

MPICH Logging  
Version 0.1  
DRAFT of July 25, 2018  
Mathematics and Computer Science Division  
Argonne National Laboratory

David Ashton

July 25, 2018

## 1 Introduction

This manual assumes that MPICH has already been installed. For instructions on how to install MPICH, see the MPICH Installer's Guide, or the README in the top-level MPICH directory. This manual will explain how the internal logging macros are generated and how the user can generate log files viewable in Jumpshot.

## 2 Configuring mpich to create log files

When users run configure they can specify logging options. There are three configure options to control logging.

`--enable-timing=<timing_type>`

Add this option to enable timing. The two options for `timing_type` are `log` and `log_detailed`. The `log` option will log only the MPI functions. The `log_detailed` will log every function in `mpich`. This option gives fine grained logging information and also creates large log files. It must be used in conjunction with a `timer_type` that can log very short intervals on the order of 100's of nanoseconds.

`--with-logging=<logger>`

Specify the logging library to use. Currently the only logger option is `rlog`.

`--enable-timer-type=<timer_type>`

Specify the timer type. The options are

- `gethrtime` - Solaris timer (Solaris systems only)
- `clock_gettime` - Posix timer (where available)
- `gettimeofday` - Most Unix systems
- `linux86_cycle` - Linux x86 cycle counter\*
- `linuxalpha_cycle` - Like `linux86_cycle`, but for Linux Alpha\*
- `gcc_ia64_cycle` - IA64 cycle counter\*

\* Note that CPU cycle counters count cycles, not elapsed time. Because processor frequencies are variable, especially with modern power-aware hardware, these are not always reliable for timing and so should only be used if you're sure you know what you're doing.

Here is an example:

```
mpich/configure
    --enable-timing=log
    --with-logging=rlog
    --enable-timer-type=gettimeofday
    ...
```

### 3 Generating log files

Run your mpi application to create intermediate `.irlog` files.

```
mpicc myapp.c -o myapp
mpiexec -n 3 myapp
```

There will be `.irlog` files created for each process:

```
log0.irlog
log1.irlog
log2.irlog
```

### 4 RLOG tools

For performance reasons each process produces a local intermediate log file that needs to be merged into a single rlog file. Use the rlog tools to merge the `.irlog` files into an `.rlog` file. The rlog tools are found in `mpich_build/src/util/logging/rlog`. Currently they are not copied to the install directory.

`irlog2rlog`

This tool combines the intermediate `.irlog` files into a single `.rlog` file. The usage is: “`irlog2rlog outname.rlog input0.irlog input1.irlog ...`”. A shortcut is provided: “`irlog2rlog outname.rlog <num_files>`”. Execute `irlog2rlog` without any parameters to see the usage options.

`printrlog`

This tool prints the contents of an `.rlog` file.

**printirlog**

This tool prints the contents of an `.irlog` file.

Continuing the example from the previous section:

```
irlog2rlog myapp.rlog 3
```

will convert `log0.irlog`, `log1.irlog` and `log2.irlog` to `myapp.rlog`.

## 5 Viewing log files

This section describes how to view a log file

`.rlog` files can be printed from a command shell using the `printrlog` tool but the more interesting way to view the log files is from Jumpshot. Jumpshot displays `slog2` files and has a built in converter to convert `.rlog` files to `.slog2` files. Start Jumpshot and open your `.rlog` file. Jumpshot will ask you if you want to convert the file and you say yes.

## 6 Logging state code generation

This section can be skipped by users. It describes the internal scripts used to develop the logging macros.

This is how the `maint/genstates` script works:

1. `autogen.sh` creates `genstates` from `genstates.in` replacing `@PERL@` with the appropriate path to perl and then runs `genstates`.
2. `genstates` finds all `.i`, `.h` and `.c` files in the mpich directory tree, searches for `_STATE_DECL` in each file and builds a list of all the `MPID_STATES`. It validates that the states start in a `_STATE_DECL` statement, followed by a `FUNC_ENTER` statement, and then at least one `FUNC_EXIT` statement. Errors are printed out if the code does not follow this format except for macros. State declarations in macros are assumed to be correct.

3. `genstates` finds all the `describe_states.txt` files anywhere in the `mpich` tree. `describe_states.txt` files are optional and are used to set the output name of the state and its associated color.
4. The `describe_states.txt` file format is this:

```
MPID_STATE_XXX <user string for the state> <optional rgb color>
```

Here is an example line:

```
MPID_STATE_MPI_SEND MPI_Send 0 0 255
```

If you don't specify a state in a `describe_states.txt` file then the state user name will be automatically created by stripping off the `MPID_STATE_` prefix and the color will be assigned a random value.

5. `genstates` outputs `mpich/src/include/mpiallstates.h` with this enum in it:

```
enum MPID_TIMER_STATE
{
    MPID_STATE_XXX,
    ...
};
```

6. `genstates` outputs `mpich/src/util/logging/describe_states.c` with the `MPIR.Describe_timer_states()` function in it. Currently, only the `rlog` version of `MPIR.Describe_timer_states()` is generated.