DIGTCERT”)
 - The date and time from which the certificate is valid
 - The date and time from which the certificate is no longer valid
 - The type of key associated with the certificate
 - The key size
 - The last eight bytes of the last certificate signed with this key
 - A sequence number for certificates within a ring
- **What's missing? The issuer's distinguished name (IDN) and the subject's DN (SDN) of the certificate!**
 - This information is encoded within the certificate
 - Maps to the profile name, but given the profile name, you can't get the IDN or SDN

IRRDBU00: Additional Certificate Information

- **A new record type (“1560”) contains:**
 - The issuer's distinguished name
 - The subject's distinguished name
 - The hashing algorithm used for the signing the certificate
- **The “1560” record links to the “0560” record using the profile name**
 - DFSORT's JOINKEY operator can be used when processing IRRDBU00 output
- **The Mapping of the 1560 Record is:**

Field Name	Type	Position		Comments
		Start	End	
CERTN_RECORD_TYPE	Int	1	4	Record type of the certificate information record (1560).
CERTN_NAME	Char	6	251	General resource name as taken from the profile name.
CERTN_CLASS_NAME	Char	253	260	Name of the class to which the general resource profile belongs.
CERTN_ISSUER_DN	Char	262	1285	Issuer's distinguished name. (1024 characters)
CERTN_SUBJECT_DN	Char	1287	2310	Subject's distinguished name. (1024 characters)
CERTN_SIG_ALG	Char	2312	2327	Certificate signature algorithm. Valid values are md2RSA, md5RSA, sha1RSA, sha1DSA, sha256RSA, sha224RSA, sha384RSA, sha512RSA, sha1ECDSA, sha256ECDSA, sha224ECDSA, sha384ECDSA, sha512ECDSA, and UNKNOWN.

&RACUID and BPX.UNIQUE.USER

&RACUID in BPX.UNIQUE.USER

- **Clients who are using BPX.UNIQUE.USER to assign z/OS UNIX information to user IDs will be able to specify specification of &racuid in the home directory field of the model user's OMVS segment.**
 - `ALTUSER BPXMODEL OMVS (HOME (/u/&racuid))`
- **The appropriate user ID will be substituted for &racuid when a new OMVS segment is created for a user using BPX.UNIQUE.USER**
 - In upper case if “&RACUID” is specified
 - In lower case if any lower case characters are specified
- **Notes**
 - Only the first occurrence of &racuid is substituted
 - If the substitution would result in a path name exceeding the 1023 character maximum then substitution is not performed.
 - If sharing the RACF database with a downlevel system, substitution will not be performed on the downlevel system

JES2/JES3 SAF Check for Job Input Class

JES2 / JES3

SAF Check for Job Input Class

- **JES2 and JES3 will perform a SAF check to verify a user's ability to use a job class**
 - Applied to both the “traditional” 36 single character classes as well as the new up-to-eight character job classes
 - Does not apply to the “special” job classes STC and TSU
- **The resource name that is checked is:**
 - *JESJOBS.nodename.jobclass.jobname*
- **Controlled by these profiles:**
 - JES.JOBCLASS.OWNER in the FACILITY class
 - If this profile is defined, then authorization checks are performed for job owners
 - JES.JOBCLASS.SUBMITTED in the FACILITY class
 - If this profile is defined, then authorization checks are performed for job submitters

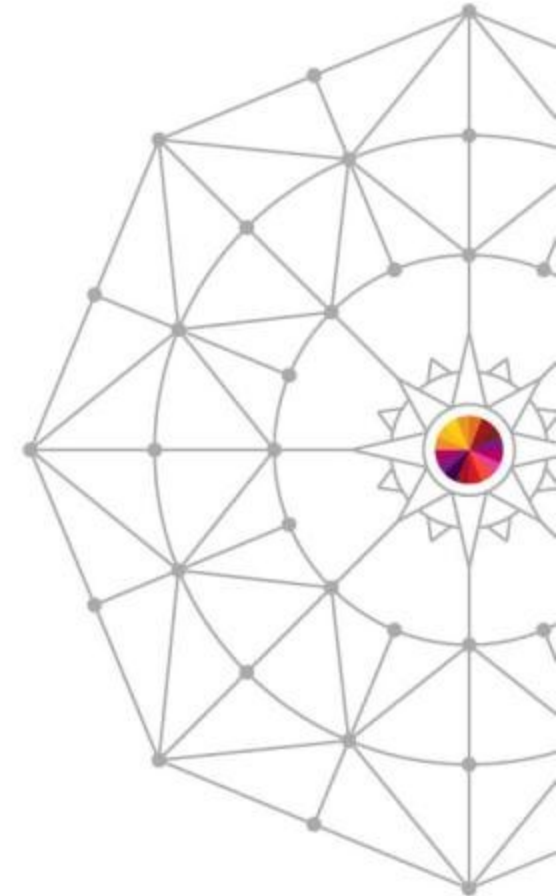
Agenda

- **PKI Services Enhancements:**
 - Extended Validation Certificates
 - Granular Access Control
 - TKDS Support
 - CA Path length
 - CRL Notification
 - DB2 Custom Columns
- **RACF Statement of general direction**
- **RACDCERT Enhancements:**
 - RACDCERT ADD update for certificate chains
 - RACDCERT LISTCHAIN new command
 - RACDCERT CHECKCERT update
 - RACDCERT GENREQ help
- **Common Criteria Evaluation Update**
- **RRSF**
 - Support for TCP/IP V6
 - Comments in the RACF parameter library
 - TLS 1.2 cipher suite support
- **New and improved RACF Health Checks**
 - RACF_AIM_STAGE
 - RACF_AUTOUID
 - RACF_CERTIFICATE_EXPIRATION
 - RACF_SENSITIVE_RESOURCES
- Certificate issuer distinguished name, subject distinguished names and signature algorithms, in IRRDBU00 output
- &RACUID in home directory path name
- Access controls for JES2/JES3 job classes

RACF and PKI Services Update

Ross Cooper, CISSP®
IBM Corporation

March 10th, 2014
Session: 14960



Background: z/OS V1.13 Statement of Direction BPX.DEFAULT.USER

Statement of Direction

z/OS V1.13 is planned to be the last release to support BPX.DEFAULT.USER. IBM recommends that you either use the BPX.UNIQUE.USER support that was introduced in z/OS V1.11, or assign unique UIDs to users who need them and assign GIDs for their groups.

