ENQ Downgrade & CA MIM Update

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- ENQ downgrade capability
- Initiator's use of the ENQ downgrade
- CA MIM's recent enhancements

ENQ Downgrade Capability

- z/OS 2.1 allows downgrade of an EXCL ENQ to a SHR ENQ
  - Uses the ISGENQ interface
  - New options

- For more on HOW to do this:
  - See Redbook module on *IBM z/OS® - Version: V2R1 - Scalability and Performance*
  - http://www.redbooks.ibm.com/iea/pdf/zOS_V2R1_BCP_GRS_ISGENQ_Change.pdf

to Downgrade ENQ?

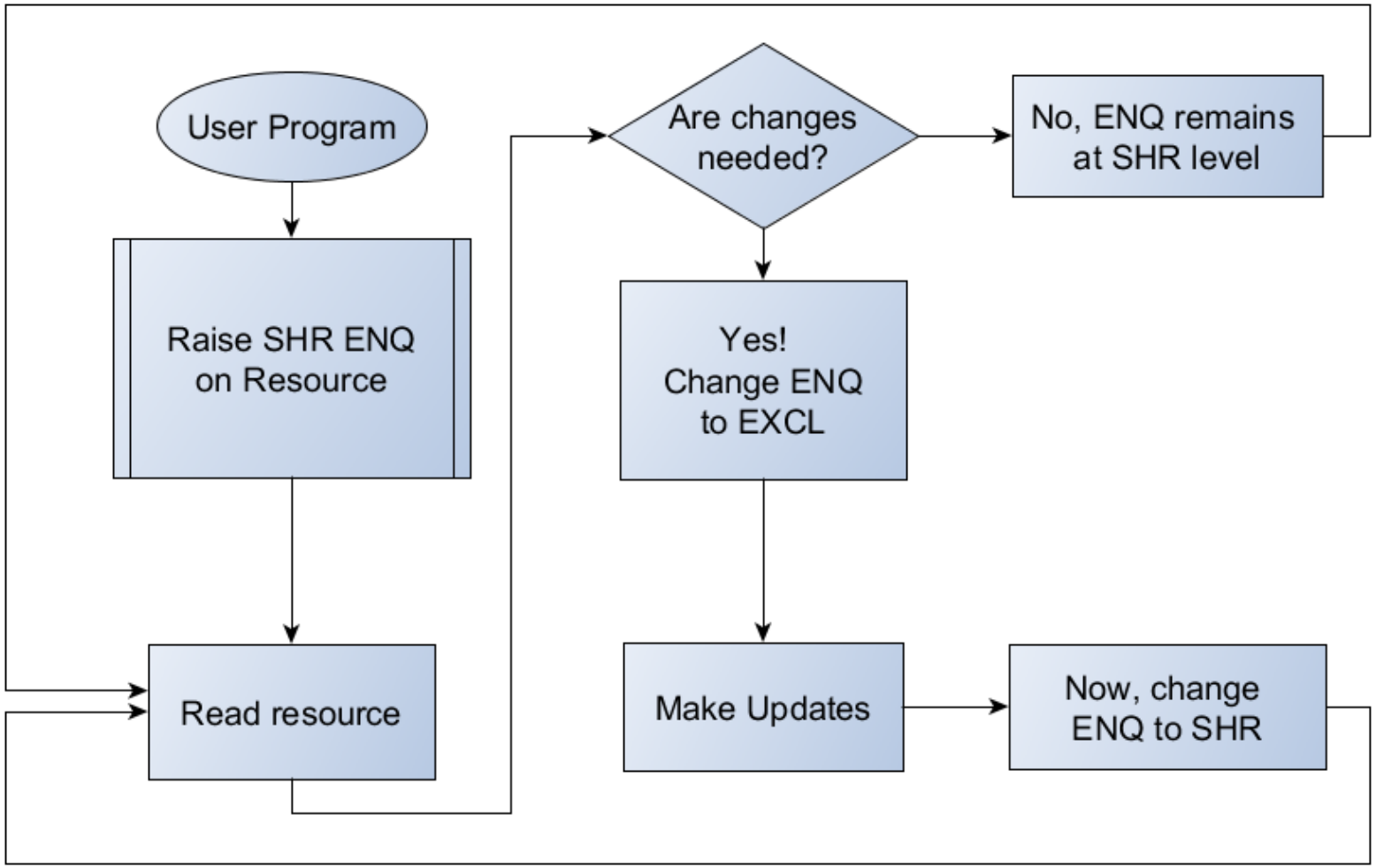
- Issue ISGENQ with REQUEST=CHANGE and CONTROL=SHARED

- REQUEST=CHANGE
  - Indicates that this is a request to change level of ownership
- CONTROL=SHARED
  - Indicates that this is a request to downgrade from EXCL to SHR level of ownership
  - EXCLUSIVE is default

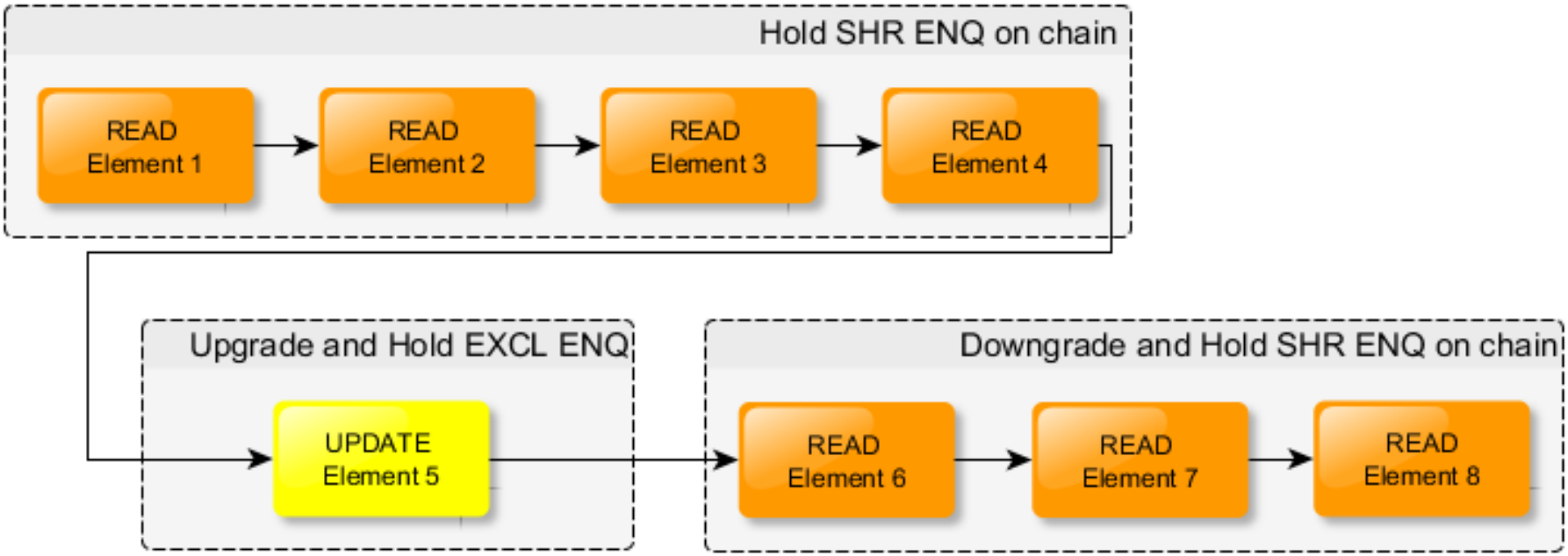
Why Downgrade your ENQ?

