

Experiences with Adabas Replicator and Mass Data

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- Environment
- Reasons for Replication
- Basics
- Definitions – Add/Modify Files – Online and Batch
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- Recovery After a Crash
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- Conclusion

Environment

- Mainframe Adabas Database
- 203 files loaded – 186 to be replicated
- Many files contain 50,000,000 – 167,000,000 ISNs

	CYL	Blocks	Gbytes
ASSO	119,676	32,312,502	76.56
DATA	388,947	58,342,040	275.15

Number of Update Commands Monthly Allowance Roll

DATE	HR	QTR HR	CMD COUNT	CMD COUNT	PCT TOTAL CMDS	PCT TOT IO	SUM TOT IO	SUM TOT IO
100315	19	78	874,107	=====	11.4	11.2	=====	755,656
100315	19	79	1,488,111	=====	19.4	18.9	=====	1,278,291
100315	20	80	1,517,170	=====	19.8	19.6	=====	1,324,734
100315	20	81	1,581,223	=====	20.6	20.5	=====	1,386,234
100315	20	82	1,467,842	=====	19.1	19.5	=====	1,318,488
100315	20	83	740,750	=====	9.6	10.3	=====	697,749
100315	21	84	11,484		0.1	0.1		9,958

➤ **7.6 million update commands in 90 min**

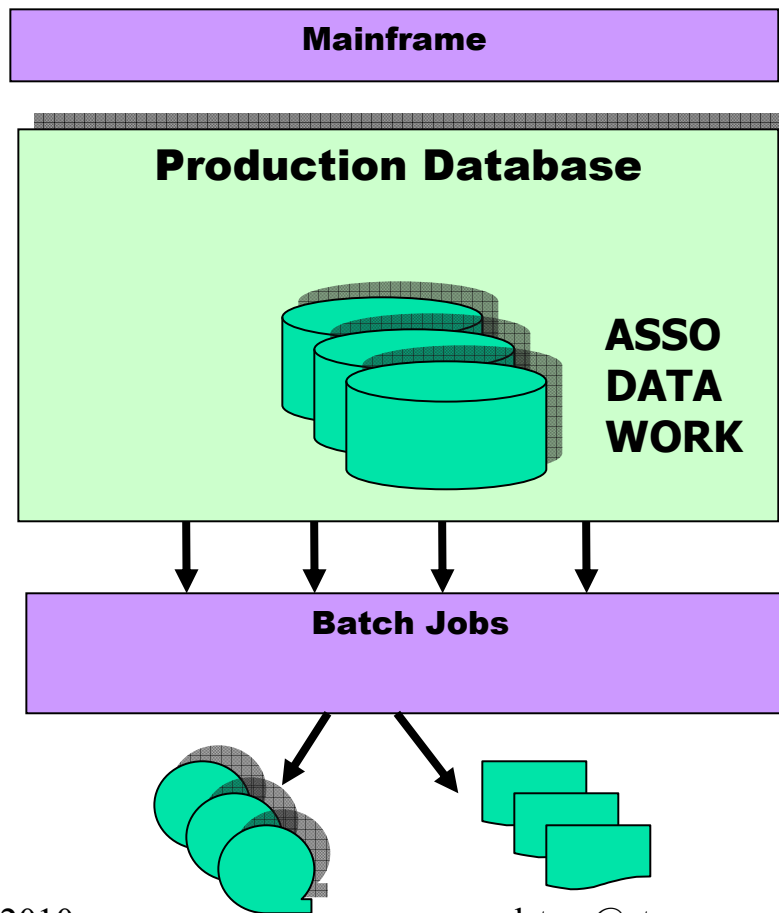
➤ **85.214 commands per min**

➤ **1,421 cmds per sec**

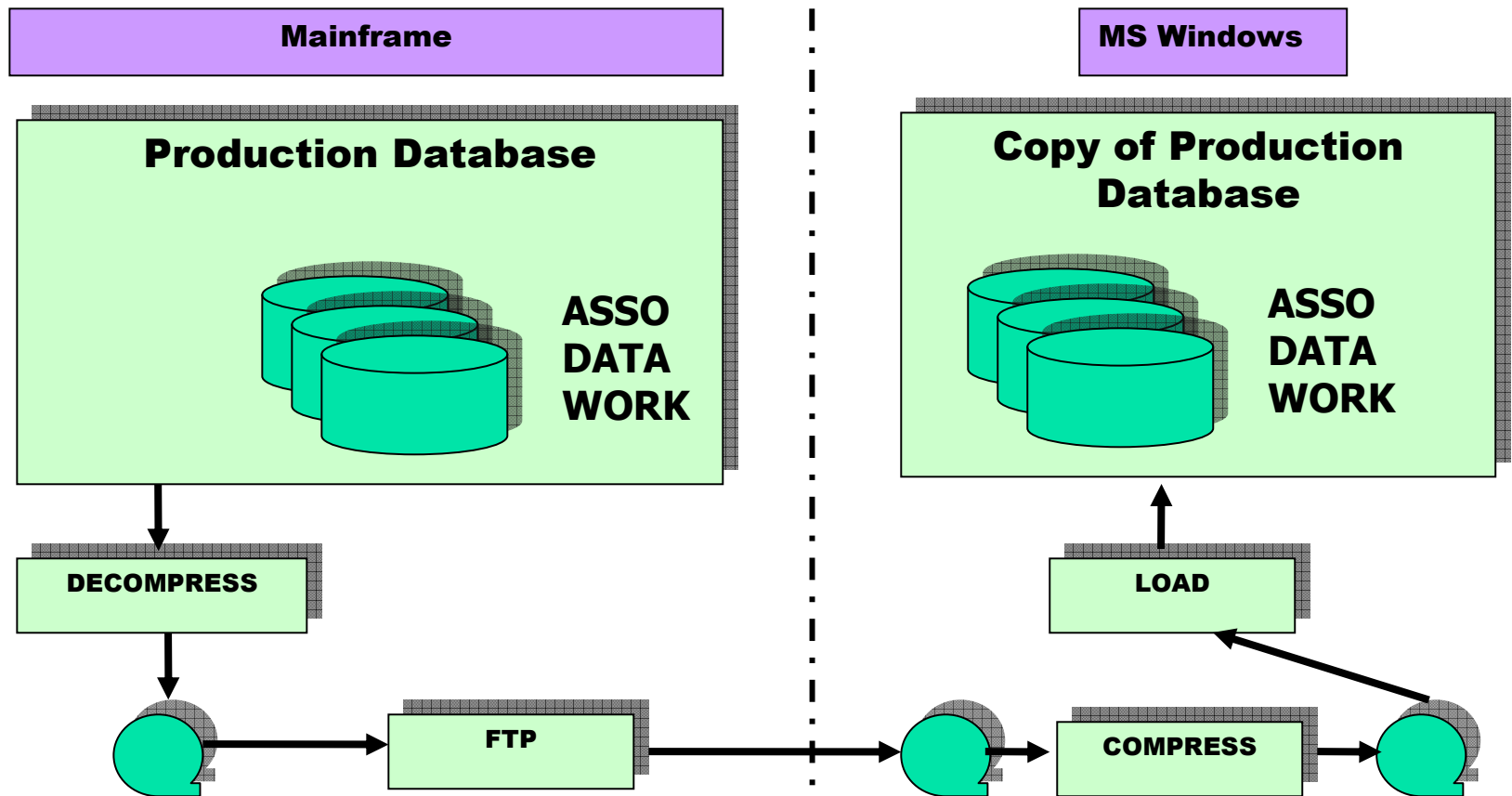
➤ **6 million update commands per hour**

Test: Larry Frazin

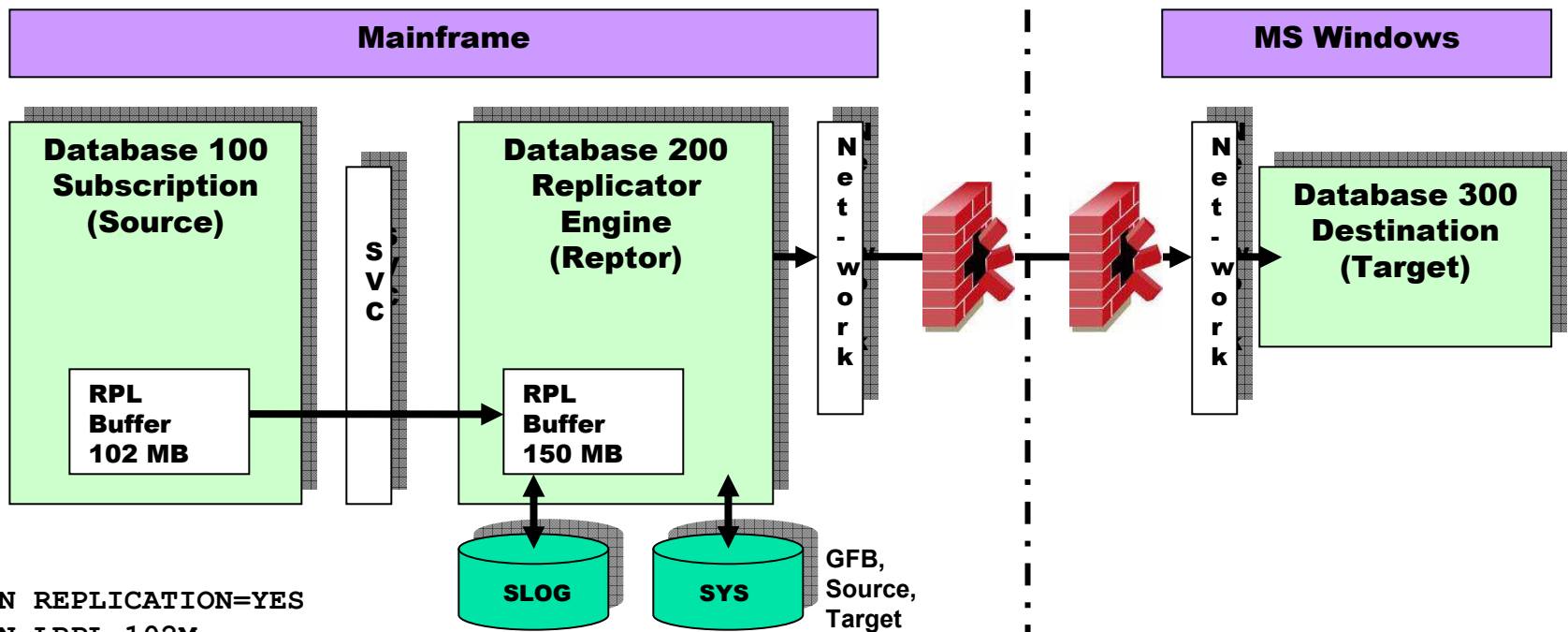
Reasons for Replication



Reasons for Replication



Basics of Event Replication Define Databases



```
ADARUN REPLICATION=YES
ADARUN LRPL=102M
ADARUN RPWARNPERCENT=50
ADARUN RPWARNINCREMENT=10
ADARUN RPWARNINTERVAL=60
ADARUN RPWARNMESASGELIMIT=5
```

```
ADARUN REPLICATION=NO
ADARUN LRPL=150M
ADARUN RPLPARMS=FILE
ADARUN RPWARNxxxxxx=xxxxx
ADARUN LOGINPUTTRANSACTION=30
ADARUN (?) REOCRDPLOGININFO=YES
dstorr@storrconsulting.com
```


Online: Event Replicator Subsystem - Reptor -

10:25:48
Vers 3.1.1

***** A D A B A S EVENT REPLICATOR SUBSYSTEM *****
Main Menu

2009-01-09
M-RP0010

Code	Function
A	Administrator Functions
D	Destination Definitions
F	Transaction Filter Definitions
G	Global Format Buffer Definitions
I	Initial-State Definitions
Q	Input Queue Definitions
R	Resend Buffer Definitions
S	Subscription Definitions
?	Help
.	Exit

