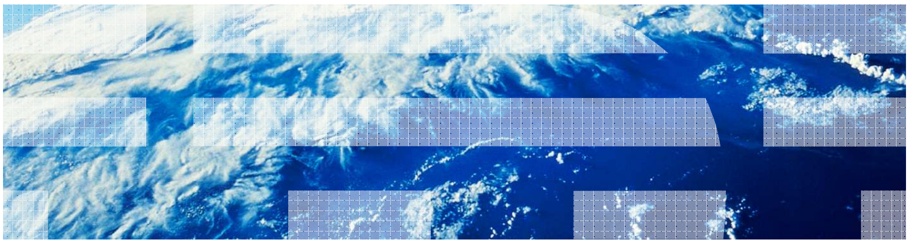
The IBM® Health Checker for z/OS®, IRRXUTIL, and You

Mark Nelson
Session AST14
z/OS Security Server (RACF ®) Design and Development. IBM Poughkeepsie
markan@us.ibm.com



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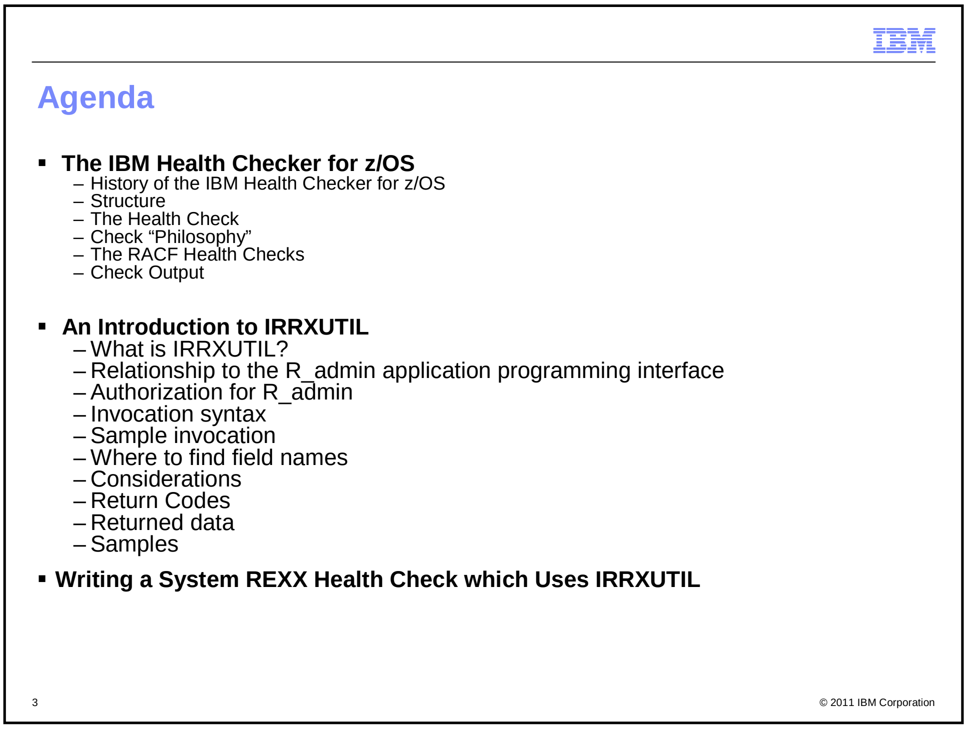

Agenda

- **The IBM Health Checker for z/OS**
  - History of the IBM Health Checker for z/OS
  - Structure
  - The Health Check
  - Check “Philosophy”
  - The RACF Health Checks
  - Check Output
- **An Introduction to IRRXUTIL**
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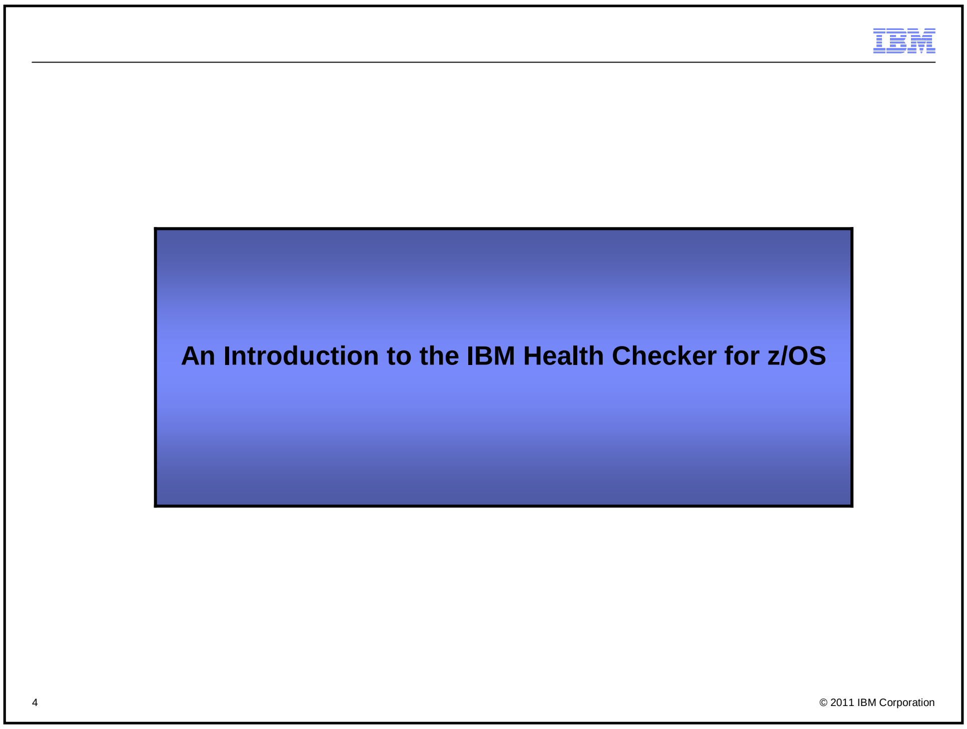
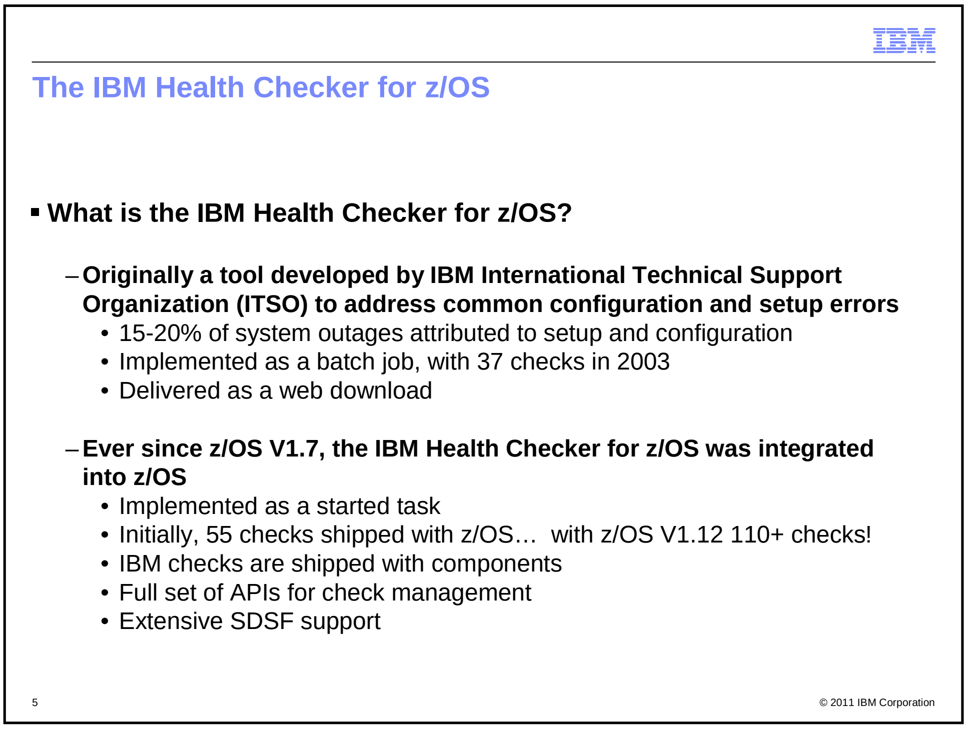
  - Relationship to the R_admin application programming interface
  - Authorization for R_admin
  - Invocation syntax
  - Sample invocation
  - Where to find field names
  - Considerations
  - Return Codes
  - Returned data
  - Samples
- **Writing a System REXX Health Check which Uses IRRXUTIL**

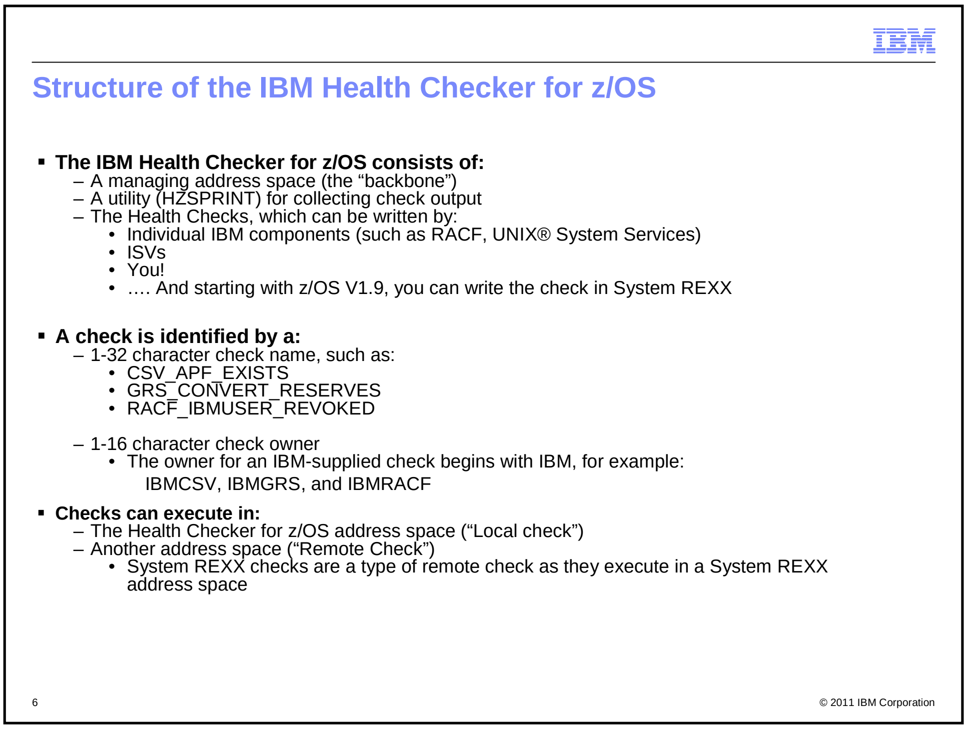


An Introduction to the IBM Health Checker for z/OS



The IBM Health Checker for z/OS

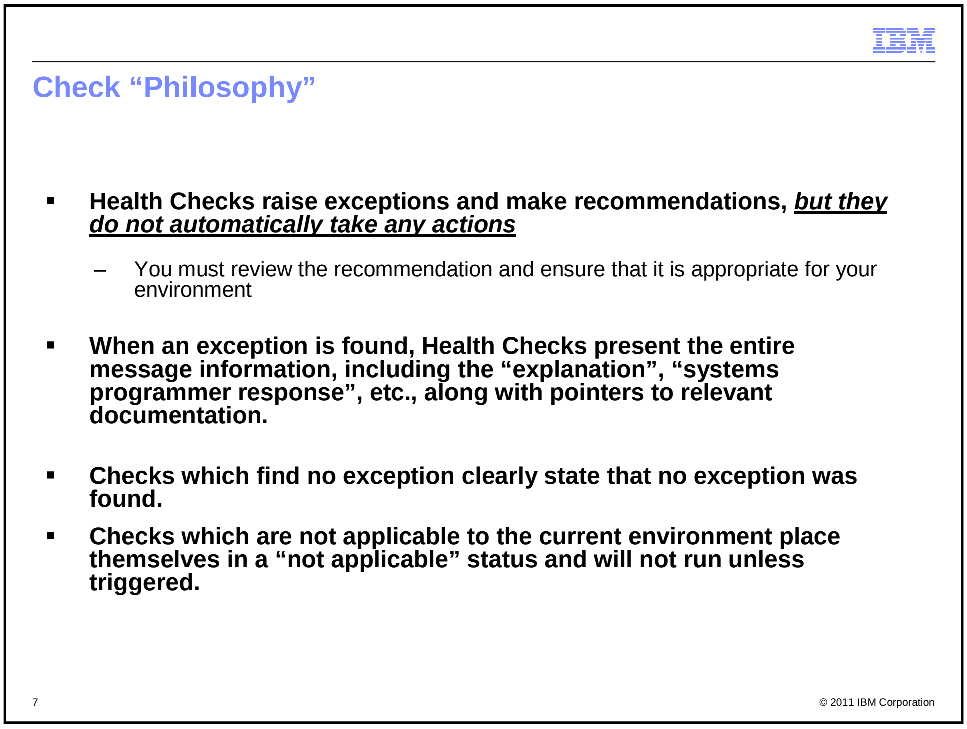
- **What is the IBM Health Checker for z/OS?**
  - **Originally a tool developed by IBM International Technical Support Organization (ITSO) to address common configuration and setup errors**
    - 15-20% of system outages attributed to setup and configuration
    - Implemented as a batch job, with 37 checks in 2003
    - Delivered as a web download
  - **Ever since z/OS V1.7, the IBM Health Checker for z/OS was integrated into z/OS**
    - Implemented as a started task
    - Initially, 55 checks shipped with z/OS… with z/OS V1.12 110+ checks!
    - IBM checks are shipped with components
    - Full set of APIs for check management
    - Extensive SDSF support



Structure of the IBM Health Checker for z/OS

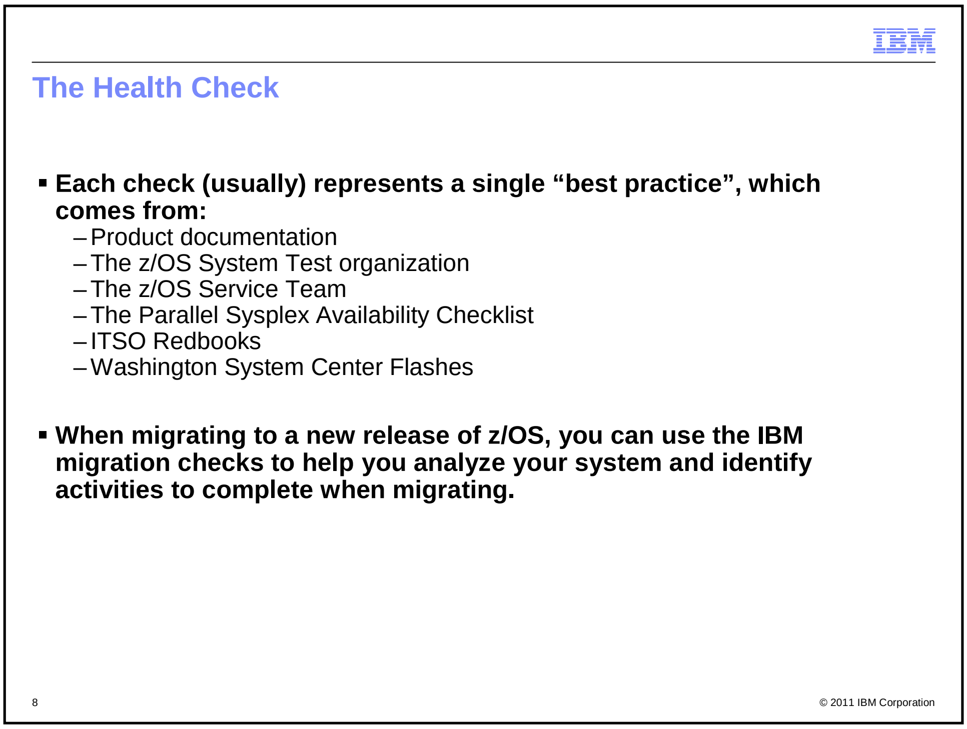
- **The IBM Health Checker for z/OS consists of:**
  - A managing address space (the "backbone")
  - A utility (HZSPRINT) for collecting check output
  - The Health Checks, which can be written by:
    - Individual IBM components (such as RACF, UNIX® System Services)
    - ISVs
    - You!
    - …. And starting with z/OS V1.9, you can write the check in System REXX
- **A check is identified by a:**
  - 1-32 character check name, such as:
    - CSV_APF_EXISTS
    - GRS_CONVERT_RESERVES
    - RACF_IBMUSER_REVOKED
  - 1-16 character check owner
    - The owner for an IBM-supplied check begins with IBM, for example:

      IBMCSV, IBMGRS, and IBMRACF
- **Checks can execute in:**
  - The Health Checker for z/OS address space ("Local check")
  - Another address space ("Remote Check")
    - System REXX checks are a type of remote check as they execute in a System REXX address space



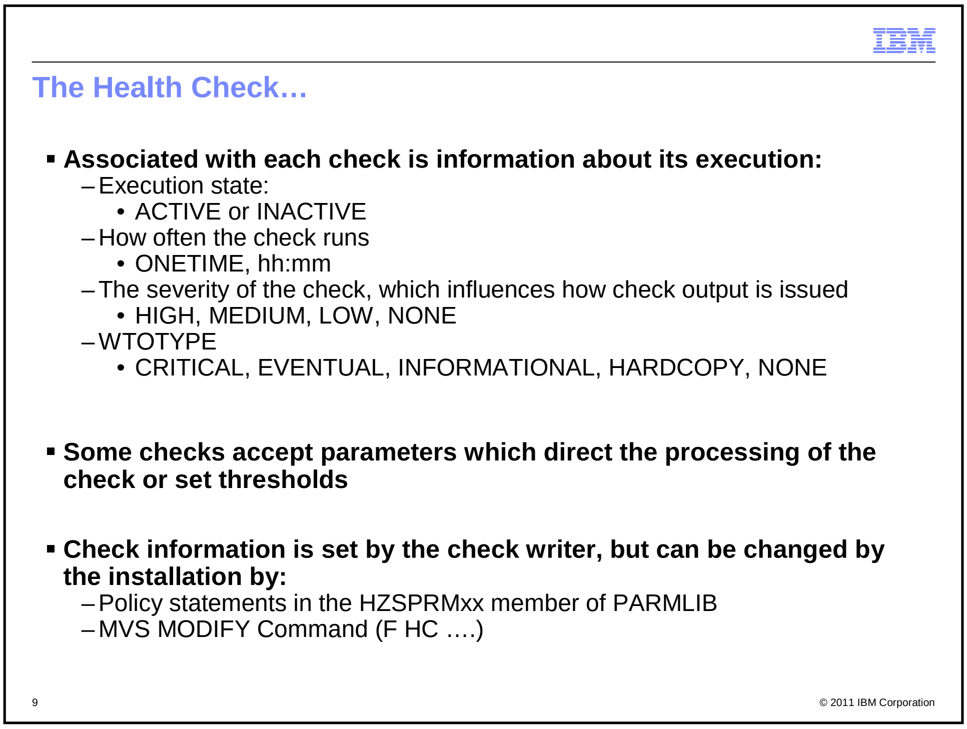
Check “Philosophy”

