CA MIM™ Resource Sharing for z/OS

How to Offload CA MIM Work to zIIP Engines

Release 12.0

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Introduction

Product: CA MIM™ Resource Sharing for z/OS

Release: 12.0

This document illustrates the process z/OS systems programmers use to activate the CA MIM zIIP enablement feature. This scenario describes how to verify your z/OS and CA MIM environments before activating the feature, and how to verify results after activating it.

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Prerequisites

You must have the following items in place before you activate the CA MIM zIIP Enablement feature.

- CA MIM calls zIIP services that the CA Common Services CAIRIM component provides. Install one of these releases and PTFs that deliver zIIP services through the CCS CAIRIM component:
  - CCS r14.0 + PTF RO32488 + All published CCS zIIP Service PTFs
  - CCS r14.1 + All published CCS zIIP Service PTFs
- CA MIM Release 12.0 installed.
- At least one System z Integrated Information Processor (zIIP) engine online and operational.

Before You Begin

Review the following considerations:

- Do you have zIIP engine capacity available on one or more systems in your MIMplex?
- Do you want to reduce CA MIM operational costs by offloading CA MIM address space work to the zIIP engines from the general processor engines?
- For zIIP technology information, see the CA zIIP Exploitation White Paper.
- Review the following commands in the *CA MIM Statement and Commands Reference Guide:*
  - DISPLAY CPUTIME
  - DISPLAY FACILITIES
  - DISPLAY OPTIONS
  - DISPLAY SYSTEMS
  - SETOPTION MIM ZIIP
- Review the z/OS DISPLAY M=CPU command in the *IBM z/OS MVS System Commands Guide.*
- Review the IEE174I message in the *IBM z/OS MVS System Messages Guide.*
- Review information about stopping and restarting CA MIM address spaces, in the *CA MIM Programming Guide*.

About zIIP Technology

IBM offers a special purpose mainframe engine that is known as the System z Integrated Information Processor (zIIP). The purpose of this processor is to offload specialized workloads to help reduce mainframe operating costs.

The type of work capable or allowed to execute on zIIP engines is limited to SRB-mode work executing within an Enclave. The software instructions that can run while in SRB-mode have special requirements. These requirements limit the type of software instructions that are eligible to run on zIIP engines. Because of these limitations, not all workloads can be offloaded to zIIP engines. However, we are happy to report that some percentage of CA MIM address space work is now eligible to be offloaded to zIIP engines.

zIIP engines provide cost savings. The IBM monthly license fees to its mainframe customers are based on consumed CP engine service units, not zIIP engine service units consumed. Therefore, software products like CA MIM that can have their work offloaded to zIIP engines can help mainframe customers:

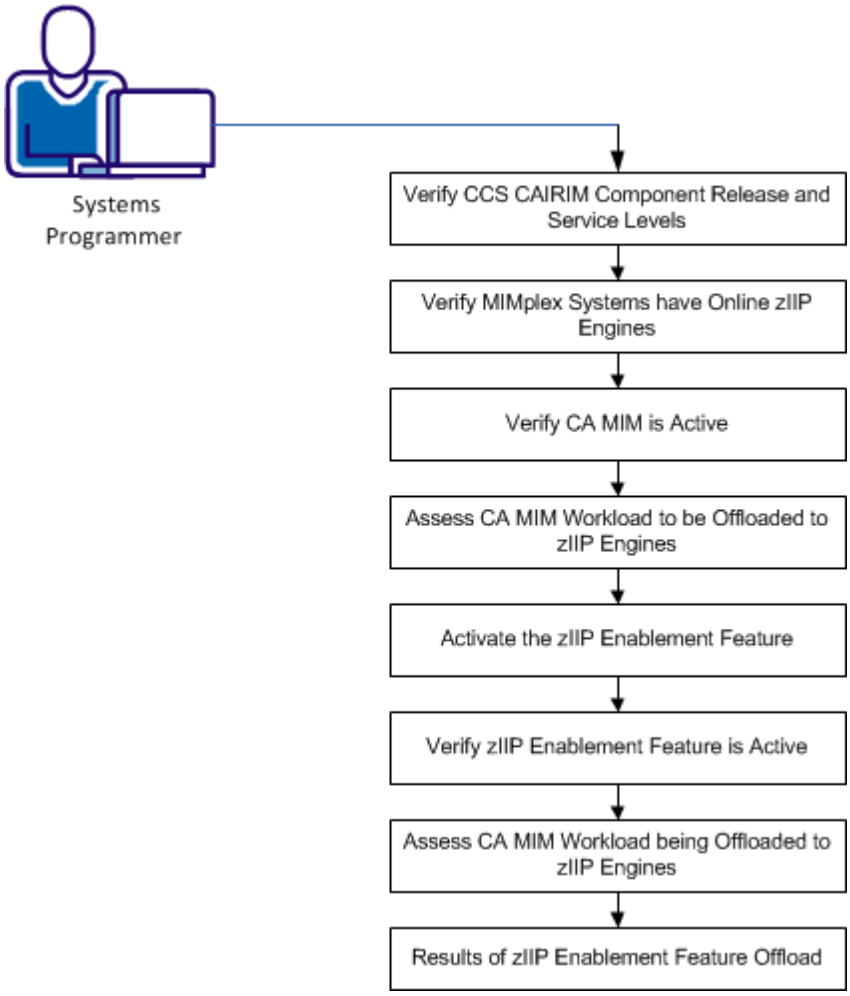
- Reduce their Total Cost of Ownership (TCO)
- Defer costly upgrades to the higher capacity CPU hardware

For more information about CA products exploiting zIIP engines, see Leveraging Mainframe Specialty Engines: zIIP, zAAP, and IFL - CA Technologies.

How to Offload CA MIM Work to zIIP Engines

The following illustration shows the steps to offload CA MIM work to zIIP engines.

