

1

**UNDERSTANDING**

**STORAGE**

**VIOLATIONS**



# 1.1 THE STORAGE MANAGER DOMAIN

Storage Manager services the **DYNAMIC STORAGE AREAS**

There are 10 Dynamic Storage Areas

The **CICS DYNAMIC STORAGE AREA** Task Usage

The **READ-ONLY DYNAMIC STORAGE AREA**

The **SHARED DYNAMIC STORAGE AREA**

The **USER DYNAMIC STORAGE AREA** Task Usage

The **EXTENDED-CICS DYNAMIC STORAGE AREA** Task Usage



# 1.1 THE STORAGE MANAGER DOMAIN

Storage Manager services the **DYNAMIC STORAGE AREAS**

The **EXTENDED-READ-ONLY DYNAMIC STORAGE AREA**

The **EXTENDED-SHARED DYNAMIC STORAGE AREA**

The **EXTENDED-USER DYNAMIC STORAGE AREA** Task Usage

The **EXTENDED-TRUSTED DYNAMIC STORAGE AREA**

The **GRANDE DYNAMIC STORAGE AREA**



## 1.1 THE STORAGE MANAGER DOMAIN

10 DSAs may have the same storage protect keys, or different storage protect keys. This is **STORAGE PROTECTION**

Storage Manager attempts to keep User storage away from CICS storage

Transaction storage areas can be kept separate from each other. This is **TRANSACTION ISOLATION**



## 1.2 THE DYNAMIC STORAGE AREAS

CDSA key 8

RDSA key 8 (0 if RENTPGM=PROTECT)

SDSA key 8

UDSA key 8 (9 if Storage Protection enabled)

ECDSA key 8

ERDSA key 8 (0 if RENTPGM=PROTECT)

ESDSA key 8

EUDSA key 8 (9 if Storage Protection enabled)

ETDSA key 8



## 1.3 STORAGE PROTECTION

CICS executes in Key 8

All storage areas subject to rogue transactions

STORAGE PROTECTION offers 2 storage protect keys

CICS-KEY 8 & USER-KEY 9



## 1.3 STORAGE PROTECTION

STORAGE PROTECTION is enabled in the SIT

STGPROT=YES

CICS honours the protect key as specified in the program definition

Only key 8 and Key 9 possible



## 1.4 DSA SUBPOOLS

CICS components issue **ADD\_SUBPOOL** during initialisation, to Storage Manager to define their subpools.

Over 200 subpools.

Each subpool has a unique 1byte Subpool Id. Storage Manager creates a **SUBPOOL CONTROL AREA (SCA)** for each Id

Storage Manager returns an 8 byte token representing the subpool





## 1.4 DSA SUBPOOLS

There are 4 task subpools

These relate to the transaction for storage requests

Storage Manager creates these subpools exclusive to the task

Subpool names are 8 characters :

xnnnnnnn (where x = indicate which DSA and nnnnnnn is taskid)



## 1.4 DSA SUBPOOLS

**Mnnnnnnnn** This subpool is used to satisfy internal 24bit CICS requests for storage in the **CDSA** for services issued by the task or transaction.

**Bnnnnnnnn** This subpool is used to satisfy application issued 24bit EXEC CICS GETMAIN commands for storage in the **UDSA**.

**Cnnnnnnnn** This subpool is used to satisfy internal 31bit CICS requests for storage in the **ECDSA** for services issued by the task or transaction.

**Unnnnnnnnn** This subpool is used to satisfy application issued 31bit EXEC CICS GETMAIN commands using the FLENGTH option for storage in the **EUDSA**.

