

E15

SIA/CedBorsa - IMS Shared Message Queue Implementation

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Società Interbancaria per l'Automazione - Cedborsa S.p.a.

- Customer location



SIA S.p.a. EDP center located in
Milano





Agenda

- Customer scenario
- Customer needs
- Project plan
- Naming convention and Structures sizing
- IMS/ESA SMQ test
- IMS/ESA SMQ behaviour
- IMS/ESA problems
- IMS/ESA SMQ results
- Summary
- SIA IMS future directions





SIA - Italy's largest IT company focused on financial services

1998 revenue:

- ▼ 160.000.000 Euro

R&D & investment p.a:

- ▼ 50.000.000 Euro

1998 Net Income pre tax:

- ▼ 24.000.000 Euro

Total staff:

- ▼ 500 professionals

Offices:

- ▼ Milan, Rome and London





Company Mission

The company's mission is to study, design, develop, implement and supply IT systems and services to institutional bodies, market corporations, banks and financial market operators, and to the companies and investors which interact with the financial system, both in Italy and abroad.





Business area

- Management of electronic financial markets (wholesale and retail)
- Payment, clearing and settlement systems
- National Interbank Network
- Data transport and security services
- Internet services





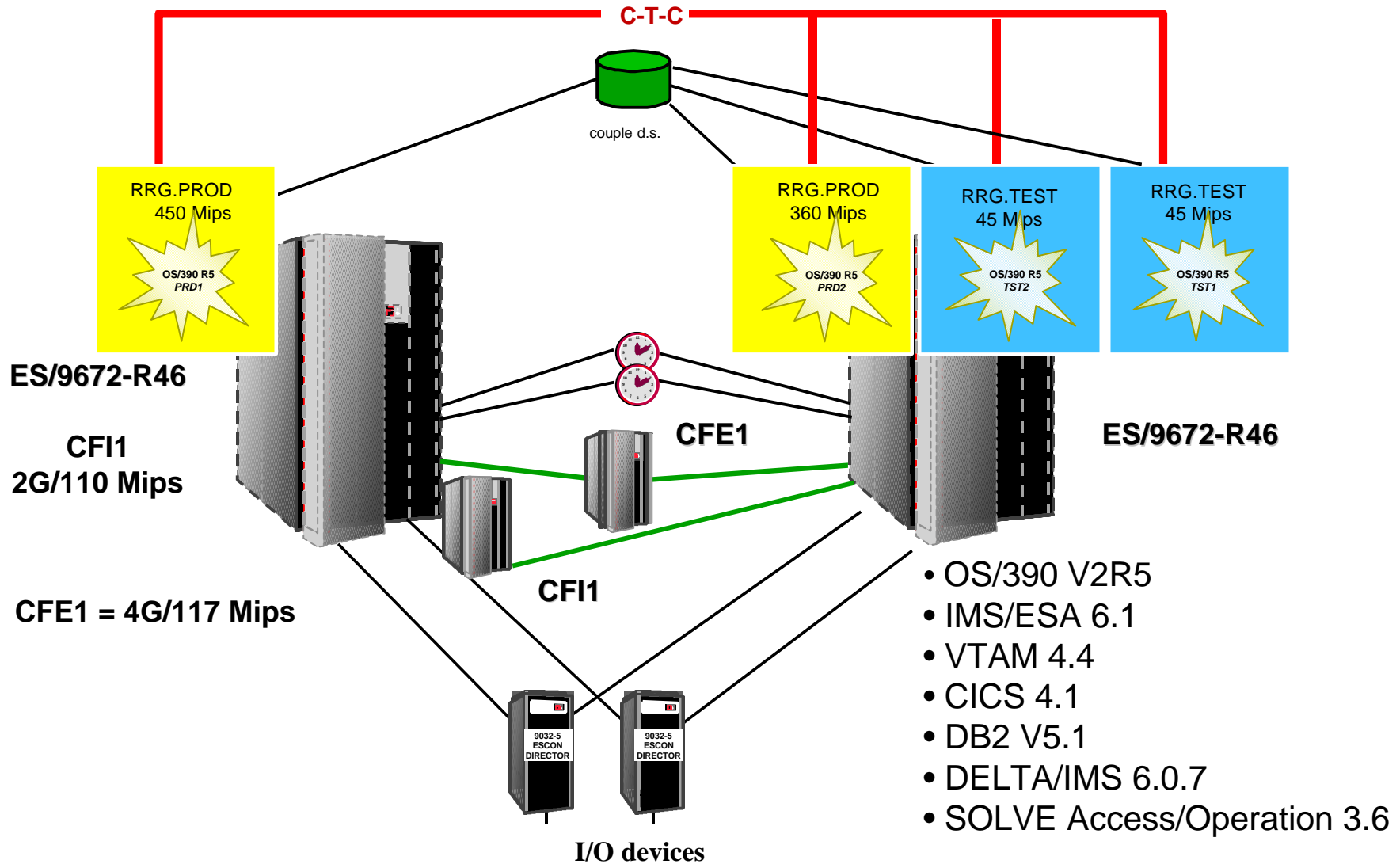
Top scores

- Stock exchange operations handled by SIA
 - ▼ About 700,000 full operations processed per day (close to 2,000,000 on peak days)
 - ▼ More than 180,000,000 basic back office operations in 1999





HW/SW environment





Customer needs

- Why IMS Shared Message Queue ?
 - ▼ Parallel Sysplex exploitation
 - ▼ Workload balancing
 - ▼ Continuous availability
 - ▼ Readiness to " dynamic " workload
 - ▼ Part of a larger GeoPlex project





