

The massively parallel processing (MPP) test detects and isolates faults in the communications link between a Cray Research mainframe (Cray host) and a CRAY T3D system (an MPP system) via the HISP and LOSP channels.

This chapter explains the execution of the MPP test. It covers the following topics:

- Understanding MPP
- Getting started with the MPP test under UNICOS
- Execution example
- MPP test menus
- MPP test commands
- MPP test modes

7.1 Understanding MPP

The massively parallel processing (MPP) connection developed for Cray Research computer systems consists of LOSP/HISP channel sets, where the LOSP channel is used for control and packet transfer, and a HISP channel pair is used for data in and out. Support of the MPP software is available with UNICOS 7.C.3 and later releases.

Under the UNICOS operating systems, the MPP character special files, also known as *device nodes*, are in the directory `/dev/mpp/name`, where *name* is either `ype` or `iog` followed by a two-digit number, or `cf` (configuration).

If your site follows the standard device-naming conventions for MPP devices, you can determine the device path names by using either the `OLNET YPEM` or `IOGM` commands, which are available from the MPP Test Initial menu. For more information on these commands, see Section 7.5, page 232.

For additional information, see the following documents:

- The UNICOS `olnet(8)` man page
- *CRAY T3D System Architecture Overview*, publication HR-04033

7.2 Getting started with the MPP test under UNICOS

To execute the OLNET MPP test, you need to perform the following tasks:

1. Log in to the Cray Research system that is connected to the Cray MPP system.
2. Determine the names of the MPP devices on your system.
3. Invoke OLNET.
4. Enter the MPP test menu.
5. Select either an IOG or a YPE path.
6. Set up all necessary MPP test parameters.
7. Execute an MPP test mode.

When entering commands in OLNET, the case of characters is important only for device names.

7.3 Execution example

This section contains an example of MPP test execution from the Cray Research computer system connected to the Cray MPP system via the HISP/LOSP channels. This example will test the `ioctl` call `YPE_FT_TO_MPP` by performing a write to the MPP system via the YPE path `/dev/mpp/ype01`.

1. On the Cray Research mainframe, enter the following command to execute OLNET:

```
/etc/diag/olnet
```

The Main menu is displayed.

2. From the Main menu, enter `MPP` to select the MPP test. The MPP Test Initial menu is displayed as shown here:

```

***** MPP TEST INITIAL MENU *****

MPP INITIAL MENU COMMANDS          Current Value(if applicable)
-----
      (open an IOG or YPE path, NOT both)

YPE - MPP YPE path -----> undefined
YPEM - MPP YPE path Menu
IOG - MPP IOG path -----> undefined
IOGM - MPP IOG path Menu

HELP - Get HELP information about this menu.

TMM - Select the OLNET MPP Test Mode Menu.
PROG - Select the OLNET MPP program menu.

RT - Return to the OLNET Main menu.

Enter a command:

```

3. Select a YPE or IOG path with the YPE, YPEM, IOG, or IOGM command. With the YPEM and IOGM selections, a menu of possible paths is displayed. If you know the path you want to test, you can enter YPE, /dev/mpp/ype01 to select a YPE path, or IOG, /dev/mpp/iog01 to select an IOG path. After selecting a valid device path, the MPP Test Initial menu is updated as shown:

```

***** MPP TEST INITIAL MENU *****

MPP INITIAL MENU COMMANDS          Current Value(if applicable)
-----
      (open an IOG or YPE path, NOT both)

YPE - MPP YPE path -----> /dev/mpp/ype01
YPEM - MPP YPE path Menu
IOG - MPP IOG path -----> undefined
IOGM - MPP IOG path Menu

HELP - Get HELP information about this menu.

TMM - Select the OLNET MPP Test Mode Menu.
PROG - Select the OLNET MPP program menu.

RT - Return to the OLNET Main menu.

Enter a command:
    
```

4. Select the MPP Test Mode menu by entering the TMM command. The MPP Test Mode menu is displayed:

```

      Test Parameter Commands          Value
-----
PC - Pass count -----> 1
MP - Messages pass -----> 10
ML - Message length -----> 100
PT - Pattern type-----> ADDRESS
TM - Test mode -----> Read YPE Statistics
Execute & miscellaneous commands
-----
HELP - Get HELP information about this menu.
EX - Execute: Read YPE Statistics for MPP.
TR - MPP driver trace:  DISABLED
RT - Return to the Initial Menu.

Enter a command:
    
```

