

# OpenSplice DDS

Version 4.1

## IDL Pre-processor Guide





# OpenSplice DDS

## IDL PRE-PROCESSOR GUIDE



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A close-up, low-angle photograph of a computer keyboard, focusing on the central and right-hand keys. The keys are white with dark lettering. A white grid pattern is overlaid on the entire image, creating a sense of depth and perspective. The lighting is soft, highlighting the texture of the keys and the grid lines.

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# Preface

## About the IDL Pre-processor Guide

The *IDL Pre-processor Guide* describes what the OpenSplice DDS IDL Pre-processor included with the OpenSplice DDS product is and how to use it.

### Intended Audience

The *IDL Pre-processor Guide* is intended to be used by developers creating applications which use OpenSplice DDS.

### Organisation

Section 1.1, *Introduction*, provides a high-level description and brief introduction of the IDL Pre-processor.

Section 1.2, *Prerequisites*, describes the prerequisites needed to run the pre-processor.

Section 1.3, *IDL Pre-processor Command Line Options*, provides the options which are available for running the pre-processor.

Section 1.4, *OpenSplice DDS Modes and Languages*, provides a summary of OpenSplice's supported modes and languages, as well as an overview of the applicable OpenSplice DDS libraries.

Section 1.5, *IDL Pre-processor Grammar*, shows the IDL grammar that is supported by the OpenSplice DDS IDL Pre-processor.

Section 1.6, *Modes, Languages and Processing steps* describes the steps required for creating programs for each of the modes and languages supported by the Pre-processor.

Section 1.7, *Built-in DDS data types* describes the built-in DDS data types and provides language-specific guidelines on how to use them.

### Conventions

The conventions listed below are used to guide and assist the reader in understanding the IDL Pre-processor Guide.



Item of special significance or where caution needs to be taken.



Item contains helpful hint or special information.



Information applies to Windows (e.g. NT, 2000, XP) only.



Information applies to Unix based systems (e.g. Solaris) only.



C language specific



C++ language specific

## Java

Java language specific

Hypertext links are shown as *blue italic underlined*.

On-Line (PDF) versions of this document: Items shown as cross references, e.g. *Contacts* on page viii, are as hypertext links: click on the reference to go to the item.

```
% Commands or input which the user enters on the
command line of their computer terminal
```

Courier fonts indicate programming code and file names.

Extended code fragments are shown in shaded boxes:

```
NameComponent newName[] = new NameComponent[1];

// set id field to "example" and kind field to an empty string
newName[0] = new NameComponent ("example", "");
```

*Italics* and ***Italic Bold*** are used to indicate new terms, or emphasise an item.

**Arial Bold** is used to indicate user related actions, e.g. **File | Save** from a menu.

**Step 1:** One of several steps required to complete a task.

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# THE IDL PRE-PROCESSOR





# 1 Description and Use

*The OpenSplice DDS IDL Pre-processor plays a role in generating code for DDS/DCPS specialized interfaces (TypeSupport, DataReader and DataWriter) from application data definitions defined in IDL for all supported languages.*

## 1.1 Introduction

The OpenSplice DDS IDL Pre-processor supports two modes:

- *Standalone* mode where the application is only used with OpenSplice DDS
- ORB *integrated* mode where the application is used with an ORB as well as with OpenSplice DDS

In a standalone context, OpenSplice DDS provides, apart from the DDS/DCPS related artifacts, all the artifacts implied by the IDL language specific mapping. In this case the used name space is DDS instead of the name space implied by the IDL language specific mapping.

In an ORB integrated context, the ORB pre-processor will provide for the artifacts implied by the IDL language specific mapping, while OpenSplice DDS only provides the DDS/DCPS related artifacts. The application data type representation provided by the ORB is also used within the OpenSplice DDS context. In this way application data types can be shared between the ORB and OpenSplice DDS within one application program.

The OpenSplice DDS IDL Pre-processor accepts IDL which complies with the OMG CORBA specification, to specify application data types. Additionally it allows specifying keys on data types.

A number of DDS data types defined in the DCPS API (for example, *Time\_t*) are available for use with application IDL data types and can be seen as OpenSplice DDS IDL Pre-processor “built-in” definitions.

*Figure 1, OpenSplice DDS IDL Pre-processor High Level Processes*, on page 4 shows the OpenSplice DDS IDL Pre-processor high-level processing.

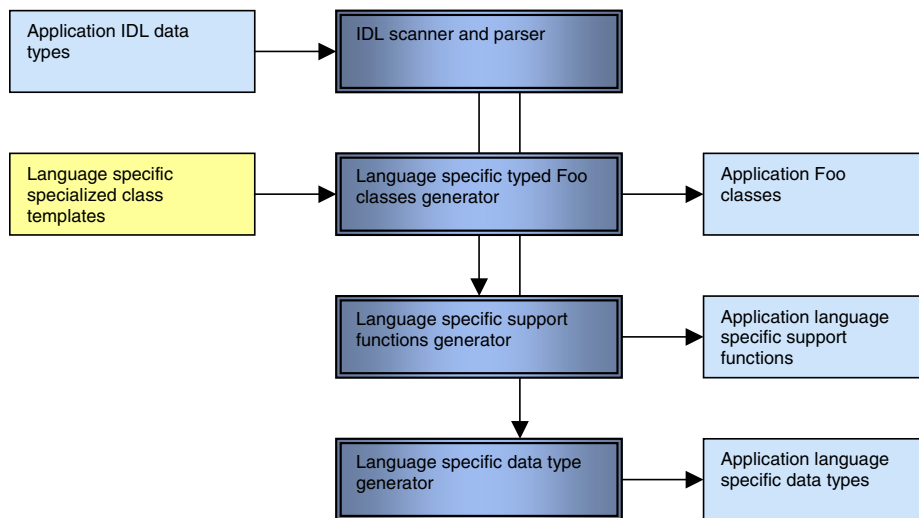
The OpenSplice DDS IDL Pre-processor scans and parses the IDL input file containing the application data type definitions.