Code ... _

Command ==>

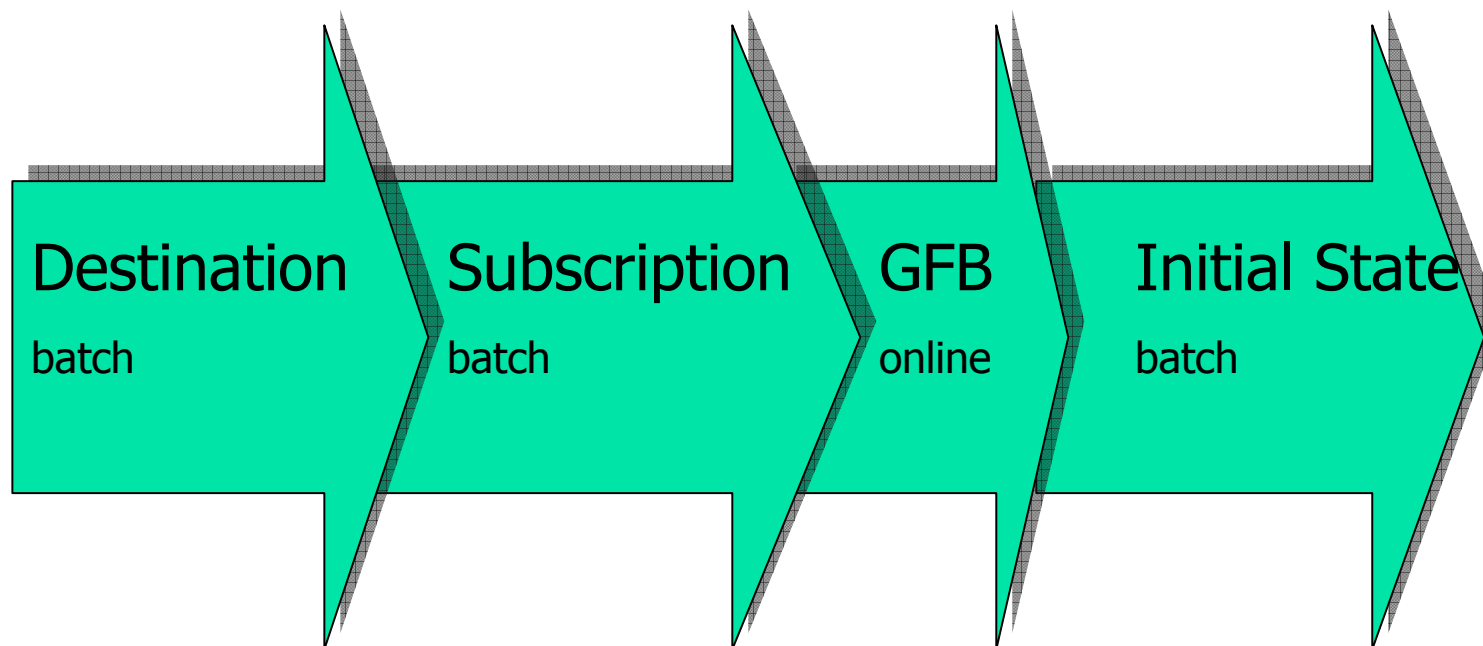
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---

Help

Exit

Event Replicator – How to Set-up Files

- Create the definitions
- Load into the Replicator Engine (REPTOR)



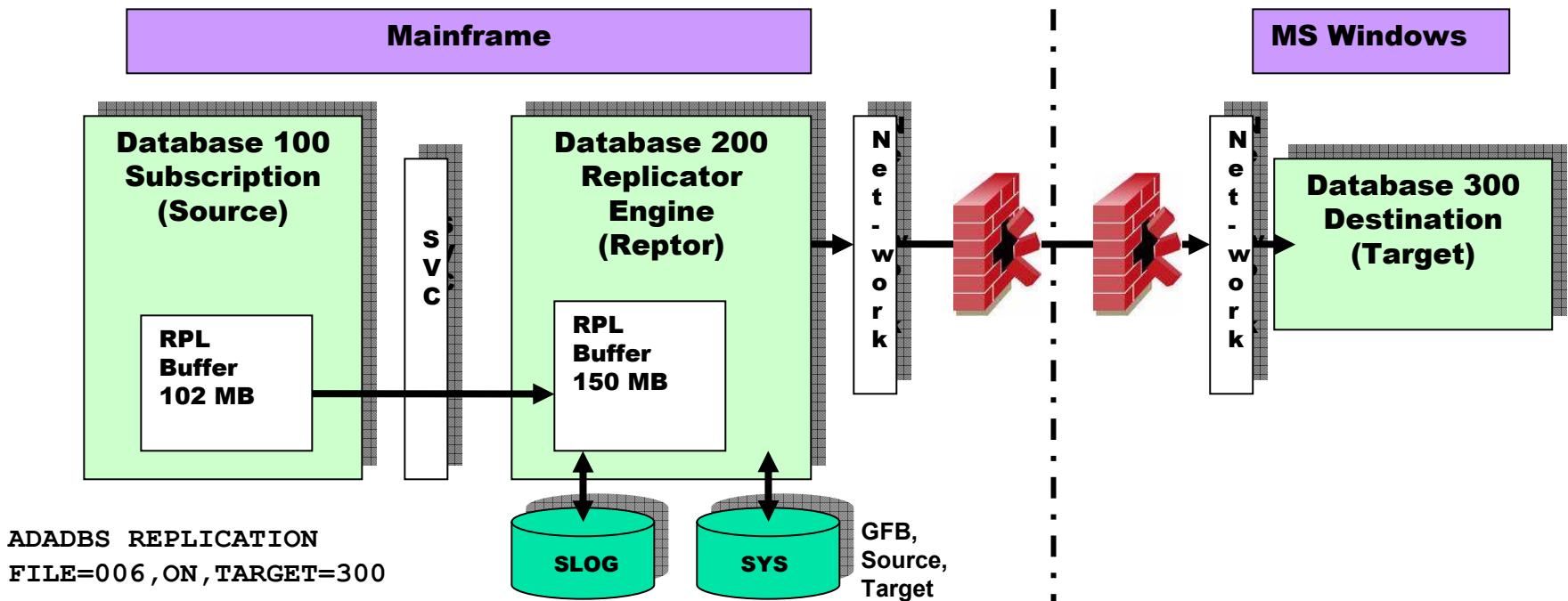
Event Replicator – How to Set-up Files

- Activate replication on the Subscription (Source) DB with new ADADBS function



```
ADADBS REPLICATION FILE=006,ON,TARGET=300  
batch
```

Basics of Event Replication Define Replications



```
ADARPD DESTINATION NAME='D300006'
ADARPD SUBSCRIPTION NAME='S100006'
ADARPD INITIALSTATE NAME='I100006'
REPTOR online: Global Format G100006
```

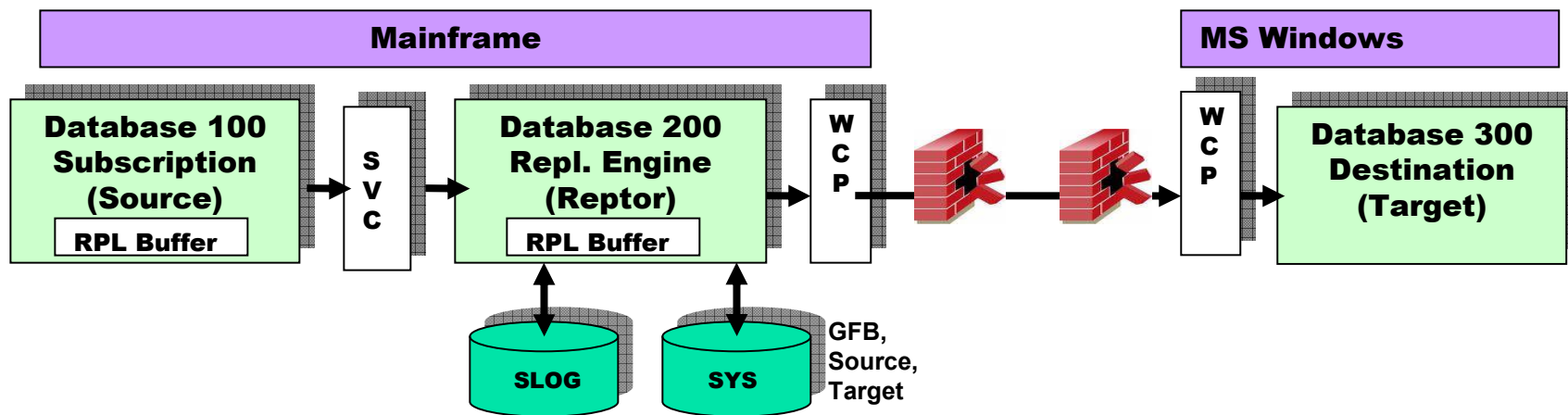
Replicator – Set-up Files in Batch

Instead of using online functions

Unload existing definitions

```
LOGON SYSRPTR
RPULD ENTITY=DE ,NAME=D1910* ,DBID=00302 ,FNR=010 ,RELATED=N
*
RPULD ENTITY=SB ,NAME=S0390* ,DBID=00302 ,FNR=010 ,RELATED=N
*
RPULD ENTITY=IS ,NAME=I0390* ,DBID=00302 ,FNR=010 ,RELATED=N
```

Event Replicator – File Changes



#1: lock file

#2: SLOG empty ?