- **Health Checks raise exceptions and make recommendations, *but they do not automatically take any actions***
  - You must review the recommendation and ensure that it is appropriate for your environment
- **When an exception is found, Health Checks present the entire message information, including the “explanation”, “systems programmer response”, etc., along with pointers to relevant documentation.**
- **Checks which find no exception clearly state that no exception was found.**
- **Checks which are not applicable to the current environment place themselves in a “not applicable” status and will not run unless triggered.**



The Health Check

- **Each check (usually) represents a single “best practice”, which comes from:**
  - Product documentation
  - The z/OS System Test organization
  - The z/OS Service Team
  - The Parallel Sysplex Availability Checklist
  - ITSO Redbooks
  - Washington System Center Flashes
- **When migrating to a new release of z/OS, you can use the IBM migration checks to help you analyze your system and identify activities to complete when migrating.**

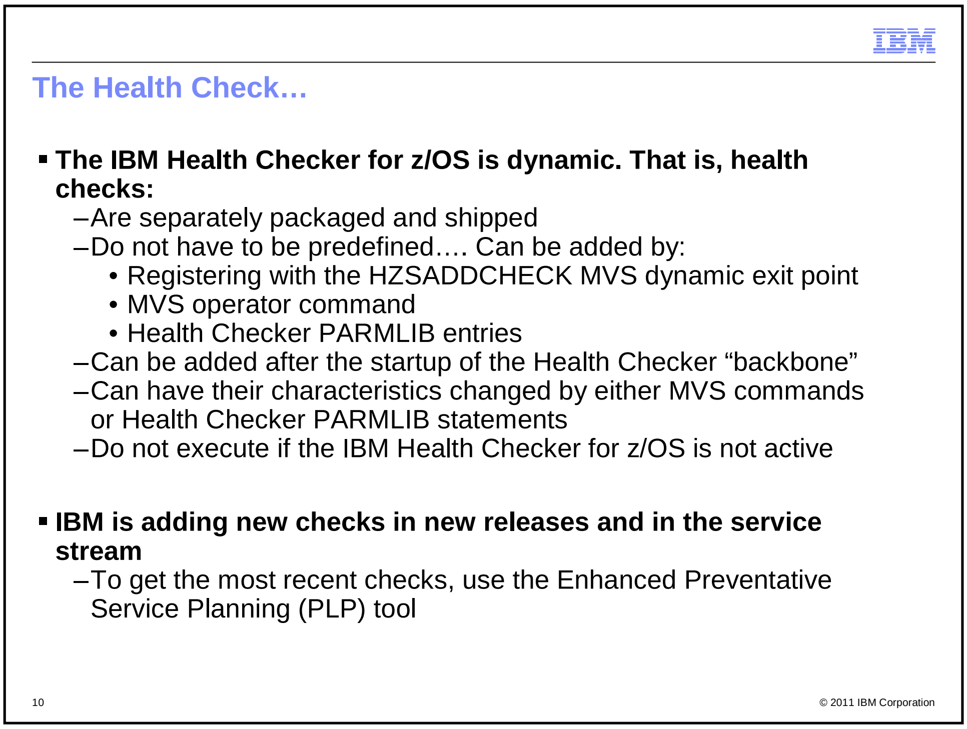


The Health Check…

- **Associated with each check is information about its execution:**
  - Execution state:
    - ACTIVE or INACTIVE
  - How often the check runs
    - ONETIME, hh:mm
  - The severity of the check, which influences how check output is issued
    - HIGH, MEDIUM, LOW, NONE
  - WTOTYPE
    - CRITICAL, EVENTUAL, INFORMATIONAL, HARDCOPY, NONE

- **Some checks accept parameters which direct the processing of the check or set thresholds**

- **Check information is set by the check writer, but can be changed by the installation by:**
  - Policy statements in the HZSPRMxx member of PARMLIB
  - MVS MODIFY Command (F HC ….)



The Health Check…

- **The IBM Health Checker for z/OS is dynamic. That is, health checks:**
  - Are separately packaged and shipped
  - Do not have to be predefined…. Can be added by:
    - Registering with the HZSADDCHECK MVS dynamic exit point
    - MVS operator command
    - Health Checker PARMLIB entries
  - Can be added after the startup of the Health Checker “backbone”
  - Can have their characteristics changed by either MVS commands or Health Checker PARMLIB statements
  - Do not execute if the IBM Health Checker for z/OS is not active

- **IBM is adding new checks in new releases and in the service stream**
  - To get the most recent checks, use the Enhanced Preventative Service Planning (PLP) tool

The RACF Health Checks

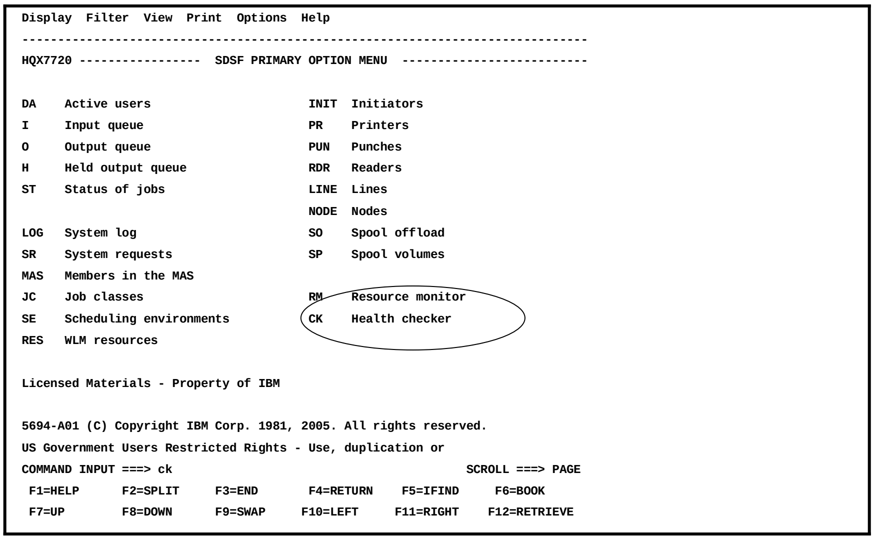
- **RACF ships these Health Checks:**
  - RACF_GRS_RNL
  - RACF_SENSITIVE_RESOURCES
  - RACF_IBMUSER_REVOKED
  - RACF_<class-name>_ACTIVE
    - Verifies that the class <class-name> is active
    - Check is performed for FACILITY, OPERCMDS, TAPEVOL, TEMPDSN, TSOAUTH, UNIXPRIV
  - RACF_ICHAUTAB_NONLPA
  - Installation-defined RACF Health Checks

Check Output

- **The output of a check consists of:**
  - Write to Operator messages (WTO)s, which are written with the routing codes and descriptor codes associated with the check
  - Messages written to the Health Check message buffer, which can be:
    - Kept in storage (most recent check invocation only)
    - Written to a log stream

- **Check output can be processed with:**
    - SDSF, using the “CK” panels
    - Using the HZSPRINT utility

Updated SDSF Primary Option Panel



```
Display  Filter  View  Print  Options  Help
-------------------------------------------------------------------------------
HQX7720 -----------------  SDSF PRIMARY OPTION MENU  -------------------------

DA    Active users                      INIT  Initiators
I     Input queue                       PR    Printers
O     Output queue                      PUN   Punches
H     Held output queue                 RDR   Readers
ST    Status of jobs                    LINE  Lines
                                        NODE  Nodes
LOG   System log                        SO    Spool offload
SR    System requests                   SP    Spool volumes
MAS   Members in the MAS
JC    Job classes                       RM    Resource monitor
SE    Scheduling environments           CK    Health checker
RES   WLM resources

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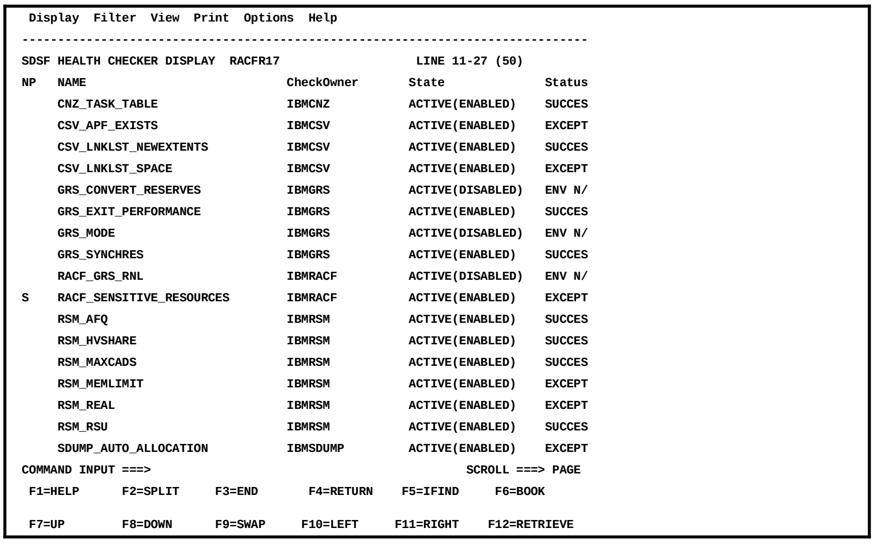
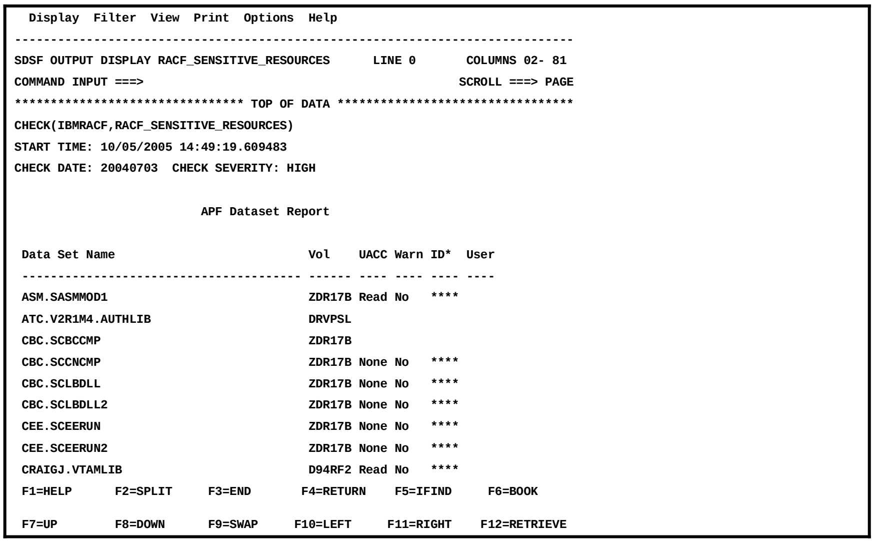

SDSF Check Selection Panel



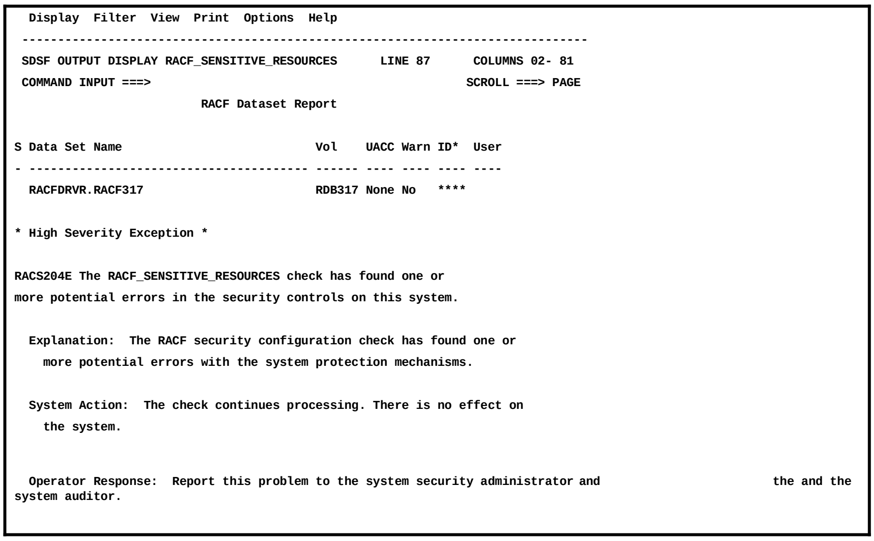
```
 Display  Filter  View  Print  Options  Help
-------------------------------------------------------------------------------
SDSF HEALTH CHECKER DISPLAY  RACFR17                   LINE 11-27 (50)
NP   NAME                           CheckOwner       State              Status
     CNZ_TASK_TABLE                 IBMCNZ           ACTIVE(ENABLED)    SUCCES
     CSV_APF_EXISTS                 IBMCSV           ACTIVE(ENABLED)    EXCEPT
     CSV_LNKLST_NEWEXTENTS          IBMCSV           ACTIVE(ENABLED)    SUCCES
     CSV_LNKLST_SPACE               IBMCSV           ACTIVE(ENABLED)    EXCEPT
     GRS_CONVERT_RESERVES           IBMGRS           ACTIVE(DISABLED)   ENV N/
     GRS_EXIT_PERFORMANCE           IBMGRS           ACTIVE(ENABLED)    SUCCES
     GRS_MODE                       IBMGRS           ACTIVE(DISABLED)   ENV N/
     GRS_SYNCHRES                   IBMGRS           ACTIVE(ENABLED)    SUCCES
     RACF_GRS_RNL                   IBMRACF          ACTIVE(DISABLED)   ENV N/
S    RACF_SENSITIVE_RESOURCES       IBMRACF          ACTIVE(ENABLED)    EXCEPT
     RSM_AFQ                        IBMRSM           ACTIVE(ENABLED)    SUCCES
     RSM_HVSHARE                    IBMRSM           ACTIVE(ENABLED)    SUCCES
     RSM_MAXCADS                    IBMRSM           ACTIVE(ENABLED)    SUCCES
     RSM_MEMLIMIT                   IBMRSM           ACTIVE(ENABLED)    EXCEPT
     RSM_REAL                       IBMRSM           ACTIVE(ENABLED)    EXCEPT
     RSM_RSU                        IBMRSM           ACTIVE(ENABLED)    SUCCES
     SDUMP_AUTO_ALLOCATION          IBMSDUMP         ACTIVE(ENABLED)    EXCEPT
COMMAND INPUT ===>                                            SCROLL ===> PAGE
 F1=HELP      F2=SPLIT     F3=END       F4=RETURN    F5=IFIND     F6=BOOK

 F7=UP        F8=DOWN      F9=SWAP     F10=LEFT     F11=RIGHT    F12=RETRIEVE
```

SDSF Browse Check Output Panel



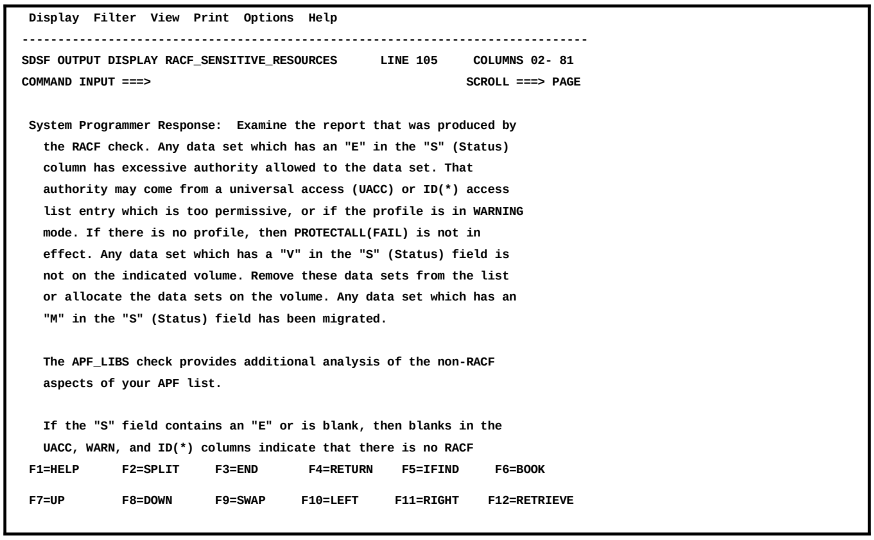
```
  Display  Filter  View  Print  Options  Help
------------------------------------------------------------------------------
SDSF OUTPUT DISPLAY RACF_SENSITIVE_RESOURCES      LINE 0       COLUMNS 02- 81
COMMAND INPUT ===>                                            SCROLL ===> PAGE
******************************** TOP OF DATA *********************************
CHECK(IBMRACF,RACF_SENSITIVE_RESOURCES)
START TIME: 10/05/2005 14:49:19.609483
CHECK DATE: 20040703  CHECK SEVERITY: HIGH