For the selected language, the OpenSplice DDS IDL Pre-processor generates the specialized interfaces for TypeSupport, the DataReader and the DataWriter from specialized class template files which are provided by OpenSplice. Note that the

OpenSplice DDS IDL Pre-processor will only generate specialized interfaces for application data types for which a key list is defined. If it is not, the OpenSplice DDS IDL Pre-processor assumes that the data type will only be used enclosed in other data types.

The OpenSplice DDS IDL Pre-processor also generates language specific support functions, which are needed to allow the OpenSplice DDS system to handle the application data types.

For the standalone context the OpenSplice DDS IDL Pre-processor generates the language specific application data types according the OMG IDL language mapping that is applicable for the specific target language.



**Figure 1 OpenSplice DDS IDL Pre-processor High Level Processes**

## 1.2 Prerequisites

### UNIX

The OpenSplice DDS environment must be set correctly for UNIX-based platforms before the OpenSplice DDS IDL Pre-processor can be used. Run *release.com* from a shell command line to set the environment. *release.com* is located in the root directory of the OpenSplice DDS installation (*<OSPL\_HOME>*):

```
% . <OSPL_HOME>/release.com
```

The OpenSplice DDS IDL Pre-processor, *idlpp*, can be invoked by running it from a command shell:

```
% idlpp
```

The `idlpp` command line options are describe in Section 1.3, *IDL Pre-processor Command Line Options*, below.

## 1.3 IDL Pre-processor Command Line Options

The OpenSplice DDS IDL Pre-processor, `idlpp`, can be run with the following command line options:

```
[ -h ]
[ -b <ORB-template-path> ]
[ -I <path> ]
[ -D <macro>[=<definition>] ]
< -S | -C >
< -l (c | c++ | cpp | java) >
[ -o <dds-types> ]
[ -d <output-directory> ]
[ -P <dll_macro_name>[,<header_file>] ]
<filename>
```

These options are described in detail, below. Options shown between angle brackets, `<` and `>`, are mandatory. Options shown between square brackets, `[` and `]`, are optional.

- h** - List the command line options and information.
- b <ORB-template-path>** - Specifies the ORB specific path within the template path for the specialized class templates (in case the template files are ORB specific). The ORB specific template path can also be set via the environment variable `OSPL_ORB_PATH`, the command line option is however leading. To complete the path to the templates, the value of the environment variable `OSPL_TMPL_PATH` is prepended to the ORB path.
- I <path>** - Passes the include path directives to the C pre-processor.
- D <macro>** - Passes the specified macro definition to the C pre-processor.
- s** - Specifies standalone mode, which allows application programs to be build and run without involvement of any ORB. The name space for standard types will be DDS instead of the name space implied by the IDL language mapping.
- c** - Specifies ORB integrated mode, which allows application programs to be build and run integrated with an ORB.
- l (c | c++ | cpp | java)** - Selects the target language. Note that the OpenSplice DDS IDL Pre-processor does not support every combination of modes and languages. This is option is mandatory, when no language is selected the OpenSplice DDS IDL Pre-processor reports an error.

- For the Standalone mode in C (when using the **-S** flag and the **c** language option), `OSPL_ORB_PATH` will by default be set to value `SAC`, which is the default location for the standalone C specialized class template files.
- For the CORBA cohabitation mode in C++ (when using the **-C** flag and the **c++** or **cpp** language option) the `OSPL_ORB_PATH` will, by default, be set to:

**UNIX**  
**WIN**

- `CCPP/DDS_OpenFusion_1_4_1` for Unix-based platforms.
- `CCPP\DDS_OpenFusion_1_5_1` for Windows platforms.

These are the default locations for the IDL to C++ specialized class template files of the OpenFusion-Tao ORB. Class templates for other ORBS are also available in separate sub-directories of the `CCPP` directory, but for more information about using a different ORB, consult the `README` file in the `custom_lib/ccpp` directory.

- For the Standalone mode in C++ (when using the **-S** flag and the **c++** or **cpp** language option), `OSPL_ORB_PATH` will by default be set to value `SACPP`, which is the default location for the standalone C++ specialized class template files.

### Java

- For the Standalone mode in Java (when using the **-S** flag and the **java** language option), `OSPL_ORB_PATH` will by default be set to the value of `SAJ`, which is the default location for the standalone Java specialized class template files.

See Section 1.4, *OpenSplice DDS Modes and Languages*, on page 7 for the supported modes and languages.

- o **dds-types** - Enables the built-in DDS data types. In the default mode, the built-in DDS data types are not available to the application IDL definitions. When this option is activated, the built-in DDS data types will become available. Refer to Section 1.7, *Built-in DDS data types*, on page 21.
- d **<output-directory>** - Specifies the output directory for the generated code.
- P **<dll\_macro\_name>[, <header\_file>]** - This option is only available on Windows platforms. This option controls the signature for every external function/class interface. If you want to use the generated code for creating a DLL, then interfaces that need to be accessible from the outside need to be exported. When accessing these operations outside of the DLL, then these external interfaces need to be imported. In case the generated code is statically linked, this option can be omitted.

The first argument `<dll_macro_name>` specifies the text that is prepended to the signature of every external function and/or class. For example: defining `DDS_API` as the macro, the user can define this macro as



`__declspec(dllexport)` when building the DLL containing the generated code and define the macro as `__declspec(dllimport)` when using the DLL containing the generated code.

