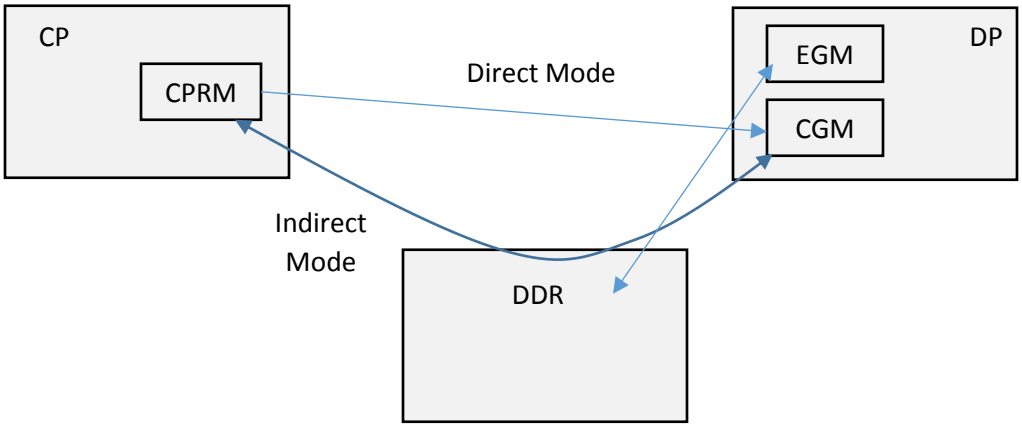
Introduction

The Bus Bandwidth Test (BWT) measures DMA performance across all Gen9 GNSS mission mode DMA data paths. It is executed via a Diag perl script, which shuts down any active GNSS sessions followed by entering its test loop. Execution continues until stopped via another Diag perl script.

BWT supports two modes: bandwidth test and system test. These two tests test the following paths.



For Indirect Mode, the following paths are executed:

- CPRM->DDR
- DDR->CGM
- DDR->EGM
- EGM->DDR

For Direct Mode, the following paths are executed:

- CPRM->CGM
- DDR->EGM
- EGM->DDR

Bandwidth Test

The Bandwidth Test is started by:

..\modem_proc\gps\gnss_tools\standalone_rfv\cgps_mode_switch>perl CGPS_ModeSwitch.pl 21 ON

..\modem_proc\gps\gnss_tools\standalone_rfv\bus_bw_test\perl *cgps_BusBwTest.pl 21 start maxdma*

Where:

1st arg is com port

2nd arg must be *start*

3rd arg must be *maxdma*

The bandwidth test generates the following results. Each test iteration takes approximately 10 seconds, followed by the results. Output is generated via F3 messages using the level PP_MSG_MASK_HIGH.

```
BBT: ***** (max) Accuracy 2
BBT:    CPRM2DDR     pass: 00000012 fail: 00000000
BBT:    EGM2DDR      pass: 00000010 fail: 00000000
BBT:    DDR2EGM      pass: 00000010 fail: 00000000
BBT:    DDR2CGM      pass: 00000008 fail: 00000000
BBT:    CPRM2CGM     pass: 00000004 fail: 00000000
BBT: *****  Performance
BBT:    CPRM2DDR     166 MBps
BBT:    CPRM2CGM     138 MBps min: 073us max: 075us avg: 073us std: 000us
BBT:    EGM2DDR      193 MBps min: 052us max: 054us avg: 052us std: 000us
BBT:    DDR2EGM      097 MBps min: 103us max: 105us avg: 104us std: 000us
BBT:    DDR2CGM      097 MBps min: 103us max: 106us avg: 104us std: 000us
BBT:    ALL w/IND    250 MBps min: 156us max: 184us avg: 163us std: 001us
BBT:    ALL w/DIR    194 MBps min: 156us max: 158us avg: 157us std: 000us
```

There are two tests performed by the bandwidth test: accuracy and performance. As shown above, each test generates its own output. The MBps reported here is the actual number of bytes transmitted per second.

Accuracy

The accuracy test (AT) determines if all DMA data paths are lossless, meaning the destination data matches the source data. The AT tests paths both individually and concurrently as would be executed in direct and indirect mode. The CPRM2DDR is tested using various transfer sizes. All other paths are tested using the standard 10240 byte size (grid size). . The AT output also displays the test loop iterator, which is shown above as 4.

Performance

The performance test (PT) measures the bandwidth for individual paths and concurrent paths as would be executed in direct and indirect mode. The CPRM2DDR path is tested using 512 Byte size (standard 256 correlators). All other paths using the standard 10240 byte size. Except for CPRM2DDR, the max, min, avg, and standard deviation (var) timings are provided that correspond to a 10240 byte transfer. The bandwidth is calculated as the number of bytes transferred over the length of the test. This number is calculated independently of the min, max, avg, and var timings, and therefore the two results are co-validating:

EGM2DDR = 193MBps

EGM2DDR Avg = 52us = 10240 / 52 * 1E6 = 196MBps

193MBps compares favorably to 196MBps.

