z990 Cryptographic Services

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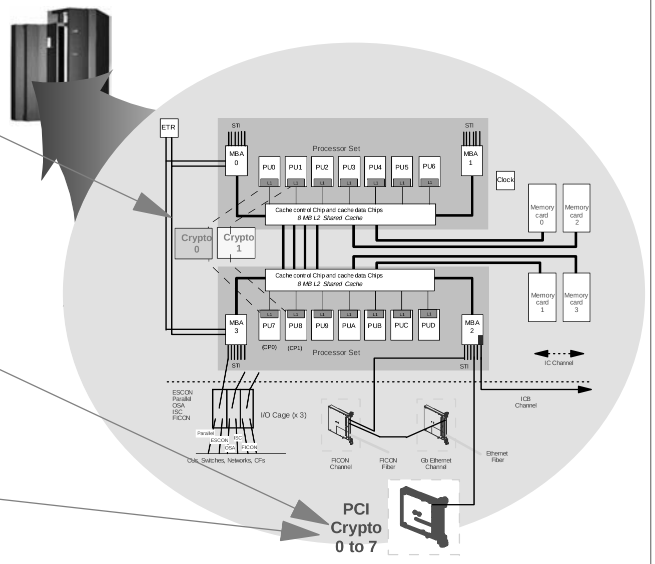
The intent of this session

- ✓ Review the cryptographic facilities available at S/390, z900 and z800 processors
- ✓ Understand the cryptographic facilities available at z990.
- ✓ Check when your operating system will be ready to full exploit the cryptographic facilities at z990
- ✓ Be aware of the new ICSF FMIDs
- ✓ How to plan the logical partition image profile customization to support the new cryptographic coprocessor available at z990.
- ✓ Understand the RMF reports available to monitor the cryptographic coprocessors.

The S/390 and z900, z800 Cryptographic Coprocessors

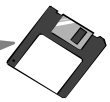
- **1994 : S/390 CMOS Cryptographic Coprocessor Facility (CCF)**
  - secure coprocessor
  - standard feature on 9672 G4, G5, G6, z900
  - optional feature on MP2000, MP3000, z800
  - evaluated FIPS 140-1 level 4
- **2000 : S/390 PCI Cryptographic Card (PCICC)**
  - secure coprocessor
  - priced feature on 9672 G5, G6, z900,z800
  - 0 to 8 'features' in a single system
  - evaluated FIPS 140-1 level 4
- **2001 : PCI Cryptographic Accelerator (PCICA)**
  - SSL accelerator (non secure)
  - priced feature on zSeries only
  - 0 to 6 'features' in a system
  - mix with PCICC for a total of 8
  - no FIPS evaluation

IBM Common Cryptographic Architecture Compliant



S/390-z900/z800 CCF and PCICC Enablement

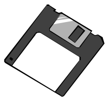
CCF					
7060<	G5/G6	z900 z800	PCICC	PCICA zSeries	Description
0800	0800	0800			CCF Hardware
0804	0814		0864		DES with PKA
0805	0815		0864		DES with PKA & TKE
0824	0834		0865		Triple DES with PKA
0825	0835	0875	0865		Triple DES with PKA & TKE
			0860 (G5/G6) / 0861 (z900/ z800)		PCI Crypto Coprocessor Card hardware
				0862	PCI Crypto Accelerator Card hardware
0866	0866	0866	0866		TKE (Token-Ring attachment)
0869	0869	0869	0869		TKE (Ethernet attachment)



One Crypto Enablement Diskette for each CCF

Requires a system Power On Reset

One PCICC FCV Diskette for the system - Concurrent installation

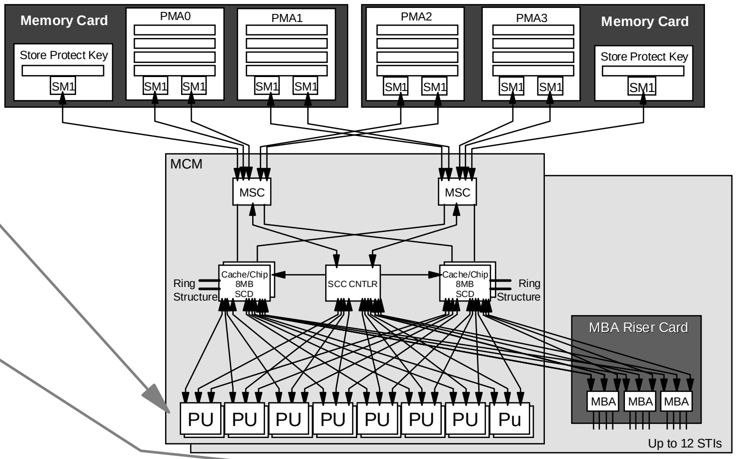


No diskette for the PCICA

z990 Hardware Cryptographic Coprocessors

- 2003 CP Assist for Cryptographic Functions (CPACF)
  - One CPACF per processing unit
  - standard orderable feature
  - 5 new published crypto instructions or through ICSF
  - non-secure (clear keys only)
- 2003 : PCI Cryptographic Accelerator (PCICA)
  - priced feature (same feature as for z900, z800)
  - SSL accelerator (non secure)
  - 0 to 6 features in a system
- 2003 : PCIX Cryptographic Coprocessor (PCIXCC)
  - priced feature
  - secure coprocessor
  - 0 to 4 features in a system
  - mix with PCICA for a maximum of 8 features
  - designed for FIPS 140-2 level 4

IBM Common Cryptographic Architecture Compliant



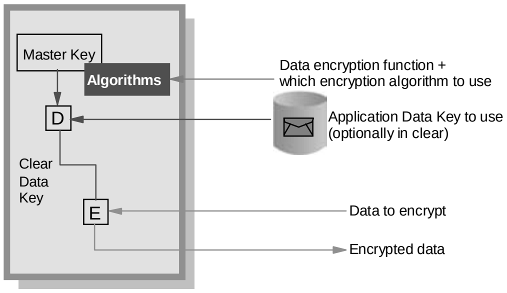
PCI Crypto 0 to 7

Secure and Non-Secure Coprocessors or Accelerators22

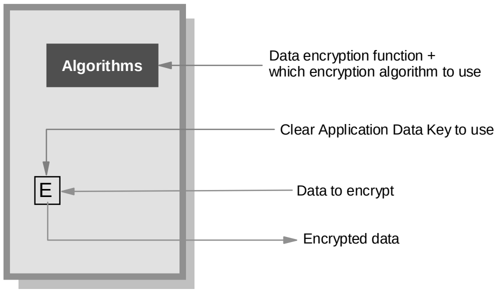
Secure Coprocessor

Non-Secure Coprocessor or Accelerator

tamper proof hardware
(**CCF**, **PCICC** or **PCIXCC**)


Master Key
Algorithms
Data encryption function +
which encryption algorithm to use
D
Application Data Key to use
(optionally in clear)
Clear
Data
Key
E
Data to encrypt
Encrypted data

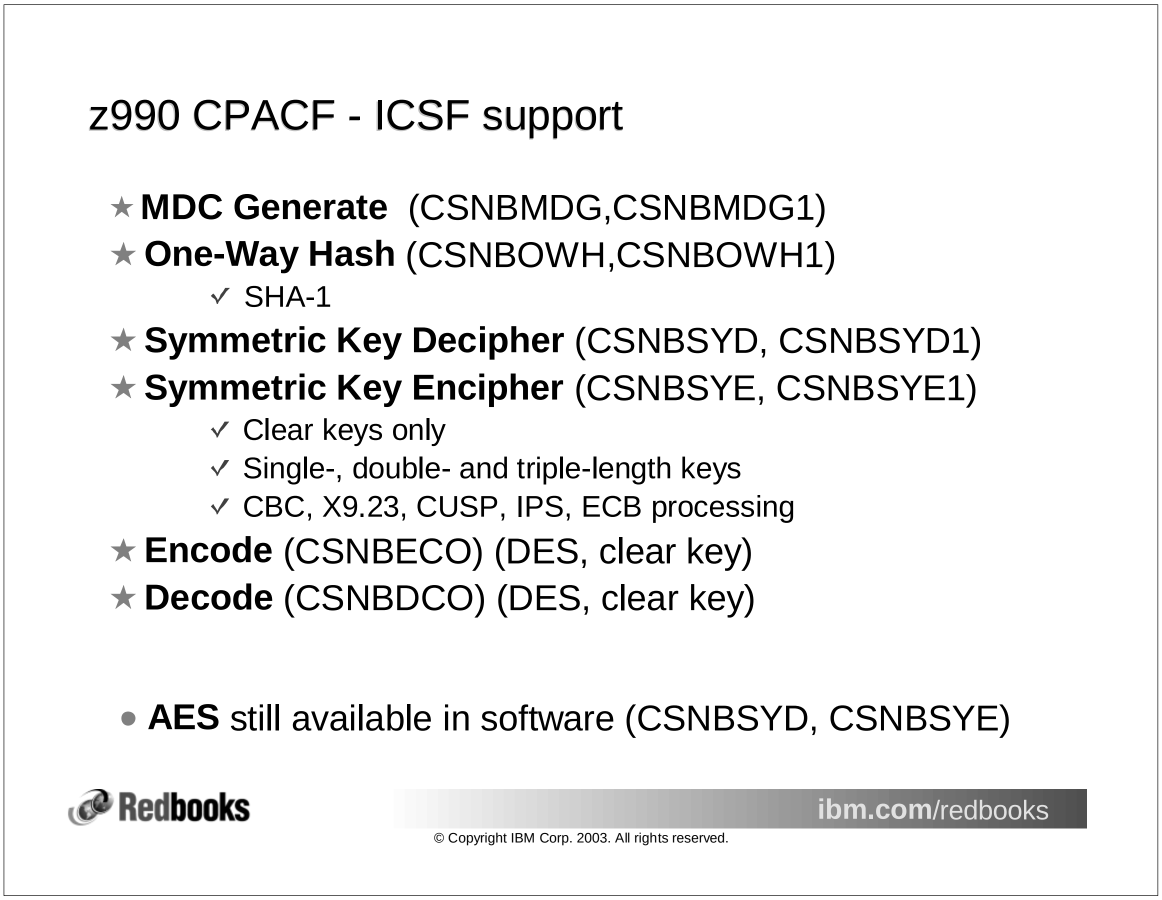
PCICA, **CPACF**


Algorithms
Data encryption function +
which encryption algorithm to use
Clear Application Data Key to use
E
Data to encrypt
Encrypted data

Evaluated FIPS 140-1 level 4
Can also operate with clear keys

Central Processor Assist for Cryptographic Functions (CPACF)

