USE OF SPECIFICATION – TERMS, CONDITIONS & NOTICES
The material in this document details an Object Management Group specification in accordance with the terms, conditions and notices set forth below. This document does not represent a commitment to implement any portion of this specification in any company's products. The information contained in this document is subject to change without notice.

LICENSES
The companies listed above have granted to the Object Management Group, Inc. (OMG) a nonexclusive, royalty-free, paid up, worldwide license to copy and distribute this document and to modify this document and distribute copies of the modified version. Each of the copyright holders listed above has agreed that no person shall be deemed to have infringed the copyright in the included material of any such copyright holder by reason of having used the specification set forth herein or having conformed any computer software to the specification.

Subject to all of the terms and conditions below, the owners of the copyright in this specification hereby grant you a fully-paid up, non-exclusive, nontransferable, perpetual, worldwide license (without the right to sublicense), to use this specification to create and distribute software and special purpose specifications that are based upon this specification, and to use, copy, and distribute this specification as provided under the Copyright Act; provided that: (1) both the copyright notice identified above and this permission notice appear on any copies of this specification; (2) the use of the specifications is for informational purposes and will not be copied or posted on any network computer or broadcast in any media and will not be otherwise resold or transferred for commercial purposes; and (3) no modifications are made to this specification. This limited permission automatically terminates without notice if you breach any of these terms or conditions. Upon termination, you will destroy immediately any copies of the specifications in your possession or control.

PATENTS
The attention of adopters is directed to the possibility that compliance with or adoption of OMG specifications may require use of an invention covered by patent rights. OMG shall not be responsible for identifying patents for which a license may be required by any OMG specification, or for conducting legal inquiries into the legal validity or scope of those patents that are brought to its attention. OMG specifications are prospective and advisory only. Prospective users are responsible for protecting themselves against liability for infringement of patents.

GENERAL USE RESTRICTIONS
Any unauthorized use of this specification may violate copyright laws, trademark laws, and communications regulations and statutes. This document contains information which is protected by copyright. All Rights Reserved. No part of this work covered by copyright herein may be reproduced or used in any form or by any means--graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems--without permission of the copyright owner.

DISCLAIMER OF WARRANTY
WHILE THIS PUBLICATION IS BELIEVED TO BE ACCURATE, IT IS PROVIDED "AS IS" AND MAY CONTAIN ERRORS OR MISPRINTS. THE OBJECT MANAGEMENT GROUP AND THE COMPANIES LISTED ABOVE MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS PUBLICATION, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF TITLE OR OWNERSHIP, IMPLIED WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR
USE. IN NO EVENT SHALL THE OBJECT MANAGEMENT GROUP OR ANY OF THE COMPANIES LISTED ABOVE BE LIABLE FOR ERRORS CONTAINED HEREIN OR FOR DIRECT, INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL, RELIANCE OR COVER DAMAGES, INCLUDING LOSS OF PROFITS, REVENUE, DATA OR USE, INCURRED BY ANY USER OR ANY THIRD PARTY IN CONNECTION WITH THE FURNISHING, PERFORMANCE, OR USE OF THIS MATERIAL, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

The entire risk as to the quality and performance of software developed using this specification is borne by you. This disclaimer of warranty constitutes an essential part of the license granted to you to use this specification.

RESTRICTED RIGHTS LEGEND
Use, duplication or disclosure by the U.S. Government is subject to the restrictions set forth in subparagraph (c) (1) (ii) of The Rights in Technical Data and Computer Software Clause at DFARS 252.227-7013 or in subparagraph (c)(1) and (2) of the Commercial Computer Software - Restricted Rights clauses at 48 C.F.R. 52.227-19 or as specified in 48 C.F.R. 227-7202-2 of the DoD F.A.R. Supplement and its successors, or as specified in 48 C.F.R. 12.212 of the Federal Acquisition Regulations and its successors, as applicable. The specification copyright owners are as indicated above and may be contacted through the Object Management Group, 9C Medway Road, PMB 274, Milford MA 01757, U.S.A.

TRADEMARKS
CORBA®, CORBA logos®, FIBO®, Financial Industry Business Ontology®, FINANCIAL INSTRUMENT GLOBAL IDENTIFIER®, IIOP®, IMM®, Model Driven Architecture®, MDA®, Object Management Group®, OMG®, OMG Logo®, SoaML®, SOAML®, SysML®, UAF®, Unified Modeling Language®, UML®, UML Cube Logo®, VSIPL®, and XMI® are registered trademarks of the Object Management Group, Inc.