#3: close destination

#4: change file

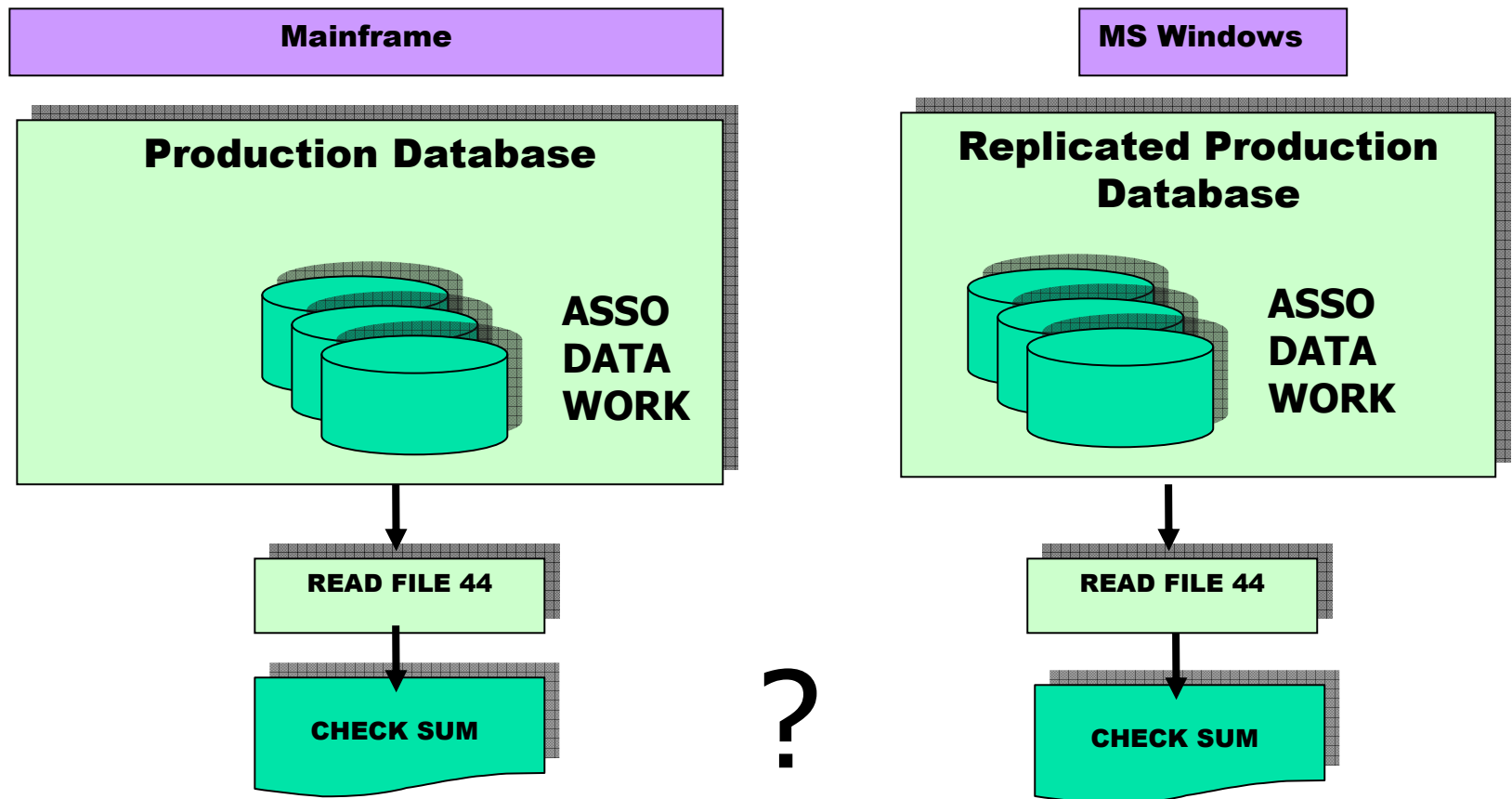
#5: change file

#6: unlink/link / update GFB

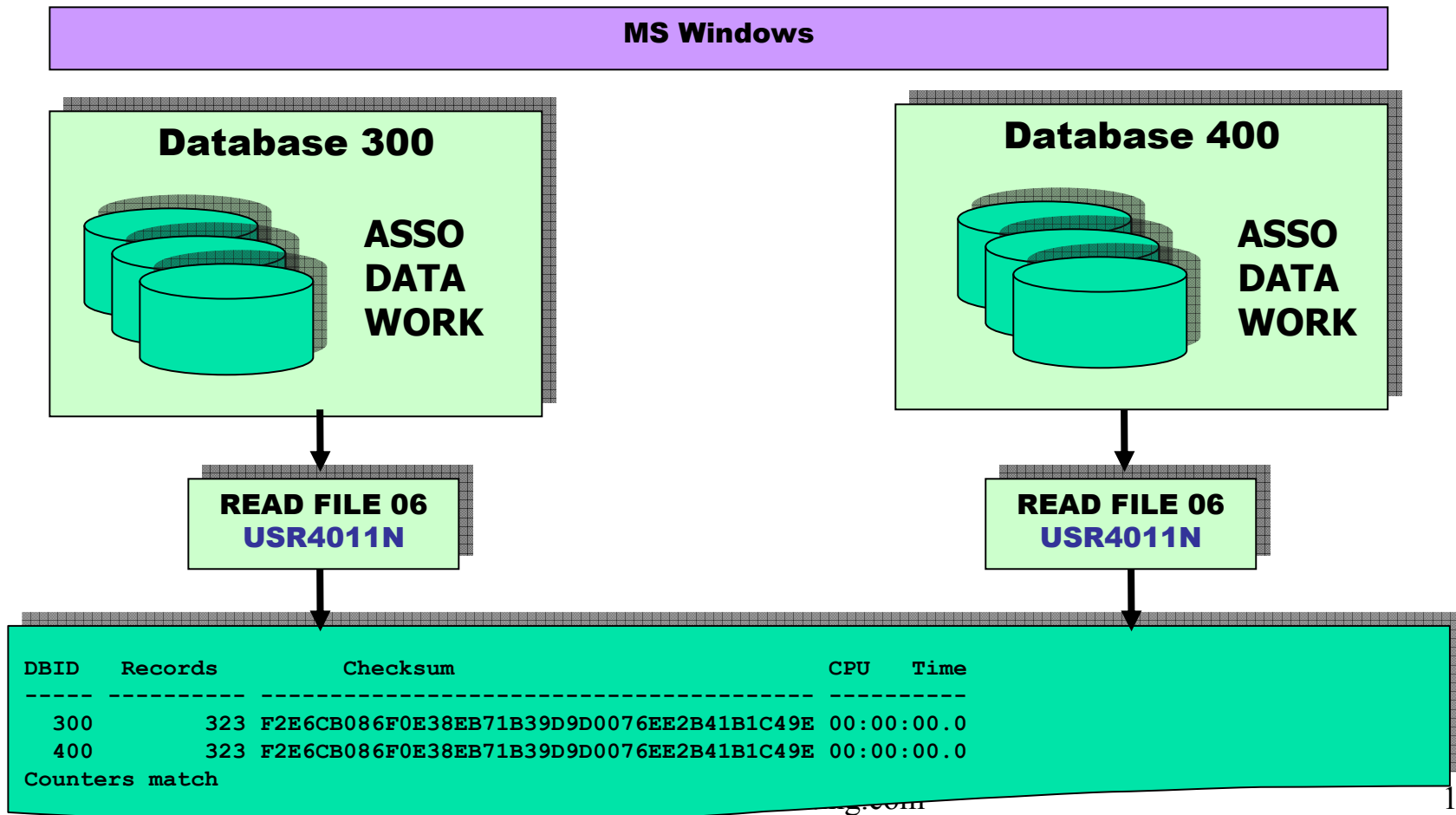
#7: unlock file

#8: open destination

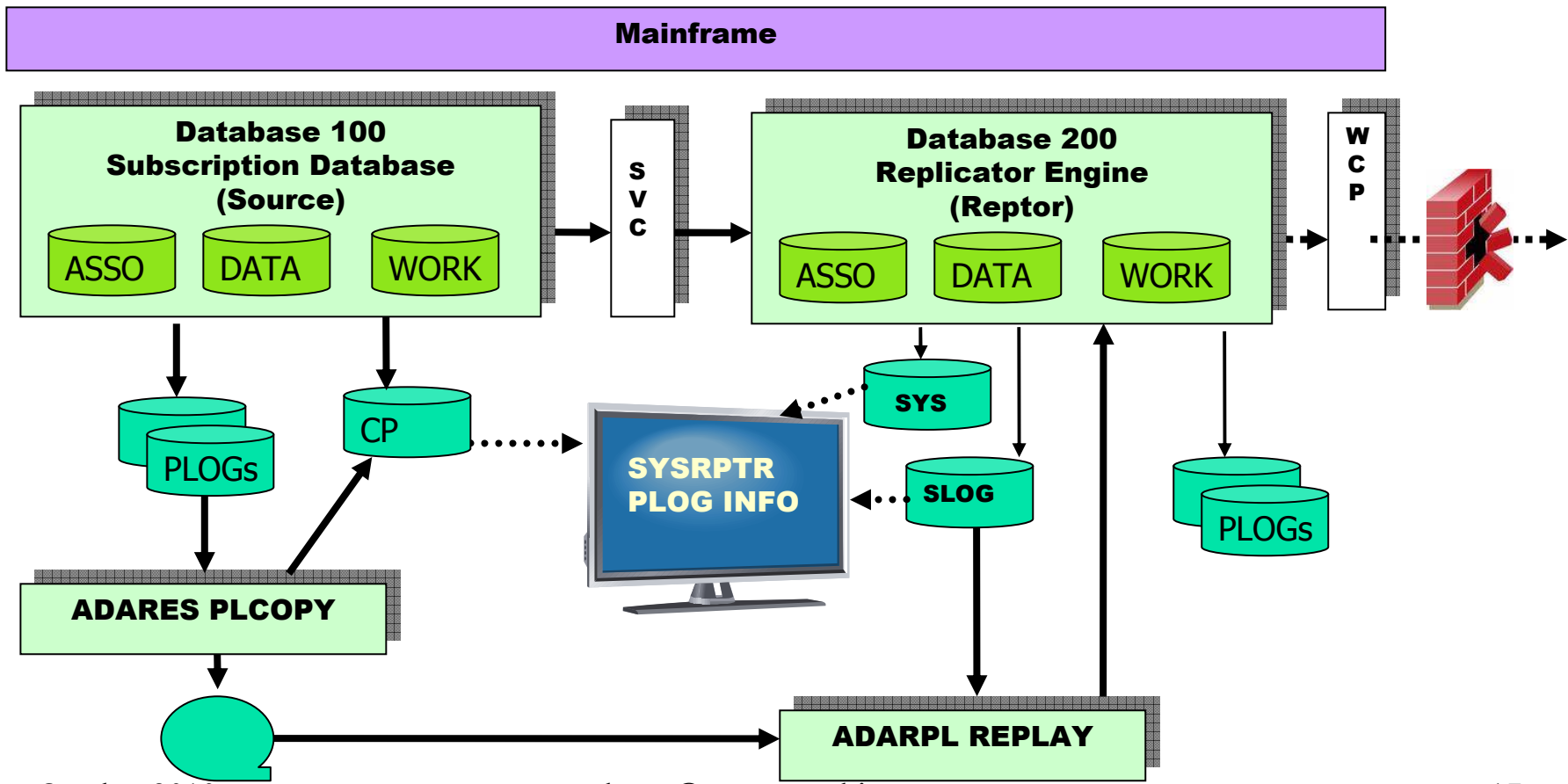
Are Source and Target Data Identical ?



Create Hash Code of a File Using USR4011N



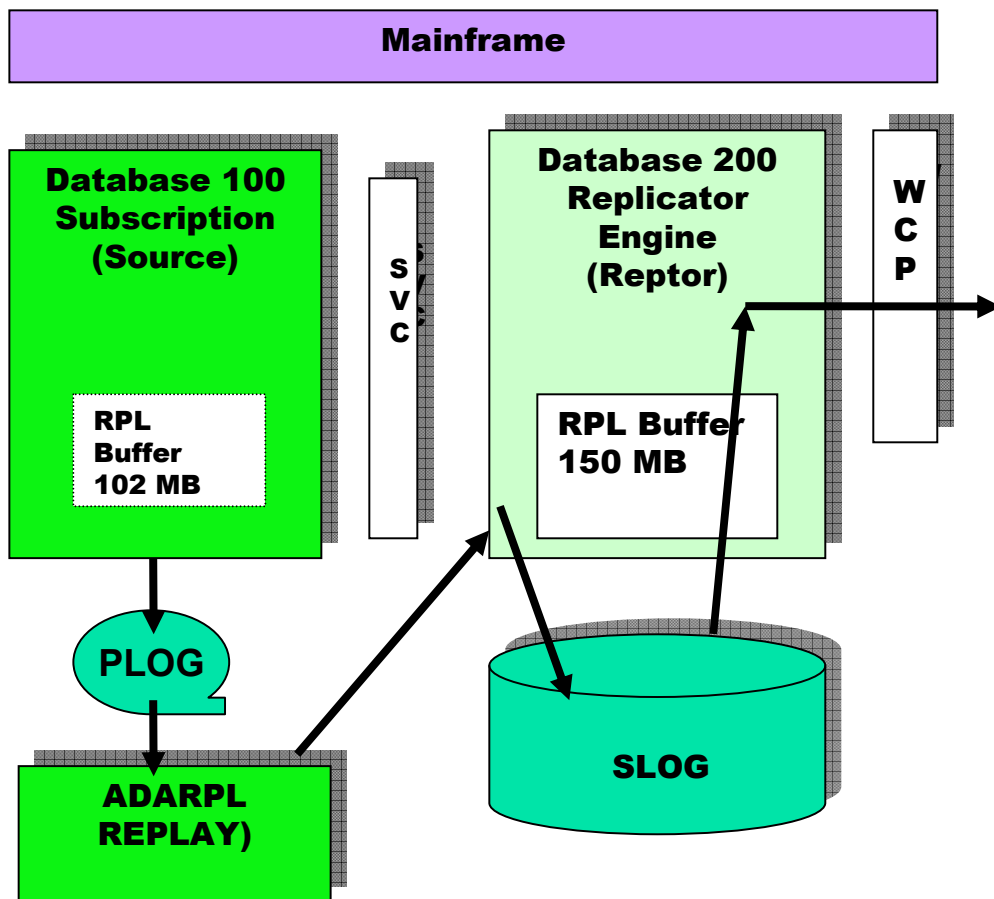
Replay with PLOGs



October 2010

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Replay with PLOGs



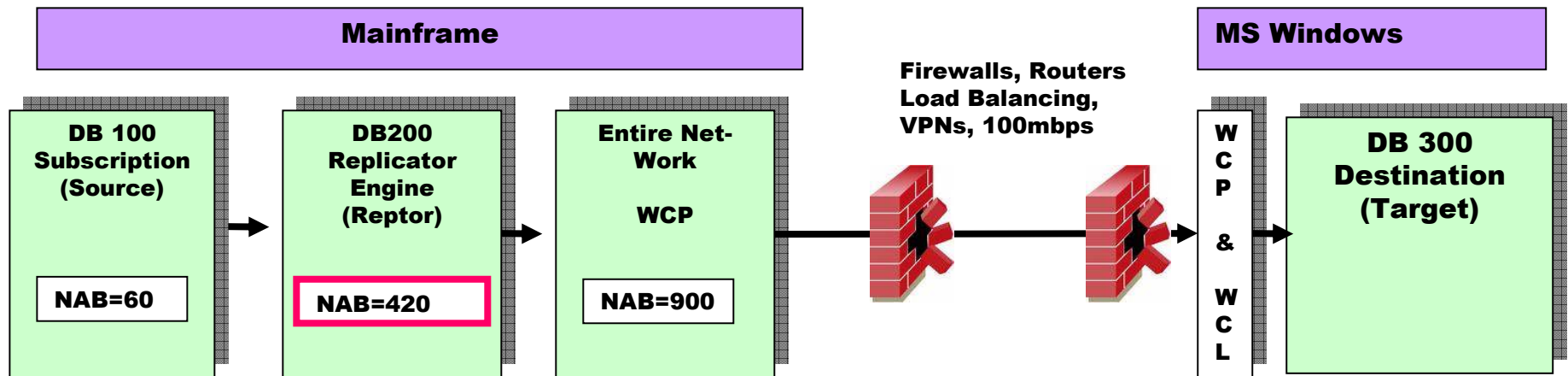
Synchronized Mode

- Suspends new ADABAS transactions
- Reactivates files, subscriptions, destinations that are inactive
- Writes all new data to SLOG
- Synchronizes after the REPLAY new ADABAS transaction

Don't use HALT command for Reptor if data is in SLOG. A Reptor restart will delete this leftover.



NAB Overflow



ADAF18 A1 cmd to DBID 300 FNR 18 RSP 254 subcode 3 ISN 185

RC 254 =

An internal error occurred during processing of an attached buffer (buffer overflow)

Subcode 3 =

CQEFLAG is not equal to CQEFAB plus CQEFW16 ← ??