- Allows other applications that only need SHR level of ownership to obtain it sooner
  - Reduce your application's effect on system throughput
  - Reduce bottleneck caused by heavily shared resources
- No need to drop ENQ to change level of ownership
  - Fewer instructions needed, so faster and cheaper

Who can use this?



When is it useful?



Initiator can use ENQ downgrade!

- From IBM z/OS 1.11 information center:
  - "When any step of a job requests exclusive control of a data set, the system converts all requests for shared control of that data set within that job (DISP=SHR) to requests for exclusive control."
  - This is still true in z/OS 2.1, but now there are options!

What is DSENQSHR?

- New JCL keyword to allow SYSDSN ENQs to be downgraded
- Can also be used a JOBCLASS attribute

Why use DSENQSHR?

- Better parallel batch job throughput when there is competition for the same datasets!!

Before: without DSENQSHR

```
//JOBA      JOB
//STEP1     EXEC PGM=PRGRAM1
//DD1       DD   DSN=USER.DATA,DISP=(SHR)
//*
//STEP2     EXEC PGM=PRGRAM2
//DD2       DD   DSN=USER.DATA,DISP=(OLD)
//*
//STEP3     EXEC PGM=PRGRAM1
//DD3       DD   DSN=USER.DATA,DISP=(SHR)
//*
//STEP4     EXEC PGM=PROGRAM
//DD4       DD   DSN=USER.DATA,DISP=(SHR)
```

- EXCL ENQ on the dataset for the entire duration of the JOB's execution

After: with DSENQSHR

```
//JOBA        JOB, DSENQSHR=ALLOW
//*
//STEP1       EXEC PGM=PRGRAM1
//DD1         DD  DSN=USER.DATA,DISP=(SHR)
//*
//STEP2       EXEC PGM=PRGRAM2
//DD2         DD  DSN=USER.DATA,DISP=(OLD)
//*
//STEP3       EXEC PGM=PRGRAM2
//DD3         DD  DSN=USER.DATA,DISP=(SHR)
//*
//STEP4       EXEC PGM=PROGRAM
//DD4         DD  DSN=USER.DATA,DISP=(SHR)
```

- JCL keyword DSENQSHR allows the INITIATOR to downgrade SYSDSN ENQs when appropriate

After: with DSENQSHR

```
//JOBA        JOB, DSENQSHR=ALLOW
//*
//STEP1       EXEC PGM=PRGRAM1
//DD1         DD  DSN=USER.DATA,DISP=(SHR)
//*
//STEP2       EXEC PGM=PRGRAM2
//DD2         DD  DSN=USER.DATA,DISP=(OLD)
//*
//STEP3       EXEC PGM=PRGRAM2
//DD3         DD  DSN=USER.DATA,DISP=(SHR)
//*
//STEP4       EXEC PGM=PROGRAM
//DD4         DD  DSN=USER.DATA,DISP=(SHR)
```

- ENQ held EXCL at this point

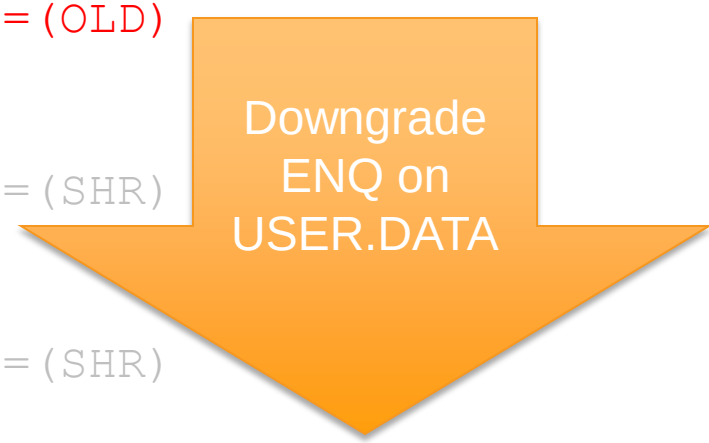
After: with DSENQSHR

```
//JOBA        JOB, DSENQSHR=ALLOW
//*
//STEP1       EXEC PGM=PRGRAM1
//DD1         DD   DSN=USER.DATA,DISP=(SHR)
//*
//STEP2       EXEC PGM=PRGRAM2
//DD2         DD   DSN=USER.DATA,DISP=(OLD)
//*
//STEP3       EXEC PGM=PRGRAM1
//DD3         DD   DSN=USER.DATA,DISP=(SHR)
//*
//STEP4       EXEC PGM=PROGRAM
//DD4         DD   DSN=USER.DATA,DISP=(SHR)
```

- ENQ still held EXCL

After: with DSENQSHR

```
//JOBA          JOB, DSENQSHR=ALLOW
//*
//STEP1         EXEC PGM=PRGRAM1
//DD1           DD   DSN=USER.DATA,DISP=(SHR)
//*
//STEP2         EXEC PGM=PRGRAM2
//DD2           DD   DSN=USER.DATA,DISP=(OLD)
//*
//STEP3         EXEC PGM=PRGRAM1
//DD3           DD   DSN=USER.DATA,DISP=(SHR)
//*
//STEP4         EXEC PGM=PROGRAM
//DD4           DD   DSN=USER.DATA,DISP=(SHR)
```



- ENQ downgraded from EXCL to SHR at STEP2 termination

After: with DSENQSHR

```
//JOBA        JOB, DSENQSHR=ALLOW
//*
//STEP1       EXEC PGM=PRGRAM1
//DD1         DD   DSN=USER.DATA,DISP=(SHR)
//*
//STEP2       EXEC PGM=PRGRAM2
//DD2         DD   DSN=USER.DATA,DISP=(OLD)
//*
//STEP3       EXEC PGM=PRGRAM1
//DD3         DD   DSN=USER.DATA,DISP=(SHR)
//*
//STEP4       EXEC PGM=PROGRAM
//DD4         DD   DSN=USER.DATA,DISP=(SHR)
```

- ENQ remains at SHR level through the rest of the JOB

Why use DSENQSHR?