For a complete list of trademarks, see: https://www.omg.org/legal/tm_list.htm. All other products or company names mentioned are used for identification purposes only, and may be trademarks of their respective owners.

COMPLIANCE
The copyright holders listed above acknowledge that the Object Management Group (acting itself or through its designees) is and shall at all times be the sole entity that may authorize developers, suppliers and sellers of computer software to use certification marks, trademarks or other special designations to indicate compliance with these materials.

Software developed under the terms of this license may claim compliance or conformance with this specification if and only if the software compliance is of a nature fully matching the applicable compliance points as stated in the specification. Software developed only partially matching the applicable compliance points may claim only that the software was based on this specification, but may not claim compliance or conformance with this specification. In the event that testing suites are implemented or approved by Object Management Group, Inc., software developed using this specification may claim compliance or conformance with the specification only if the software satisfactorily completes the testing suites.
OMG's Issue Reporting Procedure

All OMG specifications are subject to continuous review and improvement. As part of this process we encourage readers to report any ambiguities, inconsistencies, or inaccuracies they may find by completing the Issue Reporting Form listed on the main web page https://www.omg.org, under Documents, Report a Bug/Issue.
# Table of Contents

1 Scope..................................................................................................................1
2 Conformance.............................................................................................................1
3 Normative References.............................................................................................1
4 Terms and Definitions..............................................................................................1
5 Symbols....................................................................................................................2
6 Additional Information..........................................................................................3
   6.1 Changes to Adopted OMG Specifications......................................................3
   6.2 Acknowledgments..............................................................................................3
7 IDL to Java Language Mapping..............................................................................5
   7.1 General..................................................................................................................5
   7.1.1 Names..............................................................................................................5
   7.1.2 Reserved Names..............................................................................................7
   7.1.3 Holder class.....................................................................................................8
   7.1.4 Java Language Version Requirements.........................................................8
   7.1.5 Code Examples...............................................................................................8
   7.2 Core Data Types..................................................................................................9
   7.2.1 IDL Specification............................................................................................9
   7.2.2 Modules...........................................................................................................9
   7.2.3 Constants.......................................................................................................9
   7.2.4 Data Types.....................................................................................................11
   7.3 Any.......................................................................................................................21
   7.4 Interfaces – Basic................................................................................................21
   7.4.1 Exceptions.....................................................................................................22
   7.4.2 Interface Forward Declaration.......................................................................23
   7.5 Interfaces – Full...................................................................................................23
   7.6 Value Types.......................................................................................................24
   7.7 CORBA-Specific – Interfaces...........................................................................25
   7.8 CORBA-Specific – Value Types.......................................................................25
   7.9 Components – Basic..........................................................................................25
   7.10 Components – Homes......................................................................................25
   7.11 CCM-Specific....................................................................................................25
   7.12 Components – Ports and Connectors..............................................................25
   7.13 Template Modules............................................................................................26
   7.14 Extended Data Types.......................................................................................26
   7.14.1 Structures with Single Inheritance...............................................................26
   7.14.2 Union Discriminators..................................................................................26
   7.14.3 Additional Template Types..........................................................................26
   7.15 Anonymous Types............................................................................................29
   7.16 Annotations.......................................................................................................29
   7.16.1 Defining Annotations...................................................................................29
   7.16.2 Applying User-Defined Annotations.........................................................30
   7.17 Standardized Annotations................................................................................31
   7.17.1 Group of Annotations: General Purpose....................................................32
   7.17.2 Group of Annotations: Data Modeling.......................................................32
   7.17.3 Group of Annotations: Units and Ranges....................................................32

IDL4 to Java Language Mapping 1.0
Table of Tables

Table 2.1: Conformance Points.......................................................................................................................... 1
Table 5.1: Acronyms............................................................................................................................................. 2
Table 7.1: Java Language Versions and Features................................................................................................. 8
Table 7.2: Mapping of Integer Types.................................................................................................................... 11
Table 7.3: Floating-Point Types Mapping............................................................................................................ 11
Table 7.4: Mapping of Sequences of Basic Types................................................................................................. 12
Table 7.5: Mapping of Map key type..................................................................................................................... 27
Table 7.6: General Purpose Annotation Impact.................................................................................................. 32
Table 7.7: Data Modeling Annotation Impact...................................................................................................... 32
Table 7.8: Units And Ranges Annotation Impact................................................................................................. 33
Table 7.9: Data Implementation Annotation Impact............................................................................................. 33
Table 7.10: Code Generation Annotation Impact................................................................................................ 33
Table 7.11: Interface Annotation Impact........................................................................................................... 34
Table 8.1: Type Identifier and Member Name Mapping According to apply_naming_convention Value......... 35
Table 8.2: Mapping of Integer Types According to promote_integer_width....................................................... 37
Table B.1: Building Block Traceability Matrix..................................................................................................... 43
Preface