                          APF Dataset Report

 Data Set Name                           Vol    UACC Warn ID*  User
 -------------------------------------- ------ ---- ---- ---- ----
 ASM.SASMMOD1                            ZDR17B Read No   ****
 ATC.V2R1M4.AUTHLIB                      DRVPSL
 CBC.SCBCCMP                             ZDR17B
 CBC.SCCNCMP                             ZDR17B None No   ****
 CBC.SCLBDLL                             ZDR17B None No   ****
 CBC.SCLBDLL2                            ZDR17B None No   ****
 CEE.SCEERUN                             ZDR17B None No   ****
 CEE.SCEERUN2                            ZDR17B None No   ****
 CRAIGJ.VTAMLIB                          D94RF2 Read No   ****
 F1=HELP      F2=SPLIT     F3=END       F4=RETURN    F5=IFIND     F6=BOOK

 F7=UP        F8=DOWN      F9=SWAP     F10=LEFT     F11=RIGHT    F12=RETRIEVE
```

SDSF Browse Check Output Panel …



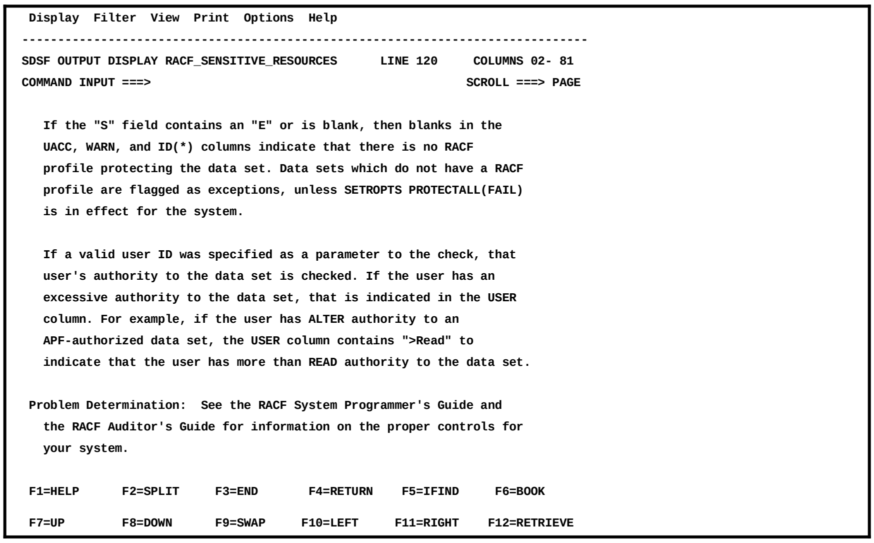
```
  Display  Filter  View  Print  Options  Help
 ------------------------------------------------------------------------------
 SDSF OUTPUT DISPLAY RACF_SENSITIVE_RESOURCES      LINE 87      COLUMNS 02- 81
 COMMAND INPUT ===>                                            SCROLL ===> PAGE
                          RACF Dataset Report

S Data Set Name                          Vol    UACC Warn ID*  User
- -------------------------------------- ------ ---- ---- ---- ----
  RACFDRVR.RACF317                       RDB317 None No   ****

* High Severity Exception *

RACS204E The RACF_SENSITIVE_RESOURCES check has found one or
more potential errors in the security controls on this system.

  Explanation:  The RACF security configuration check has found one or
    more potential errors with the system protection mechanisms.

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


  Operator Response:  Report this problem to the system security administrator and                     the and the
system auditor.
```

SDSF Browse Check Output Panel …



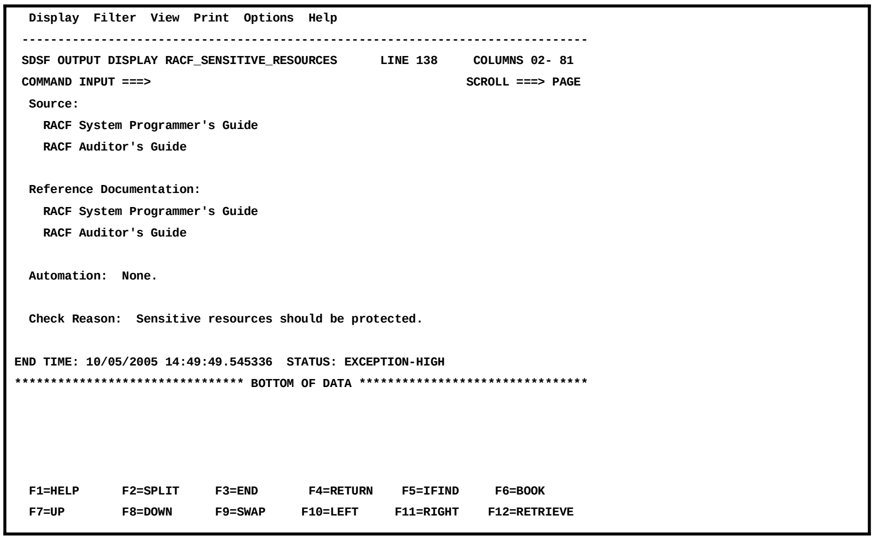
```
 Display  Filter  View  Print  Options  Help
-------------------------------------------------------------------------------
SDSF OUTPUT DISPLAY RACF_SENSITIVE_RESOURCES      LINE 105     COLUMNS 02- 81
COMMAND INPUT ===>                                            SCROLL ===> PAGE

 System Programmer Response:  Examine the report that was produced by
   the RACF check. Any data set which has an "E" in the "S" (Status)
   column has excessive authority allowed to the data set. That
   authority may come from a universal access (UACC) or ID(*) access
   list entry which is too permissive, or if the profile is in WARNING
   mode. If there is no profile, then PROTECTALL(FAIL) is not in
   effect. Any data set which has a "V" in the "S" (Status) field is
   not on the indicated volume. Remove these data sets from the list
   or allocate the data sets on the volume. Any data set which has an
   "M" in the "S" (Status) field has been migrated.

   The APF_LIBS check provides additional analysis of the non-RACF
   aspects of your APF list.

   If the "S" field contains an "E" or is blank, then blanks in the
   UACC, WARN, and ID(*) columns indicate that there is no RACF
 F1=HELP      F2=SPLIT     F3=END       F4=RETURN    F5=IFIND     F6=BOOK

 F7=UP        F8=DOWN      F9=SWAP     F10=LEFT     F11=RIGHT    F12=RETRIEVE
```

SDSF Browse Check Output Panel …



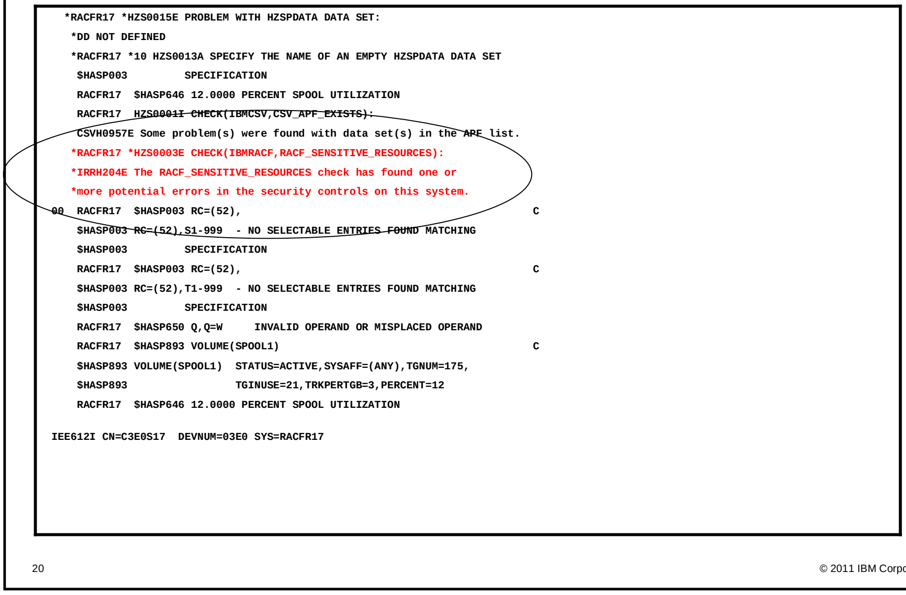
```
 Display  Filter  View  Print  Options  Help
-------------------------------------------------------------------------------
SDSF OUTPUT DISPLAY RACF_SENSITIVE_RESOURCES      LINE 120     COLUMNS 02- 81
COMMAND INPUT ===>                                            SCROLL ===> PAGE

   If the "S" field contains an "E" or is blank, then blanks in the
   UACC, WARN, and ID(*) columns indicate that there is no RACF
   profile protecting the data set. Data sets which do not have a RACF
   profile are flagged as exceptions, unless SETROPTS PROTECTALL(FAIL)
   is in effect for the system.

   If a valid user ID was specified as a parameter to the check, that
   user's authority to the data set is checked. If the user has an
   excessive authority to the data set, that is indicated in the USER
   column. For example, if the user has ALTER authority to an
   APF-authorized data set, the USER column contains ">Read" to
   indicate that the user has more than READ authority to the data set.

 Problem Determination:  See the RACF System Programmer's Guide and
   the RACF Auditor's Guide for information on the proper controls for
   your system.

 F1=HELP      F2=SPLIT     F3=END       F4=RETURN    F5=IFIND     F6=BOOK

 F7=UP        F8=DOWN      F9=SWAP     F10=LEFT     F11=RIGHT    F12=RETRIEVE
```

SDSF Browse Check Output Panel …

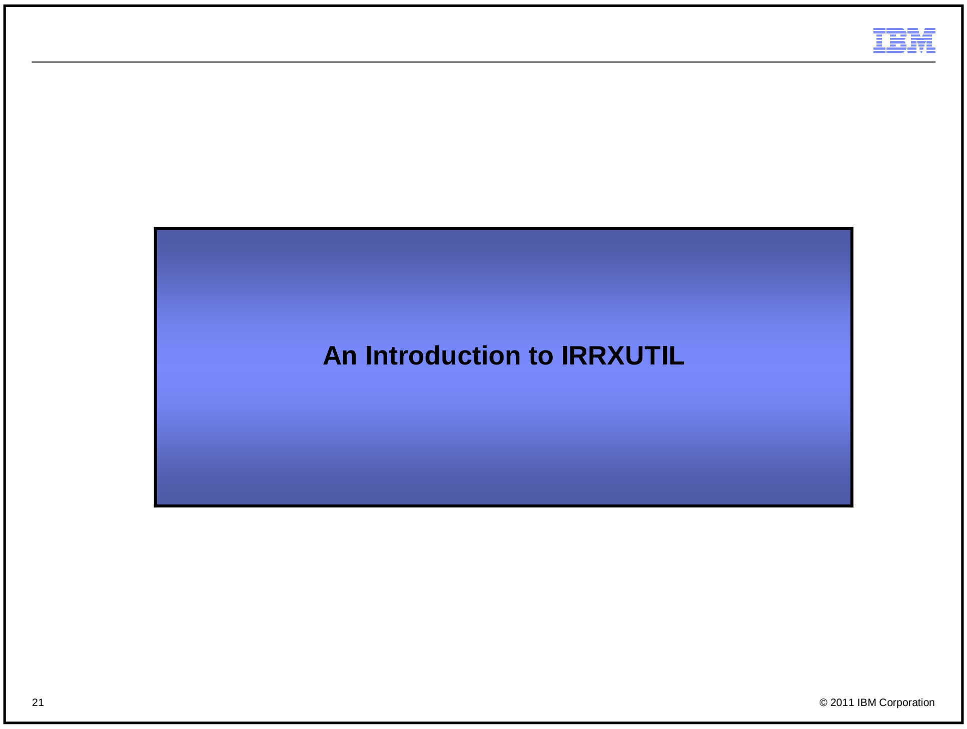


```
  Display  Filter  View  Print  Options  Help
 -------------------------------------------------------------------------------
 SDSF OUTPUT DISPLAY RACF_SENSITIVE_RESOURCES      LINE 138     COLUMNS 02- 81
 COMMAND INPUT ===>                                            SCROLL ===> PAGE
  Source:
    RACF System Programmer's Guide
    RACF Auditor's Guide

  Reference Documentation:
    RACF System Programmer's Guide
    RACF Auditor's Guide

  Automation:  None.

  Check Reason:  Sensitive resources should be protected.

END TIME: 10/05/2005 14:49:49.545336  STATUS: EXCEPTION-HIGH
******************************** 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
```

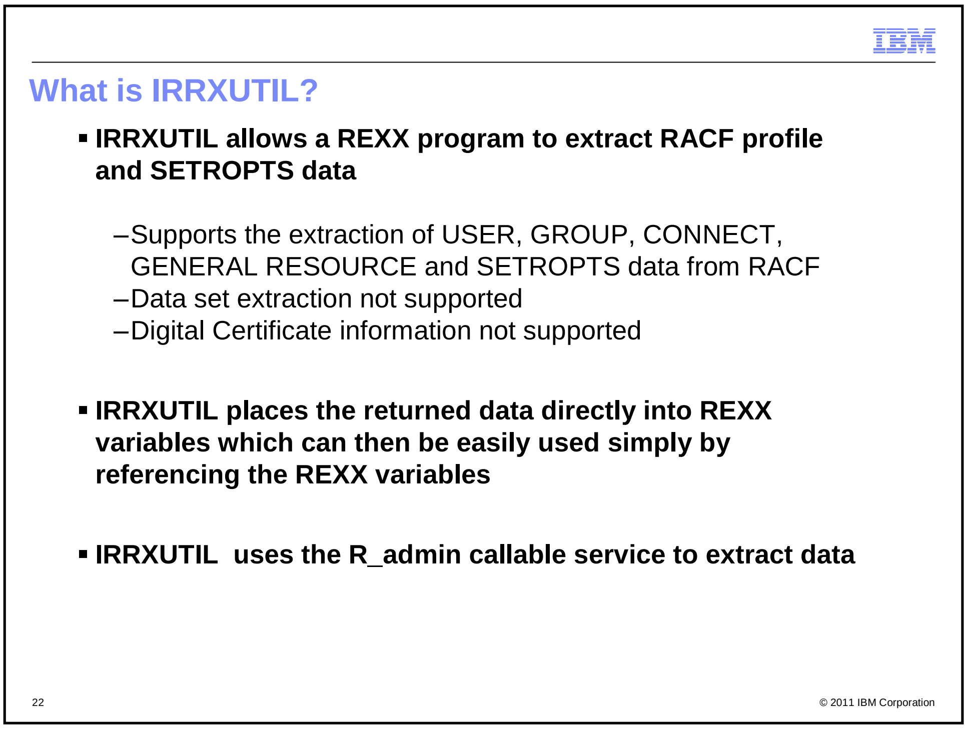
z/OS Console Messages from Health Checks



```
   *RACFR17 *HZS0015E PROBLEM WITH HZSPDATA DATA SET:
    *DD NOT DEFINED
    *RACFR17 *10 HZS0013A SPECIFY THE NAME OF AN EMPTY HZSPDATA DATA SET
     $HASP003         SPECIFICATION
     RACFR17  $HASP646 12.0000 PERCENT SPOOL UTILIZATION
     RACFR17  HZS0001I CHECK(IBMCSV,CSV_APF_EXISTS):
     CSVH0957E Some problem(s) were found with data set(s) in the APF list.
    *RACFR17 *HZS0003E CHECK(IBMRACF,RACF_SENSITIVE_RESOURCES):
    *IRRH204E The RACF_SENSITIVE_RESOURCES check has found one or
    *more potential errors in the security controls on this system.
 00  RACFR17  $HASP003 RC=(52),                                         C
     $HASP003 RC=(52),S1-999  - NO SELECTABLE ENTRIES FOUND MATCHING
     $HASP003         SPECIFICATION
     RACFR17  $HASP003 RC=(52),                                         C
     $HASP003 RC=(52),T1-999  - NO SELECTABLE ENTRIES FOUND MATCHING
     $HASP003         SPECIFICATION
     RACFR17  $HASP650 Q,Q=W     INVALID OPERAND OR MISPLACED OPERAND
     RACFR17  $HASP893 VOLUME(SPOOL1)                                   C
     $HASP893 VOLUME(SPOOL1)  STATUS=ACTIVE,SYSAFF=(ANY),TGNUM=175,
     $HASP893                 TGINUSE=21,TRKPERTGB=3,PERCENT=12
     RACFR17  $HASP646 12.0000 PERCENT SPOOL UTILIZATION