Equation 1: How CA MIM Offloads Work to zIIP Engines



Perform the following steps to offload work to a zIIP engine.

1. Verify CCS CAIRIM Component Release and Service Levels (see page 11)
2. Verify MIMplex Systems have Online zIIP Engines (see page 12)
3. Verify CA MIM is Active (see page 15)
4. Assess CA MIM Workload to be Offloaded to zIIP Engines (see page 16)
5. Activate the zIIP Enablement Feature (see page 19)
6. Verify zIIP Enablement Feature is Active (see page 20)
7. Assess CA MIM Workload being Offloaded to zIIP Engines (see page 22)
8. Results of zIIP Enablement Feature Offload (see page 27)

Verify CCS CAIRIM Component Release and Service Levels

Verify that the CA Common Services CAIRIM component is installed at the proper release and service level. For more information, see Prerequisites (see page 7).

Complete these verification steps on all systems in the MIMplex.

Follow these steps:

1. In the CAS9 JOBLOG, the CAS9075I message from the CAIRIM component shows the release level at which the CAIRM component is running.

   The CAS9075I message for the CCS 14.0 release:

   CAS9075I - SERVICE(CA-RIM/BASE) VERS(1400) GENLVL(E000AS900)

   The CAS9075I message for the CCS 14.1 release:

   CAS9075I - SERVICE(CA-RIM/BASE) VERS(1400) GENLVL(E100AS900)

2. To determine whether the required CAIRIM prerequisite zIIP Enablement service PTFs are applied, contact your CCS administrator. The required CCS zIIP Enablement Service PTF numbers are shown in the Prerequisites section of this document. To ensure the CCS zIIP Enablement Service operates with the highest degree of availability, we also recommend applying all published PTFs associated with the service.

Verify MIMplex Systems Have Online zIIP Engines

Verify that zIIP engines are online and operational.

Follow these steps:

1. To determine the names of the systems in the MIMplex, issue the following command on one system:

   F MIM,DISPLAY SYSTEMS

   This command identifies the name of each system in the MIMplex system.

2. Review this example.

   Example Display Analysis:

   SYSA, SYSB, and SYSC are the names of the systems in this MIMplex.

   Example Display Command:

   ```
   F MIM,DISPLAY SYSTEMS
   MIM0108I SYSTEMS DISPLAY
   INDEX ALIAS SYSTEM   RELATION STATUS     OPSYS    LAST ACCESS
   &MIM0108I SYSTEMS DISPLAY
     INDEX ALIAS SYSTEM   RELATION STATUS     OPSYS    LAST ACCESS
      01   AA   SYSA    LOCAL    MASTER     ZOS  2013.165 07:58:05.16
      02   BB   SYSB    EXTERNAL ACTIVE     ZOS  2013.165 07:58:05.16
      03   CC   SYSC    EXTERNAL ACTIVE     ZOS  2013.165 07:58:05.10
   ```

3. To verify the availability of online zIIP engines, issue the following command on each system in the MIMplex:

   DISPLAY M=CPU

   This z/OS command identifies the status of general and specialty processors.

4. Review this example.

   Example Display Command Analysis:

   - SYSA has two general processor engines online and one specialty zIIP engine online.
   - SYSB has four general processor engines online and two specialty zIIP engines online.
   - SYSC has six general processor engines online and four specialty zIIP engines online.

   IEE174I Message CPU Field Symbol Definitions:

   +

   Identifies ONLINE general processor engine.

   +I

   Identifies ONLINE zIIP engine.

-

Identifies OFFLINE general processor engine.

-I

Identifies OFFLINE zIIP engine.

Example Display Commands:

SYSA:

```
D M=CPU
IEE174I 08.03.50 DISPLAY M
PROCESSOR STATUS
ID  CPU              SERIAL
00  +                0AF689999
01  +                0AF689999
02  +I               0AF689999
03  -
04  -
05  -I
```

SYSB:

```
D M=CPU
IEE174I 08.08.32 DISPLAY M
PROCESSOR STATUS
ID  CPU              SERIAL
00  +                01F689999
01  +                01F689999
02  +                01F689999
03  +                01F689999
04  +I               01F689999
05  +I               01F689999
06  -
07  -
08  -I
09  -I
```

SYSC:

```
D M=CPU
IEE174I 08.15.52 DISPLAY M
PROCESSOR STATUS
ID  CPU          SERIAL
00  +            0CF689999
01  +            0CF689999
02  +            0CF689999
03  +            0CF689999
04  +            0CF689999
05  +            0CF689999
06  +I           0CF689999
07  +I           0CF689999
08  +I           0CF699999
09  +I           0CF699999
0A  -
0B  -
```

Verify CA MIM is Active

You want to verify and display the following information:

- Verify that CA MIM is running on each MIMplex system.
- Display the release and facilities that are running in the CA MIM address space.

Follow these steps:

1. To verify the release level and facilities of your CA MIM address spaces, issue the following command on each system in the MIMplex:

   ```
   F MIM,DISPLAY FACILITIES
   ```

2. Review the following command example.

   Example Display Command Analysis:

   - SYSA shows CA MIM Release 12.0 running in the CAMIMGR address space with the GDIF and ECMF facilities activated.
   - SYSB shows CA MIM Release 12.0 running in the CAMIMGR address space with the GDIF and ECMF facilities activated.
   - SYSC shows CA MIM Release 12.0 running in the CAMIMGR address space with the GDIF and ECMF facilities activated.