OMG

Founded in 1989, the Object Management Group, Inc. (OMG) is an open membership, not-for-profit computer industry standards consortium that produces and maintains computer industry specifications for interoperable, portable, and reusable enterprise applications in distributed, heterogeneous environments. Membership includes Information Technology vendors, end users, government agencies, and academia.

OMG member companies write, adopt, and maintain its specifications following a mature, open process. OMG’s specifications implement the Model Driven Architecture® (MDA®), maximizing ROI through a full-lifecycle approach to enterprise integration that covers multiple operating systems, programming languages, middleware and networking infrastructures, and software development environments. OMG’s specifications include: UML® (Unified Modeling Language®); CORBA® (Common Object Request Broker Architecture); CWM™ (Common Warehouse Metamodel™); and industry-specific standards for dozens of vertical markets.

More information on the OMG is available at https://www.omg.org/.

OMG Specifications

As noted, OMG specifications address middleware, modeling and vertical domain frameworks. All OMG Specifications are available from the OMG website at:

https://www.omg.org/spec

All of OMG’s formal specifications may be downloaded without charge from our website. (Products implementing OMG specifications are available from individual suppliers.) Copies of specifications, available in PostScript and PDF format, may be obtained from the Specifications Catalog cited above or by contacting the Object Management Group, Inc. at:

OMG Headquarters
9C Medway Road
PMB 274
Milford, MA 01757
USA

Tel: +1-781-444-0404
Fax: +1-781-444-0320
Email: pubs@omg.org

Certain OMG specifications are also available as ISO standards. Please consult https://www.iso.org

Issues

The reader is encouraged to report any technical or editing issues/problems with this specification by completing the Issue Reporting Form listed on the main web page https://www.omg.org, under Documents, Report a Bug/Issue.
1 Scope

This specification defines the mapping of OMG Interface Definition Language v4 [IDL4] to the Java programming language. The language mapping covers all of the IDL constructs in the current Interface Definition Language specification (https://www.omg.org/spec/IDL) with the exception of middleware specific constructs that are better addressed in separate specifications. The language mapping makes use of modern Java language features as appropriate and natural.

2 Conformance

Conformance to this specification can be considered from two perspectives:

1. implementations (for example, a tool [compiler] that applies the mapping to generate Java source code from IDL); and
2. users (for example, application source code that interacts with the Java source code generated by a compiler).

Table 2.1: Conformance Points

<table>
<thead>
<tr>
<th>Implementation</th>
<th>A conformant implementation shall transform IDL input into Java source code output as specified in clause 7.</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>Application source code that conforms to this specification makes use of the Java data types and API’s as defined in clause 7. Conformant application source code must make no assumptions about the underlying implementation or utilize any unspecified API or behavior beyond what is specified in the language mapping. Conformant application source code, as a result, will be portable across implementations.</td>
</tr>
</tbody>
</table>

3 Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.


4 Terms and Definitions

For the purposes of this specification, the following terms and definitions apply.
Building Block
A Building Block is a consistent set of IDL rules that together form a piece of IDL functionality. Building blocks are atomic, meaning that if selected, they must be totally supported. Building blocks are described in [IDL4] clause 7, IDL Syntax and Semantics.

Camel Case
A naming convention that represents phrases composed of multiple words using a single word where spaces and punctuation are removed, and every word begins with a capital letter.

In this specification, the term Camel Case refers to the variation of Camel Case commonly known as Lower Camel Case, where the first letter is not capitalized. For example, the Camel Case representation of “these are my words” would be “theseAreMyWords”.

Java
Java is a general-purpose computer programming language.

Language Mapping
An association of elements in one language to elements in another language (from IDL to Java, in this case) that facilitates a transformation from one language to another.

Pascal Case
Also known as Upper Camel Case, is a variation of Camel Case where the first letter is capitalized. For example, the Pascal Case representation of the phrase “these are my words” would be “TheseAreMyWords”.

