What does the z/OS Password Statement of Direction Mean to me?

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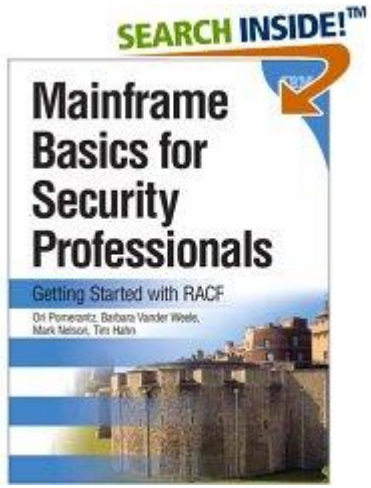
Session DJ



Background

- **Since its first release in 1976, RACF has supported the password as a primary authentication mechanism**
- **Originally, passwords were stored in a "masked" format**
  - Reversable!
- **With RACF 1.6 (1984) RACF introduced a the "Data Encryption Standard" (DES) as an option for the storage of passwords**
  - Value stored in the RACF database is the user ID encrypted with the password
  - Not reversible, other than by "brute force"
- **The encryption algorithm was selected using a new exit, ICHDEX01, located in LPA**
  - Return code 04: Use masking algorithm
  - Return code 08: Use DES
  - Return code 16: Use DES, fall-back to masking
  - No exit: Use DES than masking

Background…

- **IBM shipped a version of ICHDEX01 in LPA that unconditionally set return code 04 (masking)**
  - Maintained compatibility with RACF 1.5
- **With RACF 2.1 (1994), IBM moved the "default" ICHDEX01 exit to LINKLIB**
  - This effectively made the password algorithm DES falling back to masking
  - SYS1.SAMPLIB contained a IEALPAxx statement to put the exit back into LPA
- **Net: Without an ICHDEX01 exit that sets the return code to 8, installations are running with DES falling back to masking**

Background…

- **Ask yourself this question: “Which is a better encryption algorithm?” Your possible answers are:**
  - DES
  - AES
  - The question contains insufficient information to allow for a correct answer

- **The most important element in the question isn't the algorithm... it's the size and character set of the key!**
  - And what's the size of the key? It's the 8-byte password!
  - You can make the key space larger by enabling mixed-case passwords

- **Password phrases are a marvelous mechanism for resilience against brute force attacks.**
  - Wouldn't it be nice if you could have password phrase only users?

- **Resilience against brute-force password attacks is affected by**
  - The size and non-predictability of the key
  - The speed of the algorithm (***Faster isn't better***!)

The Paradox

- **Why does slowing down the encryption process help against a brute-force attack?**
  - You only have to do the algorithm once for a password validation.
  - The attacker has to do the algorithm once for each brute force attempt
  - The number of brute-force attempts needed is a function of the size of the key, the character set of the key…. and luck
  - **Net:** You are slowed down a little... the attacker is slowed down ***a lot!***

Other Challenges

- **RACF's password processing is very well known**
- **Some resource managers perform their processing knowing what RACF's processing is**
  - Some extract the cipher text password and then perform their own validation
  - Some present a ciphertext value during the authentication process
  - Some compute the ciphertext password themselves and insert that into the user profile
- **The challenge is to get all of these to work whatever RACF implements**
  - Some vendor applications will have to change
- **Enablement must be optional**

The Statement of Direction

- **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.**

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On the Horizon

- **New function APARs OA43998 (SAF)/OA43999(RACF)**
  - Migrate from 56-bit single key DES to key-derrived AES (KDFAES)
  - Password-phrase-only users
  - Administrator password expiration
  - Password history cleanup
  - Additional “special” characters allowed in passwords
  - Rollback planned to z/OS V1.12
  - A number of products are effected by these enhancements
- **New SMP/E FIXCATEGORIES are defined for each function so that you can identify updates as they become available**
- **Informational APAR II14765 will document known restrictions**

KDFAES

- **With KDFAES (key derivation function with AES), the password or password phrase is appended with random data, then is iteratively hashed thousands of times to derive a 256-bit encryption key. That key is used to AES encrypt the user ID which has been appended with other data.**

- **Enabling the new encryption processing is done with the SETROPTS command**
  - `SETROPTS PASSWORD(ALGORITHM(KDFAES))`
  - New passwords will be encrypted using the new algorithm

- **You can change convert a user's password and password history to KDFAES using the new ALTUSER PWCONVERT keyword:**
  - `ALTUSER userID PWCONVERT`
  - You can use a simple SEARCH command to create the commands to convert all users to KDFAES

Other Password and Password Phrase Enhancements

- **A password phrase may now be assigned to a user without requiring a password**
  - `ALTUSER userID NOPASSWORD`
- **A user's password and password phrase may now be expired without having the administrator change them**
  - `ALTUSER userID EXPIRED`
- **A user's password and password phrase history can be "cleaned up" of orphaned entries caused by the lowering of the SETROPTS PASSWORD(HISTORY(nn)) value**
  - `ALTUSER userID PWCLEAN`
- **With KDFAES active, RACF allows a password phrase of 9-13 characters without having an ICHPWX11 exit being active.**

New Special Characters

- **New special characters are enabled with the SETROPTS command**
  - `SETROPTS PASSWORD(SPECIALCHARS)`

- **Two new values are available for your SETROPTS password rules:**

  - SPECIAL
    - Includes all of the new special characters plus the national characters '#'(X'7B'), '$' (X'5B') and "@" (X'7C')

  - MIXEDALL
    - Allows all password characters
    - Can be used to force selections from each character grouping (upper case, lower case, numeric, and national/special) depending on the number of MIXEDALL positions and SETROPTS MIXEDCASE is in effect.