Additionally a header file can be specified, which contains controls to define the macro. For example the external interface of the generated code is exported when the macro `BUILD_MY_DLL` is defined, then this file could look like:

```
#ifdef BUILD_MY_DLL
#define DDS_API __declspec(dllexport)
#else /* !BUILD_MY_DLL */
#define DDS_API __declspec(dllimport)
#endif /* BUILD_MY_DLL */
```

**<filename>** - Specifies the IDL input file to process.

## 1.4 OpenSplice DDS Modes and Languages

The OpenSplice DDS IDL Pre-processor supports two modes:

- *Standalone* mode where the application is only used with OpenSplice DDS
- *ORB integrated* mode where the application is used with an ORB as well as with OpenSplice DDS

In a standalone context, OpenSplice DDS provides, apart from the DDS/DCPS related artifacts, all the artifacts implied by the IDL language specific mapping. In this case the used name space is DDS instead of the name space implied by the IDL language specific mapping.

In an ORB integrated context, the ORB pre-processor will provide for the artifacts implied by the IDL language specific mapping, while OpenSplice DDS only provides the DDS/DCPS related artifacts. The application data type representation provided by the ORB is also used within the OpenSplice DDS context. In this way application data types can be shared between the ORB and OpenSplice DDS within one application program.

The languages and modes that OpenSplice DDS supports are listed in *Table 1* below.

**Table 1 Supported Modes and Languages**

Language	Mode	OpenSplice Library	ORB Template Path
C	Standalone	dcpsac.so dcpsac.lib	SAC
C++	ORB Integrated	dcpsccpp.so	CCPP/DDS_OpenFusion_1_4_1 for UNIX-like platforms, and CCPP\DDS_OpenFusion_1_5_1 for the Windows platform
C++	Standalone	dcpsacpp.so	SACPP
Java	Standalone	dcpsaj.so	SAJ
The language mappings for each language are in accordance with their respective OMG Language Mapping Specifications (see <i>Bibliography</i> on page 25).			

## 1.5 IDL Pre-processor Grammar

The OpenSplice DDS IDL Pre-processor accepts the grammar which complies with the CORBA Specification. The OpenSplice DDS IDL Pre-processor accepts the complete grammar, but will ignore elements not relevant to the definition of data types. In the following specification of the grammar (similar to EBNF), elements that are processed by the OpenSplice DDS IDL Pre-processor are highlighted in ***bold italic***. Note that OpenSplice DDS does not support all base types that are specified by the OMG.

The `idlpp` also takes into account all C pre-processor directives that are common to ANSI-C, like `#include`, `#define`, `#ifdef`, etc.

```

<specification> ::= <import>* <definition>+
<definition> ::= <type_dcl> ";" | <const_dcl> ";" | <except_dcl> ";"
                | <interface> ";" | <module> ";" | <value> ";"
                | <type_id_dcl> ";" | <type_prefix_dcl> ";"
                | <event> ";" | <component> ";" | <home_dcl> ";"
<module> ::= "module" <identifier> "{" <definition>+ "}"
<interface> ::= <interface_dcl> | <forward_dcl>
<interface_dcl> ::= <interface_header> "{" <interface_body> "}"
<forward_dcl> ::= [ "abstract" | "local" ] "interface" <identifier>
<interface_header> ::= [ "abstract" | "local" ] "interface" <identifier>
                    [ <interface_inheritance_spec> ]
<interface_body> ::= <export>*
<export> ::= <type_dcl> ";" | <const_dcl> ";" | <except_dcl> ";"
            | <attr_dcl> ";" | <op_dcl> ";" | <type_id_dcl> ";"
            | <type_prefix_dcl> ";"
<interface_inheritance_spec> ::= ":" <interface_name> { "," <interface_name> }*
<interface_name> ::= <scoped_name>
<scoped_name> ::= <identifier> | ":" <identifier>
                | <scoped_name> ":" <identifier>
<value> ::= (<value_dcl> | <value_abs_dcl> | <value_box_dcl>
            | <value_forward_dcl>)
<value_forward_dcl> ::= [ "abstract" ] "valuetype" <identifier>
<value_box_dcl> ::= "valuetype" <identifier> <type_spec>
<value_abs_dcl> ::= "abstract" "valuetype" <identifier> [ <value_inheritance_spec> ]
                "{" <export>* "}"
<value_dcl> ::= <value_header> "{" <value_element>* "}"
<value_header> ::= [ "custom" ] "valuetype" <identifier> [ <value_inheritance_spec> ]

```

```

<value_inheritance_spec> ::= [ ":" [ "truncatable" ] <value_name> { "," <value_name> }* ]
                           [ "supports" <interface_name> { "," <interface_name> }* ]

<value_name>              ::= <scoped_name>

<value_element>           ::= <export> | <state_member> | <init_dcl>

<state_member>            ::= ("public" | "private")<type_spec> <declarators>;"

<init_dcl>                ::= "factory" <identifier> "(" [ <init_param_decls> ]
                           ")" [ <raises_expr> ] ";"

<init_param_decls>        ::= <init_param_decl> { "," <init_param_decl> }*

<init_param_decl>         ::= <init_param_attribute> <param_type_spec> <simple_declarator>

<init_param_attribute>    ::= "in"

<const_dcl>               ::= "const" <const_type> <identifier> "=" <const_exp>

<const_type>              ::= <integer_type> | <char_type> | <wide_char_type> |
                           <boolean_type> | <floating_pt_type> | <string_type> |
                           <wide_string_type> | <fixed_pt_const_type> | <scoped_name> |
                           <octet_type>

<const_exp>               ::= <or_expr>

<or_expr>                 ::= <xor_expr> | <or_expr> "/" <xor_expr>

<xor_expr>                 ::= <and_expr> | <xor_expr> "^" <and_expr>

<and_expr>                 ::= <shift_expr> | <and_expr> "&" <shift_expr>

<shift_expr>              ::= <add_expr> | <shift_expr> ">>" <add_expr>
                           | <shift_expr> "<<" <add_expr>

<add_expr>                 ::= <mult_expr> | <add_expr> "+" <mult_expr> |
                           <add_expr> "-" <mult_expr>

<mult_expr>                ::= <unary_expr> | <mult_expr> "*" <unary_expr> |
                           <mult_expr> "/" <unary_expr> | <mult_expr> "%" <unary_expr>

<unary_expr>               ::= <unary_operator> <primary_expr> | <primary_expr>

<unary_operator>           ::= "-" | "+" | "~"