- Set of hardware cryptographic functions integrated in each PU
- Can be invoked directly using published zArchitecture problem state instructions or via ICSF
  - ✓ DES, T-DES encrypt/decrypt (clear key only), SHA-1 digest
  - ✓ Two engines per asssit: one for DES/MAC and one for SHA
- Full error detection (double data flow and comparison) and recovery (checkpoints in millicode)
- Orderable standard feature: **FC 3863** - concurrent install/removal
- Certified FIPS for the algorithms
- Export controlled feature
- **Not a replacement for CCF**



z990 CPACF - ICSF support

- ★ **MDC Generate** (CSNBMDG,CSNBMDG1)
- ★ **One-Way Hash** (CSNBOWH,CSNBOWH1)
  - ✓ SHA-1
- ★ **Symmetric Key Decipher** (CSNBSYD, CSNBSYD1)
- ★ **Symmetric Key Encipher** (CSNBSYE, CSNBSYE1)
  - ✓ Clear keys only
  - ✓ Single-, double- and triple-length keys
  - ✓ CBC, X9.23, CUSP, IPS, ECB processing
- ★ **Encode** (CSNBECO) (DES, clear key)
- ★ **Decode** (CSNBDCO) (DES, clear key)

- **AES** still available in software (CSNBSYD, CSNBSYE)

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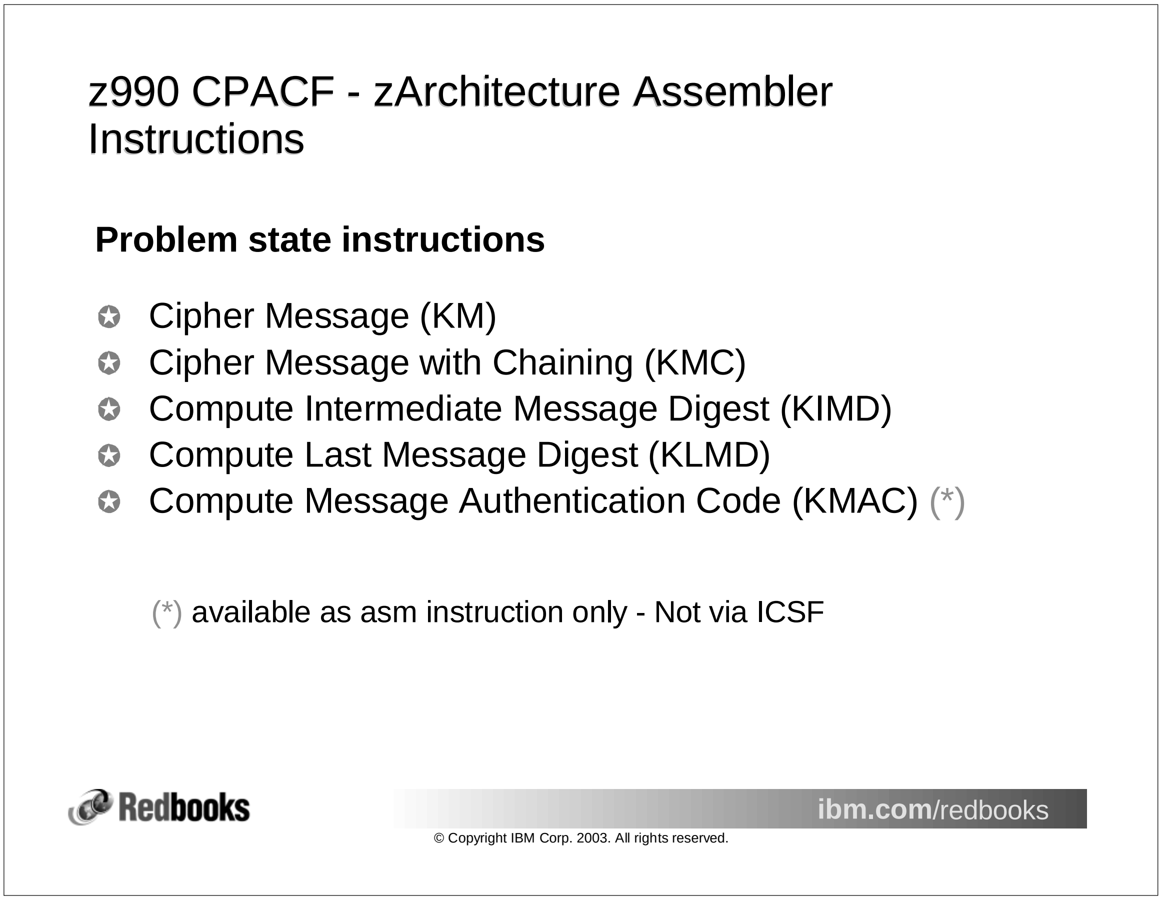

z990 CPACF - zArchitecture Assembler Instructions

Problem state instructions

- ✪ Cipher Message (KM)
- ✪ Cipher Message with Chaining (KMC)
- ✪ Compute Intermediate Message Digest (KIMD)
- ✪ Compute Last Message Digest (KLMD)
- ✪ Compute Message Authentication Code (KMAC) (*)

(*) available as asm instruction only - Not via ICSF

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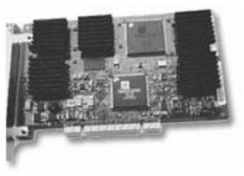
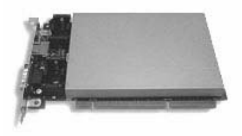
PCI Cryptographic Accelerator (PCICA)

- Accelerator for SSL handshake - driven by ICSF
- Priced feature - FC 0862 (same as z900/z800) - FC 3863 must be installed
- No enablement diskette - Concurrent install/removal

- **PKA Decrypt** (CSNDPKD)
  - ✓ PKCS-1.2 formatting
- **PKA Encrypt** (CSNDPKE)
  - ✓ ZERO-PAD formatting



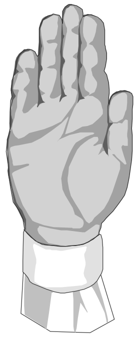
PCI X Cryptographic Coprocessors (PCIXCC)



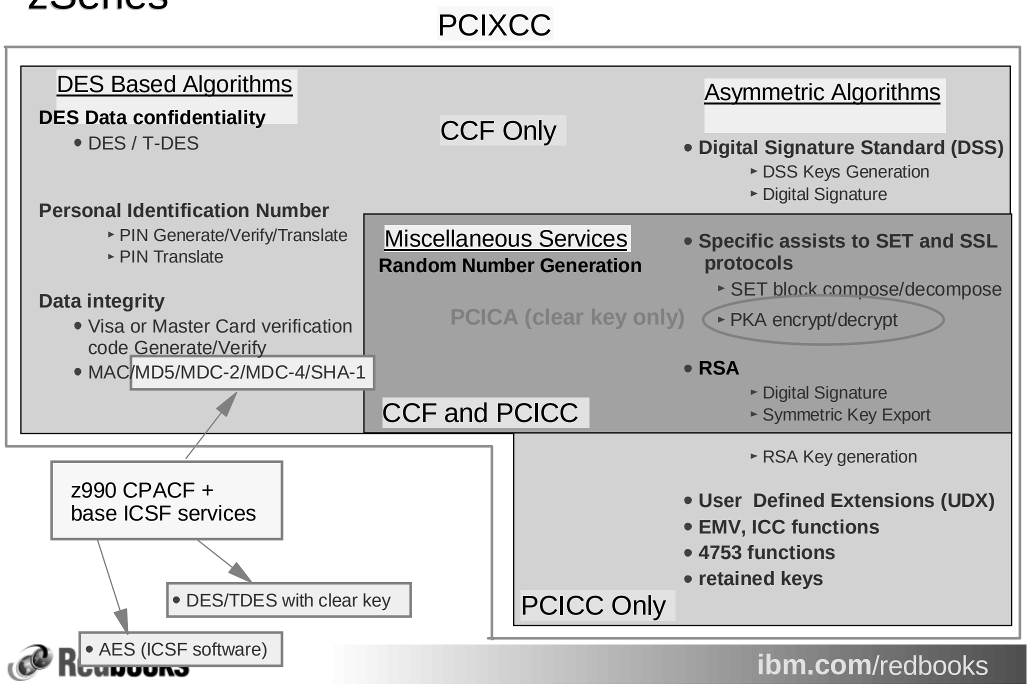
- Secure coprocessor - driven by ICSF
- Priced feature: FC 0868 - FC 3863 must be installed
- Replacement for z/900 CCF and PCICC
- No enablement diskette - Concurrent install/removal
- No Function Control Vector (FCV)
- Better performance and reliability
  - ✓ PPC 405 processor
  - ✓ Faster RSA, SHA and DES engines
  - ✓ More memory
  - ✓ Embedded LINUX operating system (replacing IBM CP/Q++ control program)

ICSF services dropped on z990

- Support for DSA signatures and key generation.
- Support for ANSI x9.17 services (offset and notarization), and associated key types.
- Support for Ciphertext_translate(CSNBCTT).
- Support for German Bank Pool - Pin Offset
- Support for CSFUDK - use CSNBDKG instead.
- Support for CDMF (40 bit encryption)



Cryptographic Algorithms Supported in zSeries



PCIXCC

DES Based Algorithms

DES Data confidentiality

- DES / T-DES

Personal Identification Number

- PIN Generate/Verify/Translate
- PIN Translate

Data integrity

- Visa or Master Card verification code Generate/Verify
- MAC/MD5/MDC-2/MDC-4/SHA-1

CCF Only

Asymmetric Algorithms

- **Digital Signature Standard (DSS)**
  - DSS Keys Generation
  - Digital Signature

Miscellaneous Services

Random Number Generation

PCICA (clear key only)

- **Specific assists to SET and SSL protocols**
  - SET block compose/decompose
  - PKA encrypt/decrypt
- **RSA**
  - Digital Signature
  - Symmetric Key Export
  - RSA Key generation

CCF and PCICC

- **User Defined Extensions (UDX)**
- **EMV, ICC functions**
- **4753 functions**
- **retained keys**

PCICC Only

z990 CPACF + base ICSF services

- DES/TDES with clear key
- AES (ICSF software)

Crypto Support General Availability

	Availability Date
PCIXCC Feature	9/19/2003
TKE 4.0 Workstation	9/30/2003
ICSF Support (z/OS V1R4) - z990	9/19/2003
ICSF Support (z/OS V1R2) - z990	9/19/2003
ICSF Support (z/OS V1R3) - z990	10/17/2003
ICSF Support (OS/390 V2R10) - z990	4Q2003

z990 PCI Crypto Configuration Rules

- Up to 2 PCICA features* per I/O cage and 6 features per CEC.
- Up to 4 PCIXCC features* per I/O cage and 4 features per CEC.
- Total number of PCICA / PCIXCC features* may not exceed 8 per CEC
- Any combination of PCIXCC, PCICA, OSA-Express and FICON-Express features* may not exceed 20 features per I/O cage and 60 features per CEC.
- PCIXCC and PCICA features do **not** use CHPIDs from the Logical Channel Subsystem pool.