Time

JOB A begins execution

```
//JOBA    JOB, DSENQSHR=ALLOW
//STEP1   EXEC PGM=PRGRAM1
//DD1      DD  DSN=USER.DATA,DISP=(SHR)
//STEP2   EXEC PGM=PRGRAM2
//DD2      DD  DSN=USER.DATA,DISP=(OLD)
//STEP3   EXEC PGM=PROGRAM
//DD3      DD  DSN=USER.DATA,DISP=(SHR)
//STEP4   EXEC PGM=PROGRAM
//DD4      DD  DSN=USER.DATA,DISP=(SHR)
```

JOB B begins execution

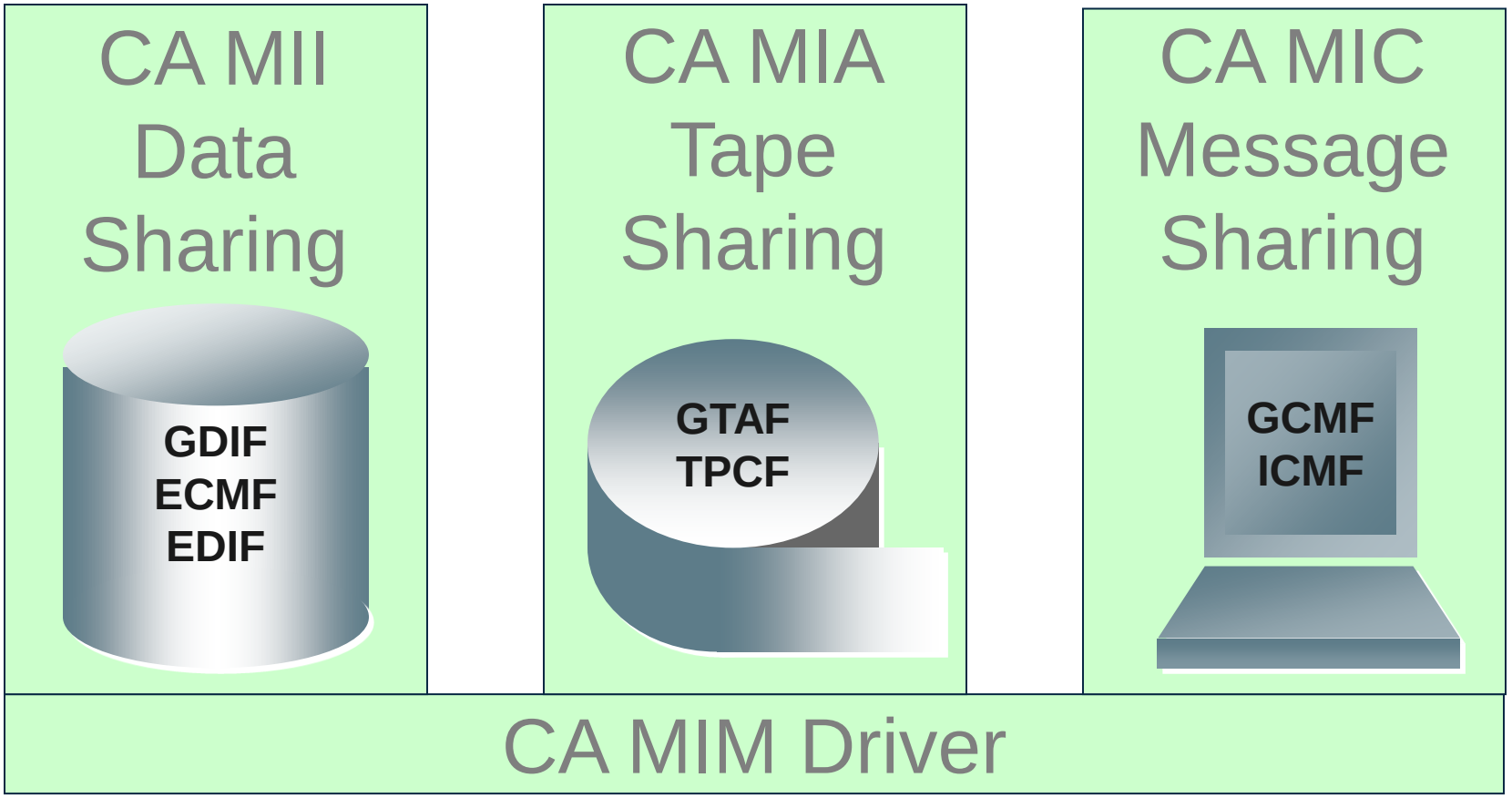
```
//JOBB    JOB
//STEP1   EXEC PGM=PRGRAM1
//DD1      DD  DSN=USER.DATA,DISP=(SHR)
//STEP2   EXEC PGM=PRGRAM1
//DD2     DD  DSN=USER.DATA,DISP=(SHR)
//STEP3   EXEC PGM=PROGRAM
//DD3      DD  DSN=USER.DATA,DISP=(SHR)
//STEP4   EXEC PGM=PROGRAM
//DD4      DD  DSN=USER.DATA,DISP=(SHR)
```

- When using DSENQSHR, ensure that the STEPs that request SHR level of ownership do not perform any updates!
  - This may cause data integrity exposures
- May need to re-evaluate older JCL to confirm that this is true, before enabling the downgrade

CA MIM Feature Update!

CA MIM Resource Sharing

Components



CA MIM Enhancement Strategy

- The “Dynamic Data Center” Strategy:
  - High Availability
  - High Performance
  - Reduce Cost
  - Reduce Risk
  - Reduce Complexity

CA MIM Enhancements “At A Glance”

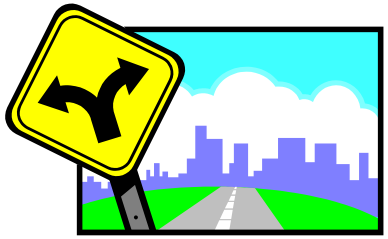
- zIIP Enablement
  - Available with release 12.0; any COMPATLEVEL
- Dynamic Reconfiguration
  - Available with release 12.0; with COMPATLEVEL=12.0
- Delay Detection and Notification
  - Available with release 12.0; with COMPATLEVEL=12.0

zIIP Enablement Overview – What is it?

- Offload work to specialty engines
  - zIIP: System Z Integrated Information Processor
- Not all work is zIIP eligible
  - SRB mode work executing in an enclave
- Designed to improve resource utilization and help reduce total cost of mainframe ownership

zIIP Offload Benefits - Why Enable zIIP?