   Example Display Commands:

   SYSA:

   ```
   F MIM,DISPLAY FACILITIES
   MIM0090I CAMIMGR FACILITIES (R12.0 0000)
    MIM  - MULTI-IMAGE MANAGER
    GDIF - GLOBAL DATA INTEGRITY FACILITY
    ECMF - ENQ CONFLICT MANAGEMENT FACILITY
   ```

   SYSB:

   ```
   F MIM,DISPLAY FACILITIES

   MIM0090I CAMIMGR FACILITIES (R12.0 0000)

    MIM  - MULTI-IMAGE MANAGER

    GDIF - GLOBAL DATA INTEGRITY FACILITY

    ECMF - ENQ CONFLICT MANAGEMENT FACILITY
   ```

   SYSC:

   ```
   F MIM,DISPLAY FACILITIES
   MIM0090I CAMIMGR FACILITIES (R12.0 0000)
    MIM  - MULTI-IMAGE MANAGER
    GDIF - GLOBAL DATA INTEGRITY FACILITY
    ECMF - ENQ CONFLICT MANAGEMENT FACILITY
   ```

Assess CA MIM Workload to be Offloaded to zIIP Engines

You want to obtain information about the CA MIM address space workload that could potentially be offloaded from general processor engines to zIIP specialty engines.

Follow these steps:

1. To view the potential CA MIM address space workload that could be offloaded to zIIP engines, issue the following command on each system in the MIMplex:

   F MIM,DISPLAY CPUTIME=DETAIL

   The CPUTIME=DETAIL form of the command shows MIM address space TCBs and SRB work that can potentially be offloaded to zIIP engines. Other forms of the display provide more and less detail about the MIM address space CPU consumption. For example:

   F MIM,DISPLAY CPUTIME=ALL

   F MIM,DISPLAY CPUTIME=SUMMARY

2. Review the following DISPLAY CPUTIME=DETAIL command example.

   Example Display Command Analysis:

   In this example, the zIIP Enablement feature has not yet been activated. This means that the CA MIM address spaces are running with the following settings:

   - SETOPTION MIM ZIIP=NO defined in the MIMCMNDS parmlib member

   This display data represents CA MIM running with none of its TCB mode work being converted to SRB mode work. Therefore, no work is running on zIIP engines.

   MIM0660I Message Fields

   - WORKUNIT – Identifies the TCB names of tasks running in the MIM address space or general system SRB activity that is associated with the MIM address space.
   - TOTALCPU - Identifies, by TCB, total consumed CP and zIIP engine time.
   - TASKCP – Identifies, by TCB, the general CP engine time consumed.
   - ZIIPONCP – Identifies, by TCB, the consumed ZIIP-eligible work time that ran on a general CP engine because zIIP engines were busy.
   - ZIIP – Identifies, by TCB, the zIIP engine time consumed.
   - PCT – Identifies, by TCB, the percentages of ZIIPONCP and ZIIP time consumed relative to the TOTALCPU time consumed.
   - Total/Summary – Identifies the totals for all fields in the display. The values in the Total/Summary line always represent activity for the entire MIM address regardless of which form of the command is used.

- Normalized - The values on this line always represent activity for the entire MIM address space regardless of which form of the command is used. A model-dependent scaling factor adjusts the zIIP value from the Total / Summary line. This method reflects the amount of CPU time that would have been used if that work had executed on general CP engines. The zIIP column is the actual amount of general CP engine time that is saved by using the MIM zIIP enablement feature.

  DISPLAY CPUTIME=ALL

  DISPLAY CPUTIME=DETAIL

  DISPLAY CPUTIME=SUMMARY

MIM0660I Message Time Values

- ss.ssssss = seconds.subseconds, up to 59.999999.
- hhh:mm:ss = hours:minutes:seconds, up to 999:59:59.
- hhhhhh:mm = hours:minutes, up to 999999:99.

Example MIM0660I Message Analysis

The DISPLAY CPUTIME=DETAIL command shows only TCBs which have the potential to offload work to zIIP engines after the zIIP Enablement feature is activated. The time values shown in the TASKCP field represent the CP time that could be offloaded to zIIP engines once the feature is activated.

The ZIIPONCP, PCT, ZIIP, and PCT fields all contain zeros in the following example display command because the zIIP Enablement feature has not been activated. When you activate the feature, these fields begin to show true time amounts and percentages.

The Total/Summary line identifies the totals for all fields in the display.

Note: The values in the Total/Summary and the Normalized lines always represent activity for the entire MIM address. Not simply the totals for the TCBs which have the potential to offload work to zIIP engines. The DISPLAY CPUTIME=ALL form of the display shows activity for all MIM address space TCBs.

Example Display Command:

SYSA:

```
F MIM,DISPLAY CPUTIME=DETAIL
MIM0660I CPU TIME:
LAST RESTART AT 20:32:16 ON 2013.16
  WORKUNIT  TOTALCPU   TASKCP   ZIIPONCP  PCT     ZIIP   PCT
  -------- ---------- ---------- ---------- ---- ---------- -----
  MIMDRDRV  00:24:15  00:24:15  0.000000  0.0  0.000000   0.0
  MIMZPXMP  0.000013  0.000013  0.000000  0.0  0.000000   0.0
  MIMDRTRC  0.000442  0.000442  0.000000  0.0  0.000000   0.0
  MIMDRVFD  00:23:46  00:23:46  0.000000  0.0  0.000000   0.0
  MIMDRLOG  0.097600  0.097600  0.000000  0.0  0.000000   0.0
  SRB       1.521509
  -------- ---------- ---------- ---------- ---- ---------- -----
  Total     00:50:03  00:50:03  0.000000  0.0  0.000000   0.0
Normalized  00:50:03  00:50:03  0.000000  0.0  0.000000   0.0
```