From Preview: z/OS Version 1 Release 13 and z/OS Management Facility Version 1 Release 13 are planned to offer new availability, batch programming, and usability functions (IBM United States Software Announcement 211-007, February 15, 2011)

z/OS V1.13 Statement of Direction...

- **Background: Assigning UID and GIDs**
 - **RACF 2.1 (1994):** Introduced OMVS segments for USERS and GROUPS.
 - Users with an OMVS segment could now use “Open MVS” (now z/OS UNIX System Services)
 - **OS/390 R2.4 (1997):** Introduced BPX.DEFAULT.USER FACILITY class profile
 - Allows assigning UIDs and GIDs to users and groups who do not have OMVS segments;

One UID and one GID shared by all default users

z/OS V1.13 Statement of Direction...

- **Background: Assigning UID and GIDs...**
 - **z/OS V1.4 (2002):** Introduced AUTOUID/AUTOGID keyword on ADDUSER, ALTUSER, ADDGROUP, ALTGROUP
 - RACF could now find the next available UID or GID using the BPX.NEXT.USER profile in the FACILITY class
 - Required enabling RACF Alternate Index Mapping (“AIM”) to stage 2
 - *Limitation of 129 eight-character users sharing one UID*
 - *Required running migration utility (“IRRIRA00”)*
 - **z/OS V1.11 (2009):** Automatic generation of OMVS segment for USERS and groups
 - Built upon AUTOUID/AUTOGID
 - Requires AIM stage 3
 - Uses the BPX.UNIQUE.USER profile in the FACILITY class

z/OS V1.13 Statement of Direction (RACF)...

What this means to you:

- If you are using BPX.UNIQUE.USER then:
 - You are not using BPX.DEFAULT.USER (even if it is defined)
 - This SoD has no impact to you.
- If you are already assigning UIDs and GIDs to all users using z/OS UNIX System Services by assigning OMVS segments to all necessary users and groups, then:
 - You must continue to assign all new users and groups OMVS segments
- If you are already assigning UIDs and GIDS to all users using z/OS UNIX System Services by defining OMVS segments using AUTOUID/AUTOGID (which uses BPX.NEXT.USER) then:
 - You are already using AIM at a minimum of stage 2
 - You must continue to assign all new users and groups OMVS segments
- If you are using only BPX.DEFAULT.USER
 - You must either move to the automatic generation of OMVS user and group segments or assign OMVS user and group segments to all necessary users and groups

z/OS V1.13: Health Check – Default UNIX ID

```

Display  Filter  View  Print  Options  Search  Help
-----
SDSF OUTPUT DISPLAY ZOSMIGV2R1_DEFAULT_UNIX_ID      LINE 0          COLUMNS 02- 81
COMMAND INPUT ==>                                     SCROLL ==> HALF
***** TOP OF DATA *****
CHECK (IBMRACF,ZOSMIGV2R1_DEFAULT_UNIX_ID)
START TIME: 05/11/2012 14:38:04.920543
CHECK DATE: 20110101  CHECK SEVERITY: LOW

IRRH504I RACF is not enabled to assign UNIX IDs when users or groups
that do not have OMVS segments use certain z/OS UNIX services. If you
choose not to define UNIX IDs for each user of UNIX functions, you can
enable RACF to automatically generate unique UNIX UIDs and GIDs for you.

END TIME: 05/11/2012 14:38:04.921996  STATUS: SUCCESSFUL
***** BOTTOM OF DATA *****

```

- **This is a migration check!**
 - Note the name: ZOSMIGV2R1.....This check is to prepare you to identify issues when you migrate to z/OS V2.1
 - Shipped INACTIVE; you activate when you start your V2.1 migration planning

Helpful Publications

- SA22-7691 - z/OS Security Server RACF Callable Services
- SA22-7687 - z/OS Security Server RACF Command Language Reference
- GA22-7680 - z/OS Security Server RACF Data Areas
- SA22-7682 - z/OS Security Server RACF Macros and Interfaces
- SA22-7686 - z/OS Security Server RACF Messages and Codes
- SA22-7683 - z/OS Security Server RACF Security Administrator's Guide
- SA22-7681 - z/OS Security Server RACF System Programmer's Guide
- SA22-7692 - z/OS Security Server RACROUTE Macro Reference
- GA22-7689 - z/OS Security Server RACF Diagnosis Guide
- SA22-7693 - z/OS Cryptographic Services PKI Services Guide and Reference
- SC24-5901 - z/OS Cryptographic Services System Secure Sockets Layer Programming
- SA23-2231 - z/OS ICSF Writing PKCS #11 Applications
- SA22-7807 - z/OS UNIX System Services: Messages and Codes
- SA22-7803 - z/OS UNIX System Services Programming: Assembler Callable Services Reference
- SC31-8775 - z/OS Communication Server: IP Configuration Guide
- GC31-8782 - z/OS Communication Server: IP Diagnosis Guide
- SC31-8781 - z/OS Communication Server: IP System Administrator's Commands
- SA22-7994 - IBM Health Checker for z/OS User's Guide