DISCLAIMER: “Your Mileage May Vary!”



- zIIP engines operate at full capacity
- Measured usage only applies to general purpose engines
- Defer costly upgrades
- Reduce total cost of ownership (TCO)

Factors that Affect zIIP Exploitation

Hardware Factors

- CPU Model
- CPU Partitioning
- Speed/Number of zIIP Processors

Software Factors

- CA MIM Communication Method
- CA MIM facilities and features active
- Other work utilizing your zIIPs
- WLM Configuration

How to Enable CA MIM zIIP Offload

- You can enable the feature locally on each system in your MIMplex
- The feature can be disabled or enabled dynamically at any time
- Use the following CA MIM command:

```
SETOPTION MIM ZIIP=[YES|NO]
```

How to Monitor CA MIM zIIP Exploitation

- CA MIM Offers a DISPLAY command for viewing CPU usage:

```
DISPLAY CPUTIME=[SUMMARY|DETAIL|ALL]
```

```
&MIM0067I COMMAND DISPLAY 127
&MIM0660I CPU TIME:
LAST RESTART AT 20:30:06 ON 2014.207
   WORKUNIT   TOTALCPU    TASKCP    ZIIPONCP  PCT       ZIIP   PCT
   -------- ---------- ---------- ---------- ---- ---------- -----
   MIMDRDRV   00:31:36  59.357566  20.864303  1.1   00:30:16  95.7
   MIMZPXMP   00:06:52   0.000462   0.250208  0.0   00:06:52  99.9
   MIMDRTRC   0.000436   0.000435   0.000000  0.0   0.000001   0.2
   MIMDRVFD   00:12:21   0.036029   0.400721  0.0   00:12:20  99.9
   MIMDRLOG   0.102244   0.034804   0.007085  6.9   0.060355  59.0
   SRB        2.629922
   -------- ---------- ---------- ---------- ---- ---------- -----
   TOTAL      00:51:27   00:01:33  21.522317  0.6   00:49:29  96.1
```

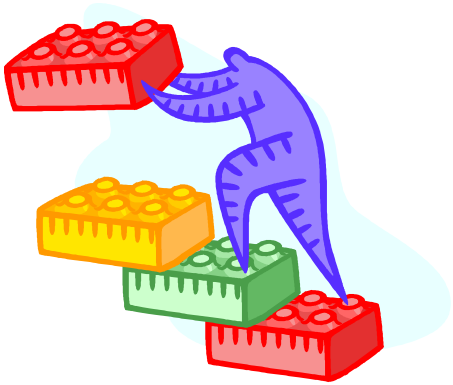
Sample CP to zIIP Offload Percentages

- Sample offload based on CA MIM communication method:
  - Pure CTC: ~99%
  - Pure XCF: ~80% to ~90%
  - XES Control File: ~60%
  - DASD Control File: ~30% to ~40%

Dynamic Reconfiguration – What is it?

The ability to configure CA MIM without the requirement of a local or global shutdown!

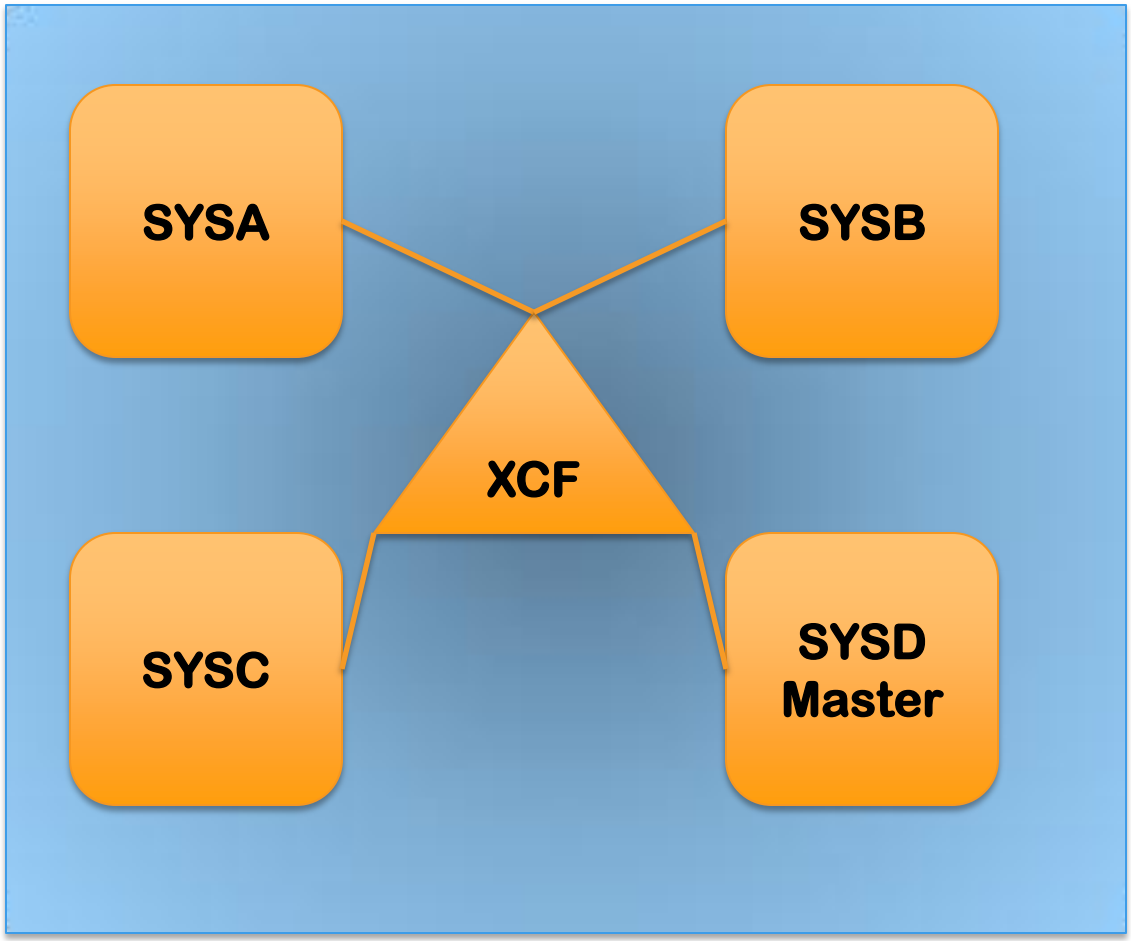
- Adding/Altering System Definitions
- Adding Communication Paths
- Allocating New/Additional Control Files
- Changing Communication Methods
- Migrations between control file types