SYSB:

```
F MIM,DISPLAY CPUTIME=DETAIL
MIM0660I CPU TIME:
LAST RESTART AT 20:32:16 ON 2013.165
  WORKUNIT  TOTALCPU   TASKCP   ZIIPONCP  PCT     ZIIP   PCT
  -------- ---------- ---------- ---------- ---- ---------- -----
  MIMDRDRV  00:16:13  00:16:13  0.000000  0.0  0.000000   0.0
  MIMZPXMP  0.000011  0.000011  0.000000  0.0  0.000000   0.0
  MIMDRTRC  0.000641  0.000641  0.000000  0.0  0.000000   0.0
  MIMDRVFD  00:13:46  00:13:46  0.000000  0.0  0.000000   0.0
  MIMDRLOG  0.097600  0.097600  0.000000  0.0  0.000000   0.0
  SRB       1.512457
  -------- ---------- ---------- ---------- ---- ---------- -----
  Total     00:32:01  00:32:01  0.000000  0.0  0.000000   0.0
Normalized  00:32:01  00:32:01  0.000000  0.0  0.000000   0.0
```

SYSC:

```
F MIM,DISPLAY CPUTIME=DETAIL
MIM0660I CPU TIME:
LAST RESTART AT 20:32:16 ON 2013.165
  WORKUNIT  TOTALCPU   TASKCP   ZIIPONCP  PCT     ZIIP   PCT
  -------- ---------- ---------- ---------- ---- ---------- -----
  MIMDRDRV  00:04:15  00:04:15  0.000000  0.0  0.000000   0.0
  MIMZPXMP  0.000017  0.000017  0.000000  0.0  0.000000   0.0
  MIMDRTRC  0.000459  0.000459  0.000000  0.0  0.000000   0.0
  MIMDRVFD  00:04:45  00:04:45  0.000000  0.0  0.000000   0.0
  MIMDRLOG  0.097600  0.097600  0.000000  0.0  0.000000   0.0
  SRB       1.491234
  -------- ---------- ---------- ---------- ---- ---------- -----
  Total     00:11:02  00:11:02  0.000000  0.0  0.000000   0.0
Normalized  00:11:02  00:11:02  0.000000  0.0  0.000000   0.0
```

Activate the zIIP Enablement Feature

Define SETOPTION MIM ZIIP=YES and start the CA MIM address spaces.

Running CA MIM with SETOPTION MIM ZIIP=NO causes all CA MIM TCB mode work to remain unchanged. That is, no eligible TCB mode work is converted to SRB mode work to allow that work to run on zIIP engines. The zIIP Enablement feature is disabled when running with SETOPTION MIM ZIIP=NO defined, which is the default operating mode.

This procedure defines the SETOPTION MIM ZIIP=YES command in the MIMCMNDS parmlib member and starts the MIM address spaces with this value in place.

In the example presented in this section, we are illustrating how to predefine the SETOPTION MIM ZIIP=YES command in the MIMCMNDS parmlib member and restart your CA MIM address spaces.

General zIIP Enablement Feature Operational Considerations

1. The zIIP Enablement feature can be activated one system at a time.
2. A global MIMplex shutdown and restart of MIM is not required to activate the feature.
3. A control file format restart is not required to activate the feature.
4. A REUSE=NO restart is not required to activate the feature.
5. If some systems in the MIMplex have zIIP engines, and others do not, the feature can be activated on the systems that do have zIIP engines, and the feature can be left deactivated on the systems that do not have zIIP engines. In this case, consider using IFSYS/ENDIF commands to nest SETOPTION ZIIP=YES and SETOPTION ZIIP=NO commands as appropriate.
6. During SETOPTION MIM ZIIP=YES command processing, when no zIIP engines are online, MIM automatically disables the feature and MIM continues running as though SETOPTION MIM ZIIP=NO had been specified. A MIM0658W message is issued in this case.
7. If a SETOPTION MIM ZIIP=YES command were specified for a given active instance of MIM and all available zIIP engines go offline for some reason at a later point in time, the MIM address space continues converting some of its TCB type work to SRB type work, but that work will be dispatched by the system to CP engines rather than to zIIP engines. A MIM0658W message is issued in this case.
8. If you cannot stop and restart MIM and wish to activate the feature dynamically, you can do so by issuing an F MIM, SETOPTION MIM ZIIP=YES command to each MIM address space from any authorized command source. Remember to then update the MIMCMNDS parmlib member to retain zIIP feature activation between MIM restarts.

Follow these steps:

1. To activate the zIIP Enablement feature:

a. Open the MIMCMNDS parmlib member.

b. Define a SETOPTION MIM ZIIP=YES command option.

2. Restart your MIM address space. During SETOPTION MIM ZIIP=YES command processing, the CA MIM address space checks whether any zIIP engines are online to the system where CA MIM is starting. When one or more zIIP engines are online, the CA MIM address space begins offloading work to the zIIP engines.

Verify zIIP Enablement Feature is Active

Verify that the zIIP Enablement feature is active on all designated MIMplex systems.

Follow these steps:

1. To verify the zIIP Enablement feature is active, issue the following command on each MIMplex system:

   F MIM,DISPLAY MIM OPTIONS

   This command shows CA MIM operating values that are established using SETOPTION commands.

2. Review this example.

   Example Display Command Analysis:

   - SYSA shows ZIIP=YES which means the zIIP Enablement feature is active.
   - SYSB shows ZIIP=YES which means the zIIP Enablement feature is active.
   - SYSC shows ZIIP=YES which means the zIIP Enablement feature is active.