```

<primary_expr>	::= <scoped_name>   <literal>   "(" <const_exp> ")"
<literal>	::= <integer_literal>   <string_literal>   <wide_string_literal>   <character_literal>   <wide_character_literal>   <fixed_pt_literal>   <floating_pt_literal>   <boolean_literal>
<boolean_literal>	::= "TRUE"   "FALSE"
<positive_int_const>	::= <const_exp>
<type_dcl>	::= "typedef" <type_declarator>   <struct_type>   <union_type>   <enum_type>   "native" <simple_declarator>   <constr_forward_decl>
<type_declarator>	::= <type_spec> <declarators>
<type_spec>	::= <simple_type_spec>   <constr_type_spec>
<simple_type_spec>	::= <base_type_spec>   <template_type_spec>   <scoped_name>
<base_type_spec>	::= <floating_pt_type>   <integer_type>   <char_type>   <wide_char_type>   <boolean_type>   <octet_type>   <any_type>   <object_type>   <value_base_type>
<template_type_spec>	::= <sequence_type>   <string_type>   <wide_string_type>   <fixed_pt_type>
<constr_type_spec>	::= <struct_type>   <union_type>   <enum_type>
<declarators>	::= <declarator> { "," <declarator> }*
<declarator>	::= <simple_declarator>   <complex_declarator>
<simple_declarator>	::= <identifier>
<complex_declarator>	::= <array_declarator>
<floating_pt_type>	::= "float"   "double"   "long" "double"
<integer_type>	::= <signed_int>   <unsigned_int>
<signed_int>	::= <signed_short_int>   <signed_long_int>   <signed_longlong_int>

<signed_short_int>	::= <b>"short"</b>
<signed_long_int>	::= <b>"long"</b>
<signed_longlong_int>	::= <b>"long" "long"</b>
<unsigned_int>	::= <b>&lt;unsigned_short_int&gt;   &lt;unsigned_long_int&gt;</b> <b>  &lt;unsigned_longlong_int&gt;</b>
<unsigned_short_int>	::= <b>"unsigned" "short"</b>
<unsigned_long_int>	::= <b>"unsigned" "long"</b>
<unsigned_longlong_int>	::= <b>"unsigned" "long" "long"</b>
<char_type>	::= <b>"char"</b>
<wide_char_type>	::= <b>"wchar"</b>
<boolean_type>	::= <b>"boolean"</b>
<octet_type>	::= <b>"octet"</b>
<any_type>	::= <b>"any"</b>
<object_type>	::= <b>"Object"</b>
<struct_type>	::= <b>"struct" &lt;identifier&gt; "{" &lt;member_list&gt; "}"</b>
<member_list>	::= <b>&lt;member&gt;+</b>
<member>	::= <b>&lt;type_spec&gt; &lt;declarators&gt; ";"</b>
<union_type>	::= <b>"union" &lt;identifier&gt; "switch" "(" &lt;switch_type_spec&gt; ")"</b> <b>"{" &lt;switch_body&gt; "}"</b>
<switch_type_spec>	::= <b>&lt;integer_type&gt;   &lt;char_type&gt;   &lt;boolean_type&gt;</b> <b>  &lt;enum_type&gt;   &lt;scoped_name&gt;</b>
<switch_body>	::= <b>&lt;case&gt;+</b>
<case>	::= <b>&lt;case_label&gt;+ &lt;element_spec&gt; ";"</b>
<case_label>	::= <b>"case" &lt;const_exp&gt; ":"   "default" ":"</b>
<element_spec>	::= <b>&lt;type_spec&gt; &lt;declarator&gt;</b>