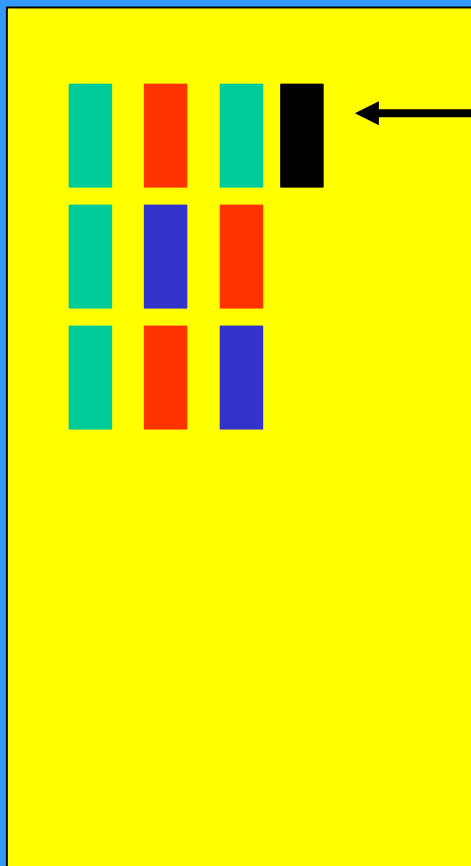
# 1.4 DSA SUBPOOLS

SMX Addr	Name	Id	Loc	Acc	Gets	Frees	Elems	Elemstg	Pagestg
ODF84020	M0000004	01	B	C	0	0	0	0	0K
	C0000004	03	A	C	1	0	1	1488	4K
	B0000004	02	B	U	0	0	0	0	0K
	U0000004	04	A	U	0	0	0	0	0K
ODFF1088	M0000006	01	B	C	1	0	1	1088	4K
	C0000006	03	A	C	0	0	0	0	0K
	B0000006	02	B	U	0	0	0	0	0K
	U0000006	04	A	U	0	0	0	0	0K
ODFF10BC	M0000007	01	B	C	1	0	1	1088	4K
	C0000007	03	A	C	0	0	0	0	0K
	B0000007	02	B	U	0	0	0	0	0K
	U0000007	04	A	U	0	0	0	0	0K
ODFF10F0	M0000008	01	B	C	1	0	1	1088	4K
	C0000008	03	A	C	0	0	0	0	0K
	B0000008	02	B	U	0	0	0	0	0K
	U0000008	04	A	U	0	0	0	0	0K
ODFF1124	M0000020	01	B	C	1	0	1	1088	4K
	C0000020	03	A	C	1	0	1	128	4K
	B0000020	02	B	U	0	0	0	0	0K
	U0000020	04	A	U	0	0	0	0	0K