   Example Display Commands:

   SYSA:

```
F MIM,DISPLAY MIM OPTIONS
MIM0038I MIM OPTION DISPLAY:
 AUTHCHECK=23 HOURS   CELLTRACE=NO        CFSIZEWARN=75
 CMDPREFIX=& X'50'    CMDRESPMAX=2048     CMDTIMEOUT=10
 CTCVERIFY=2   MINS   CYCLES=1            DOWNSYS=AUTOFREE
 HIBERNATE=3  MINS    INTERVAL=1.000      LOCALSTOP=NOABEND
 LOCKOUT=15.00        MARGIN=30.00        MIHINTERVAL=60
 MODE=DEMAND          SHUTDOWN=GLOBAL
 STATCOLLECT=(SUBTYPE=(CF) NOSUBTYPE=(VF FC CP LS))
 STATCYCLE=60.00      STATINTERVAL=15
 TRACE=(OFF,JOBNAME=*,MAXQUEUED=1024)
 VCFDEBUG=OFF         VCFFORCE=5   MINS    VCFMAXDELAY=30.00
 VCFMINDORM=.000 MS   VCFRECOVERY=180
 SETTRACE=NONE
 SETPRINT=NONE
 ZIIP=YES
```

SYSB:

```
F MIM,DISPLAY MIM OPTIONS
MIM0038I MIM OPTION DISPLAY:
 AUTHCHECK=23 HOURS   CELLTRACE=NO        CFSIZEWARN=75
 CMDPREFIX=& X'50'    CMDRESPMAX=2048     CMDTIMEOUT=10
 CTCVERIFY=2  MINS    CYCLES=1            DOWNSYS=AUTOFREE
 HIBERNATE=3  MINS    INTERVAL=1.000      LOCALSTOP=NOABEND
 LOCKOUT=15.00        MARGIN=30.00        MIHINTERVAL=60
 MODE=DEMAND          SHUTDOWN=GLOBAL
 STATCOLLECT=(SUBTYPE=(CF) NOSUBTYPE=(VF FC CP LS))
 STATCYCLE=60.00      STATINTERVAL=15
 TRACE=(OFF,JOBNAME=*,MAXQUEUED=1024)
 VCFDEBUG=OFF         VCFFORCE=5  MINS    VCFMAXDELAY=30.00
 VCFMINDORM=.000 MS   VCFRECOVERY=180
 SETTRACE=NONE
 SETPRINT=NONE
 ZIIP=YES
```

SYSC:

```
F MIM,DISPLAY MIM OPTIONS
MIM0038I MIM OPTION DISPLAY:
 AUTHCHECK=23 HOURS   CELLTRACE=NO        CFSIZEWARN=75
 CMDPREFIX=& X'50'    CMDRESPMAX=2048     CMDTIMEOUT=10
 CTCVERIFY=2  MINS    CYCLES=1            DOWNSYS=AUTOFREE
 HIBERNATE=3  MINS    INTERVAL=1.000      LOCALSTOP=NOABEND
 LOCKOUT=15.00        MARGIN=30.00        MIHINTERVAL=60
 MODE=DEMAND          SHUTDOWN=GLOBAL
 STATCOLLECT=(SUBTYPE=(CF) NOSUBTYPE=(VF FC CP LS))
 STATCYCLE=60.00      STATINTERVAL=15
 TRACE=(OFF,JOBNAME=*,MAXQUEUED=1024)
 VCFDEBUG=OFF         VCFFORCE=5  MINS    VCFMAXDELAY=30.00
 VCFMINDORM=.000 MS   VCFRECOVERY=180
 SETTRACE=NONE
 SETPRINT=NONE
 ZIIP=YES
```

Assess CA MIM Workload being Offloaded to zIIP Engines

Display the amount of CA MIM address space workload that is being offloaded from general processor engines to zIIP processor engines.

Follow these steps:

1. To view the actual CA MIM address space workload being offloaded to zIIP engines, issue the following command on each system in the MIMplex:

   F MIM,DISPLAY CPUTIME=ALL

   After the zIIP Enablement feature is activated, this command can identify CA MIM address space workloads that are being offloaded to zIIP engines.

2. Review the following DISPLAY CPUTIME=ALL command example.

   Example Display Command Analysis:

   In this example, the zIIP Enablement feature is activated on each system. The display commands represent CA MIM running with certain MIM TCB mode work being converted to SRB mode work. This conversion allows that work to become eligible to run on zIIP engines.

   MIM0660I Message Fields

   - WORKUNIT – Identifies TCB names of a tasks running in the MIM address space or general system SRB activity associated with the MIM address space.
   - TOTALCPU - Identifies, by TCB, total CP and zIIP engine time consumed.
   - TASKCP – Identifies, by TCB, the general CP engine time consumed.
   - ZIIPONCP – Identifies, by TCB, the ZIIP-eligible work time consumed that ran on a general CP engine because zIIP engines were busy.
   - ZIIP – Identifies, by TCB, the zIIP engine time consumed.
   - PCT – Identifies, by TCB, the percentages of ZIIPONCP and ZIIP time consumed relative to the TOTALCPU time consumed.
   - Total/Summary – Identifies the totals for all fields in the display. Note that the values in the Total/Summary line always represent activity for the entire MIM address regardless of which form of the command is used, DISPLAY CPUTIME=ALL, DISPLAY CPUTIME=DETAIL, or DISPLAY CPUTIME=SUMMARY.
   - Normalized - The values on this line always represent activity for the entire MIM address space regardless of which form of the command is used. A model-dependent scaling factor adjusts the zIIP value from the Total / Summary line. This method reflects the amount of CPU time that would have been used if that work had executed on general CP engines. The zIIP column is the actual amount of general CP engine time that is saved by using the MIM zIIP enablement feature.

MIM0660I Message Time Values

- ss.ssssss = seconds.subseconds, up to 59.999999
- hhh:mm:ss = hours:minutes:seconds, up to 999:59:59
- hhhhhh:mm = hours:minutes, up to 999999:99

Example MIM0660I Message Analysis

The DISPLAY CPUTIME=ALL command shows:

- TCBs that have the potential to offload work to zIIP engines after the zIIP Enablement feature is activated
- TCBs whose work is not eligible for the zIIP offload

Combined, the display totals show accurate CP and zIIP engine usage for the entire MIM address space.