<enum_type>	::= "enum" <identifier> "{" <enumerator> { "," <enumerator> }* "}"
<enumerator>	::= <identifier>
<sequence_type>	::= "sequence" "<" <simple_type_spec> "," <positive_int_const> >"   "sequence" "<" <simple_type_spec> ">"
<string_type>	::= "string" "<" <positive_int_const> ">"   "string"
<wide_string_type>	::= "wstring" "<" <positive_int_const> ">"   "wstring"
<array_declarator>	::= <identifier> <fixed_array_size>+
<fixed_array_size>	::= "[" <positive_int_const> "]"
<attr_dcl>	::= <readonly_attr_spec>   <attr_spec>
<except_dcl>	::= "exception" <identifier> "{" <member>* "}"
<op_dcl>	::= [ <op_attribute> ] <op_type_spec> <identifier> <parameter_dcls> [ <raises_expr> ] [ <context_expr> ]
<op_attribute>	::= "oneway"
<op_type_spec>	::= <param_type_spec>   "void"
<parameter_dcls>	::= "(" <param_dcl> { "," <param_dcl> }* ")"   "(" ")"
<param_dcl>	::= <param_attribute> <param_type_spec> <simple_declarator>
<param_attribute>	::= "in"   "out"   "inout"
<raises_expr>	::= "raises" "(" <scoped_name> { "," <scoped_name> }* ")"
<context_expr>	::= "context" "(" <string_literal> { "," <string_literal> }* ")"
<param_type_spec>	::= <base_type_spec>   <string_type>   <wide_string_type>   <scoped_name>
<fixed_pt_type>	::= "fixed" "<" <positive_int_const> "," <positive_int_const> ">"
<fixed_pt_const_type>	::= "fixed"
<value_base_type>	::= "ValueBase"
<constr_forward_decl>	::= "struct" <identifier>   "union" <identifier>

```

<import> ::= "import" <imported_scope> ";"
<imported_scope> ::= <scoped_name> | <string_literal>
<type_id_dcl> ::= "typeid" <scoped_name> <string_literal>
<type_prefix_dcl> ::= "typeprefix" <scoped_name> <string_literal>
<readonly_attr_spec> ::= "readonly" "attribute" <param_type_spec>
    <readonly_attr_declarator>
<readonly_attr_declarator> ::= <simple_declarator> <raises_expr>
    | <simple_declarator> { ",", <simple_declarator> }*
<attr_spec> ::= "attribute" <param_type_spec> <attr_declarator>
<attr_declarator> ::= <simple_declarator> <attr_raises_expr>
    | <simple_declarator> { ",", <simple_declarator> }*
<attr_raises_expr> ::= <get_excep_expr> [ <set_excep_expr> ]
    | <set_excep_expr>
<get_excep_expr> ::= "getraises" <exception_list>
<set_excep_expr> ::= "setraises" <exception_list>
<exception_list> ::= "(" <scoped_name> { ",", <scoped_name> } * ")"
<component> ::= <component_dcl> | <component_forward_dcl>
<component_forward_dcl> ::= "component" <identifier>
<component_dcl> ::= <component_header> "{" <component_body> "}"
<component_header> ::= "component" <identifier> [ <component_inheritance_spec> ]
    [ <supported_interface_spec> ]
<supported_interface_spec> ::= "supports" <scoped_name> { ",", <scoped_name> }*
<component_inheritance_spec> ::= ":" <scoped_name>
<component_body> ::= <component_export>*
<component_export> ::= <provides_dcl> ";" | <uses_dcl> ";" | <emits_dcl> ";"
    | <publishes_dcl> ";" | <consumes_dcl> ";" | <attr_dcl> ";"
<provides_dcl> ::= "provides" <interface_type> <identifier>

```



```

<interface_type> ::= <scoped_name> | "Object"
<uses_dcl> ::= "uses" [ "multiple" ] <interface_type> <identifier>
<emits_dcl> ::= "emits" <scoped_name> <identifier>
<publishes_dcl> ::= "publishes" <scoped_name> <identifier>
<consumes_dcl> ::= "consumes" <scoped_name> <identifier>
<home_dcl> ::= <home_header> <home_body>
<home_header> ::= "home" <identifier> [ <home_inheritance_spec> ]
               [ <supported_interface_spec> ] "manages" <scoped_name>
               [ <primary_key_spec> ]
<home_inheritance_spec> ::= ":" <scoped_name>
<primary_key_spec> ::= "primarykey" <scoped_name>
<home_body> ::= "{" <home_export>* "}"
<home_export> ::= <export> | <factory_dcl> ";" | <finder_dcl> ";"
<factory_dcl> ::= "factory" <identifier> "(" [ <init_param_decls> ] ")"
               [ <raises_expr> ]
<finder_dcl> ::= "finder" <identifier> "(" [ <init_param_decls> ] ")"
               [ <raises_expr> ]
<event> ::= (<event_dcl> | <event_abs_dcl> | <event_forward_dcl>)
<event_forward_dcl> ::= [ "abstract" ] "eventtype" <identifier>
<event_abs_dcl> ::= "abstract" "eventtype" <identifier>
               [ <value_inheritance_spec> ] "{" <export>* "}"
<event_dcl> ::= <event_header> "{" <value_element>* "}"
<event_header> ::= [ "custom" ] "eventtype" <identifier>
               [ <value_inheritance_spec> ]
<identifier> ::= Arbitrarily long sequence of ASCII alphabetic, numeric and underscore chara
               first character must be ASCII alphabetic. All characters are significant. An
               may be escaped with a prepended underscore character to prevent collisions
               IDL keywords. The underscore does not appear in the generated output.

```

### 1.5.1 Key Definitions

The OpenSplice DDS IDL Pre-processor also provides a mechanism to define a list of keys (space or comma separated) with a specific data type. The syntax for that definition is:

```
#pragma keylist <data-type-name> <key>*
```

The identifier `<data-type-name>` is the identification of a struct or a union definition.

The identifier `<key>` is the member of a struct. For a struct either no key list is defined, in which case no specialized interfaces (`TypeSupport`, `DataReader` and `DataWriter`) are generated for the struct, or a key list with or without keys is defined, in which case the specialized interfaces are generated for the struct. For a union either no key list is defined, in which case no specialized interfaces are generated for the union, or a key list without keys is defined, in which case the specialized interfaces are generated for the union. It is not possible to define keys for a union because a union case may only be addressed when the discriminant is set accordingly, nor is it possible to address the discriminant of a union. The keylist must be defined in the same name scope or module as the referred struct or union.