 IEE612I CN=C3E0S17  DEVNUM=03E0 SYS=RACFR17
```

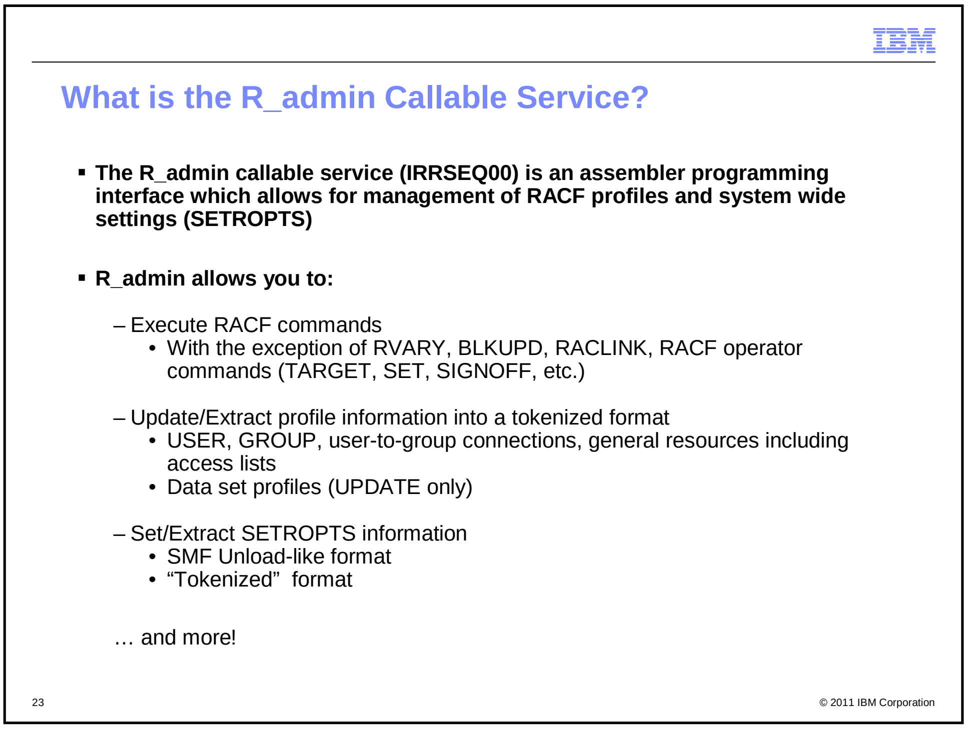


An Introduction to IRRXUTIL



What is IRRXUTIL?

- **IRRXUTIL allows a REXX program to extract RACF profile and SETROPTS data**
  - –Supports the extraction of USER, GROUP, CONNECT, GENERAL RESOURCE and SETROPTS data from RACF
  - –Data set extraction not supported
  - –Digital Certificate information not supported
- **IRRXUTIL places the returned data directly into REXX variables which can then be easily used simply by referencing the REXX variables**
- **IRRXUTIL uses the R_admin callable service to extract data**

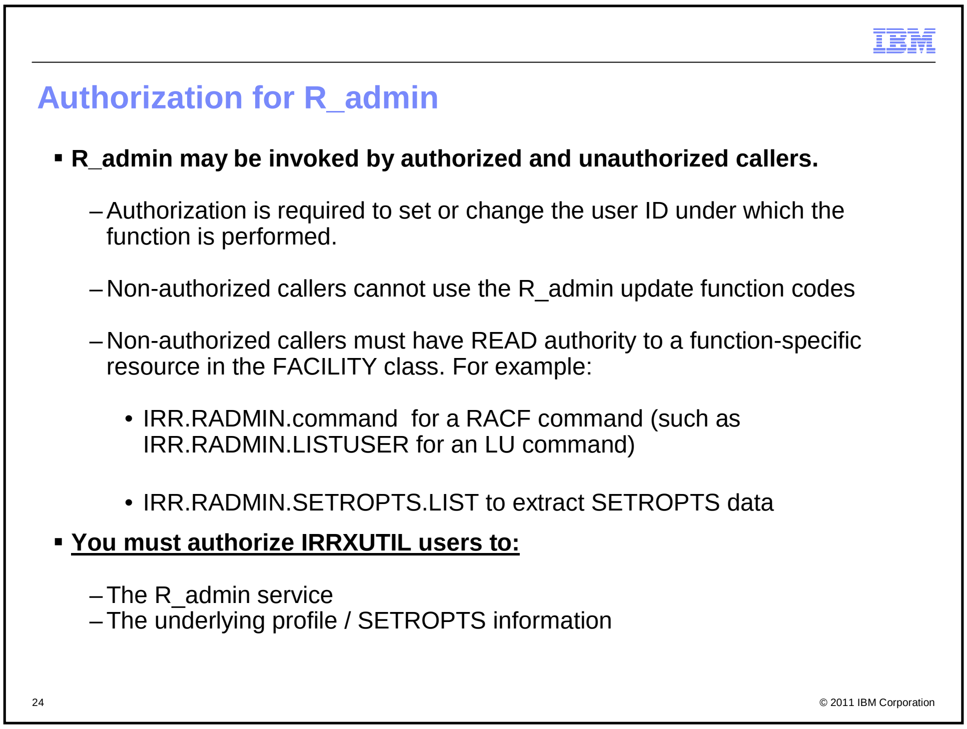


What is the R_admin Callable Service?

- **The R_admin callable service (IRRSEQ00) is an assembler programming interface which allows for management of RACF profiles and system wide settings (SETROPTS)**

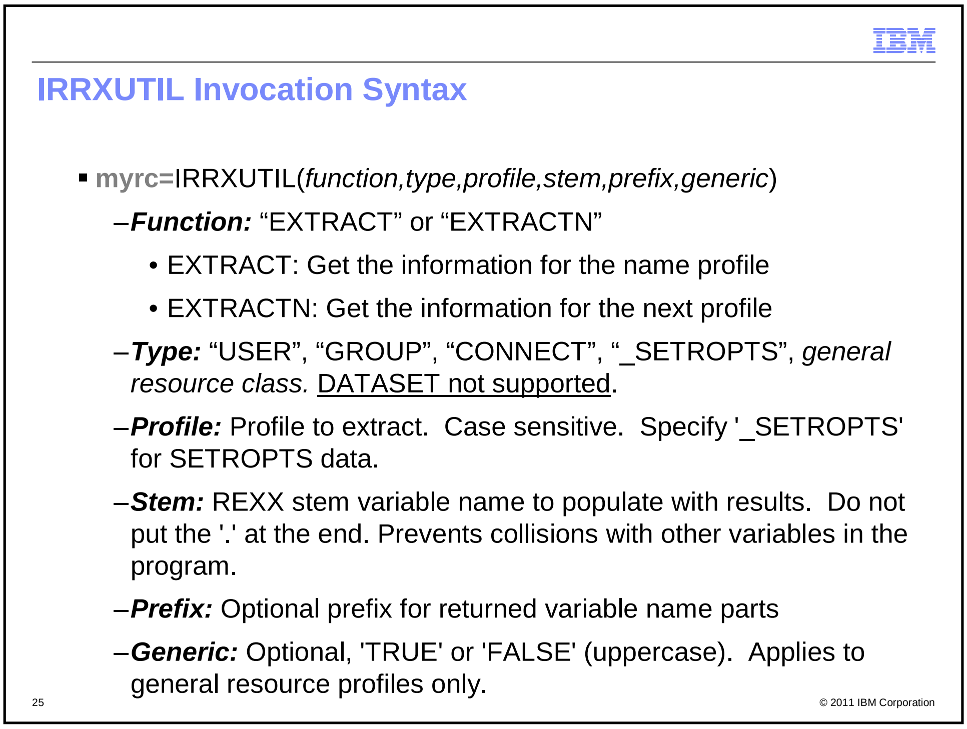
- **R_admin allows you to:**
  - Execute RACF commands
    - With the exception of RVARY, BLKUPD, RACLINK, RACF operator commands (TARGET, SET, SIGNOFF, etc.)
  - Update/Extract profile information into a tokenized format
    - USER, GROUP, user-to-group connections, general resources including access lists
    - Data set profiles (UPDATE only)
  - Set/Extract SETROPTS information
    - SMF Unload-like format
    - “Tokenized” format

… and more!



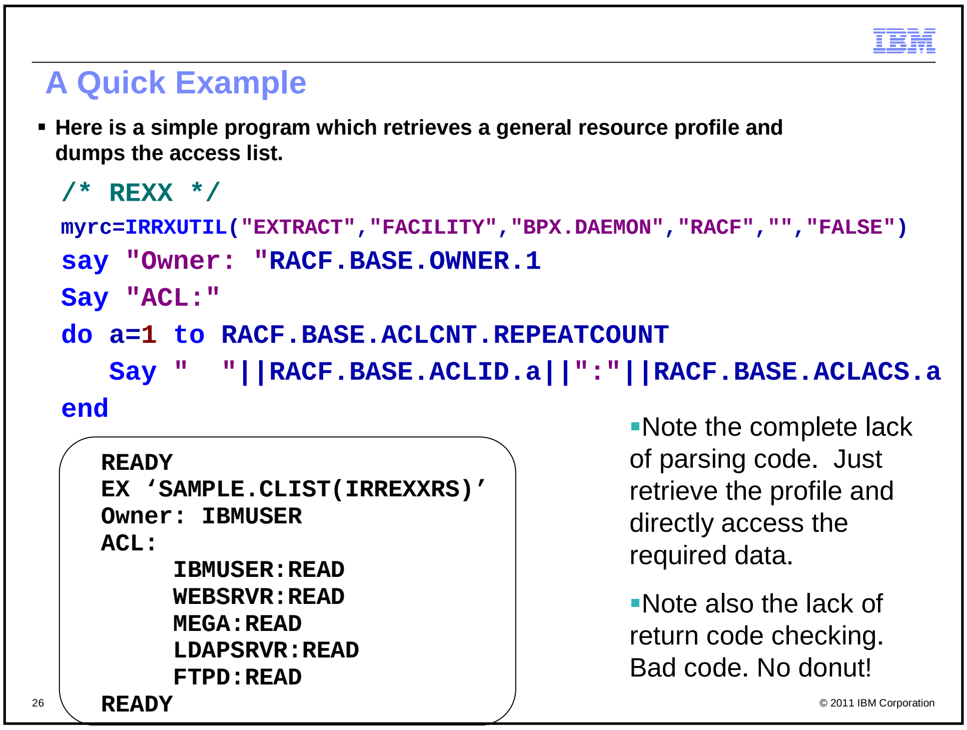
Authorization for R_admin

- **R_admin may be invoked by authorized and unauthorized callers.**
  - Authorization is required to set or change the user ID under which the function is performed.
  - Non-authorized callers cannot use the R_admin update function codes
  - Non-authorized callers must have READ authority to a function-specific resource in the FACILITY class. For example:
    - IRR.RADMIN.command for a RACF command (such as IRR.RADMIN.LISTUSER for an LU command)
    - IRR.RADMIN.SETROPTS.LIST to extract SETROPTS data
- **You must authorize IRRXUTIL users to:**
  - The R_admin service
  - The underlying profile / SETROPTS information



IRRXUTIL Invocation Syntax

- myrc=IRRXUTIL(*function,type,profile,stem,prefix,generic*)
  - ***Function:*** "EXTRACT" or "EXTRACTN"
    - EXTRACT: Get the information for the name profile
    - EXTRACTN: Get the information for the next profile
  - ***Type:*** "USER", "GROUP", "CONNECT", "_SETROPTS", *general resource class.* DATASET not supported.
  - ***Profile:*** Profile to extract. Case sensitive. Specify '_SETROPTS' for SETROPTS data.
  - ***Stem:*** REXX stem variable name to populate with results. Do not put the '.' at the end. Prevents collisions with other variables in the program.
  - ***Prefix:*** Optional prefix for returned variable name parts
  - ***Generic:*** Optional, 'TRUE' or 'FALSE' (uppercase). Applies to general resource profiles only.



A Quick Example

- **Here is a simple program which retrieves a general resource profile and dumps the access list.**

```
/* REXX */
myrc=IRRXUTIL("EXTRACT","FACILITY","BPX.DAEMON","RACF","","FALSE")
say "Owner: "RACF.BASE.OWNER.1
Say "ACL:"
do a=1 to RACF.BASE.ACLCNT.REPEATCOUNT
   Say "  "||RACF.BASE.ACLID.a||":"||RACF.BASE.ACLACS.a
end
```

```
READY
EX ‘SAMPLE.CLIST(IRREXXRS)’
Owner: IBMUSER
ACL:
     IBMUSER:READ
     WEBSRVR:READ
     MEGA:READ
     LDAPSRVR:READ
     FTPD:READ
READY
```

- Note the complete lack of parsing code. Just retrieve the profile and directly access the required data.
- Note also the lack of return code checking. Bad code. No donut!

Where Do You Find Field Names?

- z/OS Security Server RACF Callable Services contains tables which document every segment and field name supported by R_admin in appendix A.2
- Fields which are 'Returned on Extract Requests' are supported by IRRXUTIL.

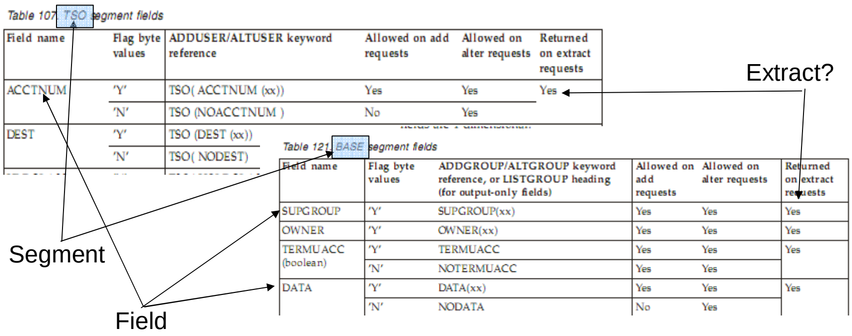


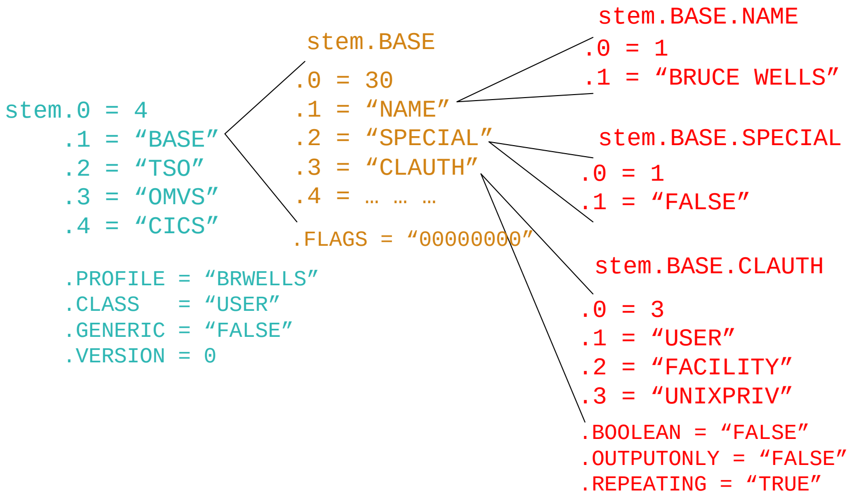
Table 107. TSO segment fields

Field name	Flag byte values	ADDUSER/ALTUSER keyword reference	Allowed on add requests	Allowed on alter requests	Returned on extract requests
ACCTNUM	'Y'	TSO(ACCTNUM (xx))	Yes	Yes	Yes
	'N'	TSO (NOACCTNUM)	No	Yes	
DEST	'Y'	TSO (DEST (xx))			
	'N'	TSO(NODEST)			

Table 121. BASE segment fields

Field name	Flag byte values	ADDGROUP/ALTGROUP keyword reference, or LISTGROUP heading (for output-only fields)	Allowed on add requests	Allowed on alter requests	Returned on extract requests
SUPGROUP	'Y'	SUPGROUP(xx)	Yes	Yes	Yes
OWNER	'Y'	OWNER(xx)	Yes	Yes	Yes
TERMUACC (boolean)	'Y'	TERMUACC	Yes	Yes	Yes
	'N'	NOTERMUACC	Yes	Yes	
DATA	'Y'	DATA(xx)	Yes	Yes	Yes
	'N'	NODATA	No	Yes	

Field Name Structure



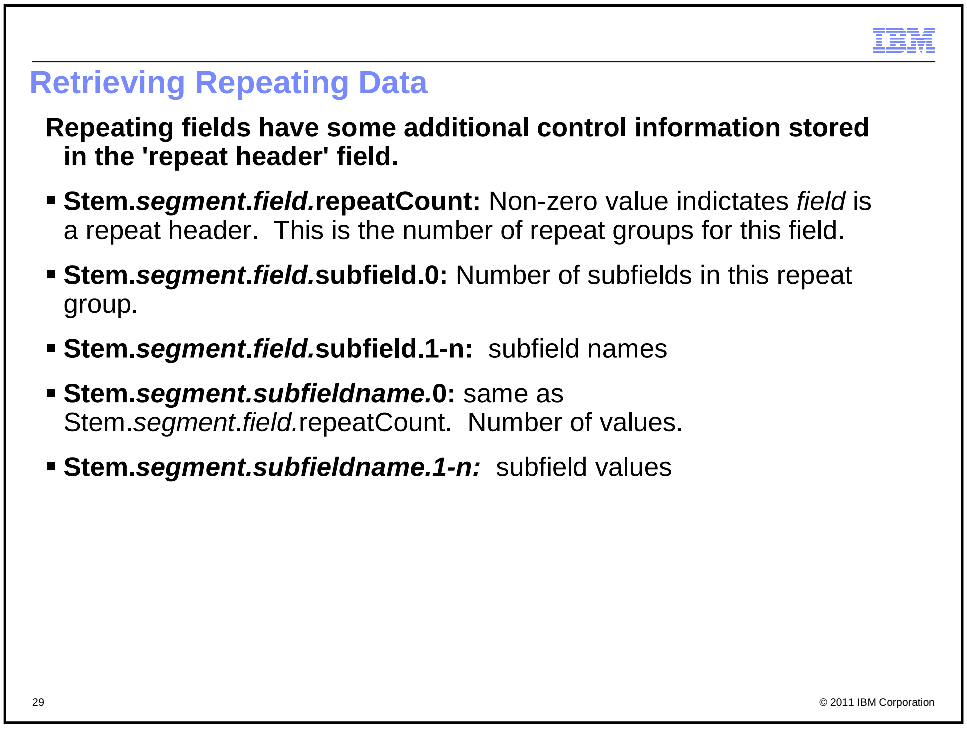
```
stem.0 = 4
    .1 = “BASE”
    .2 = “TSO”
    .3 = “OMVS”
    .4 = “CICS”