The ZIIPONCP, PCT, ZIIP and PCT fields all contain significant digits which indicate the zIIP Enablement feature has been activated. These fields show true time amounts and percentages of zIIP-eligible work that is run on zIIP engines (ZIIP) or zIIP-eligible work that was run on CP engines due to the lack of zIIP processor availability (ZIIPONCP).

The TOTAL line identifies the totals for all fields in the display. The values in the TOTAL line always represent activity for the entire MIM address not merely the totals for the TCBs that have the potential to offload work to zIIP engines. Again, the DISPLAY CPUTIME=ALL form of the display shows activity for all MIM address space TCBs.

The zIIP Enablement feature is activated, and the following percentages of work is being run on zIIP engines.

- For SYSA, TOTALCPU time is 02:27:09, and ZIIP time is 02:25:05, which means 98.5% of MIM address space work has been offloaded to zIIP engines. ZIIPONCP time is 51.588534 which means an additional 0.5% of work from the MIM address space was zIIP-eligible but was run on CP engines due to the lack of zIIP processor availability.
- For SYSB, TOTALCPU time is 02:06:19, and ZIIP time is 01:58:35, which means 98.5% of MIM address space work has been offloaded to zIIP engines. ZIIPONCP time is 00:03:19 which means an additional 2.6% of work from the MIM address space was zIIP-eligible but was run on CP engines due to the lack of zIIP processor availability.
- For SYSC, TOTALCPU time is 00:58:51, and ZIIP time is 00:56:24, which means 95.8% of MIM address space work has been offloaded to zIIP engines. ZIIPONCP time is 00:01:20 which means an additional 2.2% of work from the MIM address space was zIIP-eligible but was run on CP engines due to the lack of zIIP processor availability.

Example Display Commands:

SYSA:

```
F MIM,DISPLAY CPUTIME=ALL
MIM0660I CPU TIME:
LAST RESTART AT 21:56:09 ON 2013.167
  WORKUNIT  TOTALCPU   TASKCP   ZIIPONCP PCT     ZIIP  PCT
  -------- ---------- ---------- ---------- ---- ---------- -----
  MIMEQBLK  0.000008  0.000008  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000010  0.000010  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000010  0.000010  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000005  0.000005  0.000000 0.0  0.000000  0.0
  MIMDRDRV  00:58:27 24.560154 50.261896 1.4  00:57:12 97.8
  MIMDRHLP  0.000010  0.000010  0.000000 0.0  0.000000  0.0
  MIMCMCNF  9.283093  9.283093  0.000000 0.0  0.000000  0.0
  MIMCMREQ  4.556026  4.556026  0.000000 0.0  0.000000  0.0
  MIMEQBST  0.000007  0.000007  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000005  0.000005  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000003  0.000003  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000002  0.000002  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000006  0.000006  0.000000 0.0  0.000000  0.0
  MIMDRSTM  1.388640  1.388640  0.000000 0.0  0.000000  0.0
  MIMDRACT  0.000007  0.000007  0.000000 0.0  0.000000  0.0
  MIMDRMON  1.196736  1.196736  0.000000 0.0  0.000000  0.0
  MIMZPXMP  00:20:24  0.000169  0.323856 0.0  00:20:23 99.9
  MIMDRTRC  0.000362  0.000361  0.000000 0.0  0.000001  0.2
  MIMCTPOL  0.267117  0.267117  0.000000 0.0  0.000000  0.0
  MIMDRVFD  01:07:29  0.003030  0.988006 0.0  01:07:28 99.9
  MIMDRCKP  0.010246  0.010246  0.000000 0.0  0.000000  0.0
  MIMDRCFM  0.018199  0.018199  0.000000 0.0  0.000000  0.0
  MIMDRCMD 25.094704 25.094704  0.000000 0.0  0.000000  0.0
  MIMDRWTO  2.641808  2.641808  0.000000 0.0  0.000000  0.0
  MIMDRLOG  0.205032  0.064629  0.014776 7.2  0.125627 61.2
  SRB       3.380433
  -------- ---------- ---------- ---------- ---- ---------- -----
  Total     02:27:09  00:01:09 51.588534 0.5  02:25:05 98.5
Normalized  03:51:01  00:01:09 51.588534 0.4  03:48:57 99.1
```

SYSB:

```
F MIM,DISPLAY CPUTIME=ALL
MIM0660I CPU TIME:
LAST RESTART AT 22:20:57 ON 2013.167
  WORKUNIT  TOTALCPU   TASKCP   ZIIPONCP PCT     ZIIP  PCT
  -------- ---------- ---------- ---------- ---- ---------- -----
  MIMEQBLK  0.000006  0.000006  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000007  0.000007  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000004  0.000004  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000006  0.000006  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000009  0.000009  0.000000 0.0  0.000000  0.0
```

```
  MIMDRDRV  01:22:07  00:02:04  00:02:46 3.3  01:17:16 94.0
  MIMDRHLP  0.000012  0.000012  0.000000 0.0  0.000000  0.0
  MIMCMCNF 43.196099 43.196099  0.000000 0.0  0.000000  0.0
  MIMCMREQ  1.947101  1.947101  0.000000 0.0  0.000000  0.0
  MIMEQBST  0.000008  0.000008  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000004  0.000004  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000002  0.000002  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000009  0.000009  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000009  0.000009  0.000000 0.0  0.000000  0.0
  MIMDRSTM  1.586429  1.586429  0.000000 0.0  0.000000  0.0
  MIMDRACT  0.000007  0.000007  0.000000 0.0  0.000000  0.0
  MIMDRMON  4.593825  4.593825  0.000000 0.0  0.000000  0.0
  MIMZPXMP  00:09:59  0.000230  9.249849 1.5  00:09:49 98.4
  MIMDRTRC  0.001290  0.001289  0.000000 0.0  0.000001  0.0
  MIMCTPOL  0.205120  0.205120  0.000000 0.0  0.000000  0.0
  MIMDRVFD  00:31:52  0.000438 23.551103 1.2  00:31:29 98.7
  MIMDRCKP  0.083769  0.083769  0.000000 0.0  0.000000  0.0
  MIMDRCFM  0.018440  0.018440  0.000000 0.0  0.000000  0.0
  MIMDRCMD  00:01:09  00:01:09  0.000000 0.0  0.000000  0.0
  MIMDRWTO 12.633616 12.633616  0.000000 0.0  0.000000  0.0
  MIMDRLOG  0.273430  0.064914  0.021718 7.9  0.186798 68.3
  SRB       6.653445
  -------- ---------- ---------- ---------- ---- ---------- -----
  Total     02:06:19  00:04:18  00:03:19 2.6  01:58:35 93.8
Normalized  03:14:52  00:04:18  00:03:19 1.7  03:07:08 96.3
```