5. Select the test mode by entering the TM command. The MPP Test menu is then displayed:

```
The current test mode is: Read YPE Statistics.
Select one of the following or press <CR> to
leave the current test mode unchanged.
```

Command	Description
-----	-----
YS	----> Read YPE Statistics
IS	----> Read IOG Statistics
MPPW	----> Write to MPP (ioctl YPE_FT_TO_MPP)
MPPR	----> Read from MPP (ioctl YPE_FT_FROM_MPP)
IOGE	----> IOG Echo (ioctl IOG_ECHO)
LBK	----> Loopback mode

```
Enter a command:
```

6. Select the Write to MPP option by entering the MPPW command. This entry returns you to the MPP Test Mode menu. The MPP Test menu could have been bypassed by simply entering `tm,mppw` from the MPP Test Mode menu. Now execute the test by entering `EX`. On successful test completion, the following message is displayed:

```
OLNET mode -----> Write to MPP (ioctl YPE_FT_TO_MPP)
Current pass count -->      1
Passes remaining ---->      0

Mon Sep 13 13:53:37 1995

Test passes have completed for /dev/mpp/ype01
Write to MPP (ioctl YPE_FT_TO_MPP)

Total bytes transmitted = xxxxx
Total bytes received    = xxxxx

Elapsed time(hh:mm:ss)  = xx:xx:xx
Transfer rate           = xxxxx bytes/second
Press <CR> to continue.
```

7.4 MPP test menus

After you initialize OLNET and access the Main menu, as described in Section 1.2, page 2, and Section 1.3, page 4, enter MPP from the Main menu to display the MPP Test Initial menu as shown in Figure 90.

```

***** MPP TEST INITIAL MENU *****

MPP INITIAL MENU COMMANDS          Current Value(if applicable)
-----
      (open an IOG or YPE path, NOT both)

YPE - MPP YPE path -----> /dev/mpp/ype01
YPEM - MPP YPE path Menu
IOG - MPP IOG path -----> undefined
IOGM - MPP IOG path Menu

HELP - Get HELP information about this menu.

TMM - Select the OLNET MPP Test Mode Menu.
PROG - Select the OLNET MPP program menu.

RT - Return to the OLNET Main menu.

Enter a command:
    
```

Figure 90. MPP Test Initial menu

If the YPEM or IOGM command is entered on the MPP Test Initial menu, the YPE or IOG Device Path Selection menu is displayed. Figure 91 shows the IOG Device Path Selection menu.

```

Select no.   Pathname           status
  1 -   /dev/mpp/iog00  AVAILABLE
  2 -   /dev/mpp/iog01  AVAILABLE
  3 -   /dev/mpp/iog02  AVAILABLE
  4 -   /dev/mpp/iog03  AVAILABLE

Choose one of the following:
o - Enter a number to select/open a device path.
o - Enter help.
o - Press  to exit this routine.

Enter a command:

```

Figure 91. MPP IOG Device Path Selection menu

If the TMM command is entered on the MPP Test Initial menu, the MPP Test Mode menu is displayed as shown in Figure 92.

```

Test Parameter Commands           Value
-----
PC - Pass count -----> 1
MP - Messages pass -----> 10
ML - Message length -----> 100
PT - Pattern type-----> ADDRESS
TM - Test mode -----> Read YPE Statistics
Execute & miscellaneous commands
-----
HELP - Get HELP information about this menu.
EX - Execute: Read YPE Statistics for MPP.
TR - MPP driver trace:  DISABLED
RT - Return to the Initial Menu.

Enter a command:

```

Figure 92. MPP Test Mode menu

If the TM command is entered on the TMM Test Mode menu, the MPP Test menu is displayed as shown in Figure 93.

```

The current test mode is: Write to MPP (ioctl YPE_FT_TO_MPP).
Select one of the following or press to
leave the current test mode unchanged.

Command      Description
-----      -
YS           -----> Read YPE Statistics
IS           -----> Read IOG Statistics
MPPW         -----> Write to MPP (ioctl YPE_FT_TO_MPP)
MPPR         -----> Read from MPP (ioctl YPE_FT_FROM_MPP)
IOGE         -----> IOG Echo      (ioctl IOG_ECHO)
LBK          -----> Loopback mode

Enter a command:
    
```

Figure 93. MPP Test menu

7.5 MPP test commands

This section describes the commands that are available on the MPP Test Initial menu and the MPP Test Mode menu. (This section describes menu execution only. Appendix A, page 267, describes other methods of execution.) MPP test commands are as follows:

<u>Command</u>	<u>Description</u>
CE	Tells OLNET to continue on error. Use the <i>errorfile</i> option to specify the file to which error output is written. These options do not appear on the MPP Test menus. The CE option must be placed between the TMM and EX options in a command-line string. See Section A.2.2, page 270, for more information.
<i>errorfile</i>	Specifies the file to which error output is written. This option does not appear on the MPP Test menu. The <i>errorfile</i> option must be placed after the EX option in a command-line string. See Section A.2.2, page 270, for more information.
EX	Executes the test in the test mode specified by the TM command.
HELP	Gets help for the current menu.
IOG	Device path name for the IOG. You must have read/write permission on the path used by OLNET. Contact your system administrator to obtain these permissions.

IOGM	The IOG path menu (IOGM) command allows you to display and dynamically select an MPP IOG device path (assuming standard MPP IOG path naming conventions were used).
ML, <i>ml</i>	Message data length. <i>ml</i> is a value in the range of 1 through 125,000. The default for <i>ml</i> is 100. If the IOGE test is selected, the maximum value for <i>ml</i> is 64, and the value must be a multiple of 8 (number of bytes per word).
MP, <i>mp</i>	Messages to be generated for each pass. <i>mp</i> is a value in the range 1 through 1,000,000. The default for <i>mp</i> is 10.
PC, <i>pc</i>	Pass count. <i>pc</i> is a value in the range 1 through 1,000,000. The default for <i>pc</i> is 1.
PROG	This option is currently disabled.
PT, <i>pt</i>	Pattern type (in 64-bit words). <i>pt</i> is one of the following values:

<u>Value</u>	<u>Description</u>
AD	Address (default). This sequential address pattern is incremented in each 16-bit parcel of a 64-bit word, as in the following example: 000000 000001 000002 000003 000004 000005 000006 000007
AO	All 1's.
AP	All patterns. A new pattern is generated for each message sent and received. The patterns are processed in the following order: AD, AO, AZ, SO, SZ, RN, BT.
AZ	All 0's.
BT	Bits. This pattern contains a random number of consecutive 1-bits randomly positioned within a 64-bit word, as in the following example: 000001 177770 000000 000000 000000 000000 077770 000000 177777 177777 177600 000000 000000 000000 003777 177700
RN	Random. A random pattern is generated for each message sent and received.

SO Sliding 1's. This is a 0's data pattern in which a 1-bit is circularly shifted through each 16-bit parcel, as in the following example:

```
000001 000002 000004 000010
000020 000040 000100 000200
```

SZ Sliding 0's. This is a 1's data pattern in which a 0-bit is circularly shifted through each 16-bit parcel, as in the following example:

```
177776 177775 177773 177767
177757 177737 177677 177577
```

The default for *pt* is AD (address pattern).

For data patterns AP, BT, and RN, OLNET builds a new pattern for each message, thereby requiring extra CPU cycles and possibly reducing the data rate (bytes/second).

RT Returns to the previous menu.

TMM Selects the Test Mode menu.

YPE Device path name for the YPE. You must have read/write permission on the path used by OLNET. Contact your system administrator to obtain these permissions.

YPEM The YPE path menu (YPEM) command allows you to display and dynamically select an MPP YPE device path (assuming standard MPP YPE path naming conventions were used).

TM, *tm* Test mode. *tm* is one of the following values:

IOGE IOG echo (ioctl IOG_ECHO)

IS Read IOG statistics

LBK Loopback mode (software loopback)

MPPR Read from MPP (ioctl YPE_FT_FROM_MPP)

MPPW Write to MPP (ioctl YPE_FT_TO_MPP)

YS Read YPE statistics

TR Enables or disables the driver trace.

7.6 MPP test modes

You can execute the MPP test in any of the following test modes:

- Read IOG statistics
- Read YPE statistics
- Read from MPP (`ioctl YPE_FT_FROM_MPP`)
- Write to MPP (`ioctl YPE_FT_TO_MPP`)
- IOG echo (`ioctl IOG_ECHO`)
- Loopback mode (software loopback)

The following sections describe the execution of each mode.

7.6.1 Read IOG statistics

With the IS mode, the `ioctl`s `IOG_CONFIGURATION` and `IOG_MF_STATISTICS` are issued to read various statistics from the selected IOG.