(*) One PCICA feature = Two Coprocessors
One PCIXCC feature = One Coprocessor

PCI Crypto Feature Codes

PCICC (requires diskette FC 0864 or 0865)

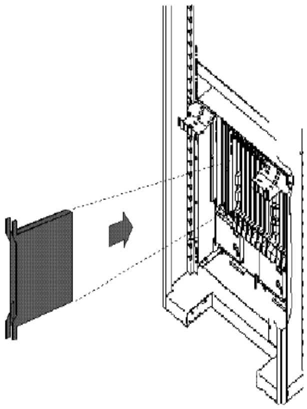
Feature Code	Maximum Number of Features	Maximum Number of Crypto Coprocessors
G5/G6 0860	8	8
zSeries 0861	8	16

PCICA (no diskette - FC 3863 must be enabled)

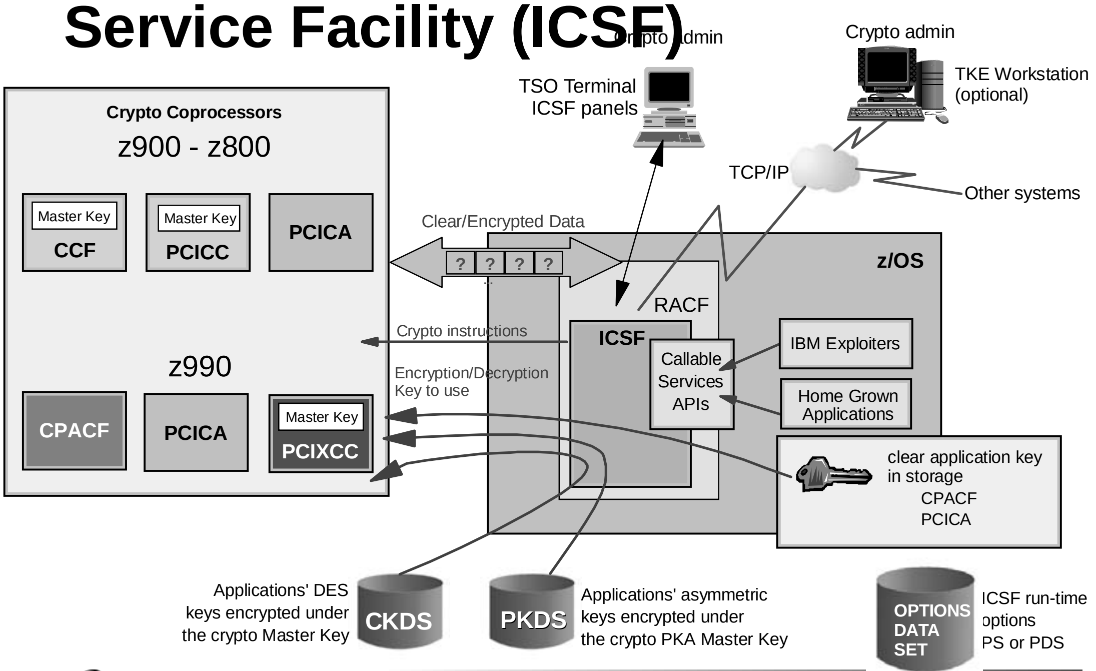
Feature Code	Maximum Number of Features	Maximum Number of Crypto Coprocessors
zSeries 0862	6	12

PCIXCC (no diskette - FC 3863 must be enabled)

Feature Code	Maximum Number of Features	Maximum Number of Crypto Coprocessors
zSeries 0868	4	4



z/OS Integrated Cryptographic Service Facility (ICSF)



HCR7708 - Hardware Support

ICSF HCR7708 will start on all crypto models

- G5/G6 - all existing function enabled
- z900 2064/2066 - all existing function enabled
- z990 2084 -
  - Clear key DES functions (CP Assist instructions)
  - Clear key RSA functions with optional PCICA
  - PCIXCC **not** supported
  - No cryptography with encrypted keys
  - CKDS and PKDS **not** supported
  - TKE **not** supported

HCR7708 - Services Available on a z990

Encode (CSNBECO)

Decode (CSNBDCO)

MDC Generate (CSNBMDG,CSNBMDG1)

One-Way Hash (CSNBOWH,CSNBOWH1)

PKA Decrypt (CSNDPKD) - requires PCICA, PKCS-1.2 formatting

PKA Encrypt (CSNDPKE) - requires PCICA, ZERO-PAD formatting

Symmetric Key Decipher (CSNBSYD, CSNBSYD1)

Symmetric Key Encipher (CSNBSYE, CSNBSYE1)

HCR7708 - Services Available on a z990 (continued)

- Control Vector Generate (CSNBCVG)
- PKA Key Token Build (CSNDPKB)
- Code Conversion (CSNBXEA, CSNBXAE)
- Character/Nibble Conversion (CSNBXBC, CSNBXCB)
- X9.9 Data Editting (CSNB9ED)

All other serivces will fail with 12/8 return/reason code

HCR7708 on a z990 - Considerations

- Most hardware cryptographic applications will not run
- z/OS V1R4 System Secure Socket Layer will run
- All applications requiring CKDS or PKDS support will not run - this includes
  - z/OS Communication Server VTAM Session Level Encryption
  - z/OS Communication Server IP Services
  - z/OS OCSF hardware crypto CSP
  - z/OS Security Server RACF using PKDS
- HCR7708 is available as a web deliverable*
  - will be replaced by HCR770A

* http://www-1.ibm.com/servers/eserver/zseries/zos/downloads/

HCR770A - Hardware Support

HCR770A will start on all crypto models

- G5/G6 - all existing function enabled
- z900 2064/z800 2066 - all existing function enabled
- z990 2084 -
  - most existing function enabled with optional PCIXCC and PCICA
  - clear key DES functions (CP Assist instructions)

HCR770A - Changes

PKDS initialization

- Required before reading or writing keys
- TSO panel utility available

Options Data Set

- CKTAUTH(YES|NO) - new
  - Controls authentication of CKDS records at dataspace creation and when CKDS is reenciphered
- COMPENC - ignored

CICS default waitlist has addtional services

NOCV KEKs

- Caller not required to be in supervisor state to write a NOCV KEK to the CKDS

HCR770A on a z990 - Considerations

- Special Secure Mode (SSM)
  - Software enforced only via options data set
  - Hardware control is replaced by access control points in PCIXCC
- NOCV KEK usage will be controlled by access control points in PCIXCC
- Return/reason codes may change
  - Most parameter checking done in PCIXCC
- HCR770A is available as a web deliverable*
  - Replaces HCR7708

* http://www-1.ibm.com/servers/eserver/zseries/zos/downloads/

Enhanced CCA Services

Encrypted PIN Verify (CSNBPVR) will support VISAPVV4 (PIN must be 4 digits long)

- G5, G6 or z900 2064 with PCICC required
- z990 2084 with PCIXCC required

MAC Generate (CSNBMGN) and MAC Verify (CSNBMVR) will support segmenting (FIRST, MIDDLE, LAST) of text for requests routed to PCICC

- restriction on G5, G6 and 2064 with PCICC
- 2084 with PCIXCC has no restrictions

z990 CKDS, PKDS and UDX Considerations

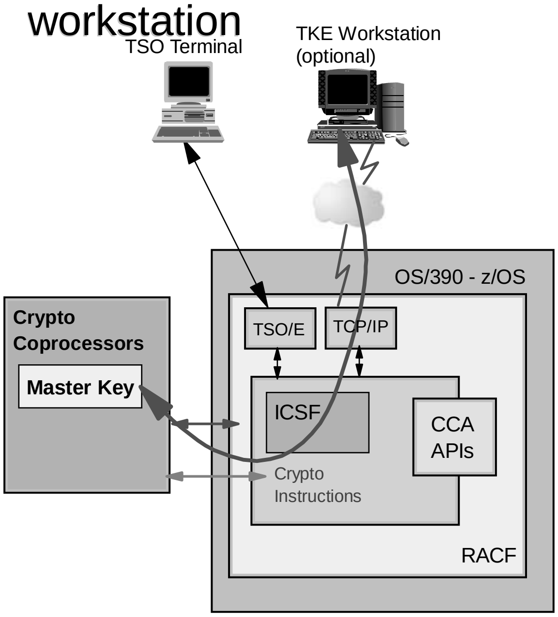
z990 CKDS and PKDS

- Not used with clear keys, but required to be online
- G5, G6 , z900, z800 CKDS and PKDS directly reusable with z990 PCIXCC (assuming KMMK=SMK)
- CKDS/PKDS initially created for z990 is not useable for legacy machines

z990 - User Defined Extensions (UDX) with PCIXCC

- Built under contract by IBM or approved third party vendor
- Customer is provided with a LIC CD to be loaded
- IBM will perform the existing PCICC UDXs migration under contract

Overview of Trusted Key Entry (TKE) workstation

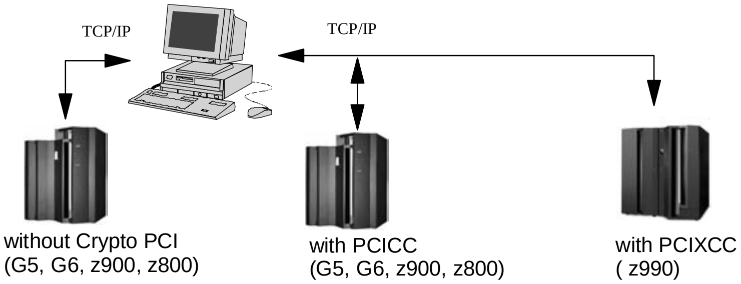


- Priced feature
- Highly secure connection over TCP/IP network
  to an ICSF host - The CSFTTCP listener program provided with ICSF
- Increased security for
  - Access to cryptographic coprocessors
    - Authorities (security officers) identified by their password and digital signature
    - Option to require multiple signatures before
      performing a crypto function
    - SOD for smart card support
  - Communications with coprocessors
    - Interactions are digitally signed both ways and,when appropriate, encrypted
- Can administer coprocessors as groups
- ICSF ISPF panels still needed

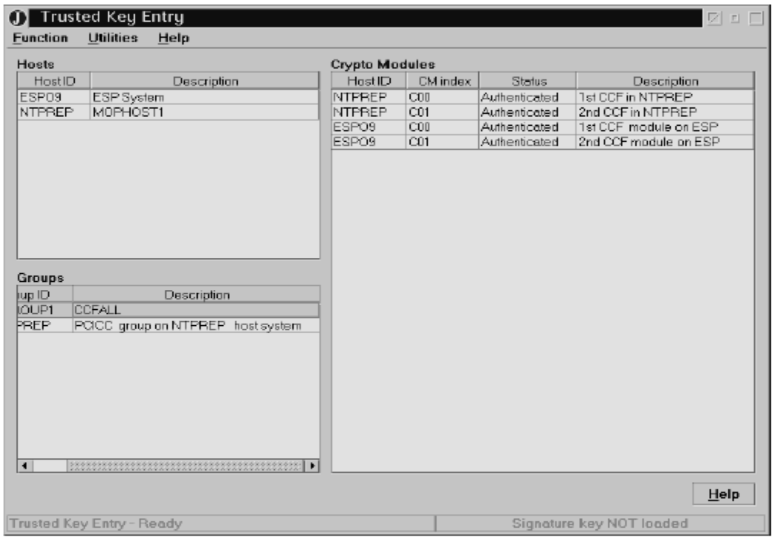
Support of z990 PCIXCC by TKE

TKE V4.0 required

- Can be brand new or TKE V3.x (G5, G6 or zSeries) with TKE code Feature Code 0851
- Brand new TKE is FC 0886 (Ethernet) or 0889 (Token Ring)
- Secure PCIXCC key entry and key management