    .PROFILE = “BRWELLS”
    .CLASS   = “USER”
    .GENERIC = “FALSE”
    .VERSION = 0
```

```
stem.BASE
.0 = 30
.1 = “NAME”
.2 = “SPECIAL”
.3 = “CLAUTH”
.4 = … … …
.FLAGS = “00000000”
```

```
stem.BASE.NAME
.0 = 1
.1 = “BRUCE WELLS”
```

```
stem.BASE.SPECIAL
.0 = 1
.1 = “FALSE”
```

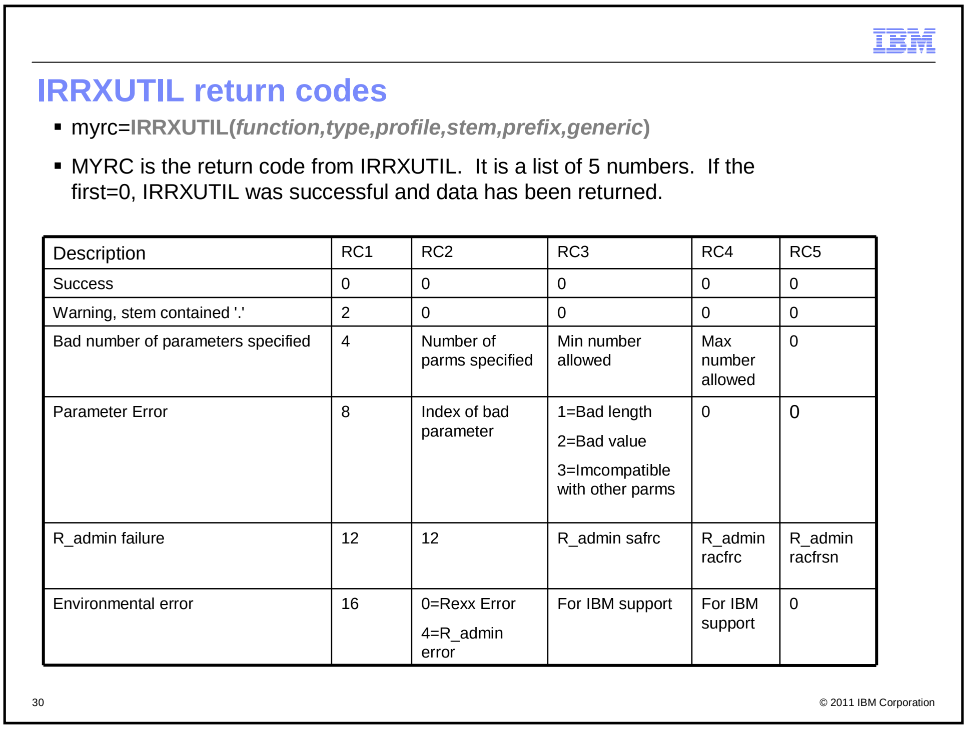
```
stem.BASE.CLAUTH
.0 = 3
.1 = “USER”
.2 = “FACILITY”
.3 = “UNIXPRIV”
.BOOLEAN = “FALSE”
.OUTPUTONLY = “FALSE”
.REPEATING = “TRUE”
```



Retrieving Repeating Data

Repeating fields have some additional control information stored in the 'repeat header' field.

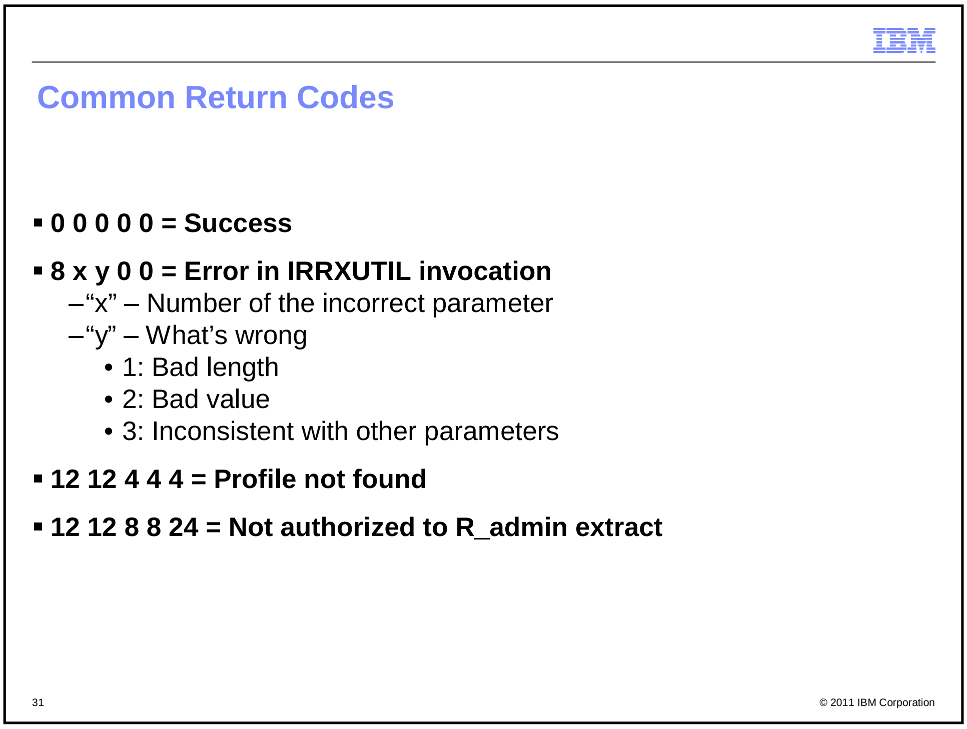
- **Stem.*segment.field.*repeatCount:** Non-zero value indictates *field* is a repeat header. This is the number of repeat groups for this field.
- **Stem.*segment.field.*subfield.0:** Number of subfields in this repeat group.
- **Stem.*segment.field.*subfield.1-n:** subfield names
- **Stem.*segment.subfieldname.*0:** same as Stem.*segment.field.*repeatCount. Number of values.
- **Stem.*segment.subfieldname.1-n:*** subfield values



IRRXUTIL return codes

- myrc=IRRXUTIL(*function,type,profile,stem,prefix,generic*)
- MYRC is the return code from IRRXUTIL. It is a list of 5 numbers. If the first=0, IRRXUTIL was successful and data has been returned.

Description	RC1	RC2	RC3	RC4	RC5
Success	0	0	0	0	0
Warning, stem contained '.'	2	0	0	0	0
Bad number of parameters specified	4	Number of parms specified	Min number allowed	Max number allowed	0
Parameter Error	8	Index of bad parameter	1=Bad length 2=Bad value 3=Imcompatible with other parms	0	0
R_admin failure	12	12	R_admin safrc	R_admin racfrc	R_admin racfrsn
Environmental error	16	0=Rexx Error 4=R_admin error	For IBM support	For IBM support	0



Common Return Codes

- **0 0 0 0 0 = Success**
- **8 x y 0 0 = Error in IRRXUTIL invocation**
  - “x” – Number of the incorrect parameter
  - “y” – What’s wrong
    - 1: Bad length
    - 2: Bad value
    - 3: Inconsistent with other parameters
- **12 12 4 4 4 = Profile not found**
- **12 12 8 8 24 = Not authorized to R_admin extract**

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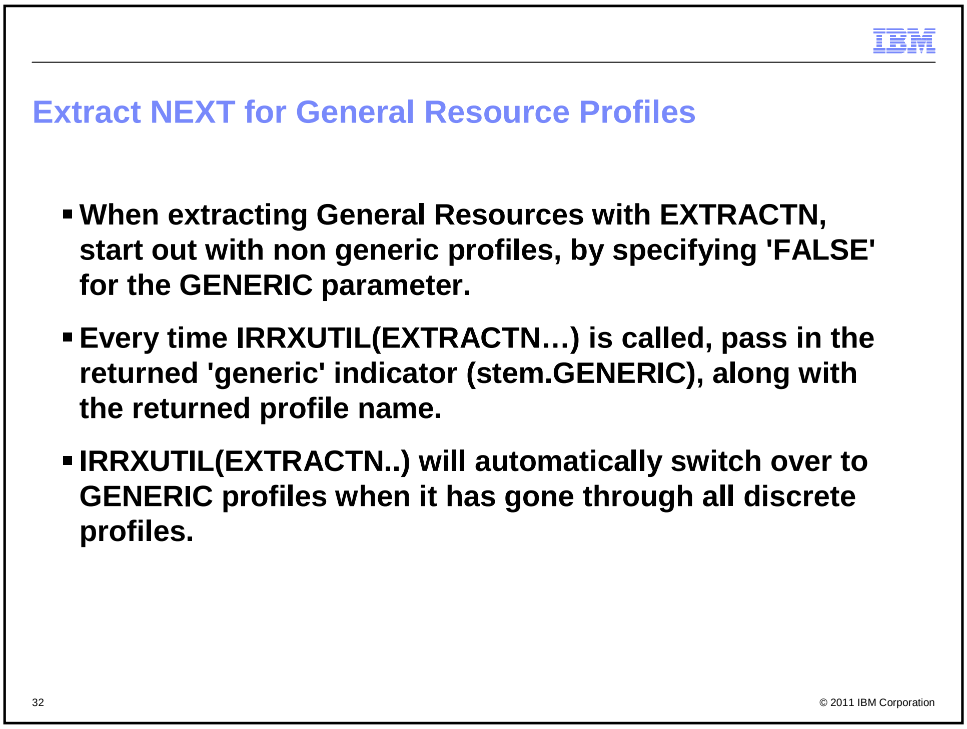

Extract NEXT for General Resource Profiles

- **When extracting General Resources with EXTRACTN, start out with non generic profiles, by specifying 'FALSE' for the GENERIC parameter.**
- **Every time IRRXUTIL(EXTRACTN…) is called, pass in the returned 'generic' indicator (stem.GENERIC), along with the returned profile name.**
- **IRRXUTIL(EXTRACTN..) will automatically switch over to GENERIC profiles when it has gone through all discrete profiles.**

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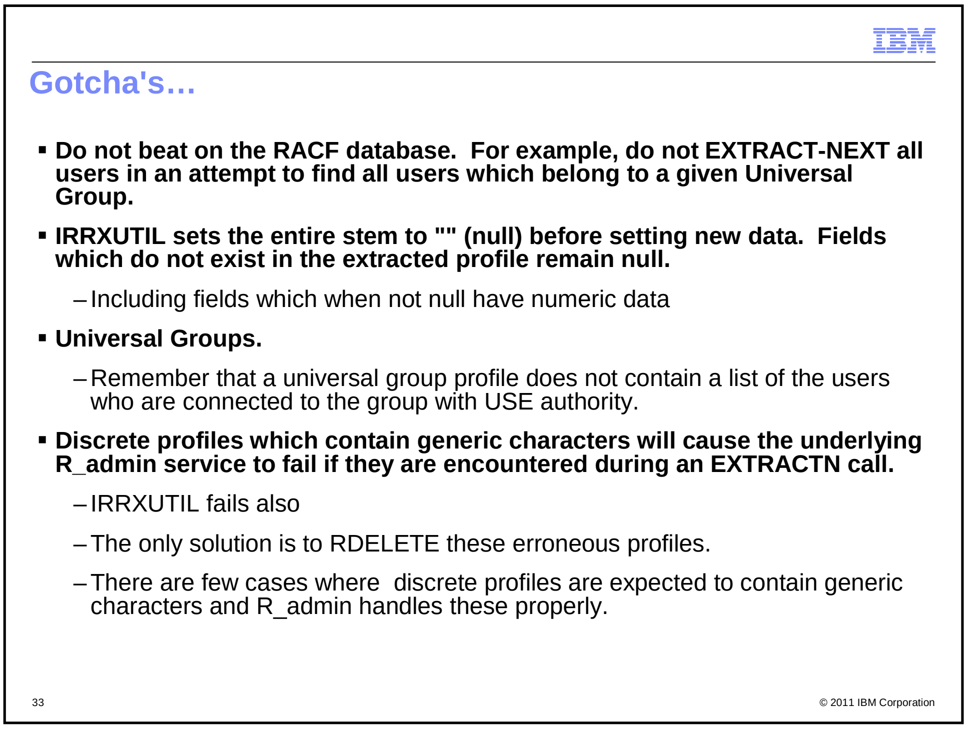
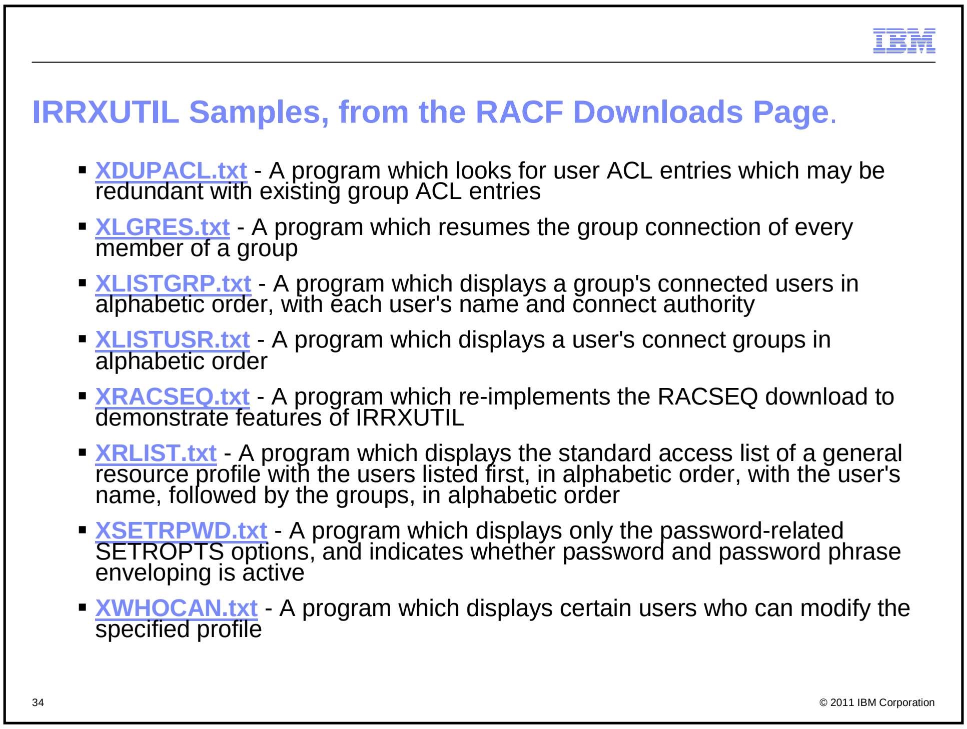


Gotcha's…

- **Do not beat on the RACF database. For example, do not EXTRACT-NEXT all users in an attempt to find all users which belong to a given Universal Group.**
- **IRRXUTIL sets the entire stem to "" (null) before setting new data. Fields which do not exist in the extracted profile remain null.**
  - Including fields which when not null have numeric data
- **Universal Groups.**
  - Remember that a universal group profile does not contain a list of the users who are connected to the group with USE authority.
- **Discrete profiles which contain generic characters will cause the underlying R_admin service to fail if they are encountered during an EXTRACTN call.**
  - IRRXUTIL fails also
  - The only solution is to RDELETE these erroneous profiles.
  - There are few cases where discrete profiles are expected to contain generic characters and R_admin handles these properly.



IRRXUTIL Samples, from the RACF Downloads Page.

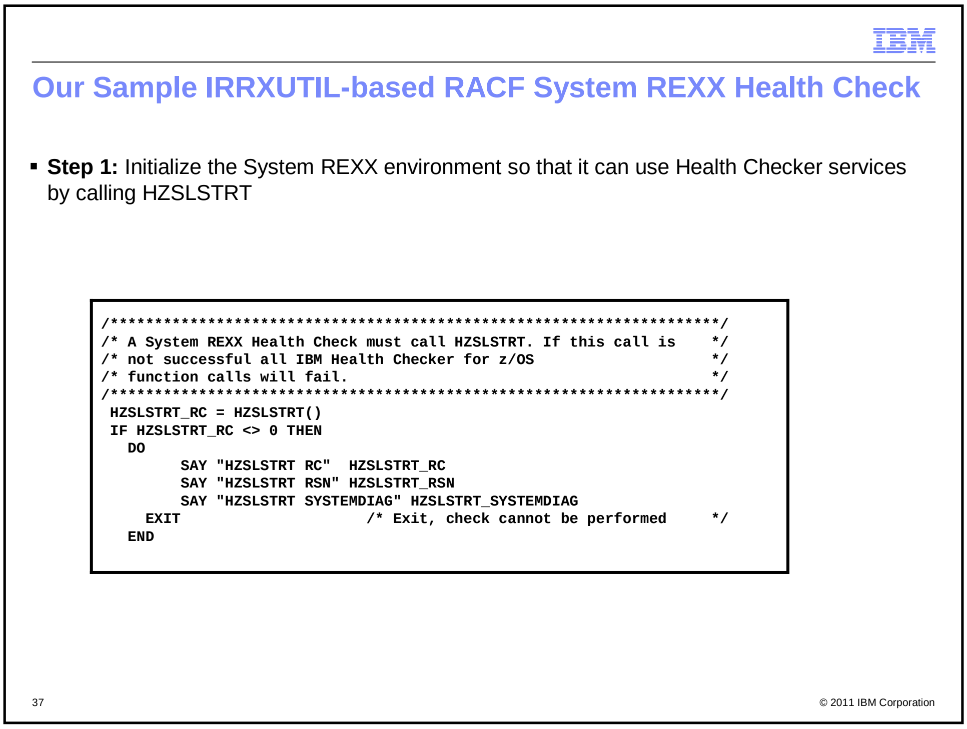
- XDUPACL.txt - A program which looks for user ACL entries which may be redundant with existing group ACL entries
- XLGRES.txt - A program which resumes the group connection of every member of a group
- XLISTGRP.txt - A program which displays a group's connected users in alphabetic order, with each user's name and connect authority
- XLISTUSR.txt - A program which displays a user's connect groups in alphabetic order
- XRACSEQ.txt - A program which re-implements the RACSEQ download to demonstrate features of IRRXUTIL
- XRLIST.txt - A program which displays the standard access list of a general resource profile with the users listed first, in alphabetic order, with the user's name, followed by the groups, in alphabetic order
- XSETRPWD.txt - A program which displays only the password-related SETROPTS options, and indicates whether password and password phrase enveloping is active
- XWHOCAN.txt - A program which displays certain users who can modify the specified profile

Using System REXX and IRRXUTIL to Write your Own RACF Health Check

Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Create a Health Check which examines the profiles in the RACF STARTED class and flags as exceptions any profile which:**
  - References a user ID which does not exist
  - References a user ID which is not a PROTECTED user
  - Note: No support for “=MEMBER”.

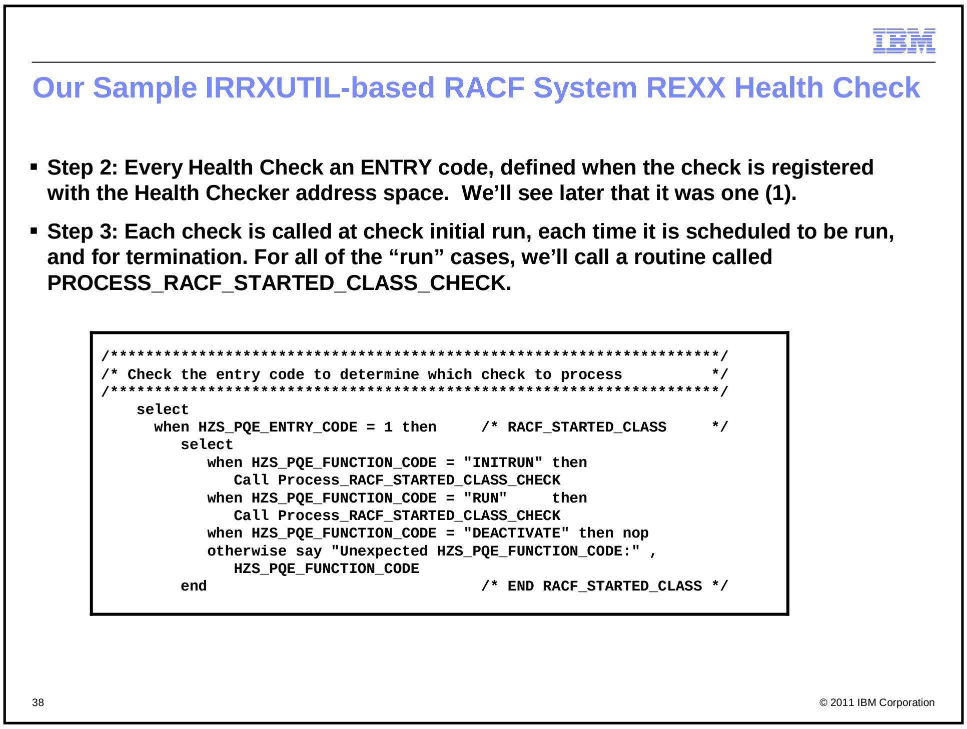
```
CHECK(IBMSAMPLE,RACF_STARTED_CLASS)
START TIME: 04/25/2011 15:10:58.866140
CHECK DATE: 20061219  CHECK SEVERITY: LOW
VERBOSE MODE: YES
                       RACF Started Class Report
S Started Profile   Gen   User     Group    Prot  Trust Priv  Trace
- ----------------- ----- -------- -------- ----- ----- ----- -----
  IRRDPTAB.*        Yes   STCUSER  SYS1     Yes   Yes   No    No
  JES2.*            Yes   STCUSER  SYS1     Yes   Yes   No    No
E JK.*              Yes   NOTPROT  SYS1     No    Yes   No    No
  JKOO.*            Yes   PROTECT  SYS1     Yes   Yes   No    No
E JKOOP.*           Yes   MARKN    SYS1     No    Yes   No    No
  JKOOP2.*          Yes   PROTECT  SYS1     Yes   Yes   No    No
  RACF.*            Yes   STCUSER  SYS1     Yes   Yes   No    No
  RSF1.*            Yes   STCUSER  SYS1     Yes   Yes   No    No
  RSF1WKSP.*        Yes   STCUSER  SYS1     Yes   Yes   No    No
U RSF2.*            Yes   NOSUCHID SYS1     ***   Yes   No    No
  RSF2WKSP.*        Yes   STCUSER  SYS1     Yes   Yes   No    No
E **                Yes   IBMUSER  SYS1     No    Yes   No    Yes