Executing IS mode does not perform any actual testing, but the fact that the `ioctl`s were issued and completed successfully proves that the following components are somewhat healthy:

- LOSP channel to/from the selected IOG
- The MPP node
- The `ioctl`s `IOG_CONFIGURATION` and `IOG_MF_STATISTICS`
- MPP device driver software

To execute IS mode, do the following:

1. Initialize OLNETH on the Cray Research system and access the Main menu, as described in Section 1.2, page 2, and Section 1.3, page 4.
2. After you initialize OLNETH and access the Main menu, enter `MPP` to display the MPP Test Initial menu (see Figure 90, page 230).
3. Set the IOG device path you want to test (`IOGM`).
4. Enter `TMM` to display the MPP Test Mode menu (see Figure 92, page 231).
5. Set the test mode to `IS` (`TM, IS`).
6. Enter the `EX` command to start the test.

Upon test completion, the following information is displayed:

```

MPP IOG STATISTICS DISPLAY          Tue Sep 14 10:13:57 1995
-----

IOG selected:                       /dev/mpp/iog01
IOG's configured:                   3
sum ticks/word:                     462391709
sum squared ticks/word:             3807612926649
low water ticks/word:               0
high water ticks/word:              406918
input EFIS packets;                 [0]: 0000000885, [1]: 0000000911
input EFIS words;                   [0]: 0000007616, [1]: 0000008626
output EFIS packets;                [0]: 0000000885, [1]: 0000000910
output EFIS words;                  [0]: 0000007618, [1]: 0000008624
EFIS retransmits sent;              [0]: 0000000000, [1]: 0000000000
EFIS dropped in error;              [0]: 0000000000, [1]: 0000000000
EFIS retransmits received;          [0]: 0000000000, [1]: 0000000000
input MFIS packets;                 [0]: 0000004956, [1]: 0000000000
input MFIS words;                   [0]: 0000024848, [1]: 0000000000
output MFIS packets;                [0]: 0000004954, [1]: 0000000000
output MFIS words;                  [0]: 0000574813, [1]: 0000000000
EFIS transactions;                  [0]: 0000000883, [1]: 0000000886
MFIS transactions;                  [0]: 0000004956, [1]: 0000000000

Choose one of the following:

LT - Save stats information to a file.
<CR> - To return to the previous menu.

Enter a command:
    
```

7.6.2 Read YPE statistics

With the YS mode, the `ioctl YPE_STATISTICS` is issued to read various statistics from the selected YPE.

Executing YS mode does not perform any actual testing, but the fact that the `ioctl` was issued and completed successfully proves that the following components are somewhat healthy:

- LOSP channel to/from the selected YPE
- The MPP node
- The `ioctl YPE_STATISTICS`

- MPP device driver software

To execute YS mode, do the following:

1. Initialize OLNETH on the Cray Research system and access the Main menu, as described in Section 1.2, page 2, and Section 1.3, page 4.
2. After you initialize OLNETH and access the Main menu, enter MPP to display the MPP Test Initial menu (see Figure 90, page 230).
3. Set the YPE device path you want to test (YPEM).
4. Enter TMM to display the MPP Test Mode menu (see Figure 92, page 231).
5. Set the test mode to YS (TM, YS).
6. Enter the EX command to start the test.

Upon test completion, the following information is displayed:

```

MPP YPE STATISTICS DISPLAY          Tue Sep 14 10:11:35 1995
-----
YPE selected:                        /dev/mpp/ype04

** The YPE_STATISTICS display was not      **
** available when this manual was printed  **

Choose one of the following:

LT - Save stats information to a file.
<CR> - To return to the previous menu.

Enter a command:

```

7.6.3 Read from MPP or write to MPP

With the MPPR or MPPW mode, the data is transferred over the HISP data channels and the control is done via the LOSEP channel. Either the `ioctl` `YPE_FT_FROM_MPP` (MPPR) or `YPE_FT_TO_MPP` (MPPW) is issued to read from (MPPR) or write to (MPPW), respectively, the MPP to/from the Cray mainframe. After one of these `ioctl`s has completed, the `ioctl` `YPE_FT_COMPLETE` is issued to verify that the first `ioctl` completed correctly.