Trusted Key Entry (TKE) Main Window



Hosts

Host ID	Description
ESP09	ESP System
NTPREP	MOPHOST1

Groups

ıup ID	Description
ıOUP1	CCFALL
PREP	PCICC group on NTPREP host system

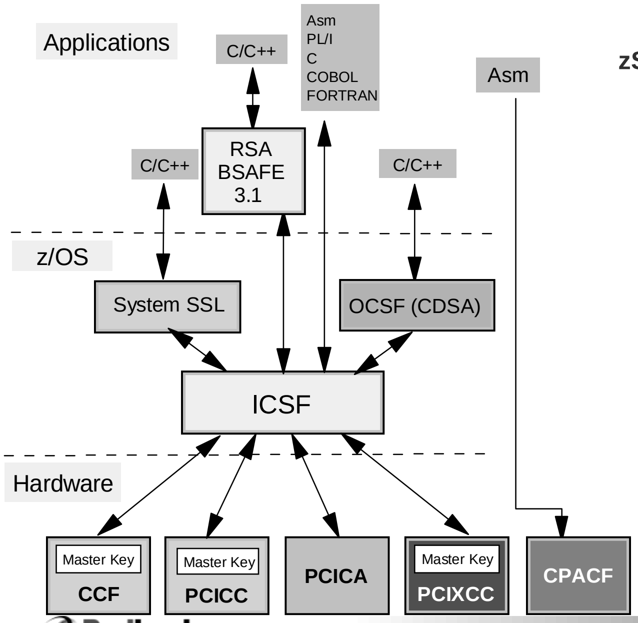
Crypto Modules

Host ID	CM index	Status	Description
NTPREP	C00	Authenticated	1st CCF in NTPREP
NTPREP	C01	Authenticated	2nd CCF in NTPREP
ESPO9	C00	Authenticated	1st CCF module on ESP
ESPO9	C01	Authenticated	2nd CCF module on ESP

Trusted Key Entry - Ready

Signature key NOT loaded

Cryptographic Coprocessors Exploiters

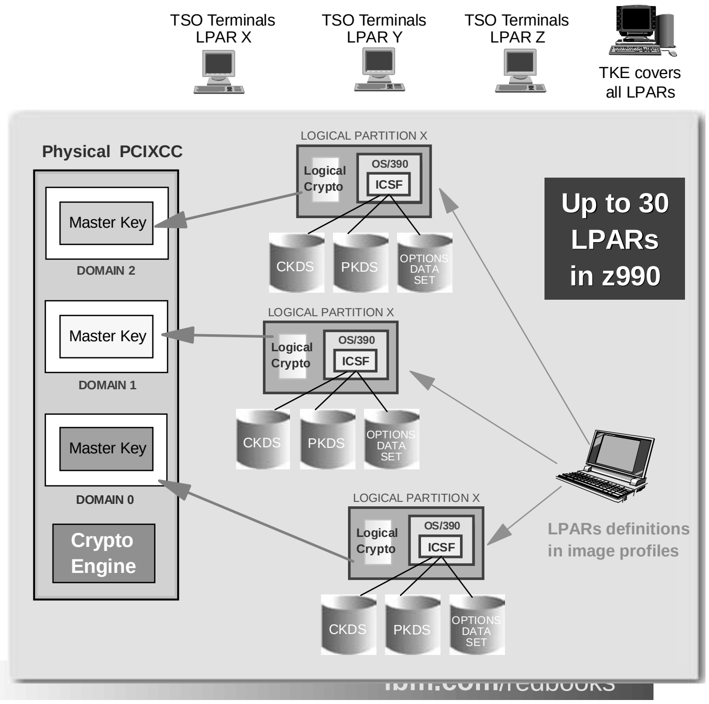


zSeries hardware crypto in use today by:

- **System SSL (HTTP, LDAP, TN3270, FTP, CICS/TS, WAS)**
- **IBM Payment Suite e-commerce solutions**
- **Firewall Technology IPSec (VPN) and IKE (Internet Key Exchange)**
- **DCE Security Server**
- **VTAM**
- **CBT (Crypto Based Transactions) banking solution**
- **Open Cryptographic Services Facility (CDSA APIs)**
- **RACF**
- **z/OS Kerberos**
- **Java JCE and JSSE**

The z/OS Cryptographic Coprocessors and PR/SM

- 16 'domains' in a physical secure coprocessor (CCF, PCICC, PCIXCC)
- Each domain has a physically separated set of master key registers
- Each logical partition uses a single dedicated domain in the secure coprocessors
- The domain to use is designated in the logical partition image profile and in the ICSF Options Data Set
- A coprocessor or accelerator can be made available to up to 16 logical partitions

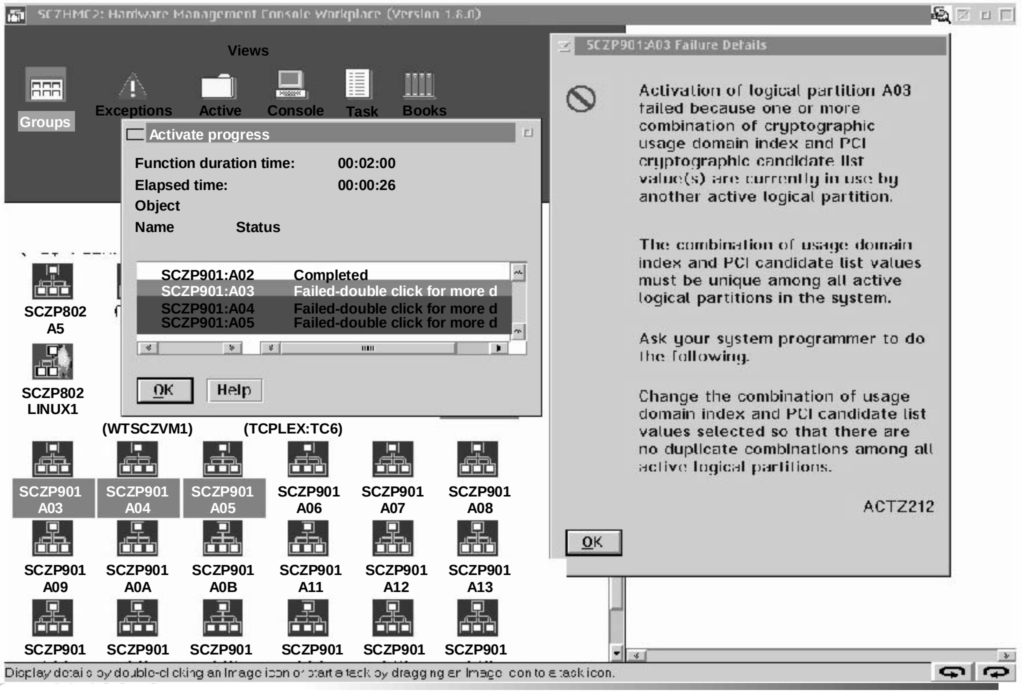


Planning LPARs Domain and Cryptographic Coprocessors

Coprocessor ID	AP0	AP1	AP2	AP3	AP4	AP5	AP6	APn
Type	PCICA or PCIXCC	PCICA or PCIXCC	PCICA or PCIXCC	PCICA or PCIXCC	PCICA or PCIXCC	PCICA or PCIXCC	PCICA or PCIXCC	PCICA or PCIXCC
LPAR 0	0	0				0	0	
LPAR 1			0	0	0			
LPAR 2	0	0	0	0				
LPAR 4	4 14	4 14	4 14	4 14	4 14	4 14	4 14	
LPAR 5				1	1	1	1	
LPAR n								

- ✓ LPAR 0 and 1 use domain 0, but are assigned to different crytographic coprocessos. The combination domain number and cryptographic coprocessor number is unique across partitions.
- ✓ LPAR 4 uses domain 4 and 14. No other partition uses the same domain number.
- ✓ LPAR 5 uses domain 1 and no other partition uses the same domain number.
- ✗ LPAR 2 uses domain 0 on the set of cryptographic coprocessors already used by LPAR 0 and LPAR 1. LPAR 2 cannot be active concurrently with LPAR 0 or LPAR 1. (Valid configuration for backup situations)

LPAR Activation Error



Activate progress

```
Function duration time:     00:02:00
Elapsed time:               00:00:26
Object
Name          Status

SCZP901:A02   Completed
SCZP901:A03   Failed-double click for more d
SCZP901:A04   Failed-double click for more d
SCZP901:A05   Failed-double click for more d
```

SCZP901:A03 Failure Details

Activation of logical partition A03 failed because one or more combination of cryptographic usage domain index and PCI cryptographic candidate list value(s) are currently in use by another active logical partition.

The combination of usage domain index and PCI candidate list values must be unique among all active logical partitions in the system.

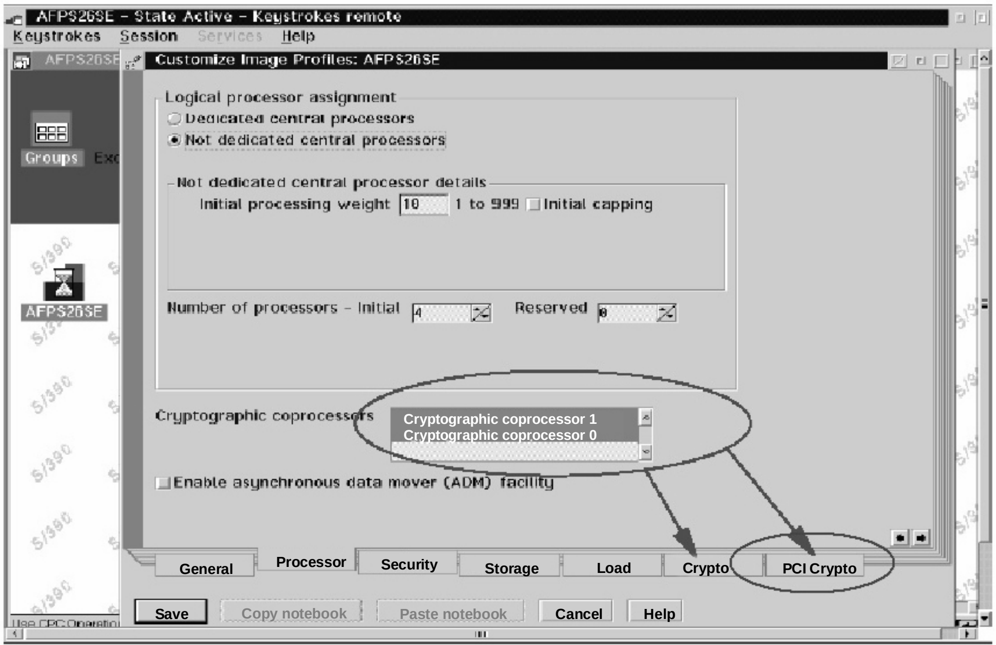
Ask your system programmer to do the following.