* Low Severity Exception *

RACS260E One or more started tasks were found which had associated user
IDs which do not have the protected attribute.
. . .
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Step 1:** Initialize the System REXX environment so that it can use Health Checker services by calling HZSLSTRT

```
/*********************************************************************/
/* A System REXX Health Check must call HZSLSTRT. If this call is    */
/* not successful all IBM Health Checker for z/OS                    */
/* function calls will fail.                                         */
/*********************************************************************/
 HZSLSTRT_RC = HZSLSTRT()
 IF HZSLSTRT_RC <> 0 THEN
   DO
         SAY "HZSLSTRT RC"  HZSLSTRT_RC
         SAY "HZSLSTRT RSN" HZSLSTRT_RSN
         SAY "HZSLSTRT SYSTEMDIAG" HZSLSTRT_SYSTEMDIAG
     EXIT                     /* Exit, check cannot be performed     */
   END
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Step 2: Every Health Check an ENTRY code, defined when the check is registered with the Health Checker address space. We'll see later that it was one (1).**
- **Step 3: Each check is called at check initial run, each time it is scheduled to be run, and for termination. For all of the "run" cases, we'll call a routine called PROCESS_RACF_STARTED_CLASS_CHECK.**

```
/*********************************************************************/
/* Check the entry code to determine which check to process          */
/*********************************************************************/
    select
      when HZS_PQE_ENTRY_CODE = 1 then     /* RACF_STARTED_CLASS     */
         select
            when HZS_PQE_FUNCTION_CODE = "INITRUN" then
               Call Process_RACF_STARTED_CLASS_CHECK
            when HZS_PQE_FUNCTION_CODE = "RUN"     then
               Call Process_RACF_STARTED_CLASS_CHECK
            when HZS_PQE_FUNCTION_CODE = "DEACTIVATE" then nop
            otherwise say "Unexpected HZS_PQE_FUNCTION_CODE:" ,
               HZS_PQE_FUNCTION_CODE
         end                               /* END RACF_STARTED_CLASS */
```

Our Sample IRRXUTIL-based RACF System REXX Health Check

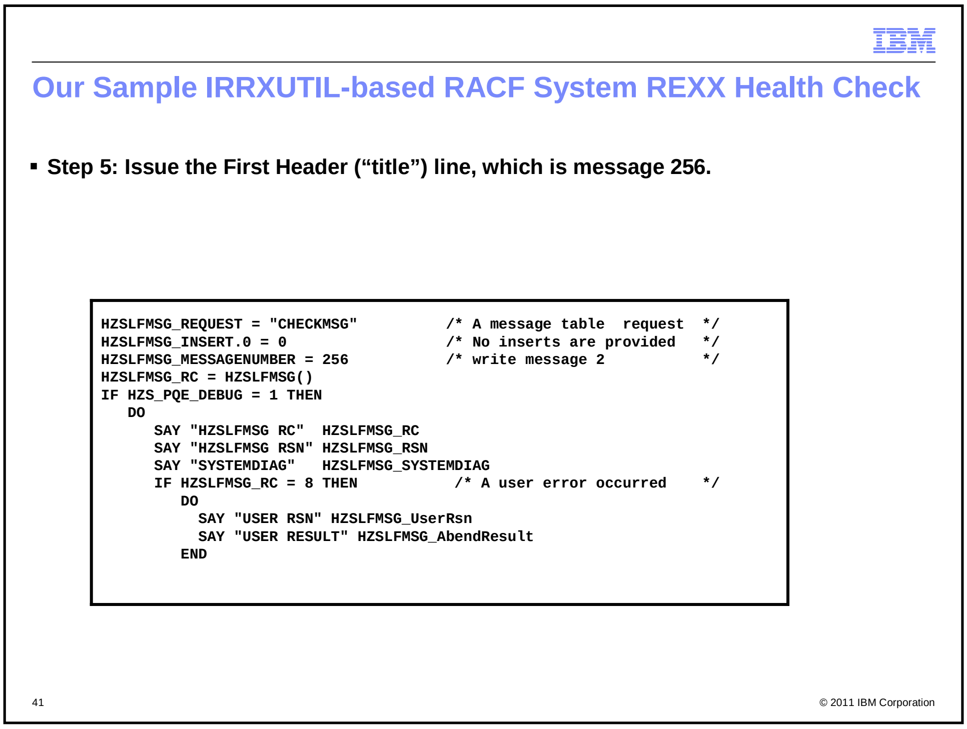
- **Before we can look at the next step, we need to highlight that every line in a Health Check Output is the result of a call to a the HZSMSG routine, which prints a message. Each message has an ID, which we can see if we put the check into DEBUG mode.**
  - Messages may contain inserted values

```
HZS1098I   CHECK(IBMSAMPLE,RACF_STARTED_CLASS)
HZS1090I   START TIME: 04/25/2011 15:10:58.866140
HZS1095I   CHECK DATE: 20061219  CHECK SEVERITY: LOW
HZS1099I   VERBOSE MODE: YES
RACS255R                          RACF Started Class Report
RACS256R   S Started Profile   Gen   User     Group    Prot  Trust Priv
RACS257R   - ----------------- ----- -------- -------- ----- ----- ----
RACS258R     IRRDPTAB.*        Yes   STCUSER  SYS1     Yes   Yes   No
RACS258R     JES2.*            Yes   STCUSER  SYS1     Yes   Yes   No
RACS258R   E JK.*              Yes   NOTPROT  SYS1     No    Yes   No
RACS258R     JKOO.*            Yes   PROTECT  SYS1     Yes   Yes   No
RACS258R   E JKOOP.*           Yes   MARKN    SYS1     No    Yes   No
RACS258R     JKOOP2.*          Yes   PROTECT  SYS1     Yes   Yes   No
RACS258R     RACF.*            Yes   STCUSER  SYS1     Yes   Yes   No
RACS258R     RACF.*            Yes   STCUSER  SYS1     Yes   Yes   No
RACS258R     RSF1.*            Yes   STCUSER  SYS1     Yes   Yes   No
RACS258R     RSF1WKSP.*        Yes   STCUSER  SYS1     Yes   Yes   No
RACS258R   U RSF2.*            Yes   NOSUCHID SYS1     ***   Yes   No
RACS258R     RSF2WKSP.*        Yes   STCUSER  SYS1     Yes   Yes   No
RACS258R   E **                Yes   IBMUSER  SYS1     No    Yes   No

          * Low Severity Exception *

RACS260E   RACS260E One or more started tasks were found which had associated
RACS260E   IDs which do not have the protected attribute.
RACS260E   . . .
```

Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Step 4: Issue the check output header line, which is message 255, with the insert.**
  - Messages are stored in a separate module
    - This module must be in an APF-authorized library accessible
  - Each message has its own number and message ID
  - With z/OS V1.12, you don’t have to have a separate message module… messages can be issued directly

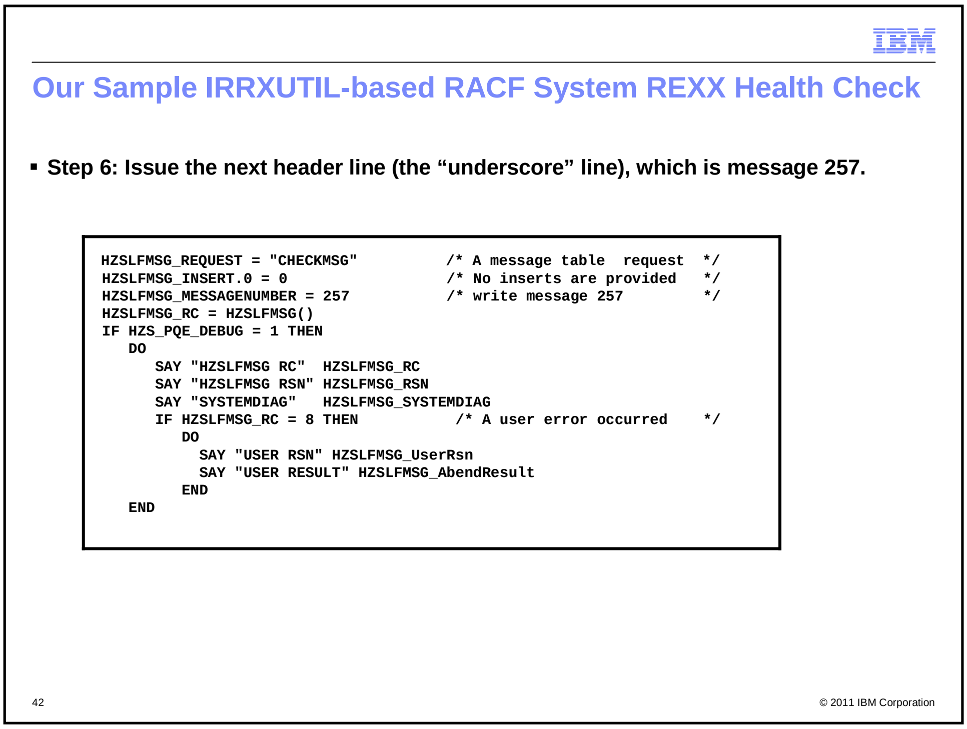
```
HZSLFMSG_REQUEST = "CHECKMSG"            /* A message table  request  */
HZSLFMSG_MESSAGENUMBER = 255           /* write message 255         */
HZSLFMSG_INSERT.0 = 1                  /* 1 input values are provided
                                                                   */
HZSLFMSG_INSERT.1 = "RACF Started Class "

HZSLFMSG_RC = HZSLFMSG()
IF HZS_PQE_DEBUG = 1 THEN
   DO
      SAY "HZSLFMSG RC"  HZSLFMSG_RC
      SAY "HZSLFMSG RSN" HZSLFMSG_RSN
      SAY "SYSTEMDIAG"   HZSLFMSG_SYSTEMDIAG
      IF HZSLFMSG_RC = 8 THEN
         DO
           SAY "USER RSN"    HZSLFMSG_UserRsn
           SAY "USER RESULT" HZSLFMSG_AbendResult
         END
   END
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Step 5: Issue the First Header ("title") line, which is message 256.**

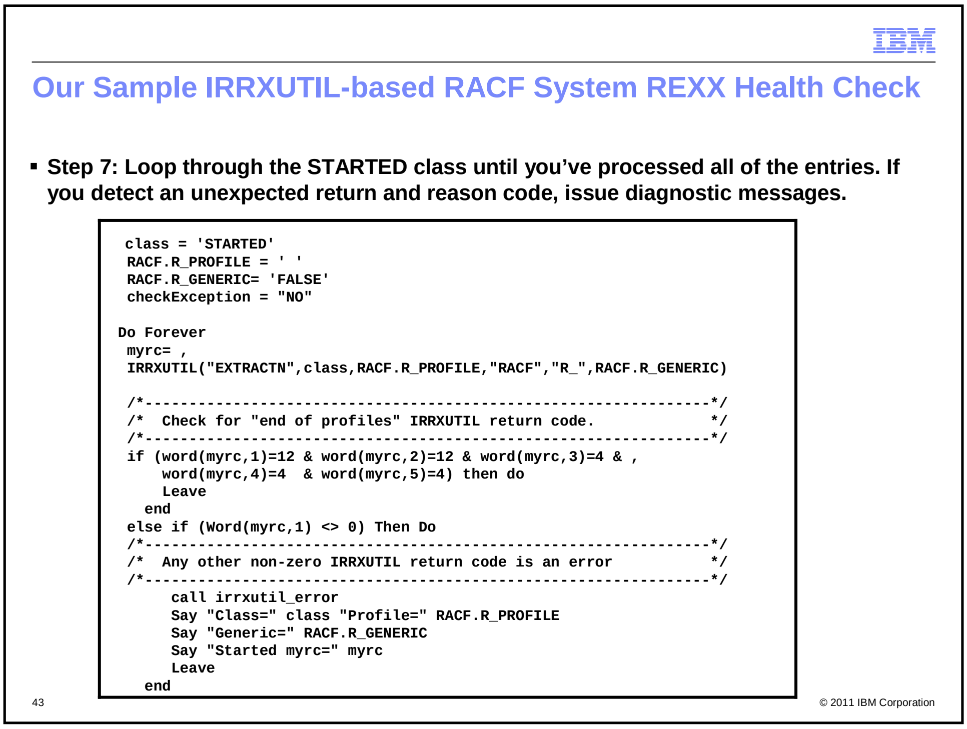
```
HZSLFMSG_REQUEST = "CHECKMSG"          /* A message table  request  */
HZSLFMSG_INSERT.0 = 0                  /* No inserts are provided   */
HZSLFMSG_MESSAGENUMBER = 256           /* write message 2           */
HZSLFMSG_RC = HZSLFMSG()
IF HZS_PQE_DEBUG = 1 THEN
   DO
      SAY "HZSLFMSG RC"  HZSLFMSG_RC
      SAY "HZSLFMSG RSN" HZSLFMSG_RSN
      SAY "SYSTEMDIAG"   HZSLFMSG_SYSTEMDIAG
      IF HZSLFMSG_RC = 8 THEN           /* A user error occurred    */
         DO
           SAY "USER RSN" HZSLFMSG_UserRsn
           SAY "USER RESULT" HZSLFMSG_AbendResult
         END
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Step 6: Issue the next header line (the "underscore" line), which is message 257.**

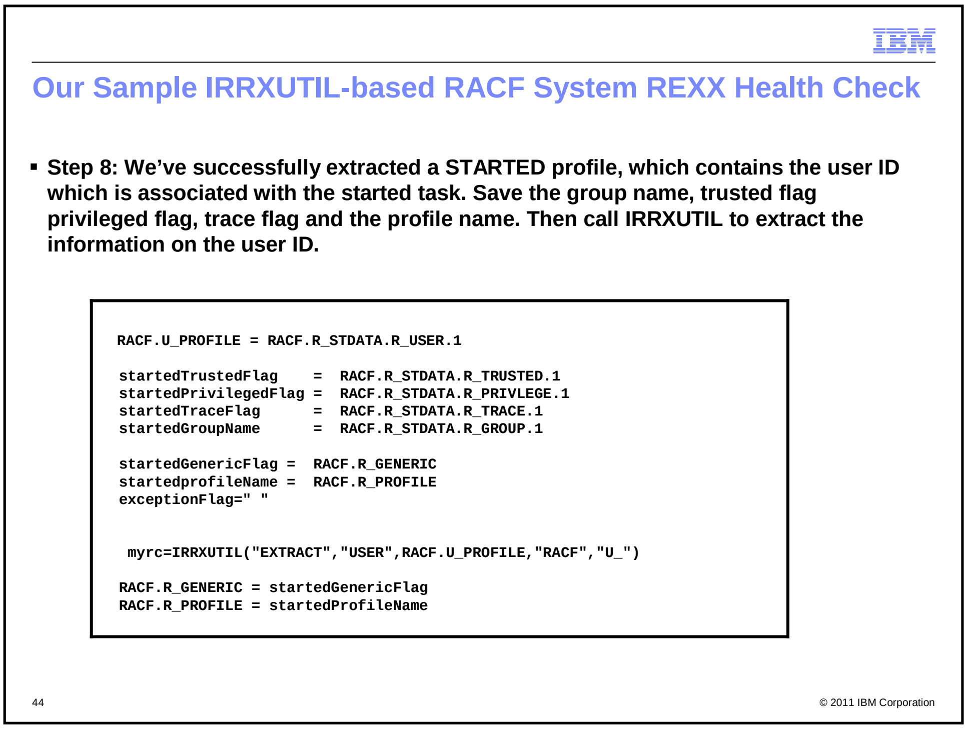
```
HZSLFMSG_REQUEST = "CHECKMSG"          /* A message table  request  */
HZSLFMSG_INSERT.0 = 0                  /* No inserts are provided   */
HZSLFMSG_MESSAGENUMBER = 257           /* write message 257         */
HZSLFMSG_RC = HZSLFMSG()
IF HZS_PQE_DEBUG = 1 THEN
   DO
      SAY "HZSLFMSG RC"  HZSLFMSG_RC
      SAY "HZSLFMSG RSN" HZSLFMSG_RSN
      SAY "SYSTEMDIAG"   HZSLFMSG_SYSTEMDIAG
      IF HZSLFMSG_RC = 8 THEN           /* A user error occurred    */
         DO
           SAY "USER RSN" HZSLFMSG_UserRsn
           SAY "USER RESULT" HZSLFMSG_AbendResult
         END
   END
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- Step 7: Loop through the STARTED class until you've processed all of the entries. If you detect an unexpected return and reason code, issue diagnostic messages.