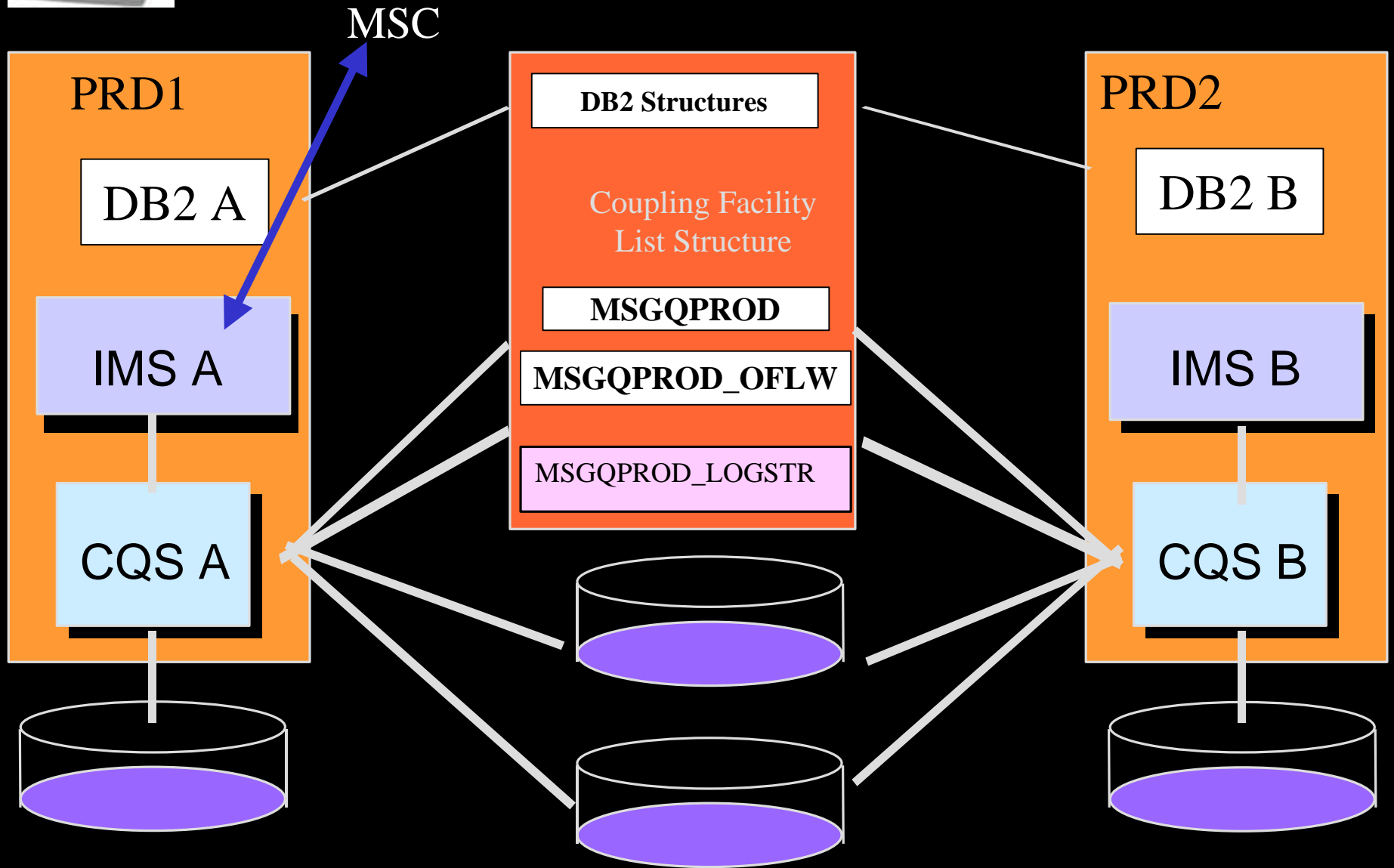
Project plan

- 09/98 HW set up, IMS/ESA V6, DB2 V5 in production
- 11/98 OS/390 V2.5 and DB2 V5 Data Sharing in production
- 01/99 Partner IMS/ESA cloned
- 02/99 IMS/ESA SMQ in test
- 05/99 IMS/ESA SMQ in Application Development System
- 11/99 IMS/ESA SMQ in production





IMS/ESA SMQ





Environment Definition

- CQS and IMS definition parameters
 - ▼ DFSPBxxx member for each IMS
 - Sharedq=pra/prb (IMS SQ local memb suffix)
 - Lgmsg , Shmsg and Qbuf size
 - ▼ DFSSQpra/prb - IMS SQ members
 - CQS subsys and procedure name
 - Primary msgq str name
 - SQ group name
 - ▼ CQS procedure definition
 - BPE config member name (BPE trace def)
 - CQS local IP (init.parm.) member suffix





Environment Definition

- ▼ CQSIPpra/prb - CQS local init. members
 - subsys and CQS group name
 - local and global STR def members suffix
- ▼ CQSSLpra/prb - local STR def. for each CQS
 - primary str and chkpt ds name
 - chkpt frequency = 50000
- ▼ CQSSGprd - global STR definition
 - str's name (primary and overfl.)
 - ovflwmax = 80
 - objavgsz = 2000