Change the combination of usage domain index and PCI candidate list values selected so that there are no duplicate combinations among all active logical partitions.

ACTZ212

Display details by double-clicking an image icon or start a task by dragging an image icon to a task icon.

Logical Partition Image Profile - Processor Page (z900)



AFPS26SE - State Active - Keystrokes remote

Customize Image Profiles: AFPS26SE

Logical processor assignment
- ○ Dedicated central processors
- ● Not dedicated central processors

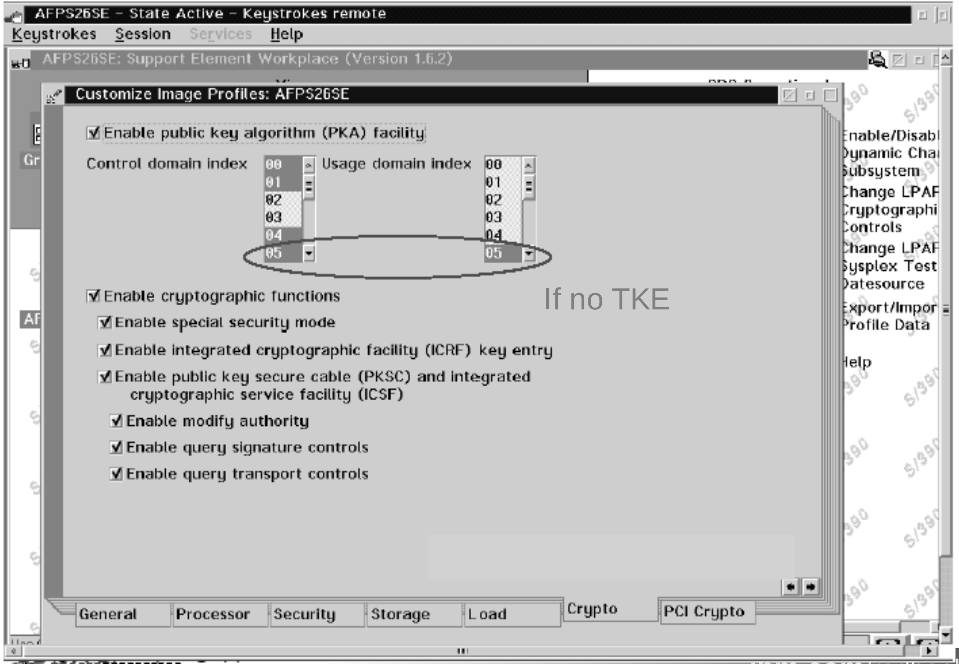
Not dedicated central processor details
- Initial processing weight 10 1 to 999 □ Initial capping

Number of processors - Initial 4 Reserved 0

Cryptographic coprocessors: Cryptographic coprocessor 1, Cryptographic coprocessor 0

□ Enable asynchronous data mover (ADM) facility

Logical Partition Image Profile - Crypto Page (z900)



AFPS26SE - State Active - Keystrokes remote

AFPS26SE: Support Element Workplace (Version 1.6.2)

Customize Image Profiles: AFPS26SE

☑ Enable public key algorithm (PKA) facility

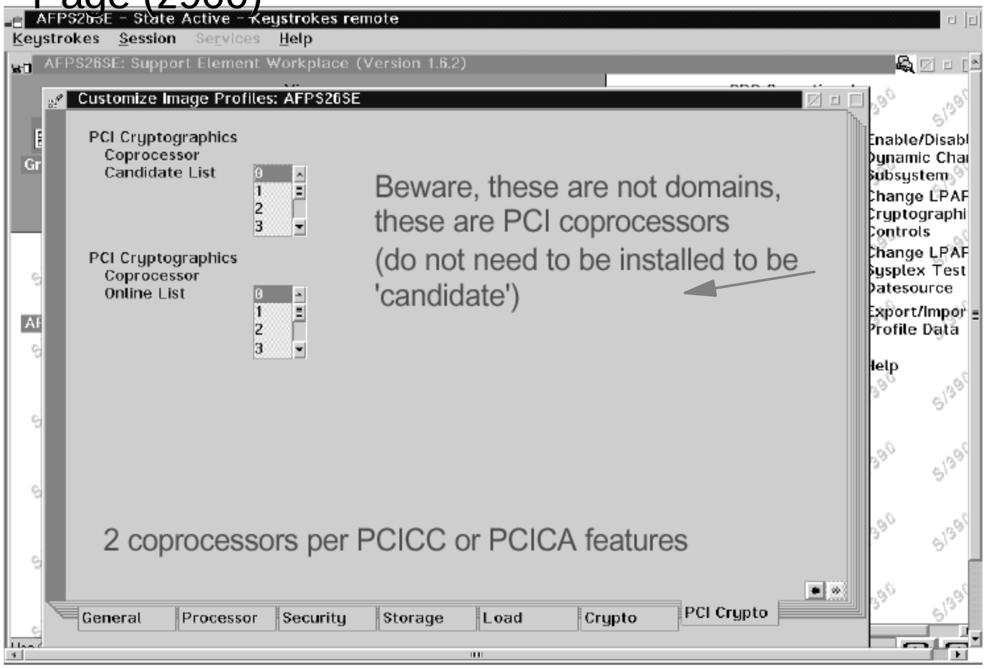
Control domain index: 00, 01, 02, 03, 04, 05

Usage domain index: 00, 01, 02, 03, 04, 05

☑ Enable cryptographic functions
- ☑ Enable special security mode
- ☑ Enable integrated cryptographic facility (ICRF) key entry
- ☑ Enable public key secure cable (PKSC) and integrated cryptographic service facility (ICSF)
  - ☑ Enable modify authority
  - ☑ Enable query signature controls
  - ☑ Enable query transport controls

If no TKE

Logical Partition Image Profile - PCI Crypto Page (z900)



PCI Cryptographics Coprocessor Candidate List: 0, 1, 2, 3

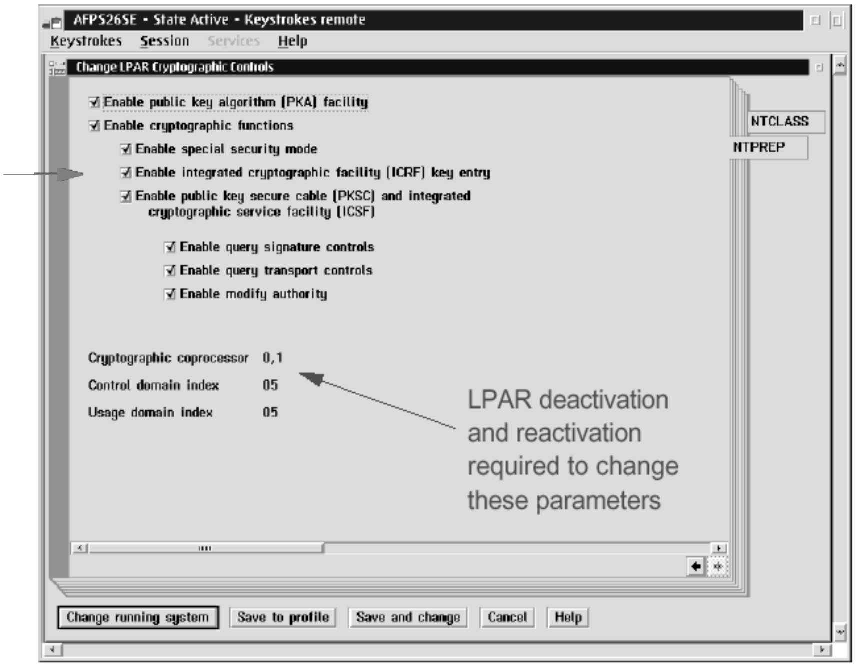
PCI Cryptographics Coprocessor Online List: 0, 1, 2, 3

Beware, these are not domains, these are PCI coprocessors (do not need to be installed to be 'candidate')

2 coprocessors per PCICC or PCICA features

LPAR Dynamic Cryptographic Controls (z900)

can be changed dynamically



☑ Enable public key algorithm (PKA) facility

☑ Enable cryptographic functions

- ☑ Enable special security mode
- ☑ Enable integrated cryptographic facility (ICRF) key entry
- ☑ Enable public key secure cable (PKSC) and integrated cryptographic service facility (ICSF)
  - ☑ Enable query signature controls
  - ☑ Enable query transport controls
  - ☑ Enable modify authority

Cryptographic coprocessor 0,1

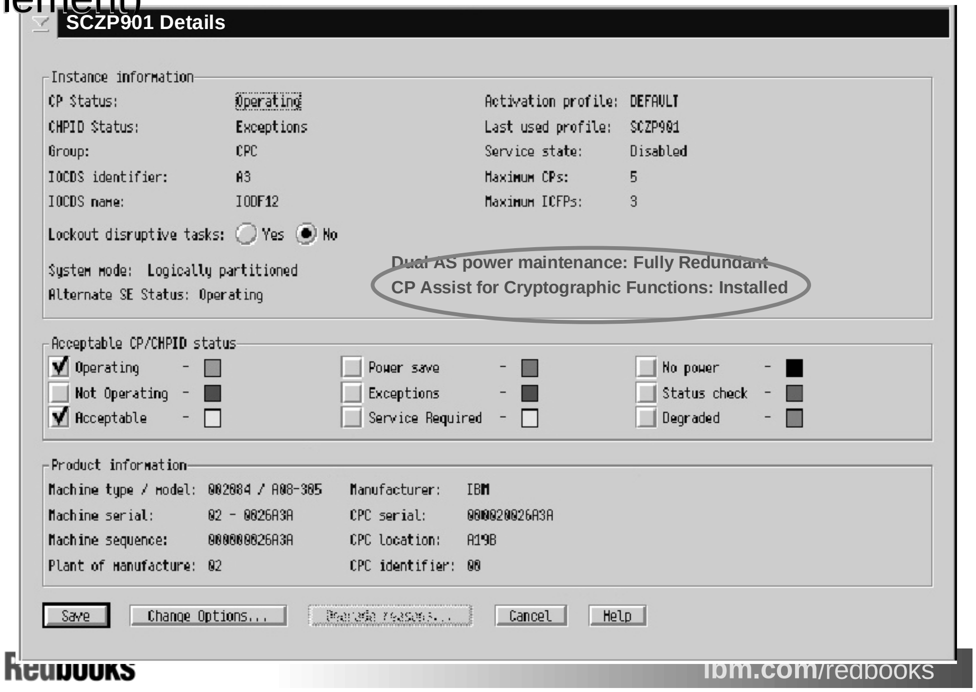
Control domain index 05

Usage domain index 05

LPAR deactivation and reactivation required to change these parameters

Redbooks ibm.com/redbooks

CPACF DES/TDES Enablement (Support Element)