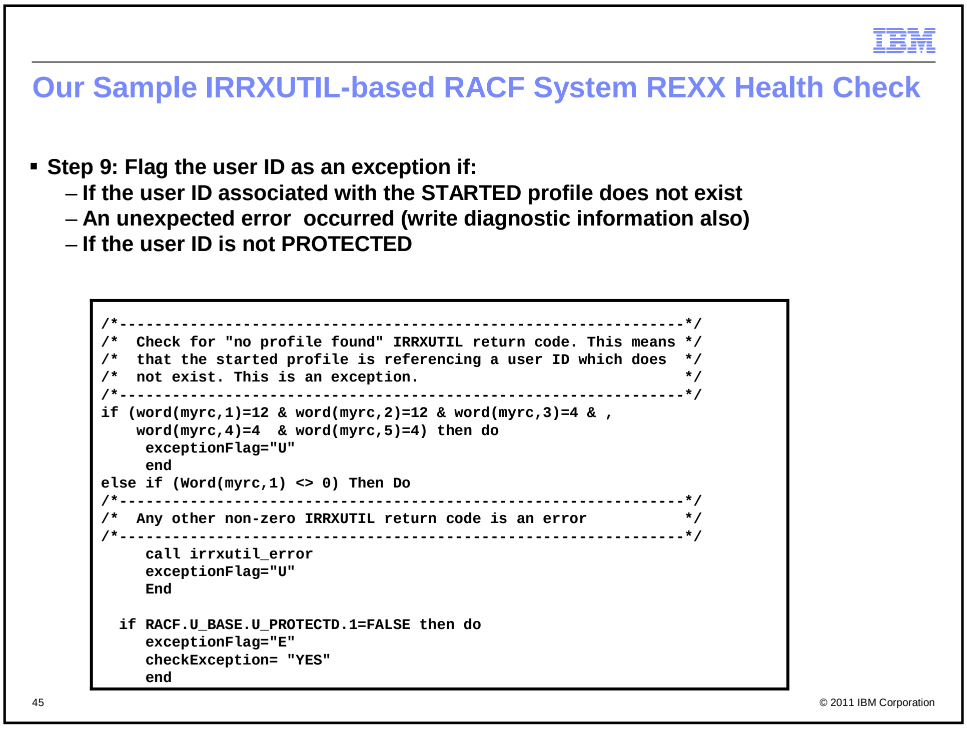
```
 class = 'STARTED'
 RACF.R_PROFILE = ' '
 RACF.R_GENERIC= 'FALSE'
 checkException = "NO"

Do Forever
 myrc= ,
 IRRXUTIL("EXTRACTN",class,RACF.R_PROFILE,"RACF","R_",RACF.R_GENERIC)

 /*---------------------------------------------------------------*/
 /*  Check for "end of profiles" IRRXUTIL return code.            */
 /*---------------------------------------------------------------*/
 if (word(myrc,1)=12 & word(myrc,2)=12 & word(myrc,3)=4 & ,
     word(myrc,4)=4  & word(myrc,5)=4) then do
     Leave
   end
 else if (Word(myrc,1) <> 0) Then Do
 /*---------------------------------------------------------------*/
 /*  Any other non-zero IRRXUTIL return code is an error          */
 /*---------------------------------------------------------------*/
      call irrxutil_error
      Say "Class=" class "Profile=" RACF.R_PROFILE
      Say "Generic=" RACF.R_GENERIC
      Say "Started myrc=" myrc
      Leave
   end
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- Step 8: We've successfully extracted a STARTED profile, which contains the user ID which is associated with the started task. Save the group name, trusted flag privileged flag, trace flag and the profile name. Then call IRRXUTIL to extract the information on the user ID.

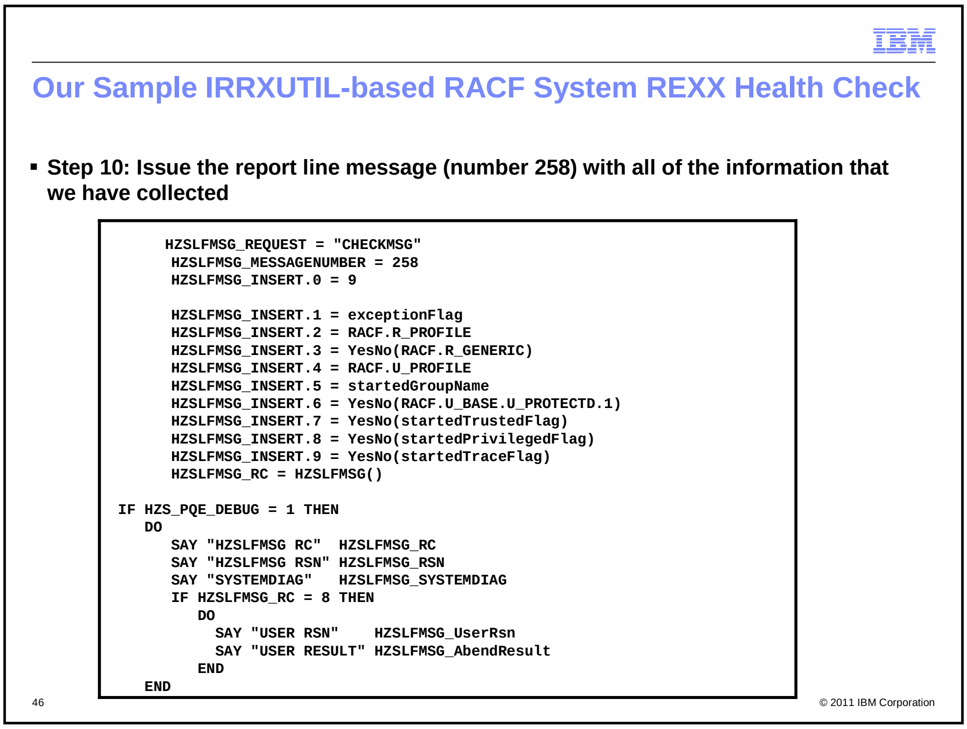
```
RACF.U_PROFILE = RACF.R_STDATA.R_USER.1

startedTrustedFlag    =  RACF.R_STDATA.R_TRUSTED.1
startedPrivilegedFlag =  RACF.R_STDATA.R_PRIVLEGE.1
startedTraceFlag      =  RACF.R_STDATA.R_TRACE.1
startedGroupName      =  RACF.R_STDATA.R_GROUP.1

startedGenericFlag =  RACF.R_GENERIC
startedprofileName =  RACF.R_PROFILE
exceptionFlag=" "


 myrc=IRRXUTIL("EXTRACT","USER",RACF.U_PROFILE,"RACF","U_")

RACF.R_GENERIC = startedGenericFlag
RACF.R_PROFILE = startedProfileName
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- Step 9: Flag the user ID as an exception if:
  - If the user ID associated with the STARTED profile does not exist
  - An unexpected error occurred (write diagnostic information also)
  - If the user ID is not PROTECTED

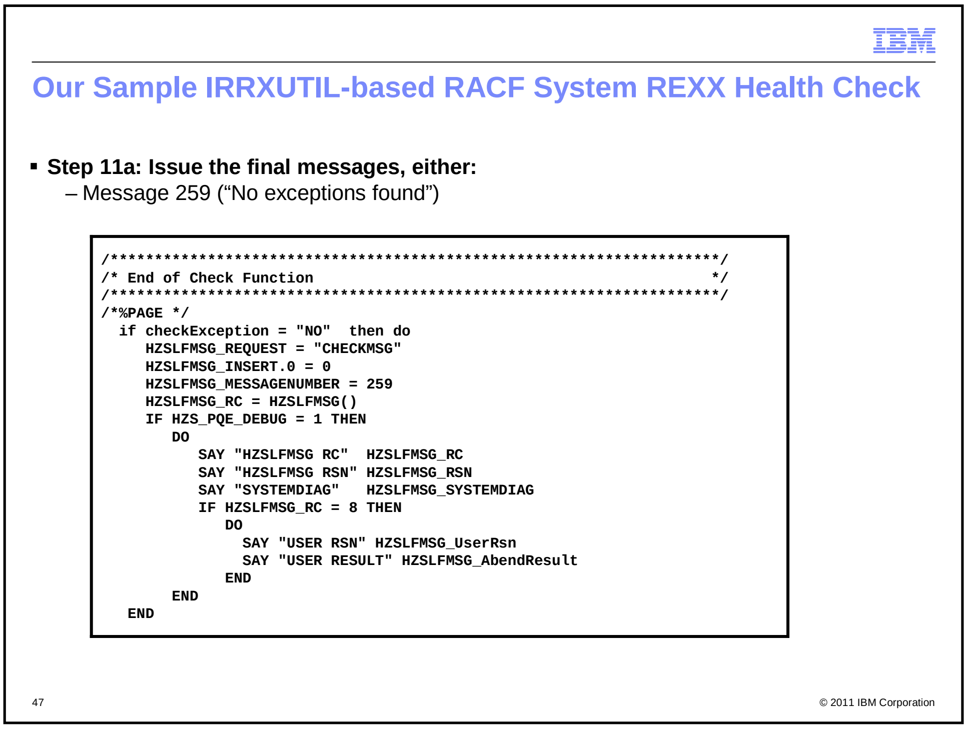
```
/*----------------------------------------------------------------*/
/*  Check for "no profile found" IRRXUTIL return code. This means */
/*  that the started profile is referencing a user ID which does  */
/*  not exist. This is an exception.                              */
/*----------------------------------------------------------------*/
if (word(myrc,1)=12 & word(myrc,2)=12 & word(myrc,3)=4 & ,
    word(myrc,4)=4  & word(myrc,5)=4) then do
     exceptionFlag="U"
     end
else if (Word(myrc,1) <> 0) Then Do
/*----------------------------------------------------------------*/
/*  Any other non-zero IRRXUTIL return code is an error           */
/*----------------------------------------------------------------*/
     call irrxutil_error
     exceptionFlag="U"
     End

  if RACF.U_BASE.U_PROTECTD.1=FALSE then do
     exceptionFlag="E"
     checkException= "YES"
     end
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- Step 10: Issue the report line message (number 258) with all of the information that we have collected

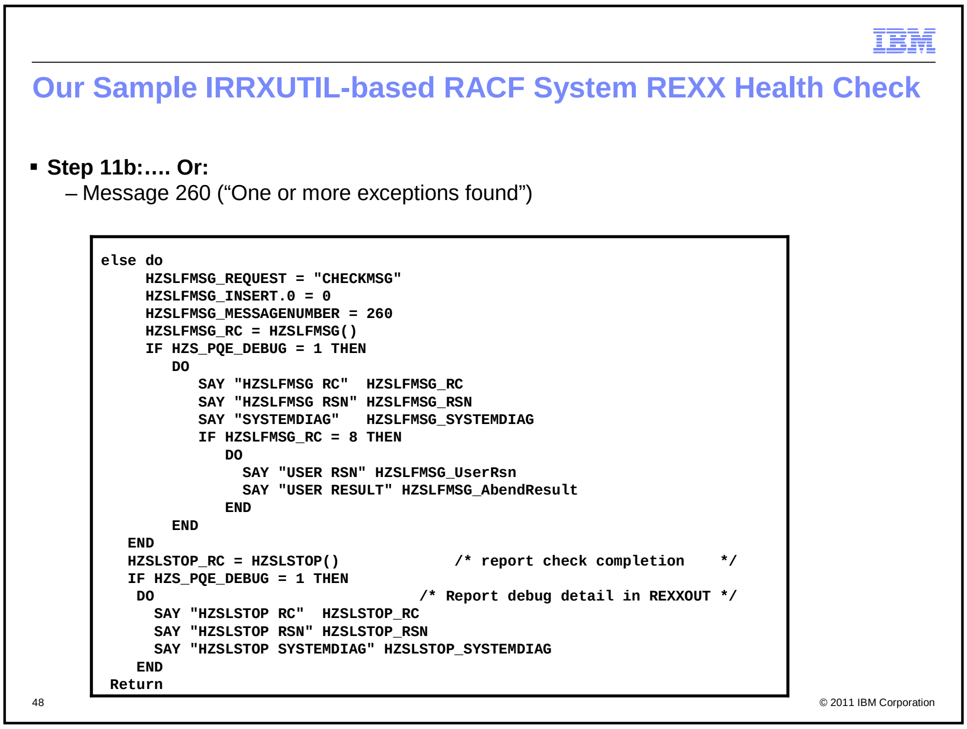
```
     HZSLFMSG_REQUEST = "CHECKMSG"
      HZSLFMSG_MESSAGENUMBER = 258
      HZSLFMSG_INSERT.0 = 9

      HZSLFMSG_INSERT.1 = exceptionFlag
      HZSLFMSG_INSERT.2 = RACF.R_PROFILE
      HZSLFMSG_INSERT.3 = YesNo(RACF.R_GENERIC)
      HZSLFMSG_INSERT.4 = RACF.U_PROFILE
      HZSLFMSG_INSERT.5 = startedGroupName
      HZSLFMSG_INSERT.6 = YesNo(RACF.U_BASE.U_PROTECTD.1)
      HZSLFMSG_INSERT.7 = YesNo(startedTrustedFlag)
      HZSLFMSG_INSERT.8 = YesNo(startedPrivilegedFlag)
      HZSLFMSG_INSERT.9 = YesNo(startedTraceFlag)
      HZSLFMSG_RC = HZSLFMSG()

IF HZS_PQE_DEBUG = 1 THEN
   DO
      SAY "HZSLFMSG RC"  HZSLFMSG_RC
      SAY "HZSLFMSG RSN" HZSLFMSG_RSN
      SAY "SYSTEMDIAG"   HZSLFMSG_SYSTEMDIAG
      IF HZSLFMSG_RC = 8 THEN
         DO
           SAY "USER RSN"    HZSLFMSG_UserRsn
           SAY "USER RESULT" HZSLFMSG_AbendResult
         END
   END
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Step 11a: Issue the final messages, either:**
  - – Message 259 (“No exceptions found”)

```
/*********************************************************************/
/* End of Check Function                                             */
/*********************************************************************/
/*%PAGE */
  if checkException = "NO"  then do
     HZSLFMSG_REQUEST = "CHECKMSG"
     HZSLFMSG_INSERT.0 = 0
     HZSLFMSG_MESSAGENUMBER = 259
     HZSLFMSG_RC = HZSLFMSG()
     IF HZS_PQE_DEBUG = 1 THEN
        DO
           SAY "HZSLFMSG RC"  HZSLFMSG_RC
           SAY "HZSLFMSG RSN" HZSLFMSG_RSN
           SAY "SYSTEMDIAG"   HZSLFMSG_SYSTEMDIAG
           IF HZSLFMSG_RC = 8 THEN
              DO
                SAY "USER RSN" HZSLFMSG_UserRsn
                SAY "USER RESULT" HZSLFMSG_AbendResult
              END
        END
   END
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Step 11b:…. Or:**
  - – Message 260 (“One or more exceptions found”)

```
else do
     HZSLFMSG_REQUEST = "CHECKMSG"
     HZSLFMSG_INSERT.0 = 0
     HZSLFMSG_MESSAGENUMBER = 260
     HZSLFMSG_RC = HZSLFMSG()
     IF HZS_PQE_DEBUG = 1 THEN
        DO
           SAY "HZSLFMSG RC"  HZSLFMSG_RC
           SAY "HZSLFMSG RSN" HZSLFMSG_RSN
           SAY "SYSTEMDIAG"   HZSLFMSG_SYSTEMDIAG
           IF HZSLFMSG_RC = 8 THEN
              DO
                SAY "USER RSN" HZSLFMSG_UserRsn
                SAY "USER RESULT" HZSLFMSG_AbendResult
              END
        END
   END
   HZSLSTOP_RC = HZSLSTOP()             /* report check completion    */
   IF HZS_PQE_DEBUG = 1 THEN
    DO                              /* Report debug detail in REXXOUT */
      SAY "HZSLSTOP RC"  HZSLSTOP_RC
      SAY "HZSLSTOP RSN" HZSLSTOP_RSN
      SAY "HZSLSTOP SYSTEMDIAG" HZSLSTOP_SYSTEMDIAG
    END
 Return
```

Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Step 12:**
  - Assemble and link edit the message table into an APF-authorized library
    - Do not link with AC(1)…. Link with AC(0)
  - Uses the HZSMSGEN utility

- **Step 13**: (If needed)
  - Update the Health Checker started task by placing the message data set into the STEPLIB concatenation

Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Message are defined using an XML-like format, processed by HZSMSGEN, the Health Checker message Utility.**
- **Message 255 is a header line with one insert.**