NAB Overflow - Solutions

Replicator: NAB 420 is too small and should be increased
 Each File in a transaction needs ONE Attached Buffer, e.g. 15

The actual high-water-marks
 for the major pools (except bufferpool)

AREA	ADARUN PARM	HIGH-WATER-MARK
AB -POOL	NAB= 420	1715456 (99 %)
CQ -POOL	NC = 23040	1920 (8 %)
DUQ -POOL	LDE= 100000	871 (0 %)
FI -POOL	LFP= 300000	29888 (9 %)
HQ -POOL	NH = 560056	700 (0 %)
RPL -POOL	LRPL= 157286400	149875480 (95 %)
SC -POOL	LCP= 10000	0 (0 %)
TBI -POOL	LI = 12000	804 (6 %)
TBS -POOL	LQ = 20000	864 (4 %)
UQ -POOL	NU = 4000	17248 (1 %)
UQF -POOL	NU = 4000	3168 (0 %)
WORK-POOL	LWP= 500000	53112 (10 %)
XID -POOL	XID=	0 (0 %)

NAB =
41 * 10 * number of Source DBs * number of files in one transaction

NAB = 41 * 10 * 1 * 15 = 6150



Monitor NAB Overflow



Monitor - Parse DDPRINT for Errors

Read DDPRINT of Active REPTOR Nucleus

```

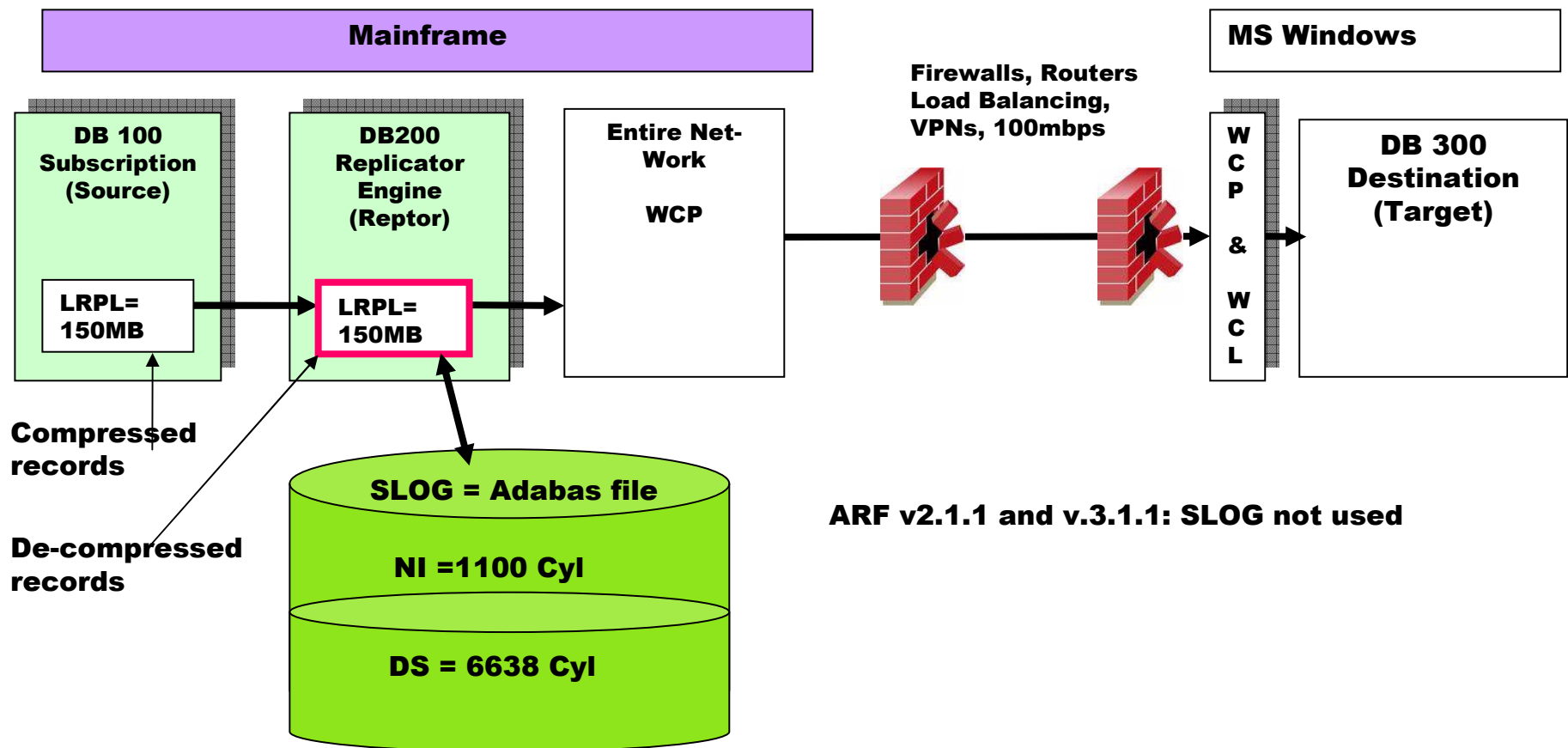
000010 //EJESLNK EXEC PGM=EJESLNK
000011 //* EJESEXT DD SYSOUT=*
000012 //EJESEXT DD DSN=ADABAS.EXTRACT.DDPRINT,
000013 //          DISP=(NEW,CATLG,DELETE),VOL=(,,20),
000014 //          UNIT=MISCDA,BUFNO=20,RECFM=FB,LRECL=240,
000015 //          SPACE=(240,(100,50),RLSE),AVGREC=K,RETPD=30
000016 //EJESOUT DD SYSOUT=*,RECFM=VB,LRECL=240
000017 //EJESIN DD *
000018     ST REPTMPM
000019     FIND RETMPM
000020     :S
000021     FIND DDPRINT
000022     :E
000023 //
    
```

EXAMINE DDPRINT FOR 'ADAF54' and others

**Replicator
Buffer (RPL)
Overflow**



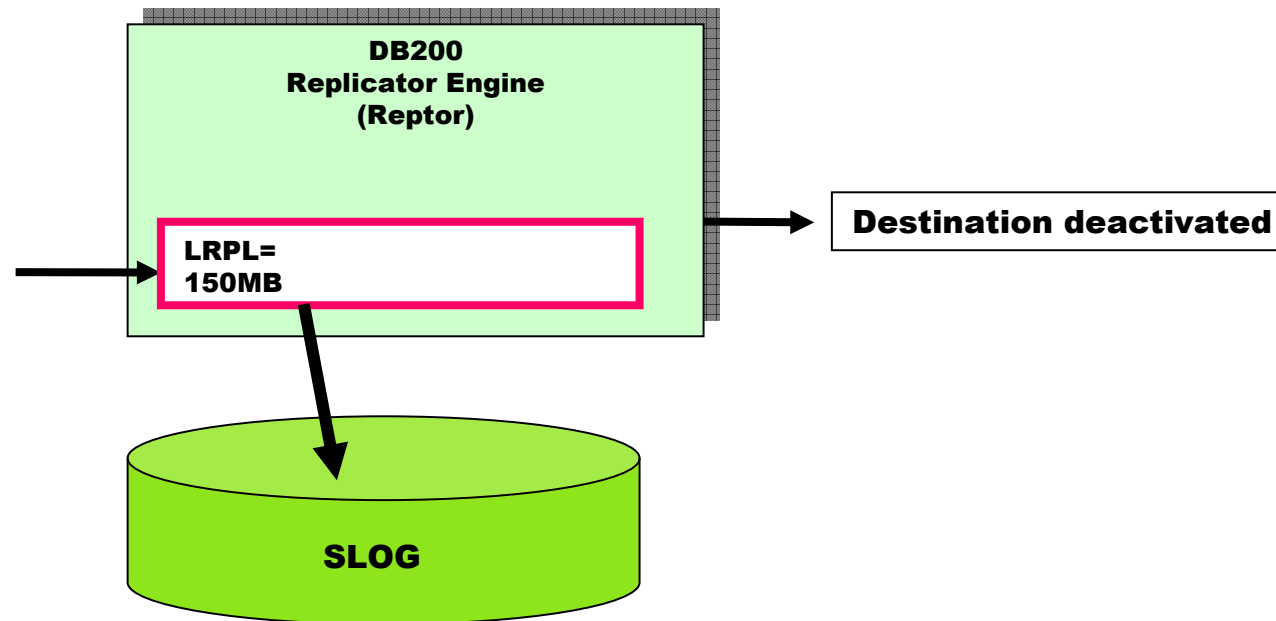
Problem: RPL Buffer Overflow



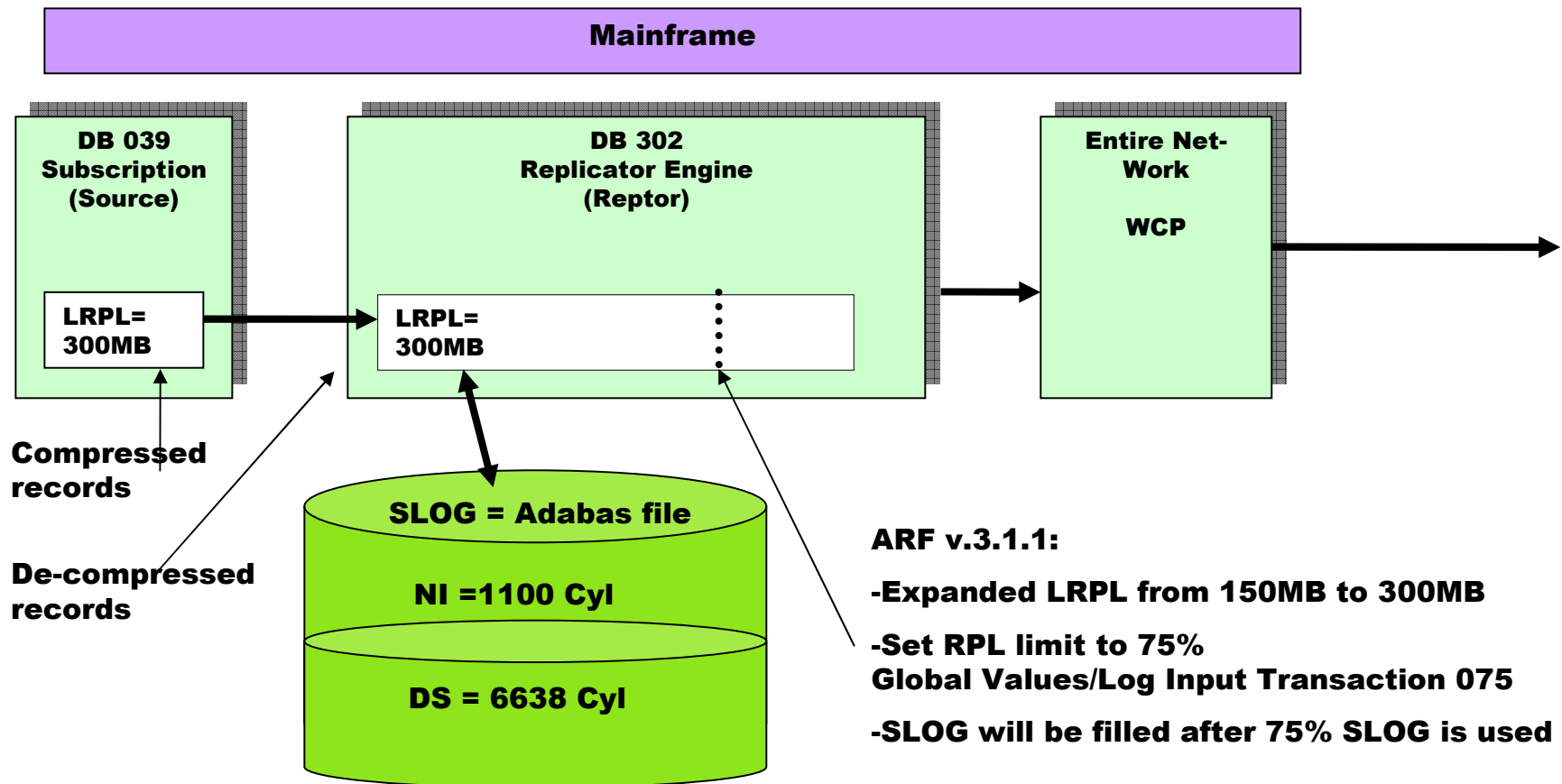
Problem: RPL Buffer Overflow

```

16:37:27 ADAF1U 00302 Reptor replication pool overflow
16:37:27 ADAF1U 00302 Failed to allocate          332 bytes for Input image
16:37:27 ADAF2N 00302 Destination D251144 deactivated
16:37:27 ADAF2N 00302 due to replication pool overflow
    
```



Solution: RPL Buffer Overflow



Monitor RPL Buffer / SLOG Overflow



Monitor HWM / SYSAOS in Batch

```

000038 /*-----*
000039 /* Create High Water Marks of Reptor DB 302 by using SYSAOS    ---*
000040 /*-----*
000041 //RPLSTAT EXEC PGM=NATBATCH,REGION=0M,
000042 // PARM=' PARM=SYPROD ,SYS=STRSY5 ,AUTO=ON ,IM=D ,STACK=(LOGON SYSAOS ;MENU) '
000043 //STEPLIB      DD DISP=SHR,DSN=ADABAS.LOADLIB                ADABAS
000044 //              DD DISP=SHR,DSN=ADABAS.PGMLIB                NATURAL
000045 //              DD DISP=SHR,DSN=ADABAS.PARMLIB                NATPARM
000046 //DDCARD       DD DISP=SHR,DSN=ADABAS.CONTROL.CARD (PRODN)
000047 //CMPRINT      DD DISP=( ,PASS) ,SPACE=(TRK,(10,10),RLSE) ,
000048 //              DSN=ST.ADADBA.DIETER.HWM.REPTOR
000049 //CMSYNIN      DD *
000050 A,302
000051 U
000052 H
000053 ,,,FIN
    
```

PARSE

Monitor RPL Buffer / SLOG Check in Batch

```

//*-----*
//* Create SLOG report by using SYSAOS / Replication Maintenance ---*
//*-----*
//RPLSTAT1 EXEC PGM=NATBATCH,REGION=0M,
// PARM=' PARM=SYPROD ,SYS=STRSY7 ,AUTO=ON ,IM=D ,STACK=(LOGON SYSAOS ;MENU) '
//STEPLIB DD DISP=SHR,DSN=ADABAS.ALIAS.SYPROD.LOADLIB ADABAS
// DD DISP=SHR,DSN=ADABAS.ALIAS.SYPROD.PGMLIB NATURAL
// DD DISP=SHR,DSN=ADABAS.ALIAS.SYPROD.PARMLIB NATPARM
//DDCARD DD DISP=SHR,DSN=ADABAS.CONTROL.CARD(TESTY)
//CMPRINT DD DSN=ST.ADADBA.STDWS.SLOG302,
// DISP=( ,CATLG) ,SPACE=(TRK,(10,10),RLSE)
//CMSYNIN DD *
O,302
X
F
B
, ,FIN
/*