Dynamic Reconfiguration Benefits

- No requirement to shutdown and restart the CA MIM address space
- Helps eliminate the need for a scheduled outage to implement configuration changes
- Experiment with different configurations and communication methodologies
- Ultimately saves you costly effort and precious time

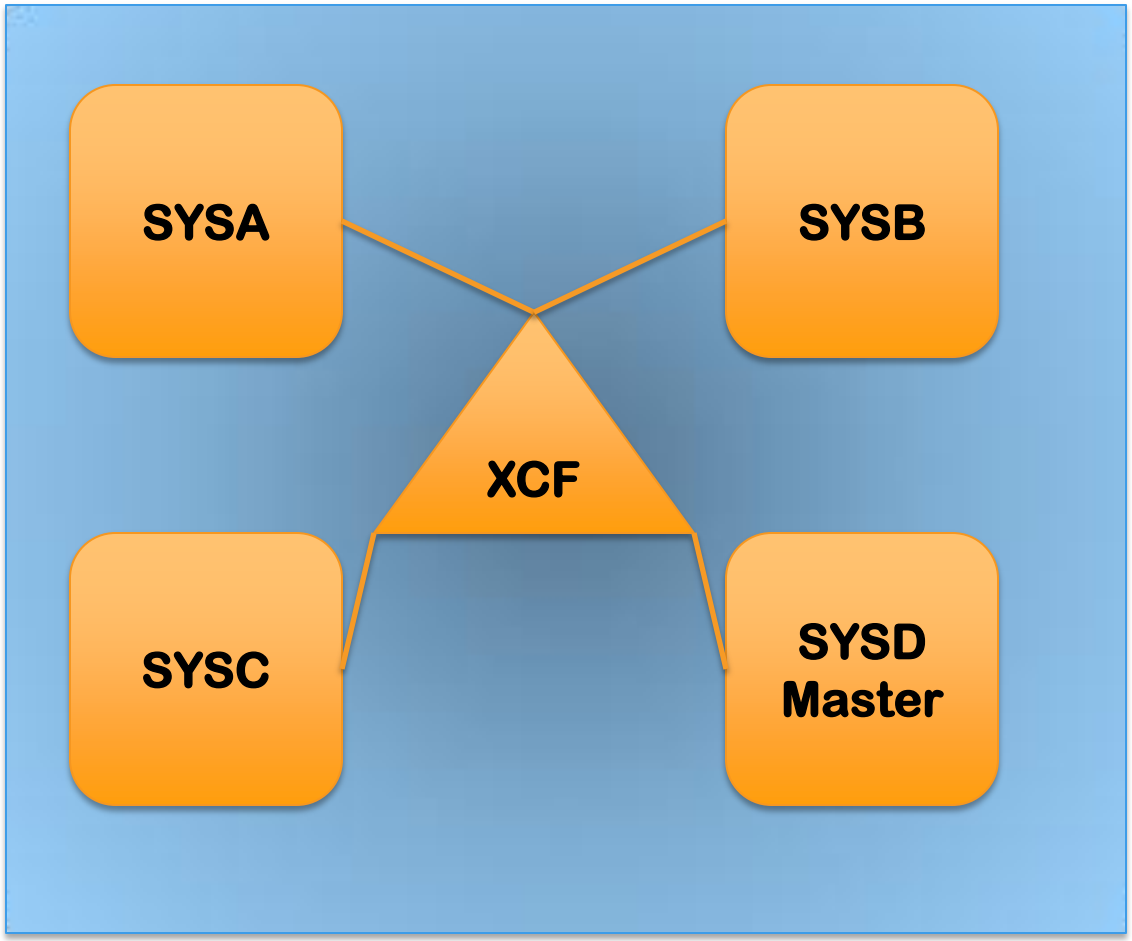
Dynamic Reconfiguration - Example



- Assume a 4 system MIMplex using:

MIMINIT COMM=XCF

Dynamic Reconfiguration - Example

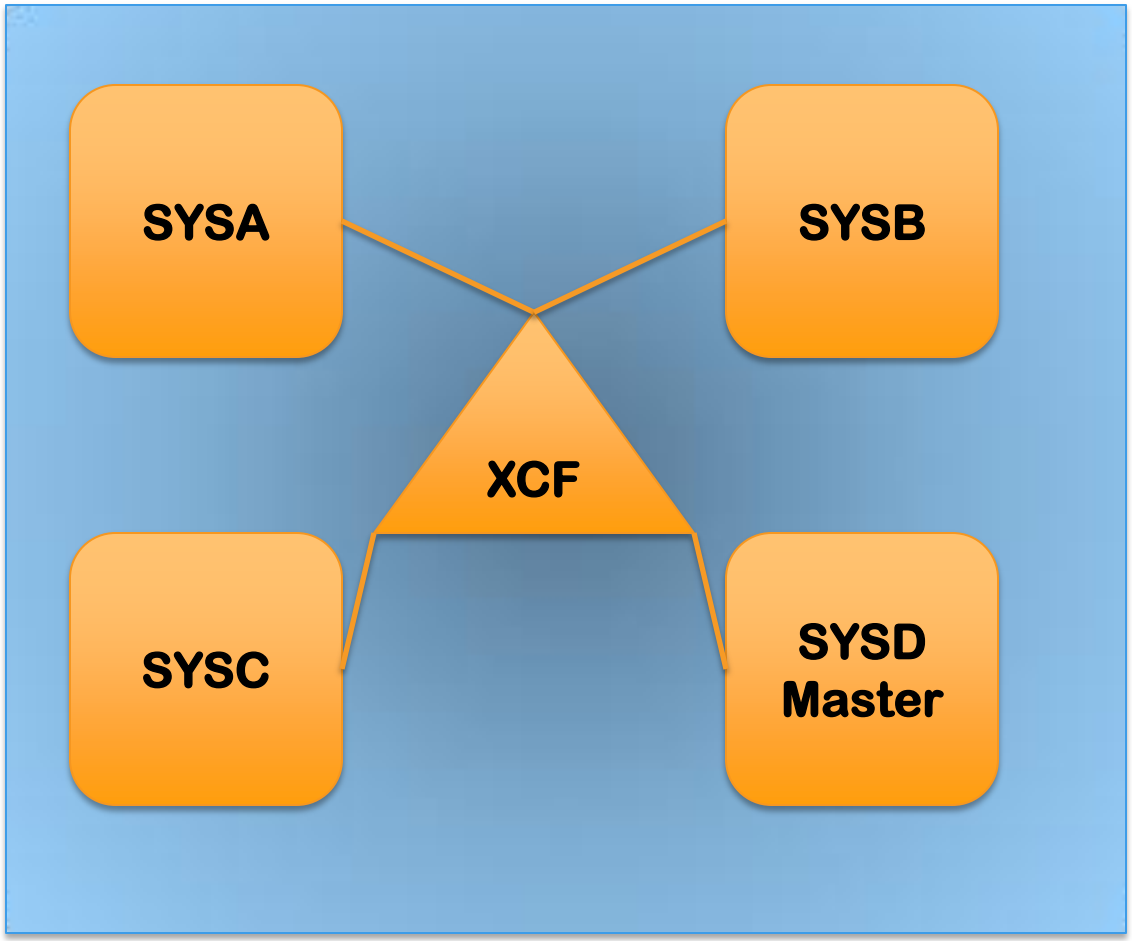


- Use the DEFSYS command to dynamically add a 5th system definition:

DEFSYS (SYSE,05,SYSE)

SYSE

Dynamic Reconfiguration - Example

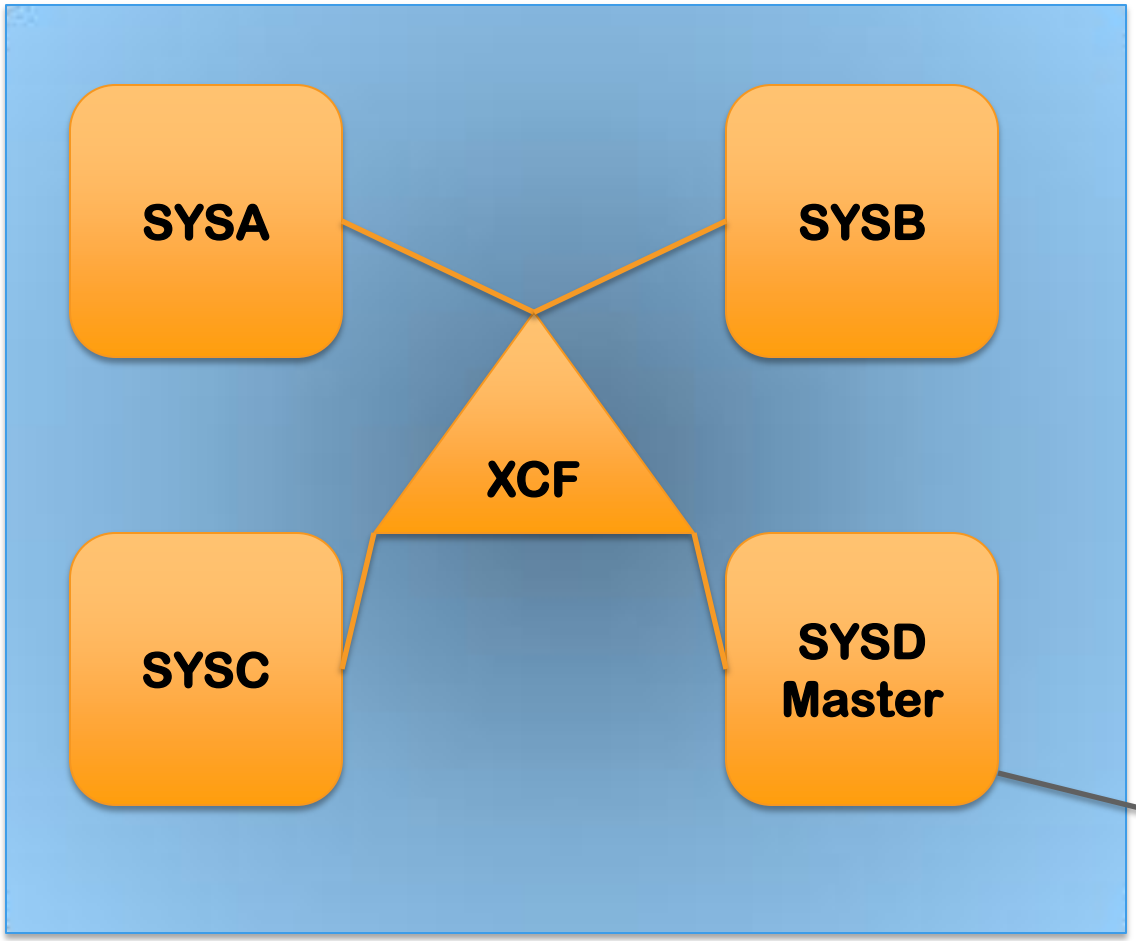


- Use the DEFSYS command to dynamically add a 5th system definition:

DEFSYS (SYSE,05,SYSE)

- Note!!! – Be sure to reflect any dynamic changes in your shared parmlib members