 - SRDS name and Logstrname

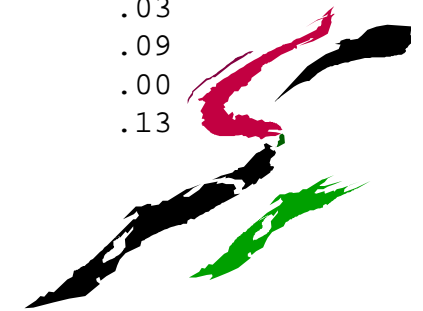




Structures sizing

MESSAGE QUEUE POOL STATISTICS

	COUNT	/TRANSACTION	INTERVAL : /SECOND
HIGHEST QBLKS RECORD EVER USED	147		
HIGHEST SHMSG RECORD EVER USED	68,823		
HIGHEST LGMSG RECORD EVER USED	111,604		
LOCATE CALLS FROM QMGR	4,299,722	7.63	50.84
RECORD RELEASE CALLS FROM QMGR	1,357,495	2.41	16.05
LOCATE AND ALTER CALLS FROM QMGR	8,014,217	14.22	94.76
REQUESTS TO PURGE THE Q POOL	68	.00	.00
ADDRESS TO DRN TRANSLATION REQUESTS	0	.00	.00
TOTAL REQUESTS TO QMGR NOT INCL TRANSLATES	13,671,502	24.26	162
READ REQUESTS	397,020	.70	4.69
WRITE REQUESTS (TOTAL)	176,046	.31	2.08
WRITES DONE BY PURGE	1,463	.00	.02
WRITES DONE FOR SPACE	174,583	.31	2.06
TOTAL I/O REQUESTS	573,066	1.02	6.78
LOCATE CALLS SATISFIED IN POOL	11,742,336		
WAITS FOR PURGE TO COMPLETE	78	.00	.00
WAITS BECAUSE NO BUFFER AVAILABLE	0	.00	.00
WAITS FOR OTHER DECB TO READ THIS BUFFER	2,728	.00	.03
WAITS FOR OTHER DECB TO WRITE THIS BFR	7,884	.01	.09
WAITS FOR CONFLICTING ENQ/DEQ BUFFER REQ	0	.00	.00
TOTAL IWAITS	10,690	.02	.13