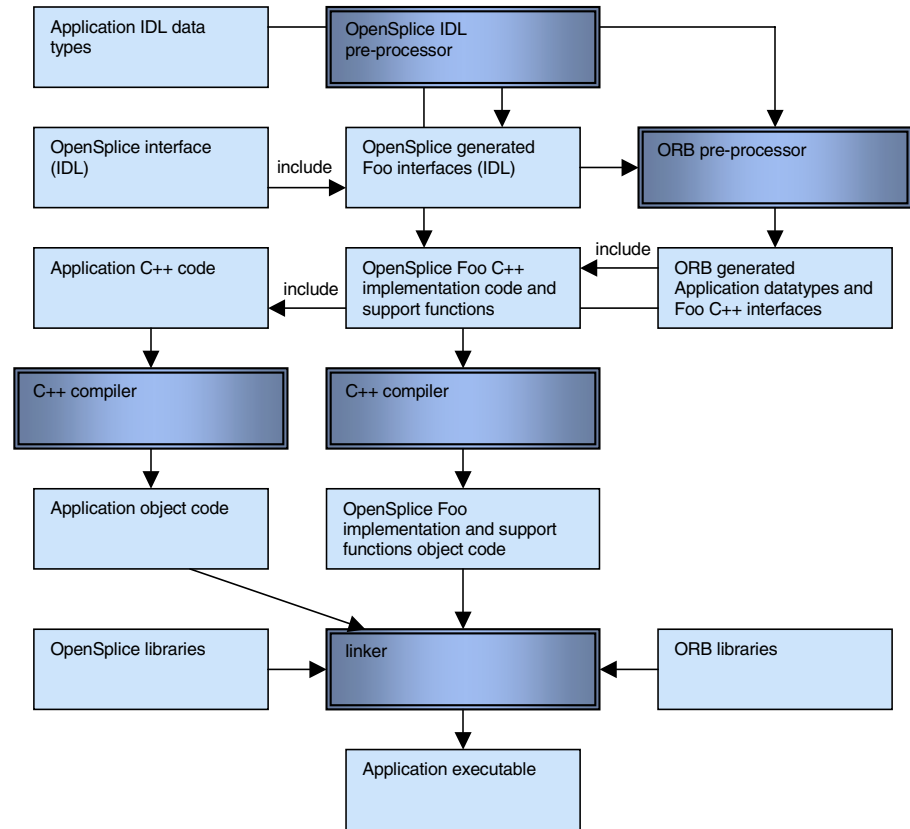
## 1.6 Modes, Languages and Processing steps

### 1.6.1 Integrated C++ ORB

The generic diagram for the ORB integrated C++ context is shown in *Figure 2*. The OpenSplice DDS IDL Pre-processor generates IDL code for the specialized `TypeSupport`, `DataReader` and `DataWriter`, as well as C++ implementations and support code. The ORB pre-processor generates from the generated IDL interfaces the C++ specialized interfaces for that specific ORB. These interfaces are included by the application C++ code as well as the OpenSplice DDS generated specialized C++ implementation code. The application C++ code as well as the specialized C++ implementation code (with the support functions) is compiled into object code and linked together with the applicable OpenSplice libraries and the ORB libraries.

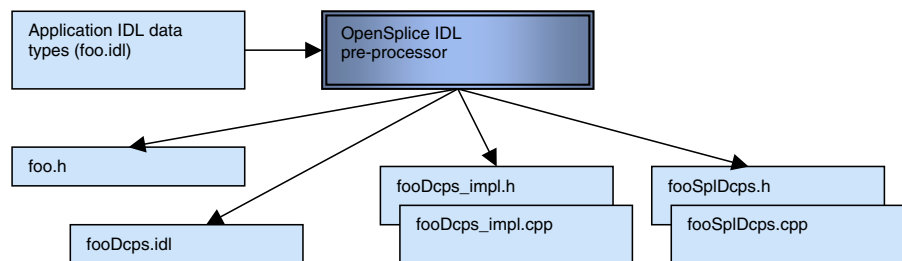
*i*

OpenSplice DDS libraries are provided for linking with TAO OpenFusion. However the source code of the C++ API is also available to build against your own ORB and/or compiler version.



**Figure 2 Integrated C++ ORB**

The role of the OpenSplice DDS IDL Pre-processor functionality is expanded in *Figure 3*. It shows in more detail which files are generated, given an input file (in this example *foo.idl*).



**Figure 3 Integrated C++ ORB OpenSplice DDS IDL Pre-processor Details**

The file *foo.h* is the only file that needs to be included by the application. It includes all files needed by the application to interact with the DCPS interface.

The file *fooDcps.idl* is an IDL definition of the specialized `TypeSupport`, `DataReader` and `DataWriter` interfaces, which will be used to generate ORB specific C++ interface files.

The *fooDcps\_impl.\** files contain the specialized `TypeSupport`, `DataReader` and `DataWriter` implementation classes needed to communicate the type via OpenSplice DDS.

The *fooSplDcps.\** files contain support functions required by OpenSplice DDS in order to be able to handle the specific data types.

## 1.6.2 C++ Standalone

The C++ standalone mode provides an OpenSplice DDS context which does not need an ORB. OpenSplice DDS resolves all implied IDL to C++ language mapping functions and requirements. The only difference when using the standalone mode is that DDS is used as the naming scope for definitions and functions instead of the CORBA naming scope<sup>1</sup>.

*Figure 4* is an overview of the artifacts and processing stages related to the C standalone context. For C++ the different stages are equal to the C standalone context. Because there is no ORB involved, all pre-processing is performed by the OpenSplice DDS IDL Pre-processor. The generated specialized implementations and the application's C++ code must be compiled into object code, plus all objects must be linked with the appropriate OpenSplice DDS libraries.