Dynamic Reconfiguration - Example

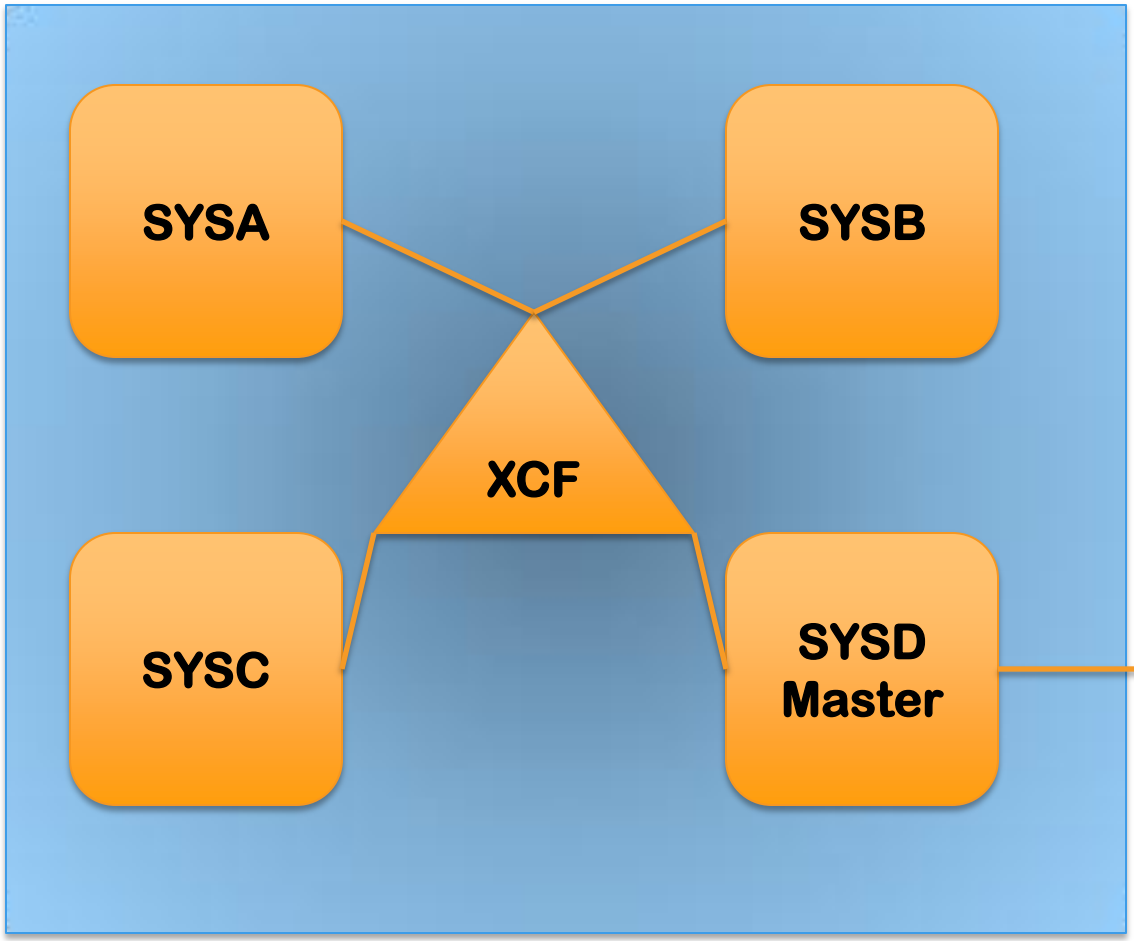


- Use the dynamic CTCPATH command to dynamically add a CTC path from the current master system:

CTCPATH ADDRESS=123

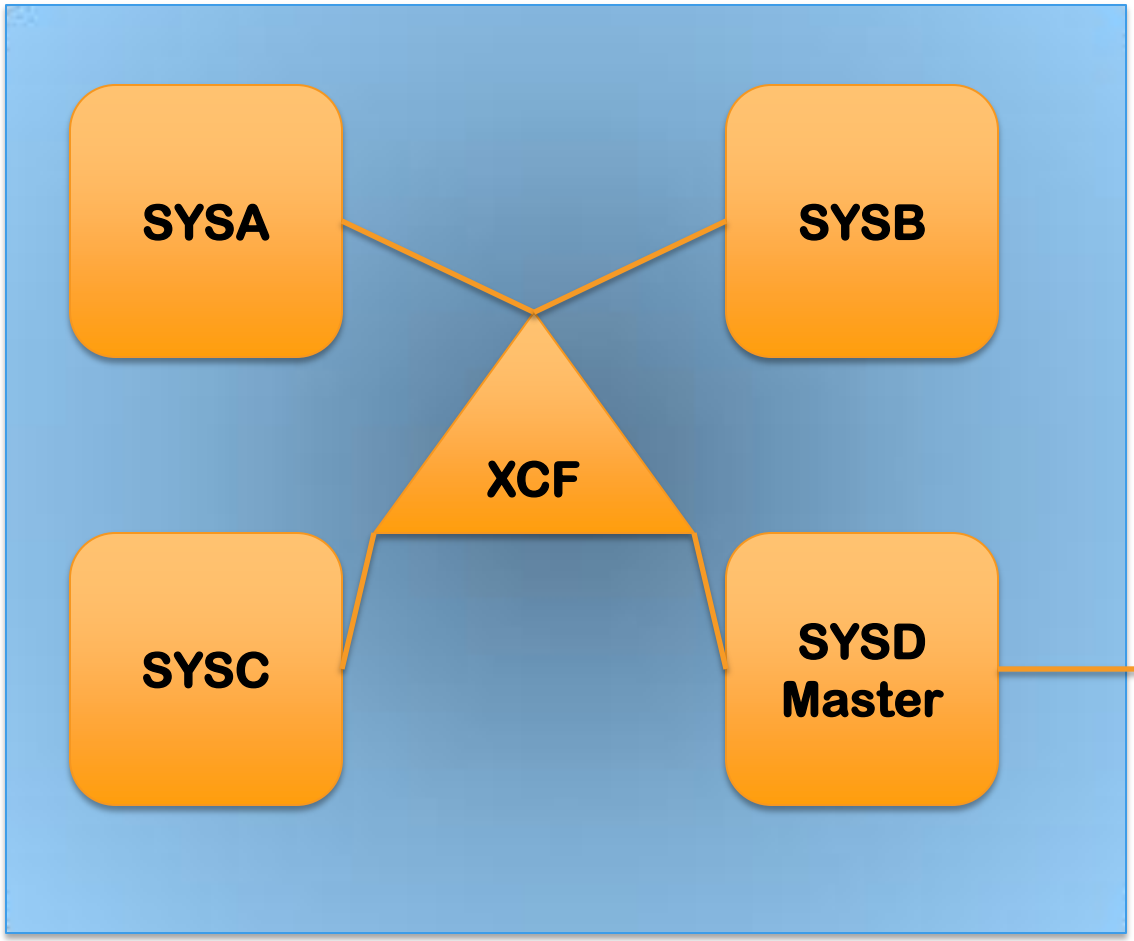
- Again, be sure to update your shared parmlib member

Dynamic Reconfiguration - Example



- Now start SYSE
- SYSE will use CTC 123 to communicate with the current master (SYSD)