Executing MPPR or MPPW mode tests the following components of the MPP connection:

- LOSP channel to/from the selected YPE
- HISP 0 and its node to the MPP
- HISP 1 and its node from the MPP
- The MPP I/O node
- The ioctl YPE_FT_FROM_MPP or YPE_FT_TO_MPP
- The ioctl YPE_FT_COMPLETE
- MPP device driver software

To execute MPPR or MPPW mode, do the following:

1. Initialize OLNET on the Cray Research system and access the Main menu, as described in Section 1.2, page 2, and Section 1.3, page 4.
2. After you initialize OLNET and access the Main menu, enter MPP to display the MPP Test Initial menu (see Figure 90, page 230).
3. Set the YPE device path you want to test (YPEM).
4. Enter TMM to display the MPP Test Mode menu (see Figure 92, page 231).
5. Set the test mode to MPPW (TM,MPPW) or MPPR (TM,MPPR).
6. Enter the EX command to start the test.

Upon test completion, the following message is displayed:

```

Test passes have completed for /dev/mpp/ype01
Read from MPP (ioctl YPE_FT_FROM_MPP)
      or
Write to MPP (ioctl YPE_FT_TO_MPP)

Total bytes transmitted = xxxxx
Total bytes received   = xxxxx

Elapsed time(hh:mm:ss) = xx:xx:xx
Transfer rate          = xxxxx bytes/second
Press <CR> to continue.
    
```

7.6.4 IOG echo

With the IOGE mode, the `ioctl IOG_ECHO` is issued. First the input and then the output buffer are filled with a data pattern. Then the `ioctl` is issued over the LOSP channel to the HISP 0 input node on the MPP, and the `ioctl` is issued again to the HISP 1 output node on the MPP. The `ioctl` causes the data to be written to the respective PE and then echoed back immediately. For this test, the maximum size for message length (ML) is 64. If a size greater than 64 is selected, it will be reduced to 64. Also, if a size that is not a multiple of 8 (number of bytes per word) is selected, it will be rounded up to the next 8-byte multiple.

Executing IOGE mode tests the following components of the MPP connection:

- LOSP channel to/from the selected IOG
- The input and output HISP nodes
- The `ioctl IOG_ECHO`
- MPP device driver software

To execute IOGE mode, do the following:

1. Initialize OLNET on the Cray Research system and access the Main menu, as described in Section 1.2, page 2, and Section 1.3, page 4.
2. After you initialize OLNET and access the Main menu, enter MPP to display the MPP Test Initial menu (see Figure 90, page 230).
3. Set the IOG device path you want to test (IOGM).
4. Enter TMM to display the MPP Test Mode menu (see Figure 92, page 231).
5. Set the test mode to IOGE (TM, IOGE).
6. Enter the EX command to start the test.

Upon test completion, the following message is displayed:

```

Test passes have completed for /dev/mpp/ype01
IOG Echo      (ioctl IOG_ECHO)

Gateway /dev/mpp/iog00, HISP 0 to output node IS responding
Gateway /dev/mpp/iog00, HISP 1 from input node IS responding

Total bytes transmitted = xxxxxx
Total bytes received   = xxxxxx

Elapsed time(hh:mm:ss) = xx:xx:xx
Transfer rate          = xxxxxx bytes/second
                        Press <CR> to continue.
    
```

7.6.5 Loopback (software)

With the LBK mode, no actual loopback cable is used; thus, the test is considered a software loopback test. The two `ioctl`s described in Section 7.6.3, page 237, are used here, and then actual reads and writes are done to exercise the HISP channel pair with data transfers.

Executing loopback mode to the MPP tests the following components of the MPP connection:

- LOSP channel to/from the selected YPE
- HISP channel pair to/from the selected YPE
- The MPP node
- MPP device driver software

To execute loopback mode, do the following:

1. Initialize OLNET on the Cray Research system and access the Main menu, as described in Section 1.2, page 2, and Section 1.3, page 4.
2. After you initialize OLNET and access the Main menu, enter `MPP` to display the MPP Test Initial menu (see Figure 90, page 230).
3. Set the YPE device path you want to test (`YPEM`).
4. Enter `TMM` to display the MPP Test Mode menu (see Figure 92, page 231).
5. Set the test mode to loopback (`TM, LBK`).
6. Enter the `EX` command to start the test.

Upon test completion, the following message is displayed:

```
Test passes have completed for /dev/mpp/ype04
Loopback mode

Total bytes transmitted = xxxxxx
Total bytes received   = xxxxxx

Elapsed time(hh:mm:ss) = xxx:xx
Transfer rate           = xxxxxx bytes/second

Press <CR> to continue.
```