```

SLOG is not empty

```

13:28:06          ***** A D A B A S  BASIC  SERVICES *****          2010-03-10
Replicator 302          - Replicator Statistics -          PRPTS10
Replicated trans / messages / bytes  Received from input queues
-----
Total trn.          80,554  Messages ...
Pending ..          13      Bytes .....
Messages          Commits ....
Tot msgs .          Backouts ...
Bytes sent to all destinations
Tot bytes.          Deleted totals from input queues
-----
SLog statistics for items          Messages ...
-----
Delogged .          35,476  Bytes .....
Logged ...          42,665  Commits ....
On file ..          7,228  Backouts ...
Replay dbid/token cnt .
Destination slog cnt ..          372          More: press PF8

PF1---  PF3---  PF4-----  PF5-----  PF6-----  PF7---  PF8---  PF12-----
Help    Exit    Refresh    DBID/Token  Dest. SLOG    +      Menu
    
```

Problems and Solutions - SLOG check

```

000104 //** -----
000105 //**  OPEN the destination
000106 //** -----
000107 //RPLOPEN EXEC PGM=NATBATCH,REGION=0M,
000108 // PARM=' PARM=SYPROD ,SYS=STRSY5 ,AUTO=ON ,IM=D ,STACK=(LOGON SYSAOS ;MENU) '
000109 //STEPLIB      DD DISP=SHR,DSN=ADABAS.LOADLIB          ADABAS
000110 //              DD DISP=SHR,DSN=ADABAS.PGMLIB          NATURAL
000111 //              DD DISP=SHR,DSN=ADABAS.PARMLIB          NATPARM
000112 //DDCARD      DD DISP=SHR,DSN=ADABAS.CONTROL.CARD (PRODN)
000113 //CMPRINT      DD SYSOUT=*
000114 //CMSYNIN      DD *
000115 O,312
000116 X
000117 A
000118 K,,D187044
(snip)
000215 K,,D187047
000216 .
000217 .
000218 ,,FIN
000219 /*

```




Problem: RSP 153 from the Target DB

- Applied 1,5 million STORES in the source database 39
- Most of them were replicated in the target database 251
- 8 STORES received RSP 153 and were not replicated (14:48-14:49)

```

Start date= 2010-028      Start time= 13:11:36
January 28, 2010, Thursday
14:48:18 ADAF54 00302 Replication error: Adabas destination D251144
14:48:18 ADAF54 00302 Source DBID    39 FNR    144, Target DBID    251 FNR    144
ADAF18  N2 cmd to DBID    251 FNR    144 RSP    153 subcode 16448 ISN      4908013
ADAF54 2010-01-28 14:48:17 Replication error: Adabas destination D251144
ADAF54 Source DBID    39 FNR    144, Target DBID    251 FNR    144
ADAF18  N2 cmd to DBID    251 FNR    144 RSP    153 subcode 16448 ISN      4908014
(snip)
    
```

RSP 153:

Previous Adabas call still in process. DB/FNR .../....

'CALL Adabas' was issued by a user while a previous call for the user was still being processed.

Monitor RSP 153



Monitor RSP 153 - Parse High Water Marks

- **Read DDPRINT of Active REPTOR Nucleus**

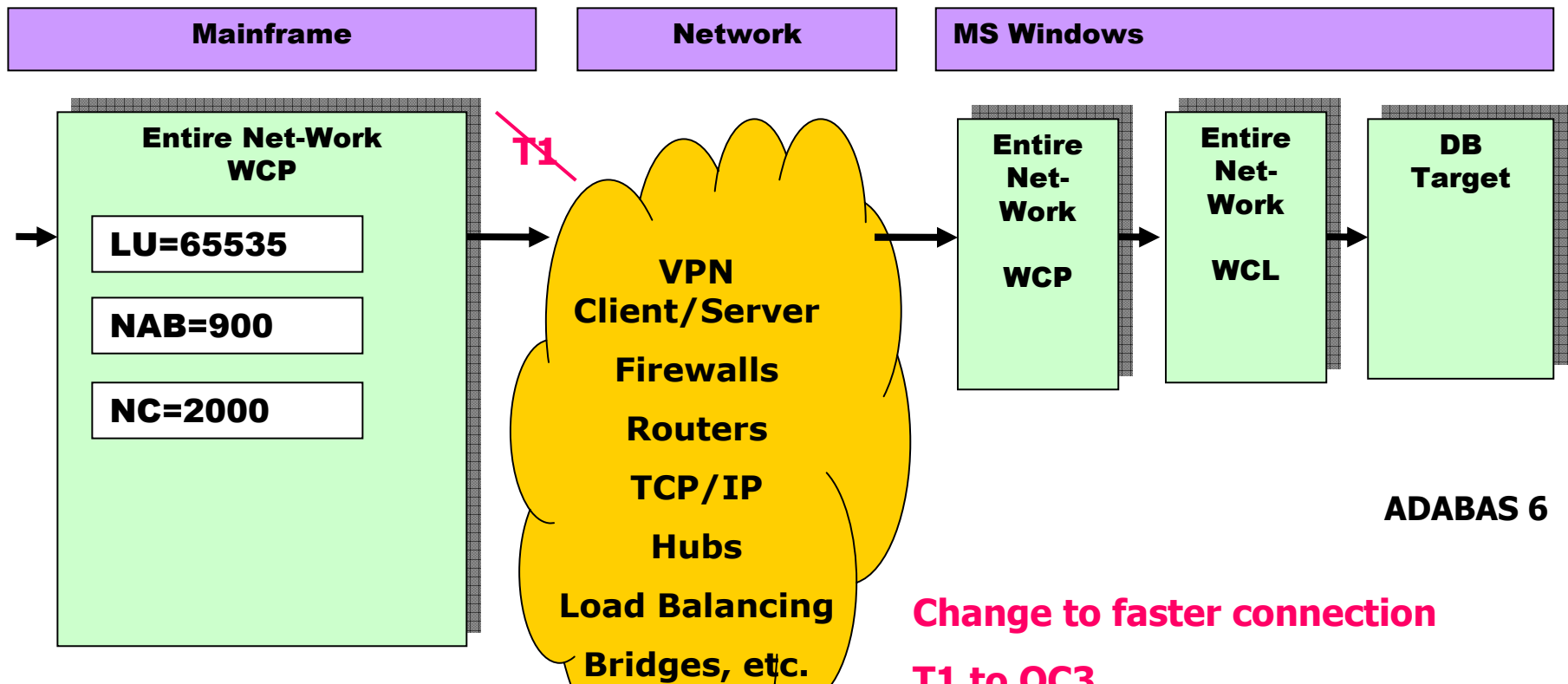
```

• 000010 //EJESLNK EXEC PGM=EJESLNK
• 000011 //* EJESEXT DD SYSOUT=*
• 000012 //EJESEXT DD DSN=ADABAS.EXTRACT.DDPRINT,
• 000013 //          DISP=(NEW,CATLG,DELETE),VOL=(,,,20),
• 000014 //          UNIT=MISCDA,BUFNO=20,RECFM=FB,LRECL=240,
• 000015 //          SPACE=(240,(100,50),RISE),AVGREC=K,RETPD=30
• 000016 //EJESOUT DD SYSOUT=*,RECFM=VB,LRECL=240
• 000017 //EJESIN DD *
• 000018     ST REPTMPM
• 000019     FIND RETMPM
• 000020     :S
• 000021     FIND DDPRINT
• 000022     :E
• 000023 //
    
```

EXAMINE DDPRINT FOR 'ADAF54' and others



Slow Communication: Entire Net-Work (WCP)



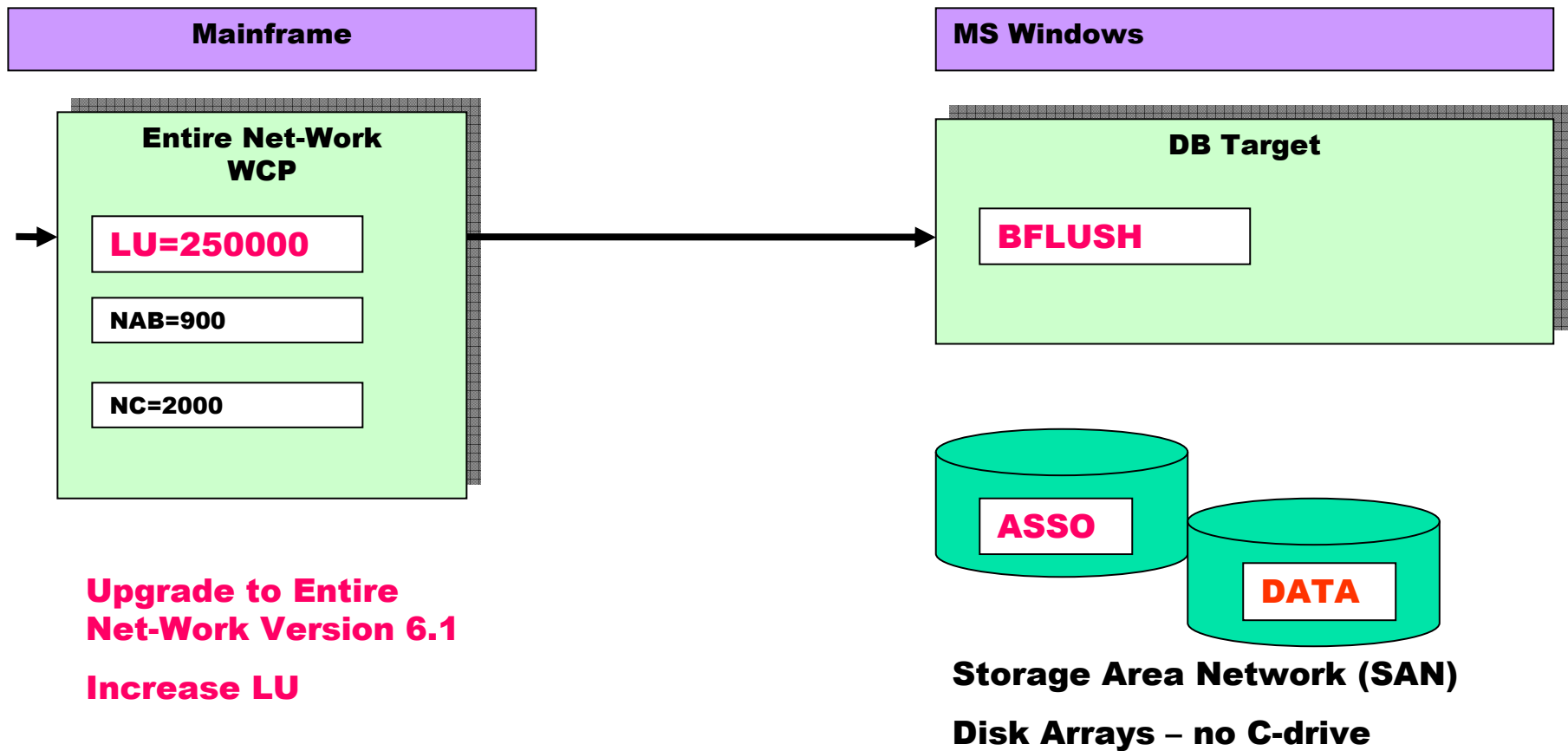
Upgrade to WCP 6.1

October 2010

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Communication Problem: Entire Net-Work (WCP)