SCZP901 Details

Instance information

CP Status: Operating
CHPID Status: Exceptions
Group: CPC
IOCDS identifier: A3
IOCDS name: IODF12
Activation profile: DEFAULT
Last used profile: SCZP901
Service state: Disabled
Maximum CPs: 5
Maximum ICFPs: 3

Lockout disruptive tasks: ○ Yes ● No

System mode: Logically partitioned
Alternate SE Status: Operating

Dual AS power maintenance: Fully Redundant
CP Assist for Cryptographic Functions: Installed

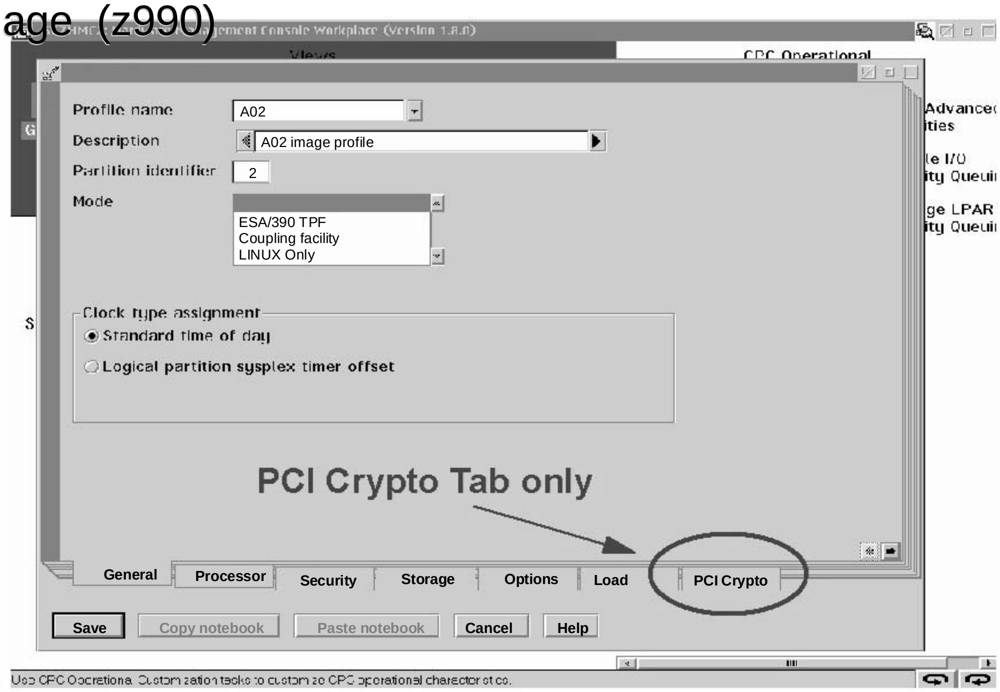
Acceptable CP/CHPID status

☑ Operating - ▨	□ Power save - ▨	□ No power - ■
□ Not Operating - ■	□ Exceptions - ■	□ Status check - ▨
☑ Acceptable - □	□ Service Required - □	□ Degraded - ▨

Product information

Machine type / model: 002084 / A08-305
Machine serial: 02 - 0026A3A
Machine sequence: 000000026A3A
Plant of manufacture: 02
Manufacturer: IBM
CPC serial: 000020026A3A
CPC location: A19B
CPC identifier: 00

Logical Partition Image Profile - General Page (z990)



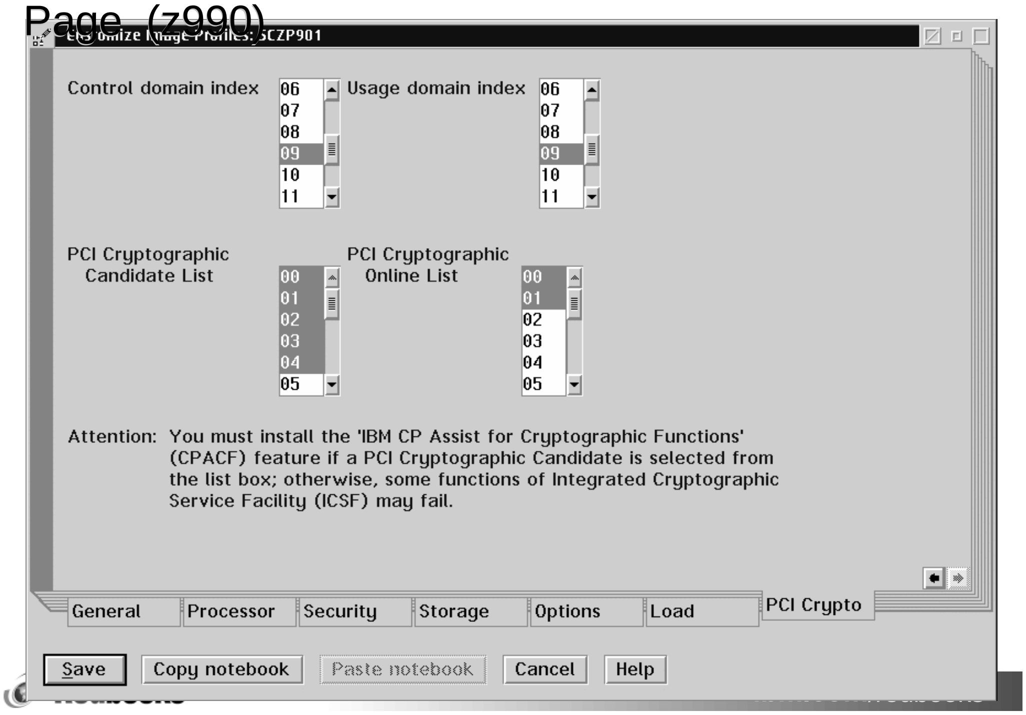
Profile name: A02
Description: A02 image profile
Partition identifier: 2
Mode: ESA/390 TPF, Coupling facility, LINUX Only

Clock type assignment
● Standard time of day
○ Logical partition sysplex timer offset

PCI Crypto Tab only

Use CPC Operational Customization tasks to customize CPC operational characteristics.

Logical Partition Image Profile - PCI Crypto Page (z990)



Customize Image Profiles: SCZP901

Control domain index: 06, 07, 08, **09**, 10, 11

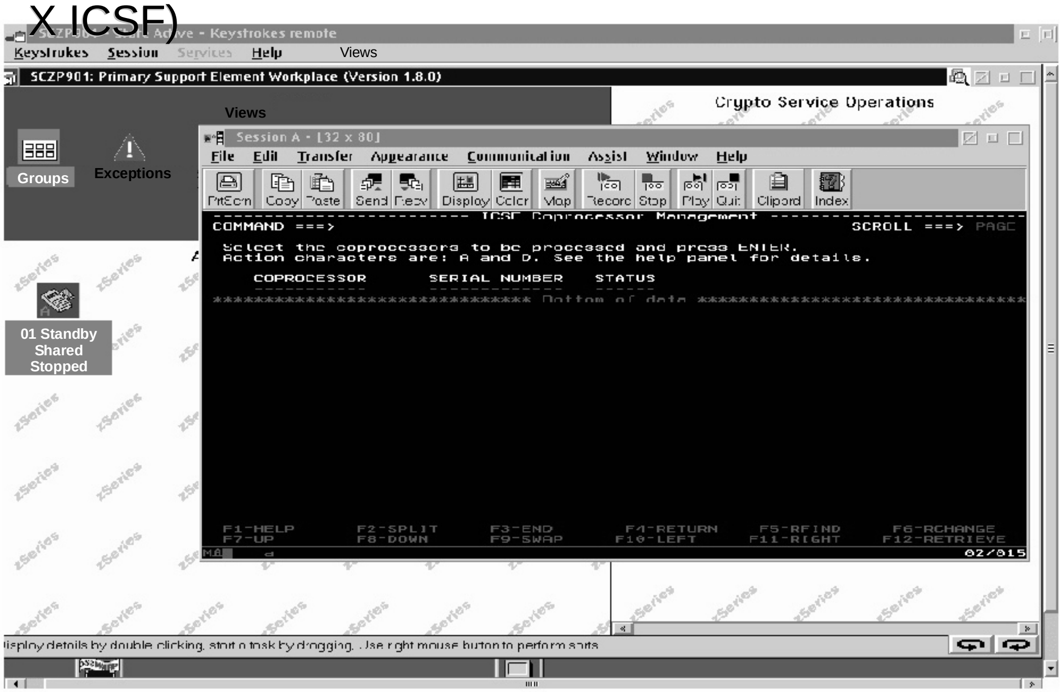
Usage domain index: 06, 07, 08, **09**, 10, 11

PCI Cryptographic Candidate List: **00**, **01**, **02**, **03**, **04**, 05

PCI Cryptographic Online List: **00**, **01**, 02, 03, 04, 05

Attention: You must install the 'IBM CP Assist for Cryptographic Functions' (CPACF) feature if a PCI Cryptographic Candidate is selected from the list box; otherwise, some functions of Integrated Cryptographic Service Facility (ICSF) may fail.