SYSC:

```
F MIM,DISPLAY CPUTIME=ALL
MIM0660I CPU TIME:
LAST RESTART AT 15:32:19 ON 2013.167
  WORKUNIT  TOTALCPU   TASKCP   ZIIPONCP PCT     ZIIP  PCT
  -------- ---------- ---------- ---------- ---- ---------- -----
  MIMEQBLK  0.000009  0.000009  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000008  0.000008  0.000000 0.0  0.000000  0.0
  MIMDRDRV  00:38:22 28.290437  00:01:06 2.9  00:36:47 95.8
  MIMDRHLP  0.000010  0.000010  0.000000 0.0  0.000000  0.0
  MIMCMCNF  7.217557  7.217557  0.000000 0.0  0.000000  0.0
  MIMCMREQ  0.166829  0.166829  0.000000 0.0  0.000000  0.0
  MIMEQBST  0.000008  0.000008  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000004  0.000004  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000008  0.000008  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000003  0.000003  0.000000 0.0  0.000000  0.0
  MIMEQBLK  0.000005  0.000005  0.000000 0.0  0.000000  0.0
  MIMDRSTM  0.634003  0.634003  0.000000 0.0  0.000000  0.0
  MIMDRACT  0.000010  0.000010  0.000000 0.0  0.000000  0.0
  MIMDRMON  0.941714  0.941714  0.000000 0.0  0.000000  0.0
  MIMZPXMP  00:04:58  0.000282  3.868266 1.2  00:04:54 98.7
  MIMDRTRC  0.001098  0.001097  0.000000 0.0  0.000001  0.0
  MIMCTPOL  0.082424  0.082424  0.000000 0.0  0.000000  0.0
```

```
MIMDRVFD  00:14:51  0.000571  9.238688  1.0  00:14:42  98.9
MIMDRCKP  0.011958  0.011958  0.000000  0.0  0.000000  0.0
MIMDRCFM  0.010271  0.010271  0.000000  0.0  0.000000  0.0
MIMDRCMD  22.345350  22.345350  0.000000  0.0  0.000000  0.0
MIMDRWTO  3.624448  3.624448  0.000000  0.0  0.000000  0.0
MIMDRLOG  0.103861  0.025749  0.006174  5.9  0.071938  69.2
SRB       3.603698
--------  ----------  ----------  ----------  ----  ----------  -----
Total     00:58:51  00:01:03  00:01:20  2.2  00:56:24  95.8
Normalized  01:31:27  00:01:03  00:01:20  1.4  00:56:24  97.3
```

Potential Results of zIIP Enablement Feature Offload

The zIIP offload scenario that is illustrated in this document involves a 3-system MIMplex running COMMUNICATION=CTCDASD with SYSA as the VCF MASTER system. All three systems were LPARs running on a single zEC12 CPU partitioned into many LPARs. The CA MII GDIF and ECMF facilities were managing ENQ requests at rate of about 230 ENQs per second on each LPAR for six days.

The results that were achieved in this MIMplex can differ from the results that you may achieve in your MIMplex. The following factors can impact the amount of CA MIM address space work that gets offloaded to zIIP engines:

- CPU model
- WLM settings
- CPU partitioning
- Speed of CP and zIIP processors
- Number of CP and zIIP processors
- CA MIM communication method used
- CA MIM facilities and features activated
- Number of systems in the MIMplex, and so on

CA MIM engineering conducted a number of contrived tests to determine which MIM communication methods produced the best zIIP offload percentages. These tests were conducted in a 2-system MIMplex on lightly loaded z/OS guest systems using various MIM cross-systems communication methods.

During each contrived test:

- 1,000,000 ENQ/DEQ pairs were created using an in-house ENQ generator utility.
- CA MIM DISPLAY CPUTIME=DETAIL commands measured the amount of consumed CPU time.

Example Display Command Analysis:

- MIM DASD control files yielded the poorest zIIP offload results at 37.5 percent.
- MIM CTC communication methods yielded the best zIIP offload results at nearly 99.8 percent.
- The other MIM communication methods achieved results in between the two results above.

The variation in the results is due to the underlying IBM services used by each MIM communication method and their ability to run in SRB mode.

Given the observed results, some sites may want to consider switching from their current MIM communication method to one that yields a higher zIIP offload rate. This switch could help reduce mainframe operating costs or defer a CPU upgrade to a higher capacity model.