Structures sizing

START 2/04/1999 22.06.05.29 I M S LOG TAPE REPORTS (V1M9) END 2/05/1999 21.35.36.45 PAGE 1
MESSAGE QUEUE UTILIZATION

MSG LENGTH INTERVAL	MSG AVG LENGTH	INPUT COUNT	TRANSACTION SHMSG LGMSG	-MESSAGE SWITCH-- COUNT SHMSG LGMSG	-PROGRAM SWITCH-- COUNT SHMSG LGMSG	-OUTPUT MESSAGE-- COUNT SHMSG LGMSG	-----TOTALS-----			ACC PCT	
00000-00511	435	15615	6799 8816	322 - 322	116K 109K 7904	149K 138K 11018	282K	254K	28060	28	28
00512-01023	695	56625	29 56604	18115 34486 960	204K 18671 185K	28824 349 28536	307K	53535	271K	30	58
01024-01535	1139	21966	- 21966	300 588 300	67030 - 67030	23021 23 23021	112K	611	112K	11	69
01536-02047	1784	39312	- 39312	3261 6518 3261	4774 - 4774	43517 302 43517	90864	6820	90864	9	78
02048-02559	2252	24121	- 24121	2 4 2	8357 - 8357	130K 388 130K	163K	392	163K	16	93
02560-03071	2802	6772	- 6772	- - -	84 - 84	16891 8 16891	23747	8	23747	2	96
03072-03583	3342	5950	- 5950	- - -	1 - 1	4856 - 4856	10807	-	10807	1	97
03584-04095	3728	244	- 244	- - -	- - -	8500 6 8500	8744	6	8744	1	98
04096-04607	4305	-	- -	109 40 198	- - -	367 2 718	476	42	916	0	98
04608-05119	4788	6	- 12	33 24 54	- - -	22 - 44	61	24	110	0	98
05120-05631	5414	1648	- 3296	- - -	224 - 448	62 2 124	1934	2	3868	0	98
05632-06143	5782	41	- 82	- - -	- - -	1700 6 3400	1741	6	3482	0	98
06144-06655	6324	-	- -	- - -	- - -	952 32 1904	952	32	1904	0	98
06656-07167	6847	-	- -	- - -	- - -	17 2 34	17	2	34	0	98
07168-07679	7344	-	- -	- - -	- - -	13 - 26	13	-	26	0	98
07680-08191	7872	-	- -	- - -	- - -	13 2 26	13	2	26	0	98
08192-08703	8453	-	- -	- - -	- - -	22 4 64	22	4	64	0	98
08704-09215	9151	-	- -	- - -	- - -	318 - 954	318	-	954	0	98
09216-09727	9385	-	- -	- - -	- - -	18252 654 54756	18252	654	54756	2	100
30720-31231	30873	-	- -	1 2 8	- - -	- - -	1	2	8	0	100
33792-34303	33968	-	- -	1 2 9	- - -	- - -	1	2	9	0	100
34816-35327	34910	-	- -	1 2 9	- - -	- - -	1	2	9	0	100
4423C-4428C	4427C	-	- -	2 4 724	- - -	- - -	2	4	724	0	100
4510C-4515C	4514C	-	- -	2 4 726	- - -	- - -	2	4	726	0	100
TOTAL	1308	172K	6828 167K	22149 41674 6573	401K 127K 274K	427K 140K 328K	1023K	316K	177K	-/-	-/-

9 CANCELLED MSG(S) ENCOUNTERED

EST. SHORT MESSAGE QUEUE DATASET RECORD SIZE IS 1552

EST. LONG MESSAGE QUEUE DATASET RECORD SIZE IS 4656



Structures sizing

- $DE = (LHW * LGRMSG / LALLMSG) * \text{Round Up} (GRSIZE / 512) + (SHW * SGRMSG / SALLMSG) * \text{Round Up} (GRSIZE / 512)$
- $OBJAVGSZ = (SUM ((LGRMSG + SGRMSG) * GRSIZE)) / (LALLMSG + SALLMSG)$
- $RATIO = \text{Integer part of } (OBJAVGSZ + 24) / 512$
- $LE = DE / RATIO$
- $SPACE = \text{the larger of } ((450 \text{ KB} + 200 * DE / RATIO + 512 * DE) * 1.25) \text{ and } (5 * EMCA)$





Structures size

- Test IMS Env.
 - ▼ Primary Str = 20M
 - ▼ Secondary Str = 20M
 - ▼ IMS LogStream Str = 10M
- Development IMS Env.
 - ▼ Primary Str = 50M
 - ▼ Secondary Str = 50M
 - ▼ IMS LogStream Str = 30M
- PRODUCTION IMS Env.
 - ▼ Primary Structure = 500M
 - ▼ Secondary Structure = 500M
 - ▼ IMS LogStream Structure = 100M