PCIXCC Stopped Status (Support Element X ICSF)



SCZP901: Primary Support Element Workplace (Version 1.8.0)

Crypto Service Operations

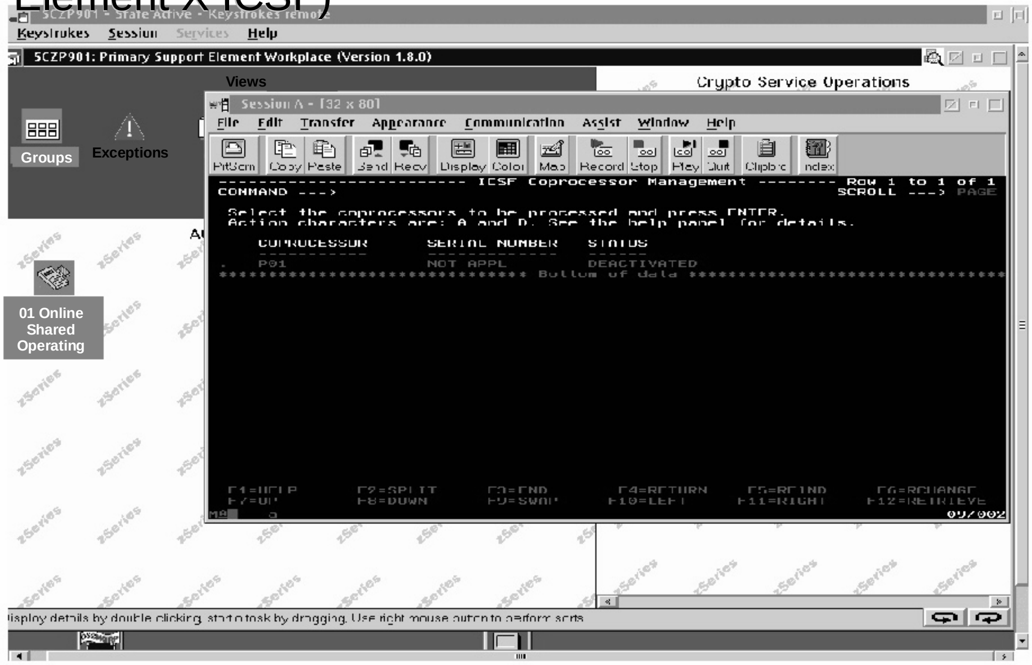
Session A - [32 x 80]

```
------------------------- ICSF Coprocessor Management --------------------------
COMMAND ===>                                                  SCROLL ===> PAGE

 Select the coprocessors to be processed and press ENTER.
 Action characters are: A and D. See the help panel for details.

    COPROCESSOR       SERIAL NUMBER    STATUS
    -----------       -------------    ------
******************************* Bottom of data ********************************

 F1=HELP      F2=SPLIT     F3=END       F4=RETURN    F5=RFIND     F6=RCHANGE
 F7=UP        F8=DOWN      F9=SWAP     F10=LEFT     F11=RIGHT    F12=RETRIEVE
                                                                        02/015
```

01 Standby Shared Stopped

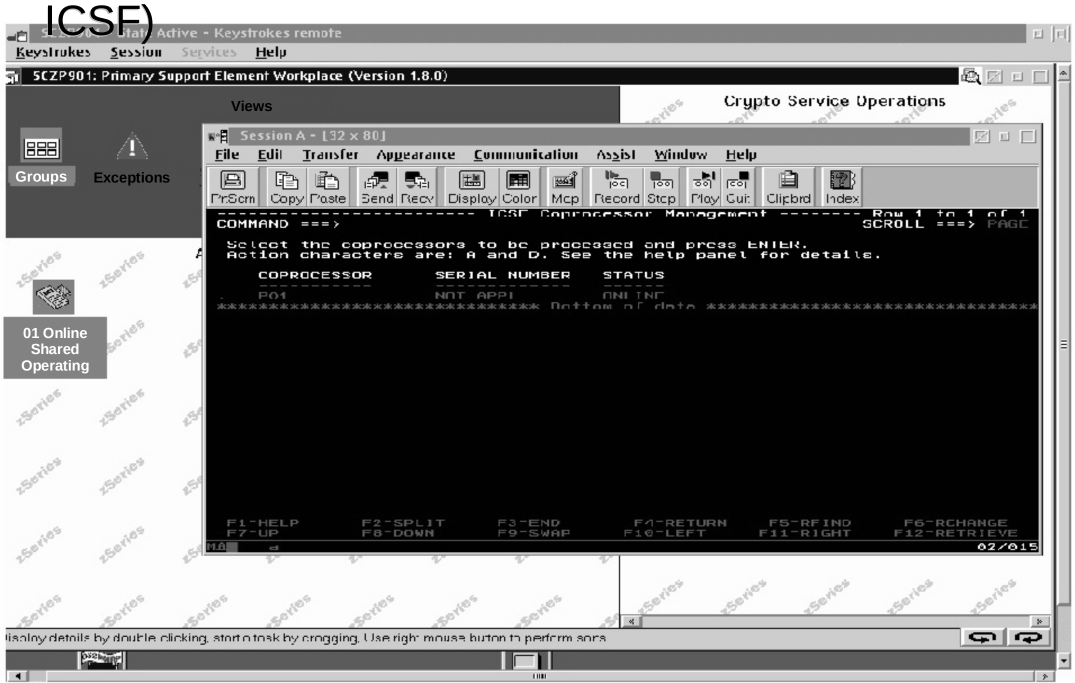
isplay details by double clicking, start a task by dragging. Use right mouse button to perform sorts

PCIXCC Deactivated Status (Support Element X ICSF)


5CZP901 - State Active - Keystrokes remote
Keystrokes Session Services Help
5CZP901: Primary Support Element Workplace (Version 1.8.0)
Views
Groups
Exceptions
01 Online Shared Operating
Crypto Service Operations
Session A - [32 x 80]
File Edit Transfer Appearance Communication Assist Window Help
PrtScrn Copy Paste Send Recv Display Color Map Record Stop Play Quit Clipbrd Index
Display details by double clicking, start a task by dragging. Use right mouse button to perform sorts

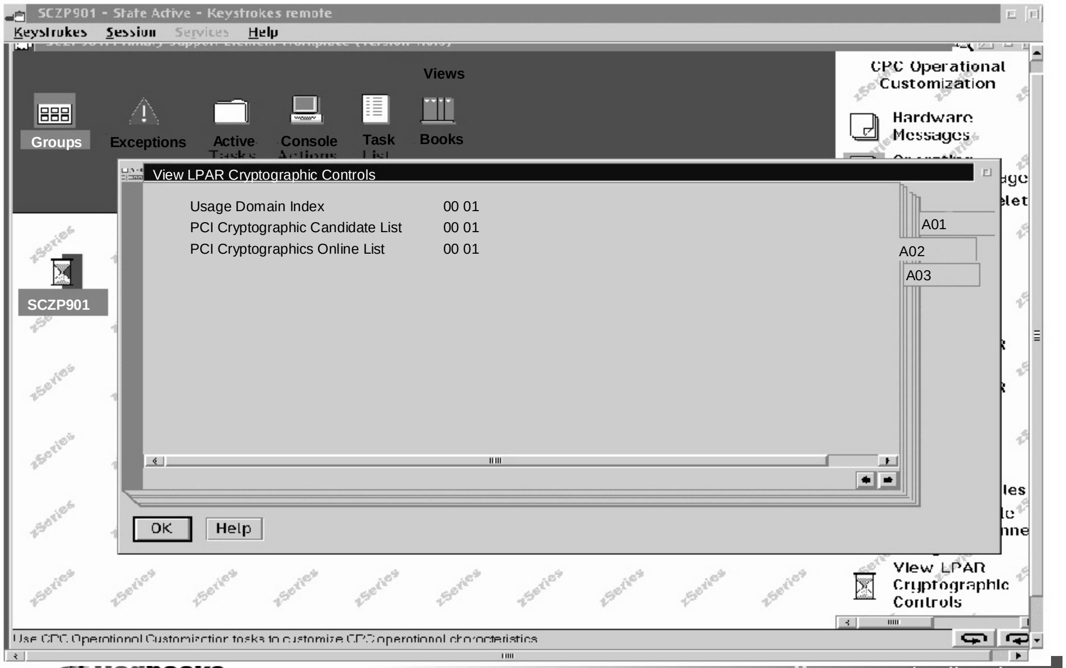
```
------------------------- ICSF Coprocessor Management -------- Row 1 to 1 of 1
COMMAND --->                                                    SCROLL ---> PAGE

 Select the coprocessors to be processed and press ENTER.
 Action characters are: A and D. See the help panel for details.

    COPROCESSOR       SERIAL NUMBER    STATUS
    -----------       -------------    ------
.   P01               NOT APPL         DEACTIVATED
******************************* Bottom of data ********************************

 F1=HELP       F2=SPLIT      F3=END        F4=RETURN     F5=RFIND      F6=RCHANGE
 F7=UP         F8=DOWN       F9=SWAP      F10=LEFT      F11=RIGHT     F12=RETRIEVE
MA      a                                                                 09/002
```

PCIXCC Online Status (Support Element X ICSF)


5CZP901 - State Active - Keystrokes remote
Keystrokes Session Services Help
5CZP901: Primary Support Element Workplace (Version 1.8.0)
Views
Groups
Exceptions
01 Online Shared Operating
Crypto Service Operations
Session A - [32 x 80]
File Edit Transfer Appearance Communication Assist Window Help
PrScrn Copy Paste Send Recv Display Color Map Record Stop Play Quit Clipbrd Index
Display details by double clicking, start a task by dragging. Use right mouse button to perform sorts

```
------------------------- ICSF Coprocessor Management -------- Row 1 to 1 of 1
COMMAND ===>                                                    SCROLL ===> PAGE

 Select the coprocessors to be processed and press ENTER.
 Action characters are: A and D. See the help panel for details.

    COPROCESSOR       SERIAL NUMBER    STATUS
    -----------       -------------    ------
.   P01               NOT APPL         ONLINE
******************************* Bottom of data ********************************

 F1=HELP       F2=SPLIT      F3=END        F4=RETURN     F5=RFIND      F6=RCHANGE
 F7=UP         F8=DOWN       F9=SWAP      F10=LEFT      F11=RIGHT     F12=RETRIEVE
MA      a                                                                 02/015
```

LPAR Cryptographic Controls - Support Element



View LPAR Cryptographic Controls

Usage Domain Index	00 01
PCI Cryptographic Candidate List	00 01
PCI Cryptographics Online List	00 01

Use CPC Operational Customization tasks to customize CPC operational characteristics

z990 RMF Report Changes

- **Crypto Activity (CRYPTO) report in Postprocessor and Monitor I**
  - ► I/O Queuing (IOQ) reports in Postprocessor, Monitor I, Monitor II, Monitor III
  - ► Channel Path (CHAN) report in Postprocessor and Monitor I
  - ► New and changed OVERVIEW CONDITIONS for IOQUEUE and CRYPTO
- **New Spreadsheet Reporter**
  - ► **Available for z/OS V1R2 and above**
  - ► **Shipped as SPE with APAR OW56656 and with z/OS V1R5**

z/OS Crypto Activity SMF Recording

- SMF Record Type 30 contains SMF30CSC : number of crypto instructions executed on behalf of caller

- type 82 reports information about events and operations of ICSF
  - subtype 17 provides some information on the PCICC utilization
  - all other subtypes report on administrative kinds of operations
  - beginning with z/OS V1R3, CSFSMFJ and CSFSMFR sample jobs are available in SYS1.SAMPLIB to format type 82 records

- type 70 (RMF Processor Activity) - z/OS V1R2 with APAR OW49808
  - subtype 2 contains measurements of cryptographic coprocessors activity