System Test

The Bandwidth Test is started by:

..\modem_proc\gps\gnss_tools\standalone_rfv\cgps_mode_switch>perl CGPS_ModeSwitch.pl 21 ON

..\modem_proc\gps\gnss_tools\standalone_rfv\bus_bw_test\perl *cgps_BusBwTest.pl 21 start maxsys 15 10*

Where:

1st arg is com port

2nd arg must be *start*

3rd arg must be *maxsys*

4th arg is # of indirect channels to execute per 20ms

5th arg is # of direct channels to execute per 20ms

The system test generates the following results. Each test iteration takes approximately 2 seconds, followed by the results. Output is generated via F3 messages using the level PP_MSG_MASK_HIGH.

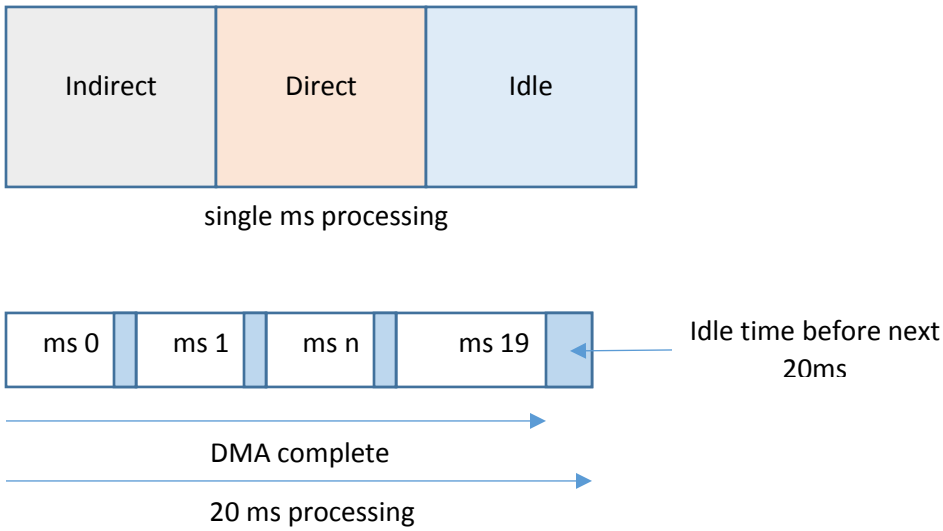
```
:BBT: ***** 8  (sys) dir_ch: 48 ind_ch: 48LF
:BBT: CCP  Min 19301us Max 19306us Avg 19304us SMin 19298us SMax 19307usLF
:BBT: DCP  Min 19639us Max 19649us Avg 19644us SMin 19638us SMax 19650usLF
:BBT: DCP  Dir  MBps: 195  min: 156.3us max: 159.2us avg: 157.2us std: 000usLF
:BBT: DCP  Ind  MBps: 187  min: 157.1us max: 183.8us avg: 163.5us std: 001usLF
:BBT: CCP  Ind  MBps:  92  min: 002.4us max: 010.0us avg: 005.5us std: 001usLF
:BBT: Total     MBps: 474LF
```

The purpose of the system test is to measure bandwidth in a mission mode environment. Mission mode executes in 20ms periods, where each 20ms period executes direct and non-direct DMAs. The direct and non-direct DMAs are load distributed across the 20ms into single ms slots [0..19], where each single ms executes some portion of the non-direct followed by direct. Thus, if the system test was started with 40 direct, each ms would execute 2 direct DMAs. If 45 direct, then the first 5 ms would execute 3 directs, and the remaining would execute 2.

The first line contains the incrementing test counter (2) and the number of direct and in-direct channels being executed per 20ms.

The second line contains shows the amount of time between the last DMA finishing in the 20ms period and the next 20ms period for the CCP. For mission mode, this should never exceed 20000us (20ms) since that means the DMA duration exceeds a single 20ms period.

The third line is the same as the second, except it's for the DCP.



The fourth line shows the DCP direct that has the following DMA actions per ms. These actions are repeated per direct load balanced per ms.

EGM->DDR 10240 bytes

CPRM->CGM 10240 bytes

DDR->EGM 10240 bytes

The fifth line shows the DCP indirect that has the following DMA actions per ms. These actions are repeated per indirect load balanced per ms.

EGM->DDR 10240 bytes

DDR->CGM 10240 bytes

DDR->EGM 10240 bytes

The sixth line shows the CCP indirect that has the following DMA actions per ms. These actions are repeated per number of indirect specified per ms.

CPRM -> DDR 512 bytes

The times specified represent a single iteration of the DMA action. For example, for the first line, 3*10240 * 1E6 / 157.2 = 195MBs.

The seventh line is simply the sum of MBs for all DMA actions. The MBps reported in system test is not the same as bandwidth test. It does not represent the number of bytes sent per second, but instead the performance in for the initiated DMA action, i.e., the MBps represents how fast 512 bytes were sent.