Symbol	Hexadecimal Value
.	4B
<	4C
+	4E
|	4F
&	50
!	5A
*	5C
-	60
%	6C
_	6D
>	6E
?	6F
:	7A
=	7E

Related Enhancements

- **RACF Database Unload Utility (IRRDBU00)**
  - User Basic Data (0200) record updated to contain:
    - The algorithm used to protect the password for the user
    - The algorithm used to protect the password phrase for the user
    - Legacy password history count
    - Legacy password phrase history count
    - KDFAES password history count
    - KDFAES password phrase history count

- **RACF SMF Unload Utility (IRRADU00)**
  - New keywords unloaded for ALTUSER, SETROPTS
  - RACF SMF type 81 initialization record new fields for SPECIALCHARS and encryption algorithm information

Related Enhancements…

- **With APAR OA44696 for V1.12(UA74753), V1.13 (UA74754), V2.1 (UA74755), RACF has provided a new health check, RACF_ENCRYPTION_ALGORITHM**

- **RACF_ENCRYPTION_ALGORITHM raises an exception if “weak” (less 'secure' than DES) encryption is allowed for logon passwords**
  - Having no ICHDEX01 is considered an exception as the absence of ICHDEX01 allow masked passwords

- **Sample Check output when ICHDEX01 is absent:**

```
CHECK(IBMRACF,RACF_ENCRYPTION_ALGORITHM)
START TIME: 01/31/2014 09:44:29.892717
CHECK DATE: 20140131  CHECK SEVERITY: MEDIUM

IRRH295E  The RACF_ENCRYPTION_ALGORITHM check has detected an
exception. ICHDEX01 is not in use on this system. DES encryption
falls back to RACF masking.

END TIME: 01/31/2014 09:44:29.893680  STATUS: EXCEPTION-MED
```

Related Enhancements…

- **Sample Check output when ICHDEX01 is present with RC=8 (DES) only:**

```
CHECK(IBMRACF,RACF_ENCRYPTION_ALGORITHM)
START TIME: 01/31/2014 09:44:29.892717
CHECK DATE: 20140131  CHECK SEVERITY: MEDIUM

IRRH296I  ICHDEX01 is in use on this system.

              ICHDEX01 Return Codes

Installation Mask    DES      Installation  DES then  Other
Only         Only    Only     Only          Mask
(RC=0)       (RC=04) (RC=08)  (RC=12)       (RC=16)   (RC=OTHER)
------------ ------- -------  ------------- --------- ----------
NO           NO      YES      NO            NO        NO


IRRH297I ICHDEX01 indicates that only DES encryption is in use.

IRRH299I No exceptions are detected.

END TIME: 01/31/2014 09:44:29.893680  STATUS: SUCCESSFUL
```

Considerations

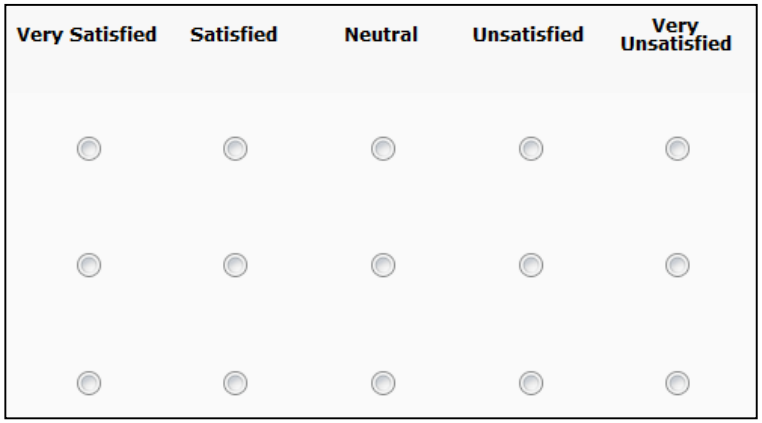
- **Before activation, be sure to:**
  - Apply the OA43998/OA43999 PTFs on all systems sharing the RACF DB
  - Apply service to any products which are impacted by this new support
  - Verify that you have no “home grown” code which is affected
  - Determine the impact to your RACF exits (such as ICHDEX01/ICHPWX11)
  - Determine the impact to RACF “downloads” that you might use
  - Ensure that you have sufficient space in your RACF database to support the expansion of user profiles
  - For better performance, ensure that you are running on a processor which has the Central Processor Assist for Cryptographic Function (CPACF) to perform the SHA-256 operations.
  - Ensure that you are using ACEE caching in VLF (IRRACEE VLF class)
  - Ensure that your RRSF systems have OA43998/OA43999 applied and have consistent password settings
- **After activation, be sure to:**
  - Monitor your RACF DB for fragmentation and storage utilization

This is the last slide in the deck

Session feedback

- Please submit your feedback at tyc.gse.org.uk/feedback

- Session is DJ



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