## TASK SUBPOOL SUMMARY



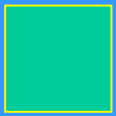


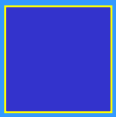
# 1.4 DSA SUBPOOLS

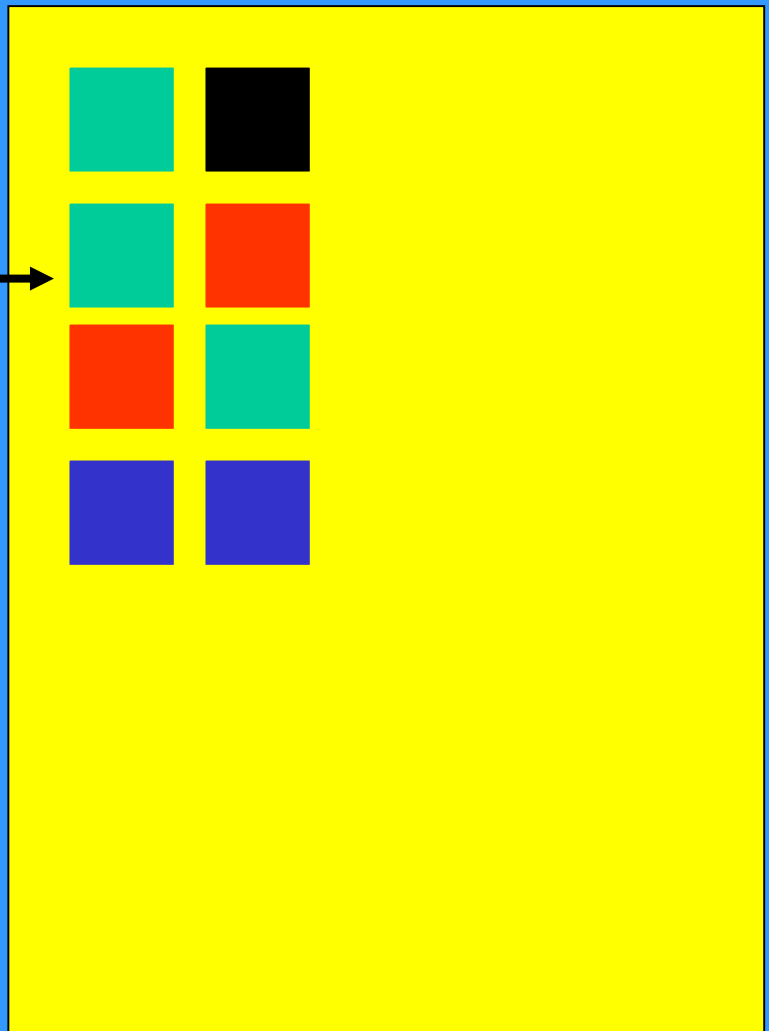


**DSALIM**

Allocated in 256K

Allocated in 1meg

- CDSA  ECDSA
- RDSA  ERDSA
- SDSA  ESDSA
- UDSA  EUDSA



**EDSALIM**



## 1.5 STORAGE MANAGER CONTROL BLOCKS

Storage Manager control blocks reside outside of the DSAs

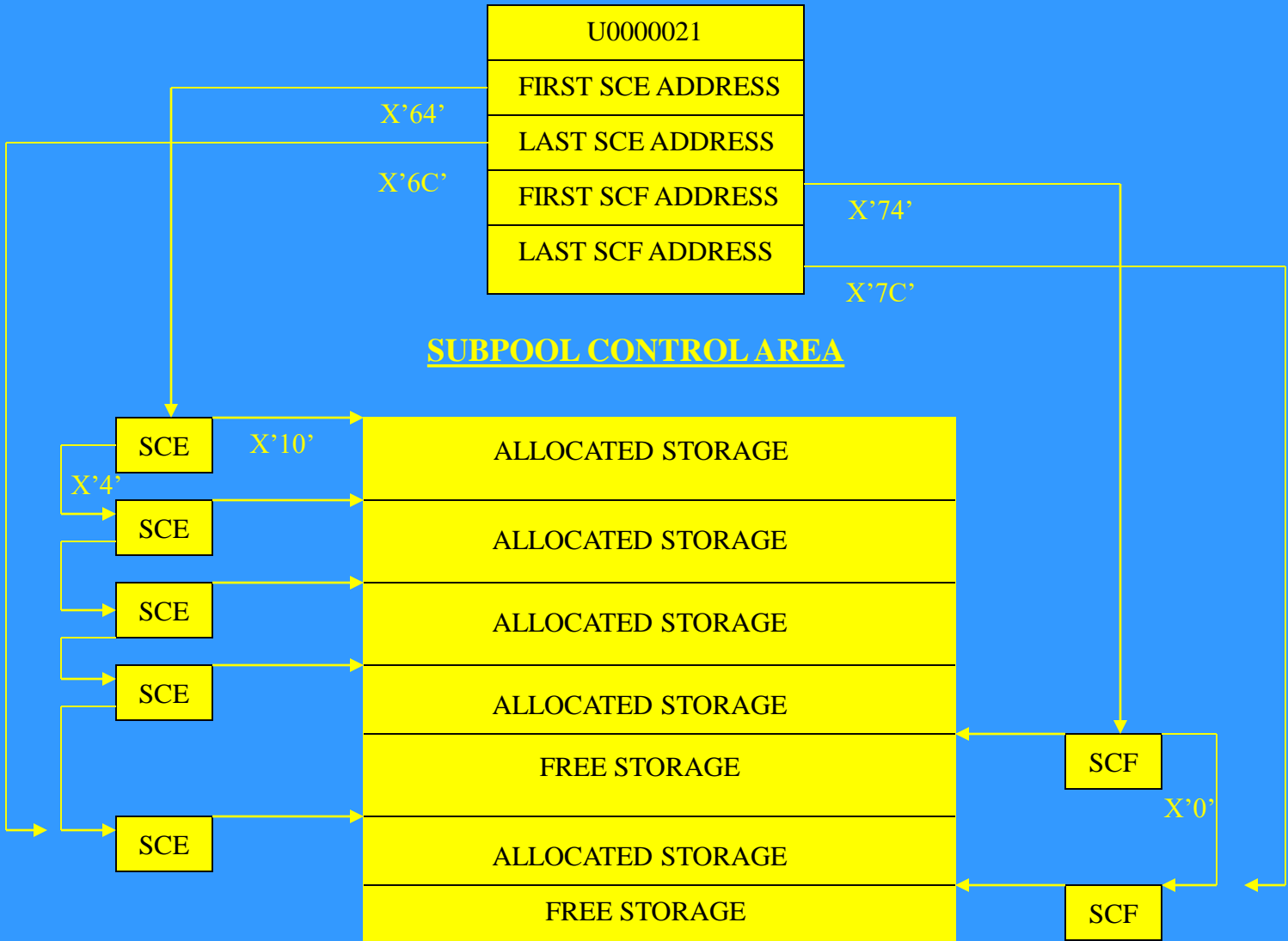
Most of them have eyecatchers

They are anchored from the Storage Manager Anchor Block

They exist outside in order to minimise storage corruption



# 1.5 STORAGE MANAGER CONTROL BLOCKS



## 1.6 STORAGE VIOLATIONS

Storage Violation is the writing of data into a storage area, not owned or not addressed by the executing transaction.

Storage Protection can offer separation between CICS and User Programs

Detecting Storage Violations is achieved by inspecting the SCZs

Storage Violations are only detected when the SCZ is checked



## 1.6 STORAGE VIOLATIONS

Transaction Isolation offers support of storage at the Working Storage level

By using the z/OS Subspace Grouping facility

Each Address Space is now a Base Space

Each Subspace is not allowed to have write access to a different transaction





## 1.6 STORAGE VIOLATIONS

CICS will take a System Dump and write it to a z/OS dynamic dump dataset

Message : **DFHSM0102** will be sent to the CICS Job Log

Message : **DFHME0116** will be sent to the CICS Job Log

A Code will be included in the message of **DFHSM0102**. The CICS/TS User's Handbook can be used to look up the meaning of the code



## 1.6 STORAGE VIOLATIONS

Storage Violations will be detected when CICS is forced to check the storage areas.