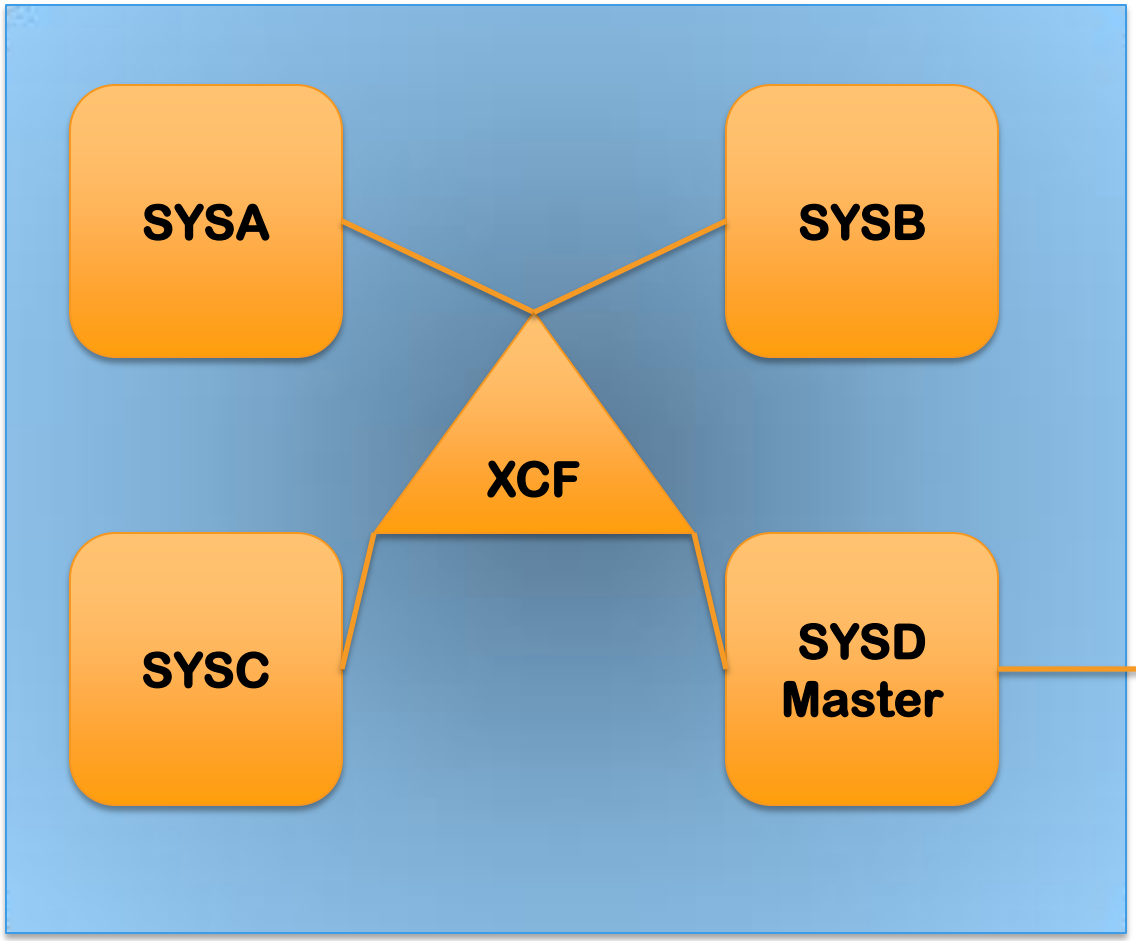
Dynamic Reconfiguration - Example



- Now allocate a physical shared DASD file on each system in the MIMPlex:

ALLOCATE DDNAME=MIMTBL00, DSNAME=MIM.CF00, VOLSER=MIM123

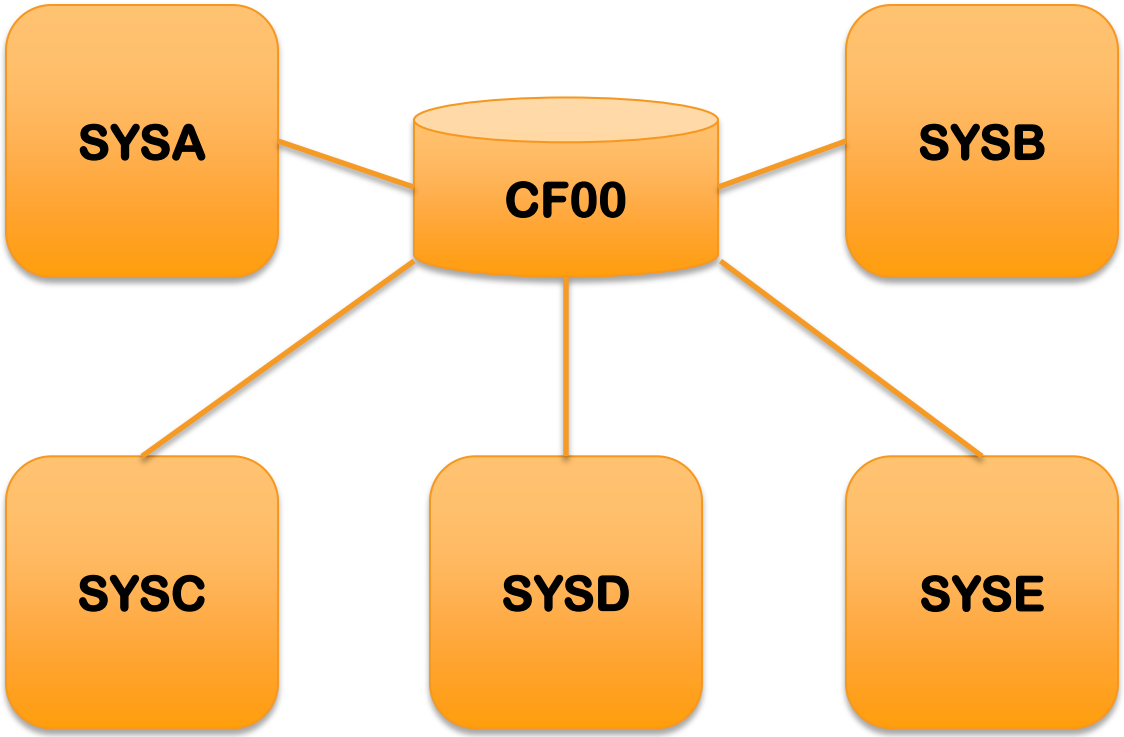
Dynamic Reconfiguration - Example



- Now you may migrate to the DASD control file:

MIGRATE CF=00

Dynamic Reconfiguration - Example



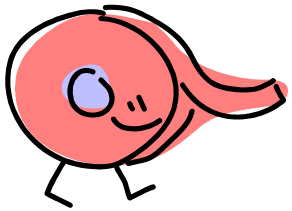
- Now the MIMplex is operating using a shared physical DASD control file

Dynamic Reconfiguration - Review

- In our example, we were able to implement all the configuration changes without an outage!
  - Adding a system definition
  - Adding a CTC communications path
  - Adding a DASD control file
  - Migrating from a virtual control file (master to client) to a shared DASD control file

CA MIA DDN – What is it?

- CA MIA DDN or ‘Delay Detection and Notification’ collects and displays real-time data regarding delays in tape device allocation
- The feature helps you identify global and local delays in tape device allocation
- Provides ‘early warning’ notifications to help you identify situations that may cause delays



CA MIA DDN Benefits – Why use it?

- Helps eliminate the need to understand cryptic operating system diagnostic commands
  - Clearly identifies the jobs/tasks that are causing the delay
  - Clearly identifies jobs/tasks that are delayed

- Provides an early warning system that will notify you when a job/task is holding tape allocation resources

- Helps you identify a potential delay long before it becomes a problem

CA MIA DDN – How to Enable

- There are two delay types that are currently identified by DDN:
  - CONTENTION
  - WAITNOHOLD

- Use the following command to enable DDN:

SETOPTION GTAF DDN=(<parms>)

CA MIA DDN - Analyze Command

- In addition to real time operator notifications, a new command was added:

ANALYZE TAPEDELAY

- The command supports a variety of operands to help you pinpoint the cause of a delay in tape device allocation

References

- Redbook module on *IBM z/OS® - Version: V2R1 - Scalability and Performance*
- MVS Programming: Authorized Assembler Services Reference, Volume 2 for *IBM z/OS® - V2R1*

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- Questions?