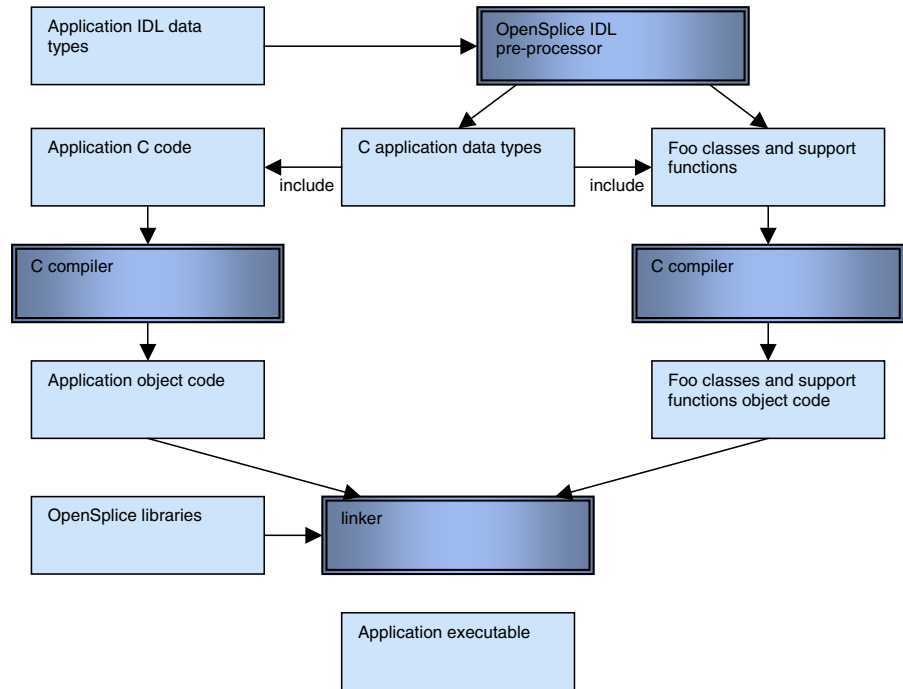
## 1.6.3 C Standalone

The C standalone mode provides an OpenSplice DDS context which does not need an ORB. OpenSplice DDS resolves all implied IDL to C language mapping functions and requirements. The only difference when using the standalone mode is that DDS is used as the naming scope for definitions and functions.

*Figure 4* shows an overview of the artifacts and processing stages related to the C standalone context. Because there is no ORB involved, all the pre-processing is done by the OpenSplice DDS IDL Pre-processor. The generated specialized class implementations and the application's C code must be compiled into object code, plus all objects must be linked with the appropriate OpenSplice DDS libraries.

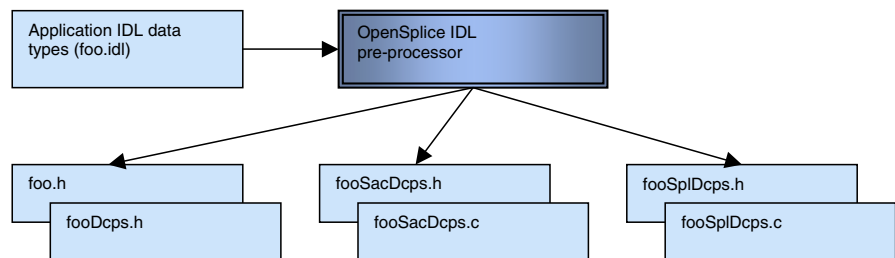
---

1. The CORBA namespace is still supported, for compatibility purposes.



**Figure 4 C Standalone**

The role of the OpenSplice DDS IDL Pre-processor functionality is expanded in *Figure 5*, providing more detail about the files generated when provided with an input file (*foo.idl* this example).



**Figure 5 C Standalone OpenSplice DDS IDL Pre-processor Details**

The file *foo.h* is the only file that needs to be included by the application. It itself includes all necessary files needed by the application in order to interact with the DCPS interface.

The file *fooDcps.h* contains all definitions related to the IDL input file in accordance with the OMG's *C Language Mapping Specification* (IDL to C).

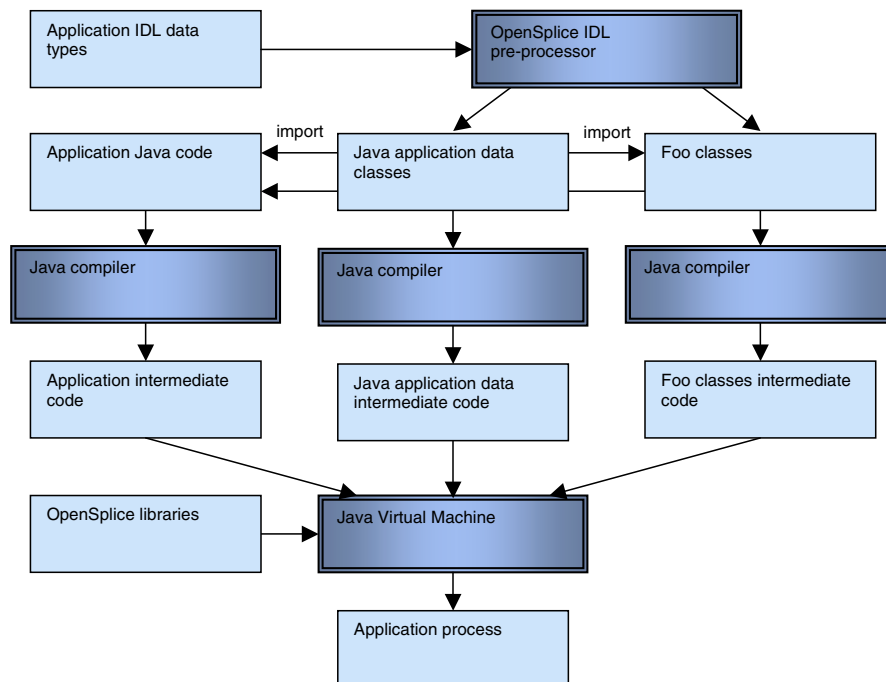
The *fooSacDcps.\** files contain the specialized TypeSupport, DataReader and DataWriter classes needed to communicate the type via OpenSplice DDS.