Structures definition

POLICY

```
STRUCTURE NAME(MSGQPROD) INITSIZE(500000) SIZE(500000)  
REBUILDPERCENT(1) PREFLIST(CFI1,CFE1)
```

```
STRUCTURE NAME(MSGQPROD_OFLOW) INITSIZE(500000) SIZE(500000)  
REBUILDPERCENT(1) PREFLIST(CFE1,CFI1)
```

```
STRUCTURE NAME(MSGQPROD_LOGSTR) INITSIZE(100000) SIZE(100000)  
REBUILDPERCENT(1) PREFLIST(CFI1,CFE1)
```

LOGGER

```
DEFINE STRUCTURE NAME(MSGQPROD_LOGSTR) LOGSNUM(1)  
MAXBUFSIZE(65272) AVGBUFSIZE(4068)
```

```
DEFINE LOGSTREAM NAME(IMSVS.CQS.LOG)  
STRUCTNAME(MSGQPROD_LOGSTR) STG_DUPLEX(YES)  
DUPLEXMODE(UNCOND) STG_SIZE(25000) LS_SIZE(25000)  
HLQ(LOGPRD) HIGHOFFLOAD(50) LOWOFFLOAD(0) AUTODELETE(NO)
```



IMS/ESA SMOQ test

- IMS and CQS normal and abnormal termination
- IMS and CQS warm and cold start
- CQS structures full condition
- CQS structures full, alter, rebuild and recovery
- IMS SQ and MSC interaction
- IMS fallback scenario
- IMS SMOQ Disaster Recovery test
- IMS SQ Message Requeuer test
- OEM product test
- IMS SQ implementation impact on current appls
- Application stress test partially performed





IMS SMQ considerations

- U0758 still received if DRRN exhausted
 - ▼ DRRN exhausted for uncommitted msgs
- Review Short and Long LRECL to accommodate as many msgs in the Qbuf as possible: IMS QBUF needs to be adjusted
 - ▼ If $\text{msg} < \text{shmsgsz}$ shmsg Qbuf used
 - ▼ If $\text{shmsgsz} < \text{msg} < \text{lgmsgsz}$ lgmsg Qbuf used
 - ▼ If $\text{msg} > \text{lgmsgsz}$ lgmsg Qbuf used, msg moved also to the SQ before commit and backed up if needed





IMS SMQ considerations Cont..

- LGMSGSZ and SHMSGSZ influence LE/DE utilization
 - ▼ If $msg < shmsgsz$ then one LE and needed DE (as many $DE=512$ as required to save the msg)
 - ▼ If $shmsgsz < msg < lgmsgsz$ then one LE and needed DE (as many $DE=512$ as required to save the msg)
 - ▼ If $msg > lgmsgsz$ then one LE required for each $lgmsgsz$ and DE as needed (if $msg=5120$ and $lgmsgsz=1024$ then 5 LE and 10 DE ($10 \times 512 = 5120$))





IMS SMQ considerations Cont..

>>>>>> 9 NOV. 1999 Values we started in production <<<<<<<<

LGMSGSZ=3402 OBJAVGSZ=1000 SHMSGSZ=1458 OVFLWMAX=70 QBUFSZ=30632

STRUCTURE NAME	LEALLOC	LEINUSE	ELMALLOC	ELMINUSE	LE/EL
MSGQPROD	334866	96852	669731	230079	0001/0002
MSGQPROD_OFLW	334866	25742	669731	77217	0001/0002

*99313/112846*û

MESSAGE QUEUE POOL: BFRS/SIZE 400/30632

ENQ 12755	DEQ 354	CAN 341	WAIT 0	I/O 0	ERR 0
QBLKS: MAX # RECORDS AVAIL	199980	CUR IN USE	2	=	0 %
SMMSGQ: MAX # RECORDS AVAIL	199980	CUR IN USE	115	=	0 %
LMSGQ: MAX # RECORDS AVAIL	79992	CUR IN USE	10	=	0 %