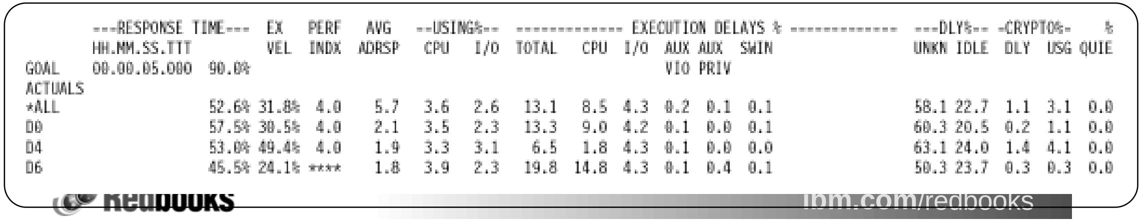
- type 72 (RMF Workload Activity and Storage Data)
  - reports on class period and crypto support by WLM (z/OS V1R2 with APAR OW49808) using subtype 3 records

z/OS Crypto Hardware Activity

SMF Type 70-2

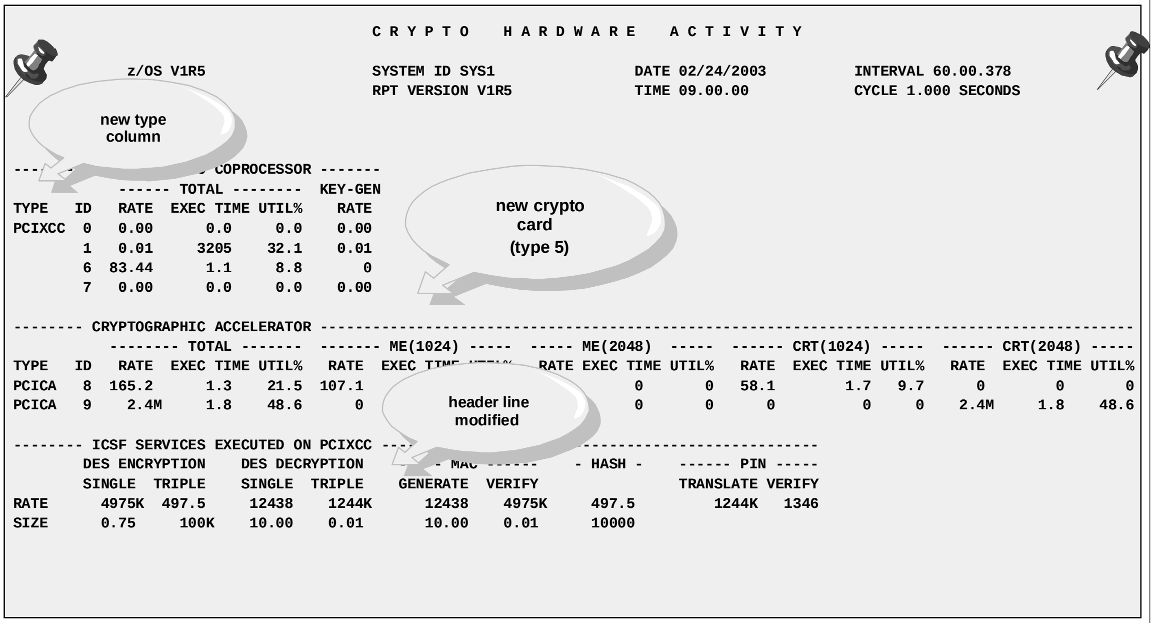
```
1                             C R Y P T O  H A R D W A R E  A C T I V I T Y
                                                                    PAGE    1
        z/OS V1R3            SYSTEM ID VSN9          DATE 09/11/2002         INTERVAL 29.59.999
                          RPT VERSION V1R2 RMF      TIME 14.00.00           CYCLE 1.000 SECONDS
0--- PCI CRYPTOGRAPHIC COPROCESSOR --
   -------- TOTAL --------  KEY-GEN
 ID   RATE  EXEC TIME  UTIL%    RATE
0 0   0.00      0.0      0.0    0.00
  1   0.00      0.0      0.0    0.00
-
 ------------------------------------------------- PCI CRYPTOGRAPHIC ACCELERATOR -------------------------------------------------
   -------- TOTAL --------   ------ ME(1024) -------   ------ ME(2048) -------   ------ CRT(1024) ------   ------ CRT(2048) ------
 ID   RATE  EXEC TIME  UTIL%    RATE  EXEC TIME  UTIL%    RATE  EXEC TIME  UTIL%    RATE  EXEC TIME  UTIL%    RATE  EXEC TIME  UTIL%
0 2   0.18      1.3      0.0    0.00      0.0      0.0    0.00      0.0      0.0    0.18      1.3      0.0    0.00      0.0      0.0
  3   0.00      0.0      0.0    0.00      0.0      0.0    0.00      0.0      0.0    0.00      0.0      0.0    0.00      0.0      0.0
-
 ---------------------------- CRYPTOGRAPHIC COPROCESSOR FACILITY ----------------------------
       DES ENCRYPTION    DES DECRYPTION    ----- MAC ------    - HASH -    ------ PIN -------
       SINGLE  TRIPLE    SINGLE  TRIPLE    GENERATE  VERIFY                TRANSLATE  VERIFIY
 RATE     0.00    1.05     0.35    1.05       0.00    0.00       0.00         0.00     0.00
 SIZE     0.00   209.3    176.0   297.3       0.00    0.00       0.00
```

SMF Type 72-3



```
       ---RESPONSE TIME---  EX    PERF   AVG    --USING%--  ------------- EXECUTION DELAYS % -------------  ---DLY%-- -CRYPTO%-   %
       HH.MM.SS.TTT        VEL   INDX  ADRSP   CPU   I/O  TOTAL   CPU  I/O  AUX  AUX  SWIN               UNKN IDLE  DLY  USG QUIE
GOAL   00.00.05.000  90.0%                                                VIO PRIV
ACTUALS
*ALL                 52.6% 31.8%  4.0    5.7   3.6   2.6   13.1   8.5  4.3  0.2  0.1  0.1                58.1 22.7  1.1  3.1  0.0
D0                   57.5% 30.5%  4.0    2.1   3.5   2.3   13.3   9.0  4.2  0.1  0.0  0.1                60.3 20.5  0.2  1.1  0.0
D4                   53.0% 49.4%  4.0    1.9   3.3   3.1    6.5   1.8  4.3  0.1  0.0  0.0                63.1 24.0  1.4  4.1  0.0
D6                   45.5% 24.1% ****    1.8   3.9   2.3   19.8  14.8  4.3  0.1  0.4  0.1                50.3 23.7  0.3  0.3  0.0
```

Monitor I Crypto Hardware Activity Report



```
                                   C R Y P T O    H A R D W A R E    A C T I V I T Y

             z/OS V1R5                SYSTEM ID SYS1              DATE 02/24/2003         INTERVAL 60.00.378
                                      RPT VERSION V1R5            TIME 09.00.00           CYCLE 1.000 SECONDS


---                       COPROCESSOR -------
             ------ TOTAL --------  KEY-GEN
TYPE   ID    RATE  EXEC TIME UTIL%    RATE
PCIXCC  0    0.00       0.0     0.0    0.00
        1    0.01      3205    32.1    0.01
        6   83.44       1.1     8.8       0
        7    0.00       0.0     0.0    0.00

-------- CRYPTOGRAPHIC ACCELERATOR ----------------------------------------------------------------------------------------------
            -------- TOTAL -------  ------- ME(1024) -----  ----- ME(2048)  -----  ------ CRT(1024) -----  ------ CRT(2048) -----
TYPE   ID    RATE  EXEC TIME UTIL%   RATE  EXEC TIME         RATE EXEC TIME UTIL%   RATE  EXEC TIME UTIL%   RATE  EXEC TIME UTIL%
PCICA   8  165.2       1.3    21.5  107.1                              0       0   58.1        1.7   9.7      0         0       0
PCICA   9    2.4M      1.8    48.6      0                              0       0      0          0     0    2.4M      1.8    48.6

-------- ICSF SERVICES EXECUTED ON PCIXCC ---                  ------------------------------
        DES ENCRYPTION    DES DECRYPTION       MAC ------    - HASH -    ------ PIN -----
        SINGLE  TRIPLE    SINGLE  TRIPLE    GENERATE  VERIFY             TRANSLATE VERIFY
RATE      4975K  497.5     12438    1244K      12438    4975K     497.5        1244K   1346
SIZE      0.75     100K    10.00    0.01       10.00    0.01      10000
```

Bibliography

▪ z/OS Cryptographic Services ICSF Overview	▪ SA22-7519
▪ z/OS Cryptographic Services ICSF System Programmer's Guide	▪ SA22-7520
▪ z/OS Cryptographic Services ICSF Application Programmer's Guide	▪ SA22-7522
▪ z/OS Cryptographic Services ICSF Administrator's Guide	▪ SA22-7521
▪ z/OS Cryptographic Services ICSF Messages	▪ SA22-7523
▪ z/OS Cryptographic Services ICSF TKE Workstation User's Guide	▪ SA22-7524
▪ Processor Resource/Systems Manager Planning Guide	▪ SB10-7036
▪ Support Element Operations Guide	▪ SC28-6820-01

Redbook SG24-5455	Exploiting S/390 Hardware Cryptography with Trusted Key Entry
Redbook SG24-5942	S/390 PCI Crypto Coprocessor Implementation Guide
Redbook SG24-6870	zSeries Crypto Update

Acronyms

ANSI	American National Standards Institute
CA	Certification Authority
CBC	Cipher Block Chaining
CCA	IBM Common Cryptographic Architecture
CCF	Cryptographic Coprocessor Feature
CDMF	Commercial Data Masking Facility
CDSA	Common Data Security Architecture
CKDS	Cryptographic Key Data Set
CRL	Certificate Revocation List
CRT	Chinese Remainder Theorem
CVC	Card Verification Code
CVV	Card Verification Value
DES	Data Encryption Standard
DSA	Digital Signature Algorithm
DSS	Digital Signature Standard
ECB	Electronic Code Book
FIPS	Federal Information Processing Standards
ICSF	Integrated Cryptographic Service Facility
IETF	Internet Engineering Task Force
IPKI	Internet Public Key Infrastructure
KGUP	Key Generation Utility Program
LDAP	Lightweight Directory Access Protocol
LIC	Licensed Internal Code
MAC	Message Authentication Code
MD5	Message Digest 5
OAEP	Optimal Asymmetric Encryption Padding
OCSF	OS/390 Open Cryptographic Services Facility
OCSP	Online Certificate Status Protocol
PCICA	PCI Cryptographic Accelerator
PCICC	PCI Cryptographic Coprocessor
PCIXCC	PCI X Cryptographic Coprocessor
PKA	Public Key Algorithm
PKCS	Public Key Cryptographic Standards
PKDS	Public Key Data Set
PKI	Public Key Infrastructure
RA	Registration Authority
RACF	Resource Access Control Facility
RSA	Rivest-Shamir-Adleman
SET	Secure Electronic Transaction
SHA-1	Secure Hash Algorithm 1
SLE	Session Level Encryption
SSL	Secure Sockets Layer
TKE	Trusted Key Entry
TLS	Transport Layer Security
VPN	Virtual Private Network

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