Explicit Freemain

End of task Freemain

The Storage Violation can be identified in the Trace with an \*EXC entry



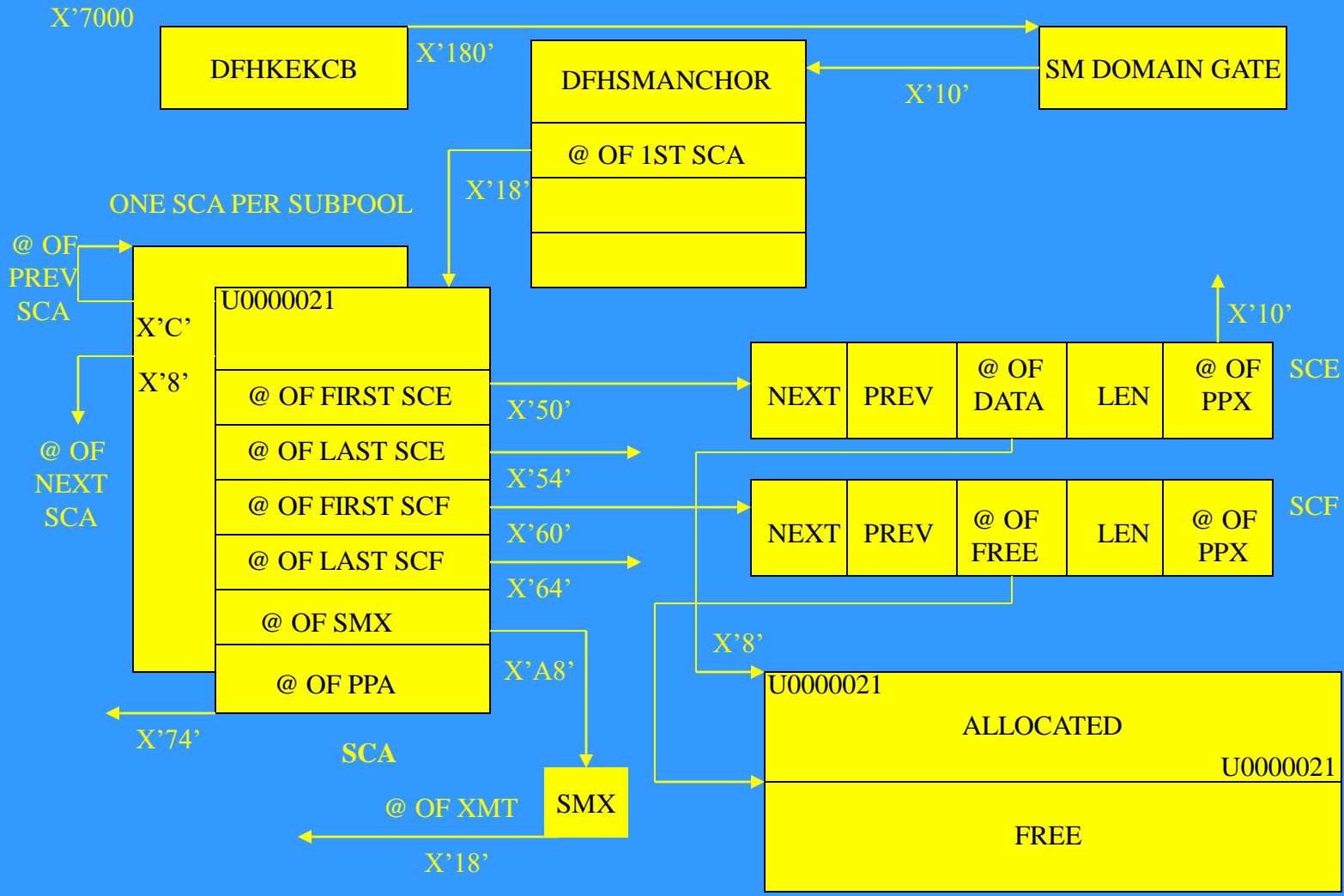
# 1.6 STORAGE VIOLATIONS

	KE_NUM	@STACK	LEN	TYPE	ADDRESS	LINK	REG	OFFS	ERROR	NAME
Tasentry number	0063	0E4EE020	0120	Bot	8DD00400	8DD006D0		02D0		DFHKETA
	0063	0E4EE140	01F0	Dom	8DD0F108	8DD0F21E		0116		DFHDSKE
	0063	0E4EE330	0370	Dom	8DDB5538	8DDB60D6		0B9E		DFHXMTA
	0063	0E4EE6A0	02A0	Dom	8DD21018	8DD223B8		13A0		DFHSMAR
				Int	+06AC	8DD210CA		00B2		<b>RELEASE_TRANSACTION_STG</b>
				Int	+0878	8DD21758		0740		<b>DELETE_SUBPOOL</b>
				Int	+08DC	8DD2189C		0884		<b>DELETE_SUBPOOL_ELEMS</b>
				Int	+11BA	8DD21970		0958		<b>STORAGE_CHECK_FAILURE</b>
	0063	0E4EE940	0FB0	Dom	8DD78EA8	8DD7C6F0		3848		DFHMEME
				Int	+2E02	8DD7901A		0172		SEND
				Int	+14EE	8DD7BD98		2EF0		CONTINUE_SEND
				Int	+3770	8DD7A428		1580		TAKE_A_DUMP_FOR_CALLER
	0063	0E4EF8F0	0490	Dom	8DD58D20	8DD5A38C		166C		DFHDUDU
				Int	+0B52	8DD58E12		00F2		SYSTEM_DUMP
				Int	+1918	8DD59D74		1054		TAKE_SYSTEM_DUMP