Example DISPLAY CPUTIME=DETAIL Commands:

- COMMUNICATION=DASDONLY using a shared DASD Control File.

```
MIM0660I CPU TIME:
 WORKUNIT  TOTALCPU    TASKCP   ZIIPONCP  PCT      ZIIP   PCT
 -------- ---------- ---------- ---------- ---- ---------- -----
 MIMDRDRV  00:03:37   00:02:22   0.023328  0.0   00:01:15  34.4
 MIMZPXMP  13.716737  0.000000   0.001420  0.0  13.715317  99.9
 MIMDRTRC  0.000000   0.000000   0.000000  0.0   0.000000   0.0
 MIMDRLOG  0.007428   0.003383   0.000334  4.4   0.003711  49.9
 SRB       4.857467
 -------- ---------- ---------- ---------- ---- ---------- -----
 TOTAL     00:03:56   00:02:22   0.025082  0.0   00:01:28  37.5
```

- COMMUNICATION=DASDONLY using a shared Coupling Facility List Structure Control File.

```
MIM0660I CPU TIME:
   WORKUNIT  TOTALCPU    TASKCP   ZIIPONCP  PCT      ZIIP   PCT
   -------- ---------- ---------- ---------- ---- ---------- -----
   MIMDRDRV  00:01:53   0.004169   3.857184  3.4   00:01:49  96.5
   MIMZPXMP  5.549710   0.000000   0.003706  0.0   5.546004  99.9
   MIMDRTRC  0.000000   0.000000   0.000000  0.0   0.000000   0.0
   MIMDRLOG  0.006835   0.002527   0.000590  8.6   0.003718  54.3
   SRB       00:01:15
   -------- ---------- ---------- ---------- ---- ---------- -----
   TOTAL     00:03:14   0.247066   3.861480  1.9   00:01:54  59.0
```

- COMMUNICATION=XCF on the Virtual Control File Master System.

```
MIM0660I CPU TIME:
   WORKUNIT  TOTALCPU    TASKCP   ZIIPONCP  PCT      ZIIP   PCT
   -------- ---------- ---------- ---------- ---- ---------- -----
   MIMDRDRV  34.358393  0.002453   0.008019  0.0  34.347921  99.9
   MIMZPXMP  4.093996   0.000000   0.000047  0.0   4.093949  99.9
   MIMDRTRC  0.000000   0.000000   0.000000  0.0   0.000000   0.0
   MIMDRVFD  5.646007   0.000094   0.000070  0.0   5.645843  99.9
   MIMDRLOG  0.004871   0.001511   0.000436  8.9   0.002924  60.0
   SRB       0.001679
   -------- ---------- ---------- ---------- ---- ---------- -----
   TOTAL     44.313972  0.213084   0.008572  0.0  44.090637  99.4
```

- COMMUNICATION=XCF on the Virtual Control File Client System.

```
MIM0660I CPU TIME:
   WORKUNIT  TOTALCPU    TASKCP   ZIIPONCP  PCT      ZIIP   PCT
   -------- ---------- ---------- ---------- ---- ---------- -----
```

```
MIMDRDRV  40.076193  0.000445  0.041263 0.1  40.034485  99.8
MIMZPXMP   4.735944  0.000000  0.000230 0.0   4.735714  99.9
MIMDRTRC   0.000000  0.000000  0.000000 0.0   0.000000   0.0
MIMDRVFD  53.923254  0.000000  0.257082 0.4  53.666172  99.5
MIMDRLOG   0.009122  0.003778  0.000628 6.8   0.004716  51.6
SRB       22.852900
--------- ---------- ---------- ---------- ---- ---------- -----
TOTAL      00:02:01  0.301478  0.299203 0.2   00:01:38  80.7
```

- COMMUNICATION=CTCONLY or CTCDASD on the Virtual Control File Master System.

```
MIM0660I CPU TIME:
   WORKUNIT   TOTALCPU    TASKCP   ZIIPONCP  PCT      ZIIP   PCT
   --------- ---------- ---------- ---------- ---- ---------- -----
   MIMDRDRV  36.945028  0.000353  0.006654 0.0  36.938021  99.9
   MIMZPXMP   4.976018  0.000000  0.000088 0.0   4.975930  99.9
   MIMDRTRC   0.000000  0.000000  0.000000 0.0   0.000000   0.0
   MIMDRVFD   5.584680  0.000000  0.000094 0.0   5.584586  99.9
   MIMDRLOG   0.001883  0.000650  0.000211 11.2  0.001022  54.2
   SRB        0.002142
   --------- ---------- ---------- ---------- ---- ---------- -----
   TOTAL     47.574052  0.065304  0.007047 0.0  47.499559  99.8
```

- COMMUNICATION=CTCONLY or CTCDASD on the Virtual Control File Client System.

```
MIM0660I CPU TIME:
   WORKUNIT   TOTALCPU    TASKCP   ZIIPONCP  PCT      ZIIP   PCT
   --------- ---------- ---------- ---------- ---- ---------- -----
   MIMDRDRV  41.856751  0.000421  0.010323 0.0  41.846007  99.9
   MIMZPXMP  10.541308  0.000000  0.000073 0.0  10.541235  99.9
   MIMDRTRC   0.000000  0.000000  0.000000 0.0   0.000000   0.0
   MIMDRVFD  23.537456  0.000000  0.000167 0.0  23.537289  99.9
   MIMDRLOG   0.006833  0.003163  0.000409 5.9   0.003261  47.7
   SRB        0.008252
   --------- ---------- ---------- ---------- ---- ---------- -----
   TOTAL      00:01:16  0.168805  0.010972 0.0   00:01:15  99.7
```

Summary

zIIP specialty engines allow IBM mainframe customers to reduce their total cost of ownership or defer upgrades to higher capacity CPU models. The CA MIM zIIP Enablement feature has yielded positive results for sites choosing to activate it. Some environments see significant cost savings by offloading CA MIM address space work from general processors to the more cost efficient zIIP processors. Additionally, some environments find that offloading CA MIM address space work to zIIP engines improves overall system throughput. These performance benefits are due to the feature:

- Making general processor engine cycles, formerly used by CA MIM, available to other workloads.
- CA MIM work completing faster on the 100 percent, full capacity zIIP engines.

Contact CA MIM Technical Support with any questions about the operational characteristics of the CA MIM product.