

Chapter 2

MPI Terms and Conventions

This chapter explains notational terms and conventions used throughout the MPI document, some of the choices that have been made, and the rationale behind those choices. It is similar to the MPI-1 Terms and Conventions chapter but differs in some major and minor ways. Some of the major areas of difference are the naming conventions, some semantic definitions, file objects, Fortran 90 *vs* Fortran 77, C++, processes, and interaction with signals.

2.1 Document Notation

Rationale. Throughout this document, the rationale for the design choices made in the interface specification is set off in this format. Some readers may wish to skip these sections, while readers interested in interface design may want to read them carefully. (*End of rationale.*)

Advice to users. Throughout this document, material aimed at users and that illustrates usage is set off in this format. Some readers may wish to skip these sections, while readers interested in programming in MPI may want to read them carefully. (*End of advice to users.*)

Advice to implementors. Throughout this document, material that is primarily commentary to implementors is set off in this format. Some readers may wish to skip these sections, while readers interested in MPI implementations may want to read them carefully. (*End of advice to implementors.*)

2.2 Naming Conventions

In many cases MPI names for C functions are of the form `MPI_Class_action_subset`. This convention originated with MPI-1. Since MPI-2 an attempt has been made to standardize the names of MPI functions according to the following rules. The C++ bindings in particular follow these rules (see Section 2.6.4 on page 18).

1. In C, all routines associated with a particular type of MPI object should be of the form `MPI_Class_action_subset` or, if no subset exists, of the form `MPI_Class_action`. In Fortran, all routines associated with a particular type of MPI object should be of the form `MPI_CLASS_ACTION_SUBSET` or, if no subset exists,

of the form **MPI_CLASS_ACTION**. For C and Fortran we use the C++ terminology to define the **Class**. In C++, the routine is a method on **Class** and is named **MPI::Class::Action_subset**. If the routine is associated with a certain class, but does not make sense as an object method, it is a static member function of the class.

2. If the routine is not associated with a class, the name should be of the form **MPI_Action_subset** in C and **MPI_ACTION_SUBSET** in Fortran, and in C++ should be scoped in the **MPI** namespace, **MPI::Action_subset**.
3. The names of certain actions have been standardized. In particular, **Create** creates a new object, **Get** retrieves information about an object, **Set** sets this information, **Delete** deletes information, **Is** asks whether or not an object has a certain property.

C and Fortran names for some MPI functions (that were defined during the MPI-1 process) violate these rules in several cases. The most common exceptions are the omission of the **Class** name from the routine and the omission of the **Action** where one can be inferred.

MPI identifiers are limited to 30 characters (31 with the profiling interface). This is done to avoid exceeding the limit on some compilation systems.

2.3 Procedure Specification

MPI procedures are specified using a language-independent notation. The arguments of procedure calls are marked as IN, OUT or INOUT. The meanings of these are:

- IN: the call may use the input value but does not update the argument,
- OUT: the call may update the argument but does not use its input value,
- INOUT: the call may both use and update the argument.

There is one special case — if an argument is a handle to an opaque object (these terms are defined in Section 2.5.1), and the object is updated by the procedure call, then the argument is marked INOUT or OUT. It is marked this way even though the handle itself is not modified — we use the INOUT or OUT attribute to denote that what the handle *references* is updated. Thus, in C++, IN arguments are usually either references or pointers to **const** objects.

Rationale. The definition of MPI tries to avoid, to the largest possible extent, the use of INOUT arguments, because such use is error-prone, especially for scalar arguments. (*End of rationale.*)

MPI's use of IN, OUT and INOUT is intended to indicate to the user how an argument is to be used, but does not provide a rigorous classification that can be translated directly into all language bindings (e.g., **INTENT** in Fortran 90 bindings or **const** in C bindings). For instance, the “constant” **MPI_BOTTOM** can usually be passed to OUT buffer arguments. Similarly, **MPI_STATUS_IGNORE** can be passed as the OUT status argument.

A common occurrence for MPI functions is an argument that is used as IN by some processes and OUT by other processes. Such an argument is, syntactically, an