Monitor the Network



System Management Hub

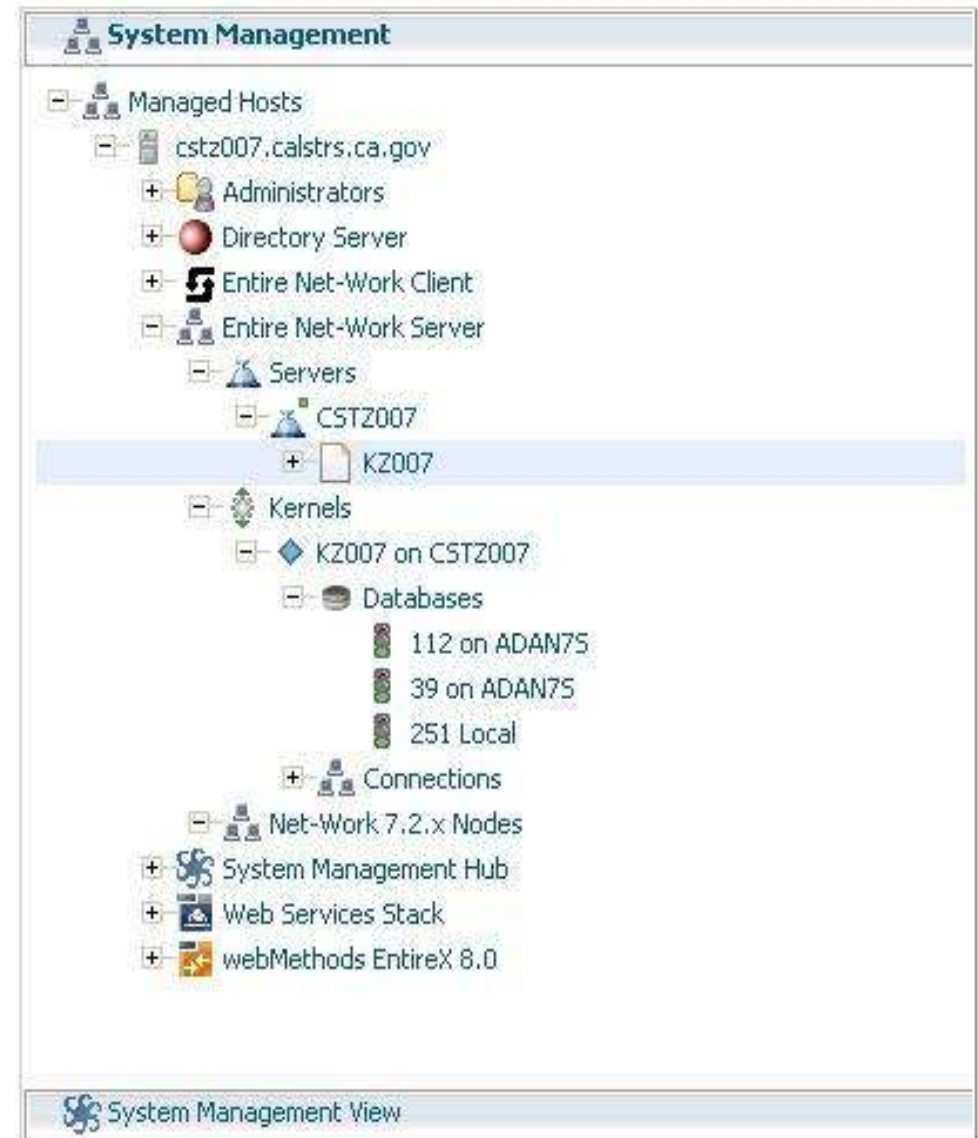
Checklist for RPL and WCP

- **Windows (SAG) Services up ?**
- **System Management Hub - SMH**
 - **Servers**
 - **Kernels**
 - **Databases**
 - **WCP**

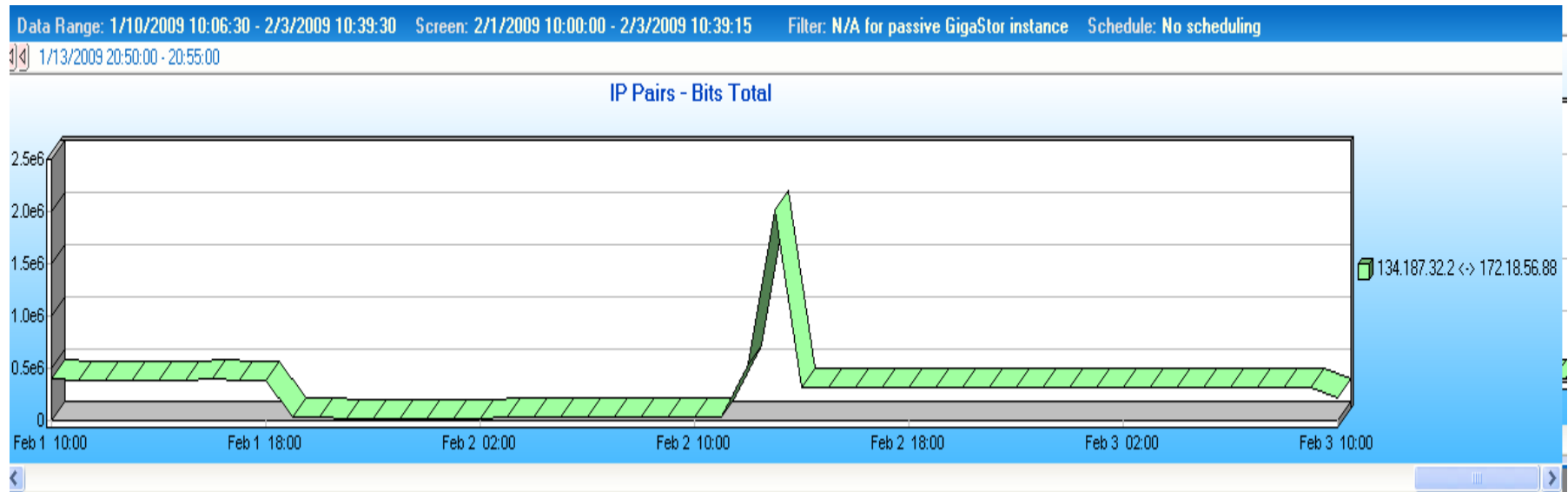
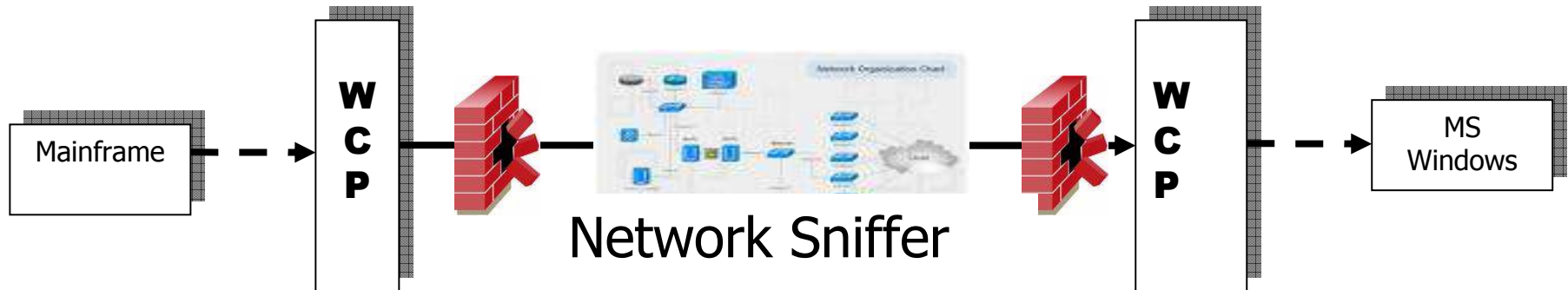
(Re-)start

(Re-)connect

Not clear why they disconnected



Monitor the Network



Monitor the Network



NetQoS
Performance First

NetQoS Performance Center

COEMS Group: /All Groups

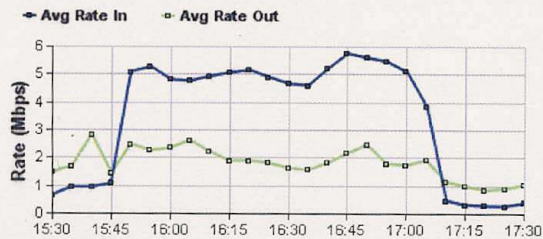
Timeframe: Custom Mon 27 Sep 2010 22:30:00 - Tue 28 Sep 2010 00:30:00 PST8PDT