5 Symbols
The following acronyms are used in this specification.

<table>
<thead>
<tr>
<th>Table 5.1: Acronyms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acronym</strong></td>
</tr>
<tr>
<td>CCM</td>
</tr>
<tr>
<td>CORBA</td>
</tr>
<tr>
<td>DDS</td>
</tr>
<tr>
<td>J2SE</td>
</tr>
<tr>
<td>IDL</td>
</tr>
<tr>
<td>OMG</td>
</tr>
</tbody>
</table>
6 Additional Information

6.1 Changes to Adopted OMG Specifications
This specification is an alternative to the existing OMG IDL to Java Mapping specification; it is distinct in that it provides a mapping for the constructs of IDL4, and the mapping exploits newer Java language features.

6.2 Acknowledgments
The following companies submitted this specification:

- ADLINK Technology Ltd.
- Real-Time Innovations, Inc.
- Twin Oaks Computing, Inc.

The following companies supported this specification:

- Kongsberg Defence & Aerospace
- Object Computing, Inc.
7 IDL to Java Language Mapping

7.1 General

7.1.1 Names

IDL member names and type identifiers shall map to equivalent Java names and identifiers. This specification defines two naming schemes that determine the name transformation behavior:

- **IDL Naming Scheme** (defined in Clause 7.1.1.1), which preserves the naming conventions of the original IDL names and type identifiers.
- **Java Naming Scheme** (defined in Clause 7.1.1.2), which transforms names and type identifiers to follow the naming conventions of the Java programming language.

The `@java_mapping` annotation defined in Clause 8.1 provides a mechanism to select the appropriate naming scheme. Implementations of this specification may also provide custom compiler settings or compiler parameters for such purpose.

Regardless of the naming scheme of choice, if a mapped name or identifier collides with one of the names reserved in Clause 7.1.2, the collision shall be resolved by prepending an underscore ("_") to the mapped name.

NOTE—Name conflict resolutions also apply to name collisions caused by compiler-specific settings, such as those that enable users to customize Java package prefixes. In such cases, conflicting attributes in generated code should also be resolved prepending a leading underscore ("_").

### 7.1.1.1 IDL Naming Scheme

IDL member names and type identifiers shall map to Java names and identifiers without case transformation, maintaining the original IDL names.

Table 8.1 (apply_naming_convention = IDL_NAMING_CONVENTION column) defines the name mapping for every IDL construct according to the naming scheme.

### 7.1.1.2 Java Naming Scheme

IDL member names and type identifiers shall map to Java names and identifiers that follow the coding guidelines defined in the JavaBeans 1.01 [JavaBeans] specification.

Table 8.1 (apply_naming_convention = JAVA_NAMING_CONVENTION column) defines the name mapping for every IDL construct according to this naming scheme. Most of the rules defined in Table 8.1 require transforming IDL names into Pascal Case, Camel Case, All Uppercase, or All Lowercase; in such cases, the transformation shall be performed according to the rules defined in Clauses 7.1.1.2.1, 7.1.1.2.2, 7.1.1.2.3, and 7.1.1.2.4, respectively.

NOTE—Implementations of this specification should report as an error collisions caused by the transformation of IDL member names and type identifiers resulting in the same name. For example, without the appropriate error handling, two IDL structs named `MyType` and `My_Type` within the same scope, will be mapped onto two different classes named `MyType`.

#### 7.1.1.2.1 Pascal Case Transformation

- When required, an IDL member name or type identifier shall be transformed into Pascal Case according to the following rules:
• The first letter after each underscore shall be capitalized and all underscores shall be removed.
• The first letter of the IDL name shall be capitalized.

For example:
• “pascalcase” maps to “Pascalcase”.
• “PASCALCASE” remains “PASCALCASE”.
• “Pascal_Case” maps to “PascalCase”, “pascal_case” to “PascalCase”, “Pascal_case” to “PascalCase”, “PASCAL_case” to “PASCALCase”, “_pascalCase” to “PascalCase”, “_PascalCase” to “PascalCase”, and “pascal_case_” to “PascalCase”.
• “pascalCase” maps to “PascalCase”, “PascalCase” remains “PascalCase”, “PASCALcase” remains “PASCALcase”, and “PASCALCase” remains “PASCALCase”.

7.1.1.2.2 Camel Case Transformation

When required, an IDL member name or type identifier shall be transformed into Camel Case according to the following rules:
• The first letter after each underscore shall be capitalized and all underscores shall be removed.
• The first letter of the IDL name shall be lower case.