```
<!-- ============================================================= -->
<!--  Message:    RACS255R                                         -->
<!-- ============================================================= -->
<msg class="report">
<msgnum xreftext="255">RACS255R</msgnum>
<msgtext>
<lines class="center">
<mv>report-name</mv>Report
</lines>
</msgtext>
<msgitem class="explanation"><p>
Header line for the sample RACF checks.
</p></msgitem>
<msgitem class="sysact"><p>
Processing continues.
</p></msgitem>
<msgitem class="oresp"><p>
None.
<msgitem>
…
…
…
</msg>
```

Our Sample IRRXUTIL-based RACF System REXX Health Check

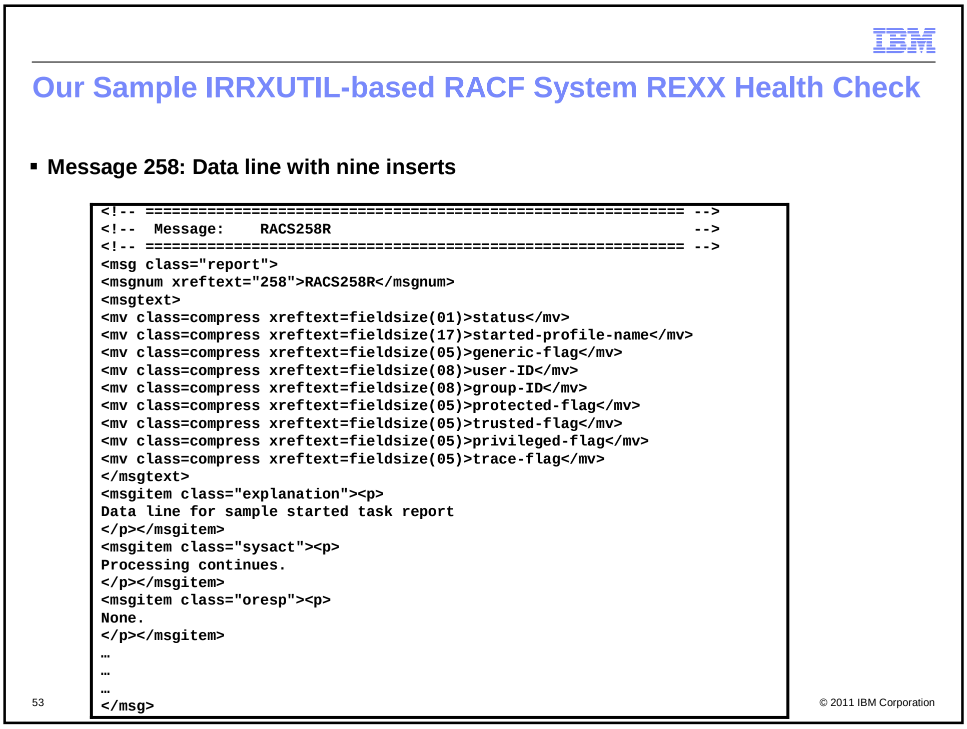
- **Message 256: Header line with no inserts**

```
<!-- ============================================================= -->
<!--  Message:    RACS256R                                          -->
<!-- ============================================================= -->
<msg class="report">
<msgnum xreftext="256">RACS256R</msgnum>
<msgtext>
S Started Profile   Gen   User     Group    Prot  Trust Priv  Trace
</msgtext>
<msgitem class="explanation"><p>
Header line for the sample RACF check
</p></msgitem>
<msgitem class="sysact"><p>
Processing continues.
</p></msgitem>
<msgitem class="oresp"><p>
None.
<msgitem>
…
…
…
</msg>
```

Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Message 257: Header line with no inserts**

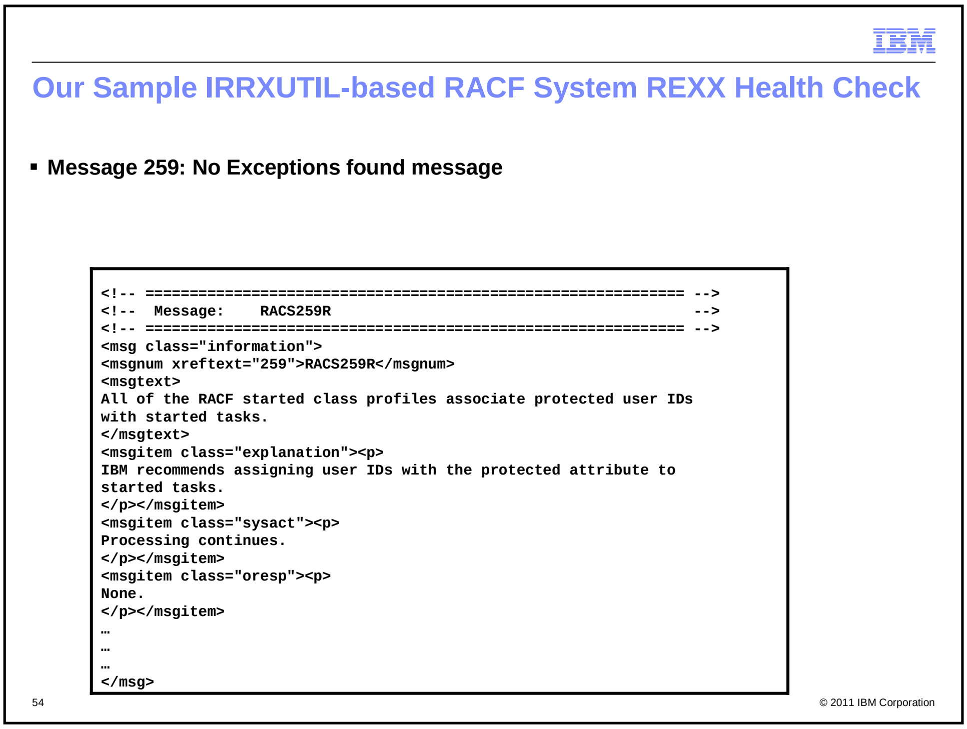
```
<!-- ============================================================= -->
<!--  Message:    RACS257R                                          -->
<!-- ============================================================= -->
<msg class="report">
<msgnum xreftext="257">RACS257R</msgnum>
<msgtext>
- ---------------- ----- -------- -------- ----- ----- ----- -----
</msgtext>
<msgitem class="explanation"><p>
Data set header line for the sample RACF check
</p></msgitem>
<msgitem class="sysact"><p>
Processing continues.
</p></msgitem>
<msgitem class="oresp"><p>
None.
</p></msgitem>
<msgitem class="spresp"><p>
None.
</p></msgitem>
…
…
…
</msg>
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Message 258: Data line with nine inserts**

```
<!-- ============================================================ -->
<!--  Message:    RACS258R                                        -->
<!-- ============================================================ -->
<msg class="report">
<msgnum xreftext="258">RACS258R</msgnum>
<msgtext>
<mv class=compress xreftext=fieldsize(01)>status</mv>
<mv class=compress xreftext=fieldsize(17)>started-profile-name</mv>
<mv class=compress xreftext=fieldsize(05)>generic-flag</mv>
<mv class=compress xreftext=fieldsize(08)>user-ID</mv>
<mv class=compress xreftext=fieldsize(08)>group-ID</mv>
<mv class=compress xreftext=fieldsize(05)>protected-flag</mv>
<mv class=compress xreftext=fieldsize(05)>trusted-flag</mv>
<mv class=compress xreftext=fieldsize(05)>privileged-flag</mv>
<mv class=compress xreftext=fieldsize(05)>trace-flag</mv>
</msgtext>
<msgitem class="explanation"><p>
Data line for sample started task report
</p></msgitem>
<msgitem class="sysact"><p>
Processing continues.
</p></msgitem>
<msgitem class="oresp"><p>
None.
</p></msgitem>
…
…
…
</msg>
```



Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Message 259: No Exceptions found message**

```
<!-- ============================================================ -->
<!--  Message:    RACS259R                                        -->
<!-- ============================================================ -->
<msg class="information">
<msgnum xreftext="259">RACS259R</msgnum>
<msgtext>
All of the RACF started class profiles associate protected user IDs
with started tasks.
</msgtext>
<msgitem class="explanation"><p>
IBM recommends assigning user IDs with the protected attribute to
started tasks.
</p></msgitem>
<msgitem class="sysact"><p>
Processing continues.
</p></msgitem>
<msgitem class="oresp"><p>
None.
</p></msgitem>
…
…
…
</msg>
```

Our Sample IRRXUTIL-based RACF System REXX Health Check

- **Message 260: One or more exceptions found message**

```
<!-- ============================================================ -->
<!--  Message:    RACS260E                                        -->
<!-- ============================================================ -->
<msg class="exception">
<msgnum xreftext="260">RACS260E</msgnum>
<msgtext>
One or more started tasks were found which had associated user IDs
which do not have the protected attribute.
</msgtext>
<msgitem class="explanation"><p>
IBM recommends assigning user IDs with the protected attribute to
started tasks.
</p></msgitem>
<msgitem class="sysact"><p>
Processing continues.
</p></msgitem>
<msgitem class="oresp"><p>
None.
</p></msgitem>
…
…
…
</msg>
```

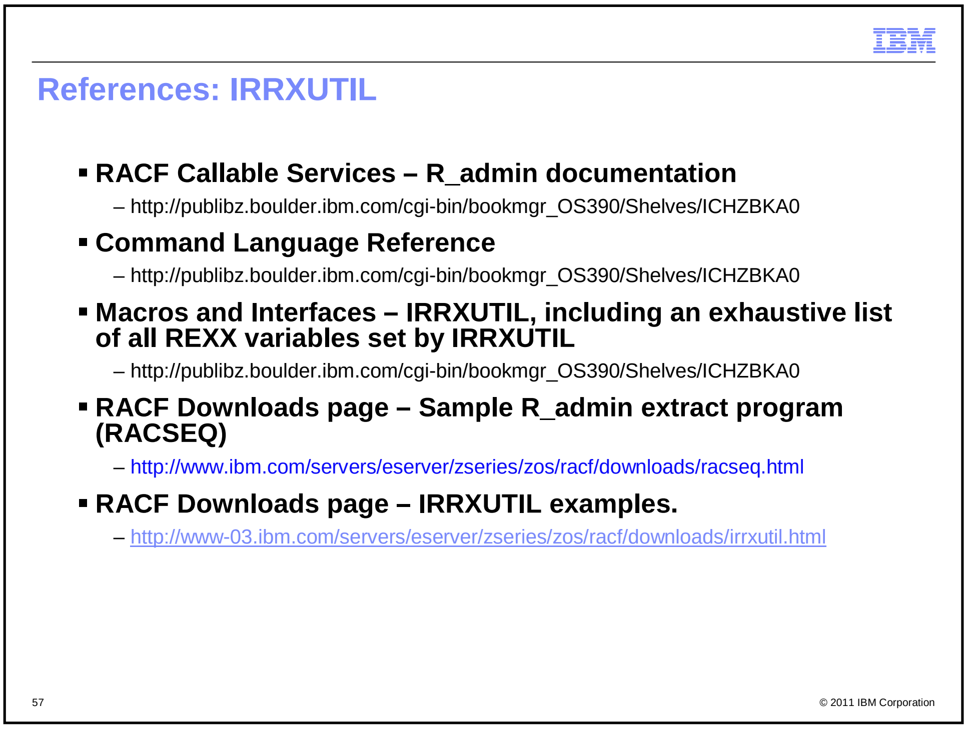
Registering your Check

- **The check is “registered” or defined to the z/OS Health Checker by placing a statement in the Health Checker PARMLIB:**

```
ADDREP CHECK(IBMSAMPLE,RACF_STARTED_CLASS)
     EXEC(HCSTART)
      REXXHLQ(MARKN)
      REXXTSO(NO)
      REXXIN(NO)
      MSGTBL(HCSTCMSG)
      ENTRYCODE(1)
      USS(NO)
      VERBOSE(YES)
      SEVERITY(LOW)
      INTERVAL(ONETIME)
      DATE(20061219)
      REASON('RACF Started Class Sample Check')
```

- **Activating the partly entry (HZSPRM$N in this example) is activated starts the check execution:**

```
F HCMARKN,ADD,PARMLIB=$N
```



References: IRRXUTIL

- **RACF Callable Services – R_admin documentation**
  - http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/ICHZBKA0
- **Command Language Reference**
  - http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/ICHZBKA0
- **Macros and Interfaces – IRRXUTIL, including an exhaustive list of all REXX variables set by IRRXUTIL**
  - http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/ICHZBKA0
- **RACF Downloads page – Sample R_admin extract program (RACSEQ)**
  - http://www.ibm.com/servers/eserver/zseries/zos/racf/downloads/racseq.html
- **RACF Downloads page – IRRXUTIL examples.**
  - http://www-03.ibm.com/servers/eserver/zseries/zos/racf/downloads/irrxutil.html

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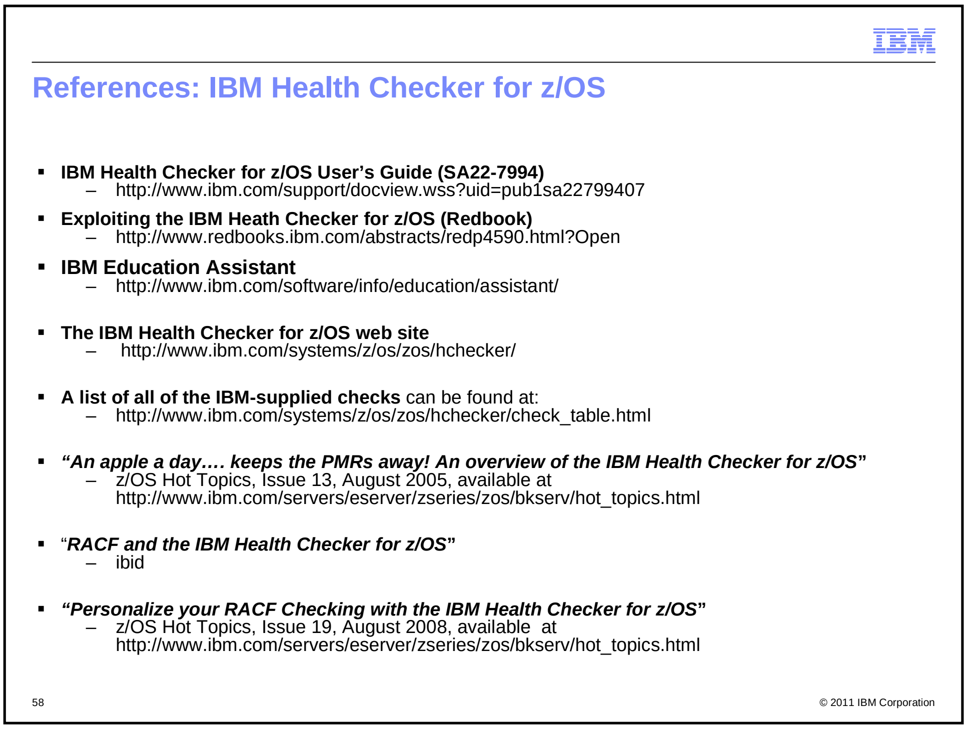

References: IBM Health Checker for z/OS

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  - http://www.ibm.com/support/docview.wss?uid=pub1sa22799407
- **Exploiting the IBM Heath Checker for z/OS (Redbook)**
  - http://www.redbooks.ibm.com/abstracts/redp4590.html?Open
- **IBM Education Assistant**
  - http://www.ibm.com/software/info/education/assistant/
- **The IBM Health Checker for z/OS web site**
  - http://www.ibm.com/systems/z/os/zos/hchecker/
- **A list of all of the IBM-supplied checks** can be found at:
  - http://www.ibm.com/systems/z/os/zos/hchecker/check_table.html
- ***"An apple a day…. keeps the PMRs away! An overview of the IBM Health Checker for z/OS"***
  - z/OS Hot Topics, Issue 13, August 2005, available at http://www.ibm.com/servers/eserver/zseries/zos/bkserv/hot_topics.html
- "***RACF and the IBM Health Checker for z/OS*"**
  - ibid
- ***"Personalize your RACF Checking with the IBM Health Checker for z/OS"***
  - z/OS Hot Topics, Issue 19, August 2008, available at http://www.ibm.com/servers/eserver/zseries/zos/bkserv/hot_topics.html

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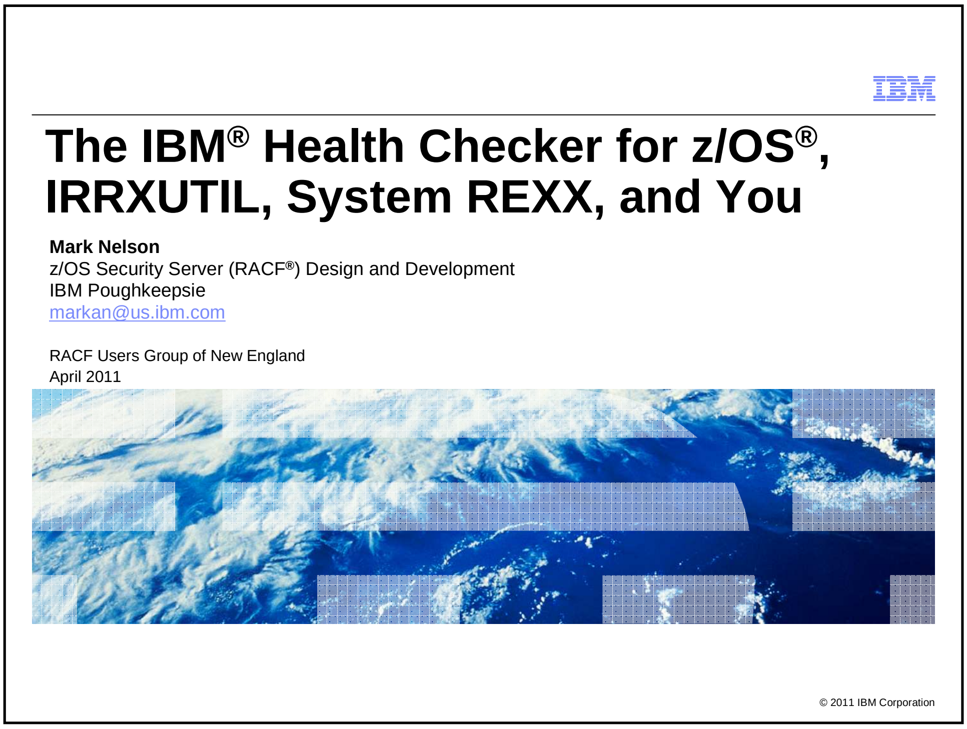

The IBM® Health Checker for z/OS®, IRRXUTIL, System REXX, and You

Mark Nelson
z/OS Security Server (RACF®) Design and Development
IBM Poughkeepsie
markan@us.ibm.com

RACF Users Group of New England
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