## KERNEL LINKAGE STACKS FOR A STORAGE VIOLATION



# 1.7 STORAGE MANAGER CONTROL BLOCKS 4.1



=== DUMP SUMMARY

DUMPID: 1/0001
DUMPCODE: SM0102
DATE/TIME: 14/02/12 06:15:26 (LOCAL)
MESSAGE: DFHSM0102 CICSTS41 A storage violation (code X'0F0C') has been detected by module DFHSMAR.
SYMPTOMS: PIDS/5655S9700 LVLS/660 MS/DFHSM0102 RIDS/DFHSMAR PTFS/UK57632 PRCS/00000F0C

==SM: EUDSA Summary

Size: 1024K
Cushion size: 0K
Current free space: 768K (75%)
\* Lwm free space: 768K (75%)
\* Hwm free space: 1024K (100%)
Largest free area: 768K
\* Times nostg returned: 0
\* Times request suspended: 0
Current suspended: 0
\* Hwm suspended: 0
\* Times cushion released: 0
Currently SOS: NO
\* Times went SOS: 0
\* Time at SOS: 00:00:00.000
\* Storage violations: 1
Access: CICS
\* Extents added: 1
\* Extents released: 0
Number of extents: 1
Extent list: Start End Size Free
1FB00000 1FBFFFFFF 1024K 768K

INTERNAL TRACE TABLE

XM QR SM 0F0C SMAR \*EXC\* Storage\_check\_failed\_at\_address 1FB3C0C0
RELEASE\_TRANSACTION\_STG =003627=

SM 0F0C DFHSMAR Exc Storage check failure

- 1 SMAR parameter list
2 Address of storage element
3 Length of storage element
4 First 512 bytes (max) of storage element
5 Last 512 bytes (max) of storage element
6 Data preceding storage element (1K max)
7 Data following storage element (1K max)

===TR: TRACE DOMAIN FULL TRACE

SM 0F0C SMAR \*EXC\* - Storage\_check\_failed\_at\_address - 1FB3C0C0
FUNCTION(RELEASE\_TRANSACTION\_STG)
TASK-XM KE\_NUM-001A TCB-QR /008D07B0 RET-9E74697E TIME-
06:15:25.0954820000 INTERVAL-00.0000360000 =003627=
1-0000 00280000 000000D1 00000000 00000000 B0000000
00000000 02000100 00000000 \*.....J.....\*

```

0020 00000000 00000000
*.....*
2-0000 1FB3C0C0
*..{{*
3-0000 00000060
*...-*
4-0000 E4F0F0F0 F0F0F4F2 00000000 00000000 00000000
00000000 00000000 00000000 *U0000042.....*
0020 00000000 00000000 00000000 00000000
*.....*
5-0000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 *.....*
0020 00000000 00000000 FFFFFFFF F0F0F4F2
*.....0042*

```

==DS: TASKS SUMMARY

DS_TOKEN	KE_TASK	T	S	F	P	TT	RESOURCE	RESOURCE_NAME	W	TIME OF
TIMEOUT	DTA	AD	ATTACHER	M	SUSPAREA	XM	TXN_TOKEN		SUSPEND	DUE
(DSTSK)	TOKEN									
0282000B	1F92F700	N	R							
2B376200	XM 1EB09300	QR					1EB093000000042C			