For example:
• “camelcase” remains “camelcase”.
• “CAMELCASE” becomes “cAMELCASE”.
• “Camel_Case” maps to “camelCase”, “camel_case” to “camelCase”, “Camel_case” to “camelCase”, “camel_Case” to “camelCase”, “CAMEL_case” to “cAMELCase”, “CAMEL_CASE” to “cAMELCase”, “_camelCase” to “camelCase”, “_CamelCase” to “camelCase”, and “camel_case_” to “camelCase”.
• “camelCase” remains “camelCase”, “CamelCase” maps to “camelCase”, “CAMELcase” to “cAMELcase”, and “CAMELCase” to “cAMELCase”.

7.1.1.2.3 All Uppercase Transformation

When required, an IDL member name or type identifier shall be transformed into All Uppercase according to the following rules:
• Every letter shall be capitalized.
• All underscores shall remain unchanged.

For example:
• “ALL” remains “ALL” and “ALL_UPPERCASE” remains “ALL_UPPERCASE”.
• “all” maps to “ALL” and “all_uppercase” maps to “ALL_UPPERCASE”.
• “allUppercase” maps to “ALLUPPERCASE”, “AllUppercase” to “ALLUPPERCASE”, and “ALLUppercase” to “ALLUPPERCASE”.

7.1.1.2.4 All Lowercase Transformation

When required, an IDL member name or type identifier shall be transformed into All Lowercase according to the following rules:
• Every letter shall be lowercase.
• All underscores shall remain unchanged.

For example:
• “ALL” maps to “all” and “ALL_LOWERCASE” to “all_lowercase”.
• “all” remains “all” and “all_lowercase” remains “all_lowercase”.
• “allLowercase” maps to “alllowercase”, “AllLowercase” to “alllowercase”, and “ALLLowercase” to “all_lowercase”.

7.1.1.3 Suffixes
In addition, because of the nature of the Java language, a single IDL construct may be mapped to several (differently named) Java constructs. The additional names are constructed by appending a descriptive suffix. If an IDL name ends in a reserved suffix (for example, Abstract), then an underscore is prepended to the mapped name. For example, an IDL struct whose name is FooAbstract shall be mapped to _FooAbstract, regardless of whether another IDL type named Foo exists. Any synthesized names (for example the abstract class in clause 7.6) will be based on the modified IDL name. For example, the abstract class for struct FooAbstract is named _FooAbstractAbstract.

7.1.2 Reserved Names
The mapping in effect reserves the use of several names for its own purposes. These are:

• The Java class <type>Abstract, where <type> is the name of an IDL defined valuetype.
• The Java class Constants, defined in each Java package <moduleName> resulting from an IDL defined module named <moduleName>.
• The keywords in the Java language. For example for the Java Language Specification [J2SE 8.0], clause 3.9 the keywords are:

  abstract     final     public
  assert       finally    return
  boolean      float      short
  break        for        static
  byte         goto       strictfp
  case         if         super
  catch        implements switch
  char         import     synchronized
  class        instanceof this
  const        int        throw
  continue     interface  throws
  default      long       transient
  do           native     try
  double       new        void
  else         package    volatile
  enum         private    while
  extends      protected

• The additional Java constants/literals:

  true          false     null

• The following names are treated as reserved if used in a context where the mapping collides with the following methods on java.lang.Object (from [J2SE 8.0], clause 4.3.2):

  clone          notifyAll    getClass
  notify         finalize      wait
  equals         toString     hashCode
The use of any of these names for a user defined IDL type or interface (assuming it is also a legal IDL name) will result in the mapped name having an underscore ("_") prepended.

7.1.3 Holder class

The following classes shall be used as a box to hold objects of a related type. These holder types are required in cases when an IDL defined data type is passed to an operation as an inout or out parameter. Primitive types utilize the Holder<E> class parameterized with the associated box type (e.g., Holder<Integer> for the int primitive). Non-primitive types utilize the generic Holder<E> class parameterized with the non-primitive type,

```java
package org.omg.type;
public class Holder<E> {
    public E value;
};
```

7.1.4 Java Language Version Requirements

Some features of this language mapping depend on certain Java language support that is not available in some older versions of the Java Language. The following table identifies pertinent Java language features, and in which Java language version they become available.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Java Version Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enumerations</td>
<td>J2SE 5.0</td>
</tr>
<tr>
<td>Generics (e.g., List&lt;T&gt;, Map&lt;K,V&gt;)</td>
<td>J2SE 5.0</td>
</tr>
<tr>
<td>Annotation application (type declaration)</td>
<td>J2SE 5.0</td>
</tr>
<tr>
<td>Annotation application (type use)</td>
<td>Java SE 8.0</td>
</tr>
</tbody>
</table>

7.1.5 Code Examples

In various places the notation {...} is used in describing Java code. This indicates that concrete Java code will be generated for the method body and that the method is concrete, not abstract. The generated code is specific to a particular vendor’s implementation and is internal to their implementation.