The *fooSplDcps.\** files contain support functions required by OpenSplice DDS in order to be able to handle the specific data types.

### 1.6.4 Java Standalone

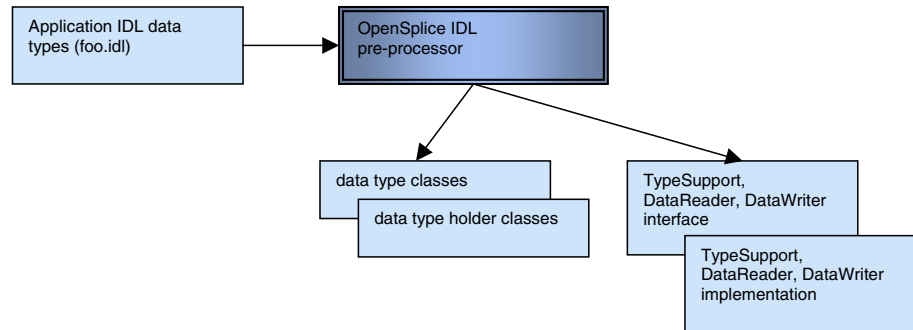
The Java standalone mode provides a OpenSplice DDS context without the need of an ORB, which still enables portability of application code because all IDL Java language mapping implied functions and requirements are resolved by OpenSplice DDS.

Figure 6 shows an overview of the artifacts and processing stages related to the Java standalone context. The OpenSplice DDS IDL Pre-processor generates the application data classes from IDL according the language mapping. The OpenSplice DDS IDL Pre-processor additionally generates classes for the specialized TypeSupport, DataReader and DataWriter interfaces. All generated code must be compiled with the Java compiler as well as the application Java code.



**Figure 6 Java Standalone**

The role of the OpenSplice DDS IDL Pre-processor functionality is more magnified in Figure 7. It shows in more detail which files are generated based upon input file (in this example *foo.idl*).



**Figure 7 Java Standalone OpenSplice IDL Pre-Processor Details**

## 1.7 Built-in DDS data types

The OpenSplice DDS IDL Pre-processor and the OpenSplice DDS runtime system supports the following DDS data types to be used in application IDL definitions:

- `Duration_t`
- `Time_t`

When building C or Java application programs, no special actions have to be taken other than enabling the OpenSplice DDS IDL Pre-processor built-in DDS data types using the `-o dds-types` option.

For C++, however, attention must be paid to the ORB IDL compiler, which is also involved in the application building process. The ORB IDL compiler is not aware of any DDS data types, so the supported DDS types must be provided by means of inclusion of an IDL file (`dds_dcps.idl`) that defines these types. This file must *not* be included for the OpenSplice DDS IDL Pre-processor, which has the type definitions built-in. Therefore `dds_dcps.idl` must be included conditionally. The condition can be controlled via the macro definition `OSPL_IDL_COMPILER`, which is defined when the OpenSplice DDS IDL Pre-processor is invoked, but not when the ORB IDL compiler is invoked:

```

#ifndef OSPL_IDL_COMPILER
#include <dds_dcps.idl>
#endif

module example {
    struct example_struct {
        Time_t time;
    };
};

```

The ORB IDL compiler must be called with the `-I$OSPL_HOME/etc/idlpp` option in order to define the include path for the `dds_dcps.idl` file. The OpenSplice DDS IDL Pre-processor must be called without this option.



A close-up, low-angle photograph of a computer keyboard, focusing on the central and right-hand keys. The keys are white with dark lettering. A white grid of thin lines is superimposed over the entire image, creating a geometric pattern. The lighting is soft, and the overall color palette is muted, with a slight purple or blue tint. The word "BIBLIOGRAPHY" is centered in the upper half of the image in a dark blue, serif font.

# BIBLIOGRAPHY



# Bibliography

The following documents are referred to in the text:

- [1] *Data Distribution Service for Real-Time Systems Specification*, Final Adopted Specification, ptc/04-04-12, Object Management Group (OMG).
- [2] *The Common Object Request Broker: Architecture and Specification*, Version 3.0, formal/02-06-01, OMG
- [3] *C Language Mapping Specification*, Version 1.0, formal/99-07-35, OMG
- [4] *C++ Language Mapping Specification*, Version 1.1, formal/03-06-03, OMG
- [5] *Java Language Mapping Specification*, Version 1.2, formal/02-08-05, OMG



A close-up, low-angle photograph of a computer keyboard, focusing on the central and right-hand keys. The keys are white with dark lettering. A white grid pattern is overlaid on the image, creating a sense of depth and perspective. The lighting is soft, highlighting the texture of the keys and the grid lines.

# GLOSSARY



# Glossary

## *Acronyms*

<i>Acronym</i>	<i>Meaning</i>
ASCII	American Standard Code for Information Interchange
BOF	Business Object Facility
CORBA	Common Object Request Broker Architecture
COS	Common Object Services
DCPS	Data Centric Publish Subscribe
DDS	Data Distribution System
EBNF	Extended Backus-Naur Format
IDL	Interface Definition Language
OMG	Object Management Group
ORB	Object Request Broker





A close-up, low-angle photograph of a computer keyboard, focusing on the central and lower-right keys. The keys are white with dark lettering. A white grid pattern is overlaid on the entire image, creating a sense of depth and perspective. The lighting is soft, highlighting the texture of the keys and the grid lines.

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