Generated On: Tue 28 Sep 2010 10:04:31 PST8PDT

Interface Rate In/Out Trend

2010-09-27 15:30 - 2010-09-27 17:30 PDT

Interface: CWGCDTS-SW1 - DTSUPLINK

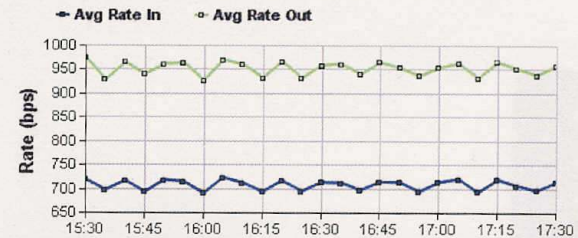


Interface Speed In: 100.00 Mbps, Speed Out: 100.00 Mbps, Resolution: 5 min

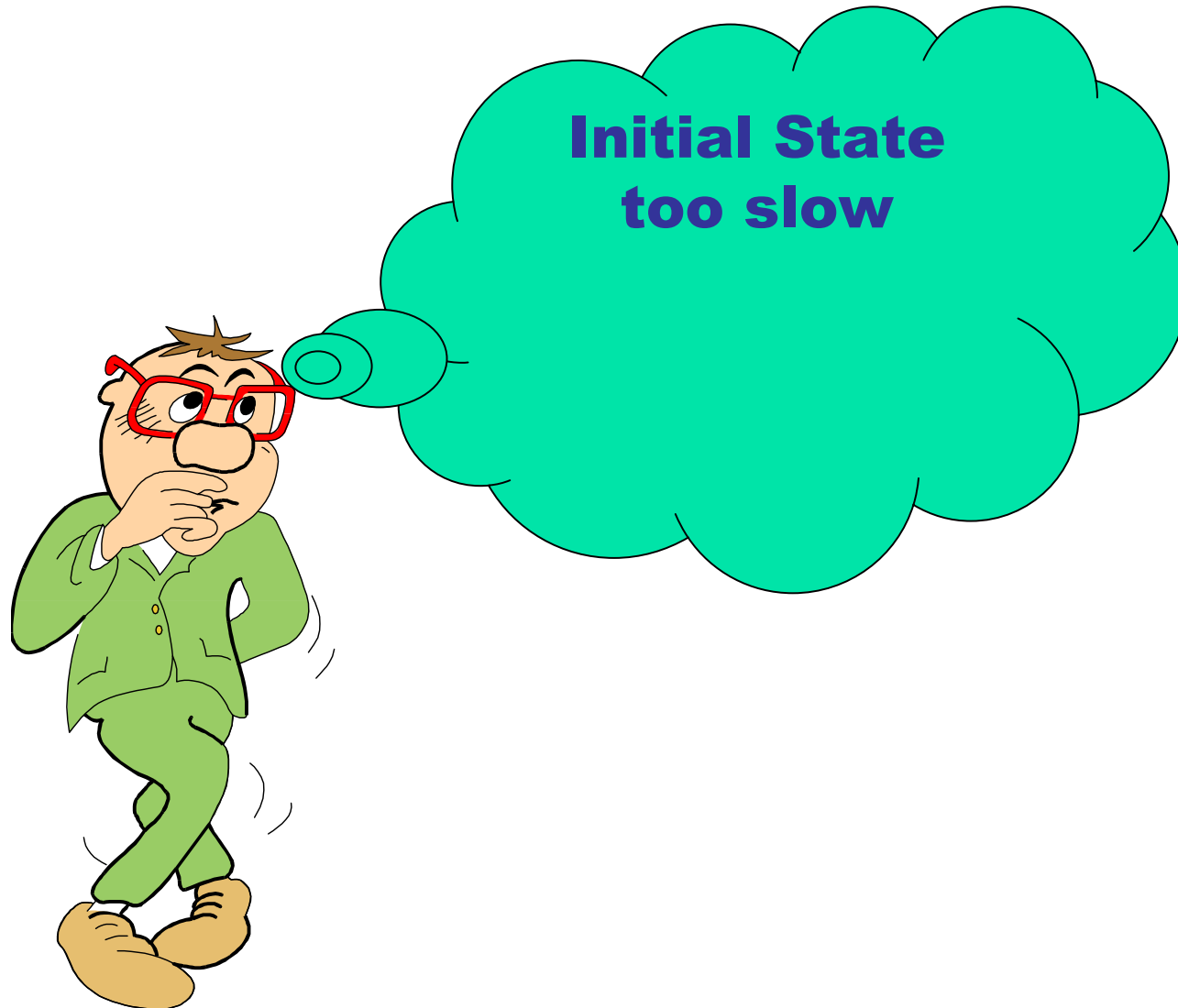
Interface Rate In/Out Trend

2010-09-27 15:30 - 2010-09-27 17

Interface: CWGCDTS-SW1 - DTSUPLINK



Interface Speed In: 100.00 Mbps, Speed Out: 100.00 Mbps, Resolution: 5 min

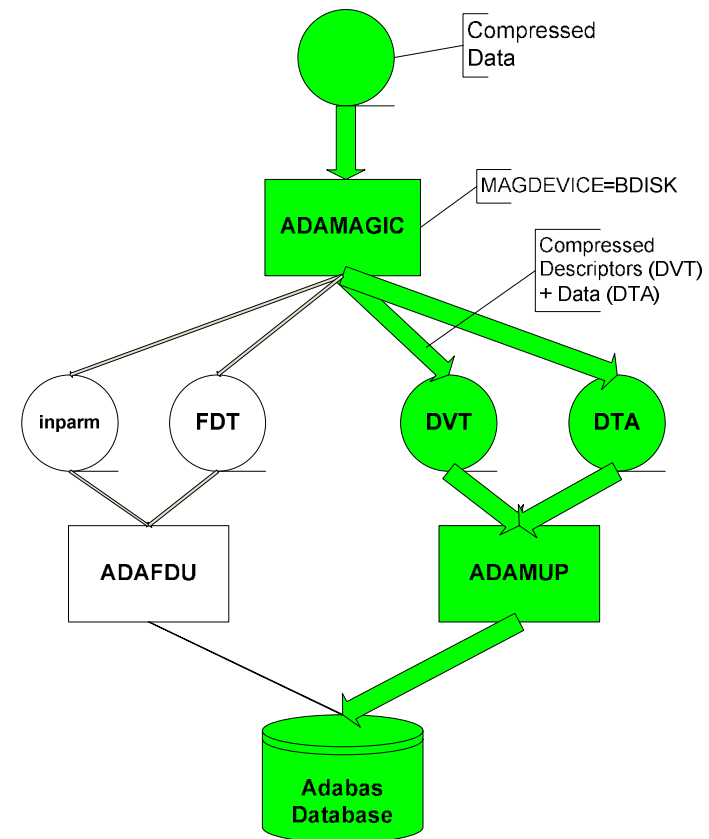


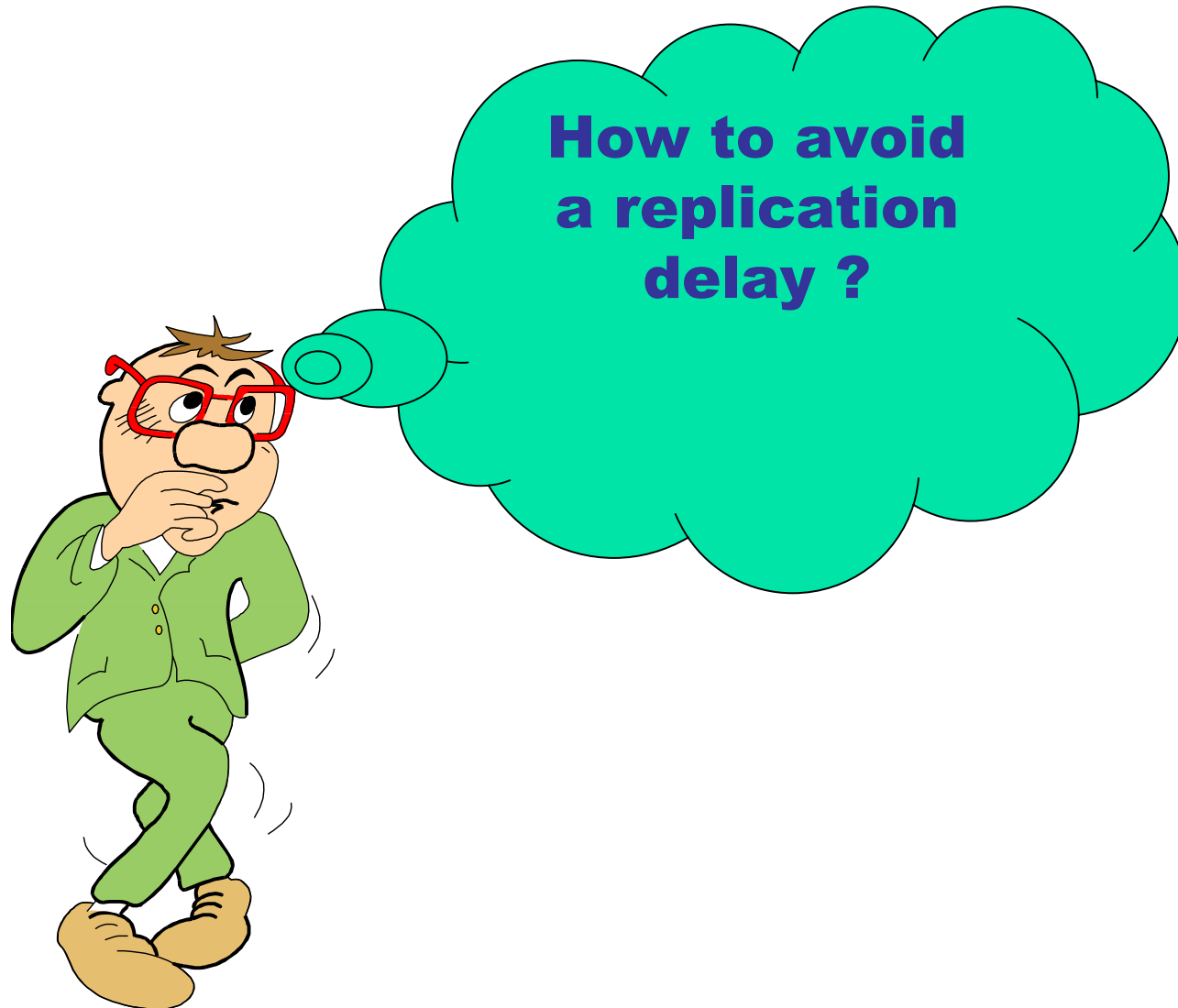
Initial State too slow

- Files for initial state too big, for example 160 mill. Records
- Initial state for one file would take days
- Therefore:
 - DECOMPRESS by ISN directly from Subscription DB
 - FDT from mainframe to Windows
 - Compress with USERISN
 - LOAD with USERISN
- Still the DB copy process takes 3-4 days ! !

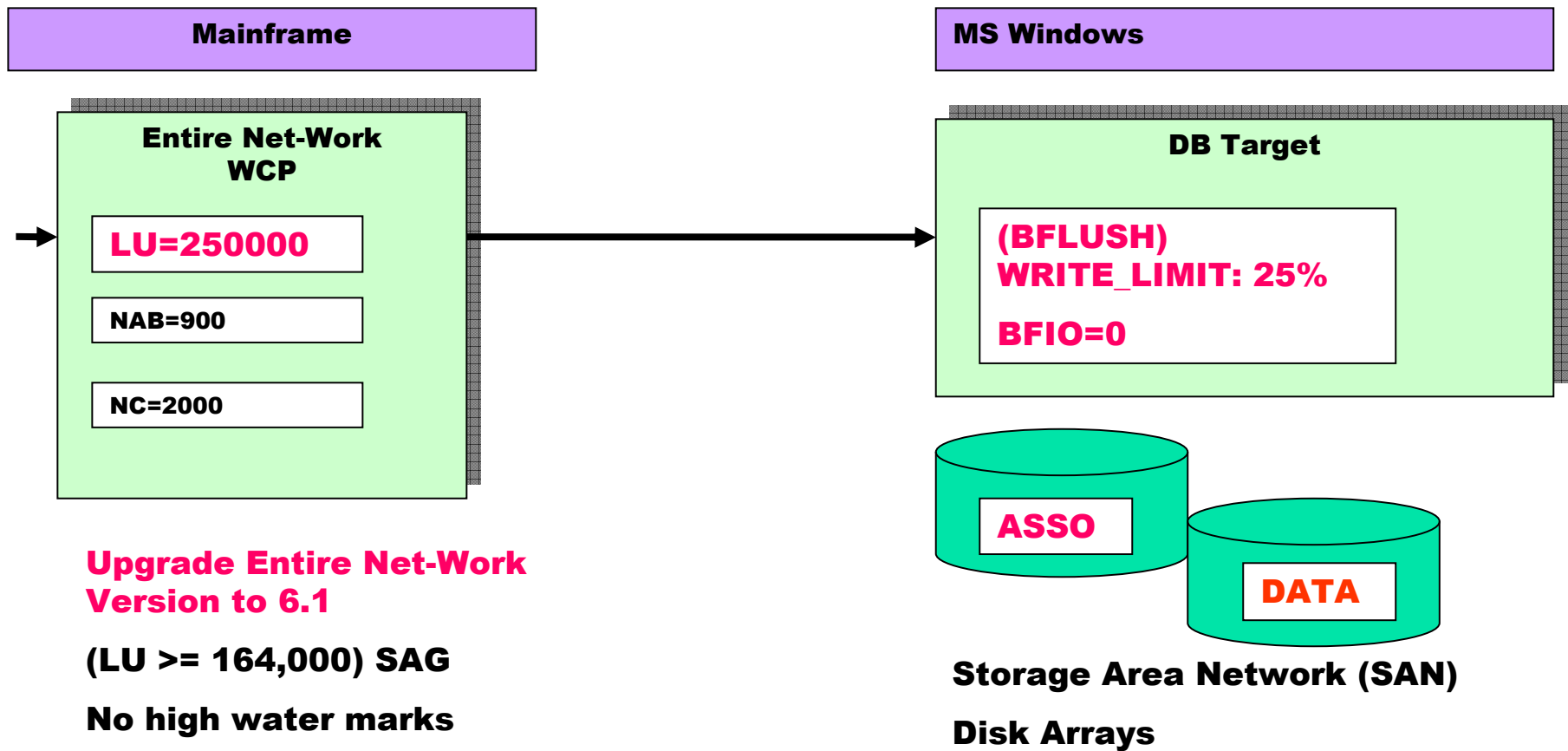
Possible Solution for Initial State

- DB back-up (ADASAV) on the mainframe (compressed data)
- FTP the back-up to the Windows server
- Restore (ADAMUP) the back-up (still compressed data) to Adabas on Windows
- SAG solution: NO
- Third-party solution: YES – for UNIX and Windows (ADA612 under development)





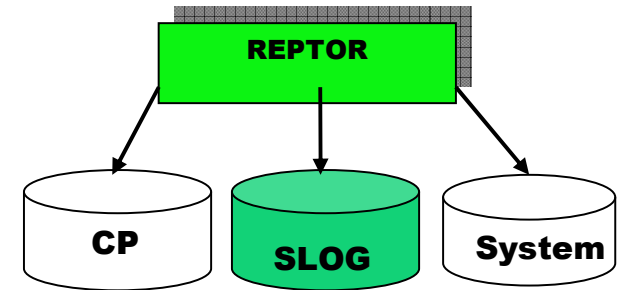
Replication Delay



**Why is Reptor
Acting Unusual
Under Stress?**



Reptor Under Stress



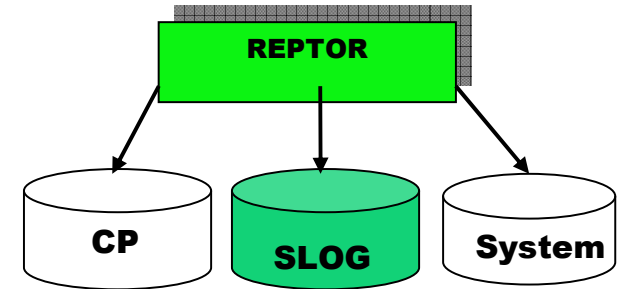
Reptor Abend U0065 at 0016AA66 = ADARPS+006A66

```

10:45:52 ADAF5Q 00302 that ended before 2010-04-20 17:03:11
10:45:52 ADAF5Q 00302 have been processed for file      20
10:45:55 ADAFRY 00302 SLOG turned off for destination D191020
10:45:55 ADAF8N 00302 Close request received for destination D191020
10:45:55 ADAN59 00302 Abend U0065 at 0016AA66 = ADARPS+006A66
10:45:55 ADAN59 00302 00000008 00000000 8016AA66 31A398E0 (R0-R3)
10:45:55 ADAN59 00302 00000000 00000000 449D29C0 00054FF8 (R4-R7)
10:45:55 ADAN59 00302 3157D3FC 0016A960 00053000 00054000 (R8-RB)
10:45:55 ADAN59 00302 315AA000 315AB000 31080000 0000003C (RC-RF)
10:45:55 ADAM99 00302 ADABAS   Abend code 00000041 00000000
10:45:55 078D3000 80019E26 0002000D 00000000 (PSW, EC Info)
10:45:55 00000000_00013870 00000000_00000041 (R0-R1)
10:45:55 00000000_000550F8 00000000_000533D4 (R2-R3)
10:45:55 00000000_00055D68 00000000_00000000 (R4-R5)
10:45:55 00000000_00055DCE 00000000_000545EC (R6-R7)
10:45:55 00000000_000545EC 00000000_00055B84 (R8-R9)
(snip)
  
```

Restarted Reptor

Reptor Under Stress



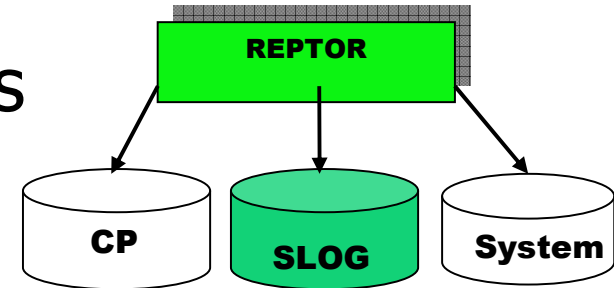
Replicated Records Measured on the Target Database

Report Time	Rpted RC	Time Differ	Seconds	Total Records	Rec Per Second
2010/04/23 07:24:05	1,564,092				
2010/04/23 07:37:48	1,656,733	13:43	823	92,641	113
2010/04/23 08:15:04	1,902,986	37:16	2236	246,253	110
2010/04/23 08:47:27	2,101,398	32:23	1943	198,412	102
2010/04/23 08:54:25	2,145,171	06:58	418	43,773	105
2010/04/23 09:13:09	2,237,220	18:44	1124	92,049	82
2010/04/23 09:51:49	2,428,858	38:40	2320	191,638	83
2010/04/23 10:15:54	2,556,922	24:05	1445	128,064	89
2010/04/23 10:42:03	2,690,992	26:09	1569	134,070	85
2010/04/23 10:55:30	2,766,535	13:27	807	75,543	94
2010/04/23 11:07:13	2,829,072	11:43	703	62,537	89
2010/04/23 11:18:49	2,892,120	11:36	696	63,048	91
2010/04/23 12:52:34	3,324,097	33:45	2025	431,977	213
2010/04/23 13:04:35	3,377,015	12:01	721	52,918	73

(after restart of the Reptor - it repeats already replicated records)

2010/04/23 17:35:18	52,802	46:05	2765	34,381	12
---------------------	--------	-------	------	--------	----

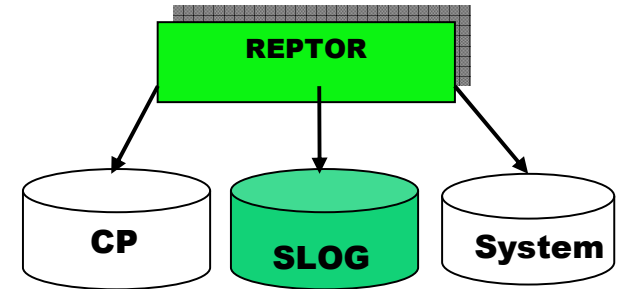
Reptor under Stress



- **Reptor couldn't be monitored (SYSAOS)**
- **SYSAOS locked only for the Reptor database**
- **Batch report (ADAREP SLOG file) went into wait**
- **Display DDPRIINT of Reptor was not possible**
- **Cancelled Reptor with dump**
- **Restarted Reptor**
- **Reptor came up and repeated already replicated records**
- ADAAF54 2010-04-24 00:08:32 Replication error: Adabas destination D191027
- ADAAF54 Source DBID 39 FNR 27, Target DBID 191 FNR 27
- ADAAF18 N2 cmd to DBID 191 FNR 27 RSP 113 subcode ISN 2717024
- ADAFCV The record to be inserted already exists on the target DBID/file
- ADAFCW The insert is part of a transaction with the resend flag set.
- ADAFCY The record will be updated..