99313/112900

>>>>>> 11 NOV. 1999 Values we adjusted <<<<<<<<

LGMSGSZ=7650 OBJAVGSZ=2000 SHMSGSZ=2550 OVFLWMAX=80 QBUFSZ=30632,

STRUCTURE NAME	LEALLOC	LEINUSE	ELMALLOC	ELMINUSE	LE/EL
MSGQPROD	234340	55442	703020	275621	0001/0003
MSGQPROD_OFLW	234340	30545	703020	127741	0001/0003

*99315/113055*û

MESSAGE QUEUE POOL: BFRS/SIZE 400/30632

ENQ 617776	DEQ 236325	CAN 7331	WAIT 90	I/O 0	ERR 0
QBLKS: MAX # RECORDS AVAIL	119988	CUR IN USE	28	=	0 %
SMMSGQ: MAX # RECORDS AVAIL	119988	CUR IN USE	491	=	0 %
LMSGQ: MAX # RECORDS AVAIL	39996	CUR IN USE	10	=	0 %

99315/113200





IMS SMQ considerations

- IMS SMQ Queue management performance overhead
 - ▼ mass msg isrt BMP NON-SQ and SQ comparison
 - ▶ no difference on elapsed time
- SRDS chkpt
 - ▼ 2 consecutive srds chkpt's taken at 08.00 and 13.00 to accomplish LogStr offload cleanup
- LogStream
 - ▼ Stg_Duplex(YES) Duplexmode(UNCOND)
Highoffload(50)





IMS/ESA SMOQ behaviour

- Different msg queue cleanup approach
- IMS SQ Serial tran processing
- /DIS Lterm/Tran different meaning
- /DIS QBUF only shows local Qbuf info
 - ▼ msg kept in the Qbuf until commit
- Consequences of a Structure Full condition
 - ▼ new TP tran rejected DFS070 unable to route msg
 - ▼ Msg isrt from BMP are saved on the IMS log
 - ▼ MSC link stopped





IMS/ESA problems

- ABEND80A during /ERE apar PQ28880/UQ35039
- ABEND0C4 in DFSQLD00 apar PQ30336/UQ36651
- Structure full with SMASTER msg apar PQ27131/UQ34972
- Unresolved UOWE unknown PQ27818/UQ33973 and PQ32590/UQ41845 plus RDC
- Doc. change submitted to clarify QBUF value set
- /DIS QCNT MSGAGE 0 performance PQ27923/UQ35155





IMS/ESA problems

- CQS U0014 RC390 - msg CQS0242E
RC0D000012 during Disaster Recovery test
PQ36869/UQ44795
- Bad performance BMP in SMO: EXPRESS=YES
- MSC trx duplicated after IMS crash and Link
restart PQ31757/UQ42452
- DFS681I (BMP CHKP) not issued if IMSabend
before chkpt/call completion PQ32811/FIN
- DB2 Data Sharing problem PQ25818/PQ24935





SMQ Design Change Request

- REQ00075690 SMQ Commands abbreviation
- REQ00075692/PQ27821 Total number of received and unprocessed transaction in SQ (as ENQCT and QCT) / global and local Q count not clear
- REQ00075693 /DIS QCNT LTERM
- REQ00075694SCAN process interval





SMQ Design Change Request

- REQ00075691 unres. UOWE automatically written out
- REQ00075803 DFS681I issued synchronously: not specific for SQ
- REQ00075806 MRQ to reprocess unres. UOWE
- REQ00075816 automatic MSC link restart
- REQ00076276 GBLQCT on /DIS OVERFLOWQ STRUCTURE cmd





IMS/ESA SMQ results

- IMS SMQ objectives reached
 - ▼ Workload balanced on two IMS subsystems
 - ▼ more capacity
 - ▼ increased availability
- Real DB2 Data Sharing exploitation
- Y2K cross over with IMS SMQ
- IMS SMQ part of the Disaster Recovery scenario





Customer's final considerations

- IMS SMQ new architecture implementation effort
- Some logic functionality discovered during project run
- Great help obtained from IBM (STL C/T and Lab, local team)
- Very satisfied of IMS SMQ behaviour
- No problem encountered on production since production switch





IMS: now and future ...

- VGR to fully exploit availability, capacity and workload balancing implemented in 1stQ/2000
- GeoPlex exploitation
 - ▼ a CF defined in the remote system
 - Looking to
- MVS WLM implementation
- IMS e-business and Internet connections





Bibliography

- Formal IMS manulas
- IMS/ESA V6 Shared Queue SG24-5088
- IMS/ESA Shared Queue: a planning guide SG24-5257
- Using VTAM Generic resource with IMS SG24-5487