===KE: Kernel Domain KE\_TASK Summary

KE_NUM	KE_TASK	STATUS	TCA_ADDR	TRAN_#	TRANSID	DS_TASK	KE_KTCB	ERROR
0002	1E890530	KTCB QR	00000000			1EB03100	1E8D7FF8	
001A	1F92F700	***Running**	00000000			2B376200	1E8D7FF8	

E_NUM	@STACK	LEN	TYPE	ADDRESS	LINK	REG	OFFSET	ERR	NAME
001A	1F937020	0170	Bot	9E701F00	9E702316		000416		DFHKETA
001A	1F937190	0380	Dom	9E71C268	9E71C480		000218		DFHDSKE
001A	1F937510	0880	Dom	9E744EE0	9E74697E	001A9E			DFHXMTA
001A	1F937D90	0390	Dom	9E735A00	9E737320	001920			DFHSMAR
			Int	+0007BA	9E735BBA		0001BA		
			Int	+000982	9E7362CA		0008CA		DELETE_SUBPOOL
			Int	+0009E6	9E73638E		00098E		DELETE_SUBPOOL_ELEMS
			Int	+0012AE	9E736462		000A62		STORAGE_CHECK_FAILURE
001A	1F938120	0EA0	Dom	9E7913F0	9E7950F0	003D00			DFHMEME
			Int	+0032B6	9E79165A		00026A		SEND
			Int	+0014BE	9E79477E		00338E		CONTINUE_SEND
			Int	+003C34	9E7929B8		0015C8		
			Int	+000C76	9E8350EE		000216		SYSTEM_DUMP
			Int	+001BDE	9E836054		00117C		TAKE_SYSTEM_DUMP

==SM: Task subpool summary

SMX	Addr	Name	Id	Loc	Acc	Gets	Frees	Elems	Elemstg	Pagestg	Tran
2B3752C8	U0000042		0004	A	C	3	0	3	49440	64K	VIOL

```

===SM: STORAGE MANAGER DOMAIN - CONTROL BLOCKS
SMA 1E92EB00 Storage Manager domain Anchor block
0000 03906EC4 C6C8E2D4 C1D5C3C8 D6D94040 2B378350 2B31C890 2B337E30
2B31C7DC *..>DFHSMANCHOR ..c&..H...=...G.* 1E92EB00

```

```

SCA.U0000042 2B31C7DC Subpool Control Area
0000 E4F0F0F0 F0F0F4F2 1E92EB10 2B34650C 28010600 00000000 00000000
00000000 *U0000042.k.....* 2B31C7DC

```

```

SCE.U0000042 2B378200 Storage Element Descriptor
0000 2B338680 2B31C82C 1FB3C0C0 00000060 1EA6B038 00000000
*..f...H...{{...-.w..... * 2B378200
SCE.U0000042 2B338680 Storage Element Descriptor
0000 2B338F98 2B378200 1FB33AE0 000085E0 1EA6B038 00000000
*...q..b....\..e\..w..... * 2B338680
SCE.U0000042 2B338F98 Storage Element Descriptor
0000 2B31C82C 2B338680 1FB30000 00003AE0 1EA6B038 00000000
*..H...f.....\..w..... * 2B338F98
SCF.U0000042 2B338FB0 Free Storage Descriptor
0000 2B31C83C 2B31C83C 1FB3C120 00003EE0 1EA6B038 00000000
*..H...H...A....\..w..... * 2B338FB0

```

==XM: TRANSACTION SUMMARY

Tran PG	Tran XS	TxnAddr TxdAddr	Start code	Sys RM	Status	DS SM	Facility type	Facility token	AP token
VIOL 00000000	00042 00000000	1EB09300	T 00000000	No 00000000	ACT	0282000B	None		00000000
						2B3752C8	FF4FAC00		
							1FADEBE0		008C4000
						00000000	00000000		