Reptor Under Stress

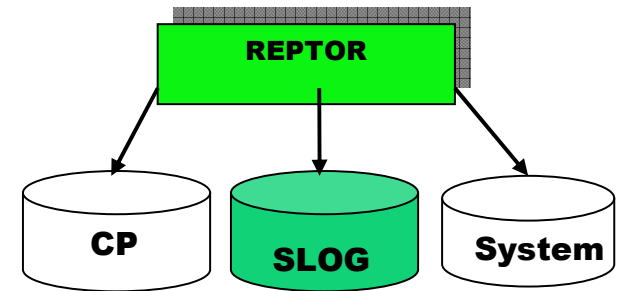
SYSOUT > 7mm lines → Reptor cancelled with dump



```

ADAF18  N2 cmd to DBID   191 FNR   31 RSP   113 subcode      ISN      31942
ADAFCV  The record to be inserted already exists on the target DBID/file
ADAFCY  The record will be updated.
ADAF54  2010-04-23 16:40:15 Replication error: Adabas destination D191031
ADAF54  Source DBID     39 FNR    31, Target DBID   191 FNR    31
ADAF18  N2 cmd to DBID   191 FNR   31 RSP   113 subcode      ISN      31943
ADAFCV  The record to be inserted already exists on the target DBID/file
ADAFCY  The record will be updated.
ADAF54  2010-04-23 16:40:15 Replication error: Adabas destination D191031
ADAF54  Source DBID     39 FNR    31, Target DBID   191 FNR    31
ADAF18  N2 cmd to DBID   191 FNR   31 RSP   113 subcode      ISN      31944
ADAFCV  The record to be inserted already exists on the target DBID/file
ADAFCY  The record will be updated.
  
```

REPLAY



A D A R P L V8.1 SM1 DBID = 00039 Started

2010-04-28 18:16:06

Parameters:

MAX 60 Files – Why?

ADARPL REPLAY

ADARPL FILES=006,007,009,010,012,013,016,019,021,023,028,033,034,037

ADARPL FILES=039,040,041,043,047,048,051,058,059,060,061,063,066,066

ADARPL FILES=067,068,071,072,076,077,078,080,081,082,083,084,086,088

ADARPL FILES=090,091,092,093,094,096,097,099,103,104,105,106,109,110

*** ADARPL FILES=111,113,116,119,123,124,125,130,131,133,135,137,138,140

ERROR-009, Parameter error, too many values in a list

Check the parameter input.

Supply no more than the maximum number of parameter

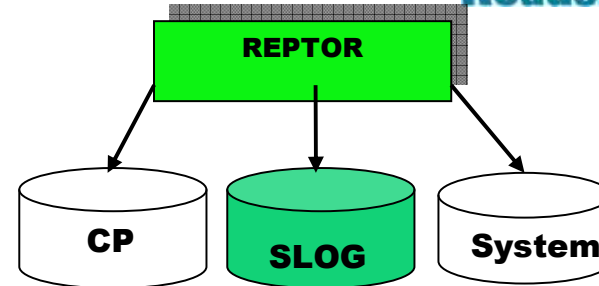
values permitted, and rerun the job.

A D A R P L Terminated
October 2010

dstorr@storrconsulting.com

2010-04-28 18:16:06

REPLAY



A D A R P L V8.1 SM1 DBID = 00039 Started 2010-05-03 15:38:21

Parameters:

ADARPL REPLAY, LRPL=300000K



ADARPL FILES=052,085,087,094,107,108,112,132,146,147,159,162,163,164

ADARPL FILES=165,167,173,214

Initialization handshake for Reptor 302 successful, token = 24115

A D A R P L: Error occurred during execution:

ERROR-139, ADARPL Replication pool overflow

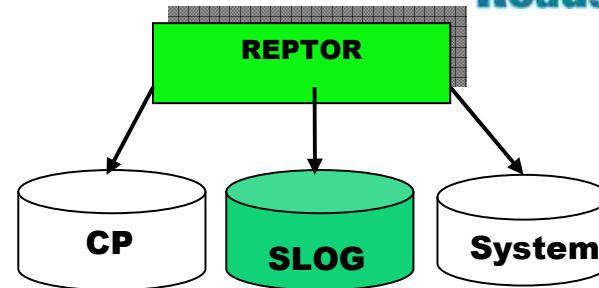
Increase LRPL parameter and rerun the job

A D A R P L Terminated

2010-05-03 15:40:16

LRPL of Source and Reptor =314,572,800 – 0% and 1.9% used

REPLAY



A D A R P L V8.1 SM1 DBID = 00039 Started 2010-05-03 17:31:58

Parameters:

ADARPL REPLAY

ADARPL LRPL=300000K

ADARPL FILES=052,085,087,094,107,108,112,132,146,147,159,162,163,164

ADARPL FILES=165,167,173,214

Initialization handshake for Reptor 302 successful, token = 24116

A D A R P L: Error occurred during execution:

ERROR-140, Unexpected REPTOR response 254 subcode 6 location 1

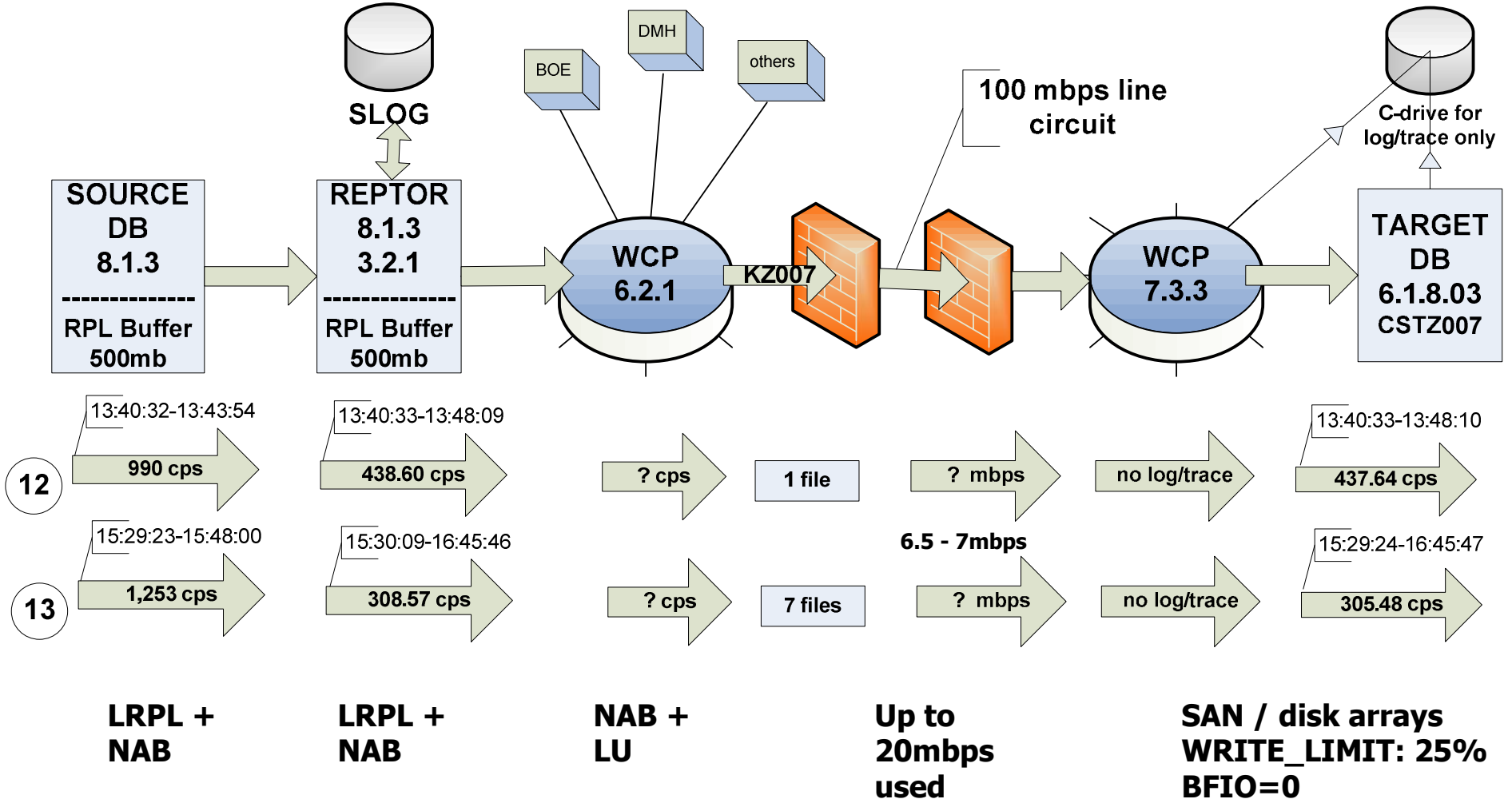
A D A R P L Terminated

2010-05-03 17:39:25

NAB of Source and Reptor = 20.3% and 11.5% used



Improve the RPL Process

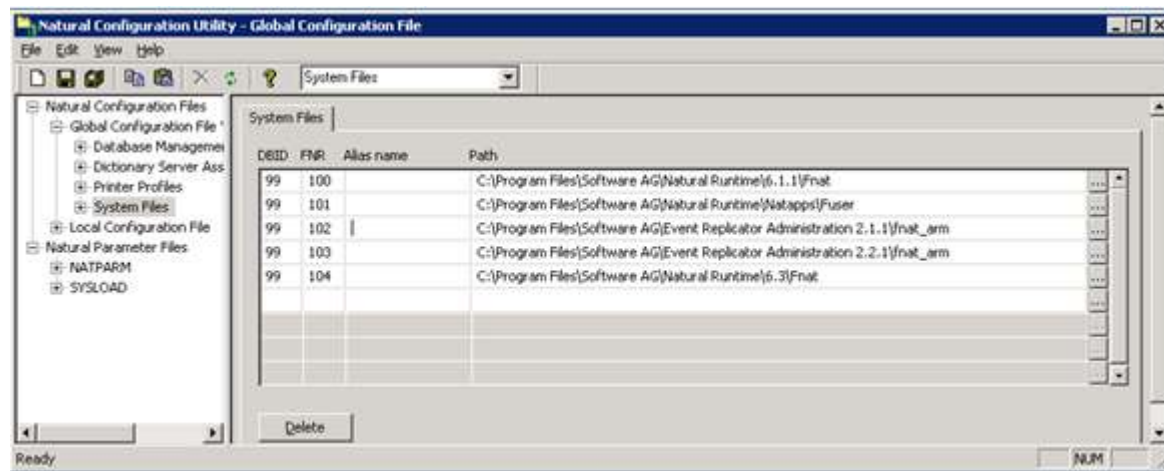




**Software AG's
"Monitor Tools"**

Event Replicator Administration (ARM)

- Web-based graphical user interface that can be used to perform administrative tasks for Event Replication for Adabas. It runs in Software AG's System Management Hub



Optimize for Infrastructure

- Unix or Windows-based tool
- Observe performance data from a single web-based dashboard
 - Adabas
 - EntireX
 - Event Replicator
 - Delta Save
 - Natural
 - Entire Net-Work
 - Fastpath



Conclusion - Evaluation

++

- Replication to Adabas on Windows saves money and time
- SAG will continuously improve the product and integrate new functions from other products fast
- Event Replicator is not connected to backups or protection logs, as other products
- Easy fixes make the product manageable
- . . .

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- Reptor under stress caused problems
- Initial State too slow
- Not real-time when mass data updated
- REPLAY not possible with more than 60 files
- Felt sometimes to be a beta tester
- . . .

The End