7.2 Core Data Types

7.2.1 IDL Specification

There is no direct mapping of the IDL Specification itself. The elements contained in the IDL specification are mapped as described in the following clauses.

7.2.2 Modules

An IDL module is mapped to a Java package with the same name. All IDL declarations within the module are mapped to Java class or interface declarations within the corresponding package.
IDL declarations not enclosed in any modules are mapped to classes or interfaces in the (unnamed) Java global scope.

For example, the following module declaration in IDL:

```idl
// ...
module MY_MATH {
    // ...
};
```

would map to the following Java package declaration according to the IDL Naming Scheme:

```java
package MY_MATH;
```
or to the following Java package declaration when using the Java Naming Scheme:

```java
package my_math;
```

### 7.2.3 Constants

IDL constants shall be mapped to public final classes of the same name within the equivalent scope and package. The mapped class shall contain a public final static field named value with the value of the original IDL constant.

For example, the IDL const declarations below:

```idl
module MY_MATH {
    const double PI = 3.141592;
    const double e = 2.718282;
    const string my_string = "My String Value";
};
```

would map to the following Java according to the IDL Naming Scheme:

```java
package MY_MATH;

public final class PI {
    public final static double value = 3.141592;
}

public final class e {
    public final static double value = 2.718282;
}

public final class my_string {
    public final static String value = "My String Value";
}
```
or to the following Java when using the Java Naming Scheme:

```java
package my_math;

public final class PI {
    public final static double value = 3.141592;
}

public final class E {
    public final static double value = 2.718282;
}

public final class MyString {
    public final static String value = "My String Value";
}
```

NOTE—The mapping rules defined above provide a complete solution for mapping IDL constants to the Java programming language. In practice, they enable code generators to perform partial compilation of IDL files, where the code for constants can be generated independently of other constants that separate IDL files may be declaring within the same scope (e.g., the same module). However, we acknowledge that grouping related constants in a holding class is
a common practice in the Java programming language. Therefore, this specification defines in Clause 7.2.3.1 an alternative mapping that constructs classes composed of public final static fields with the value of every constant within a scope. Such alternative mapping may be exercised by partial compilers, as long as all constants within a scope are defined in a single IDL file; and by advanced compilers capable of parsing multiple IDL files before generating code for all constants within a scope, which may or may not be defined in a single IDL file.

7.2.3.1 Alternative Mapping

Every scope containing a constant declaration shall contain a public final class. By default, the mapped class shall be named "Constants". The class name may be modified using the @java_mapping annotation defined in Clause 8.1, preceding the declaration of the IDL module containing the constants or the constant declaration itself:

@java_mapping(constants_container="<ContainerName>")

For every IDL constant, the mapped public final class shall contain a public final static field declaration of the equivalent type with the same name and value. In accordance with Clause 7.2.2, if the constants are not enclosed in any module, the public final class shall be placed under the (unnamed) Java global scope.

For example, the IDL const declarations below:

```java
@java_mapping(constants_container="Constants")
module MY_MATH {
    const double PI = 3.141592;
    const double e = 2.718282;
    const string my_string = "My String Value";
}
```

would map to the following Java according to the IDL Naming Scheme:

```java
package MY_MATH;
public final class Constants {
    public final static double PI = 3.141592;
    public final static double e = 2.718282;
    public final static string my_string = "My String Value";
}
```

or to the following Java when using the Java Naming Scheme:

```java
package my_math;
public final class Constants {
    public final static double PI = 3.141592;
    public final static double E = 2.718282;
    public final static string MY_STRING = "My String Value";
}
```

7.2.4 Data Types

7.2.4.1 Basic Types

7.2.4.1.1 Integer Types

IDL integer types shall be mapped as shown in Table 7.2.
Table 7.2: Mapping of Integer Types

<table>
<thead>
<tr>
<th>IDL Type</th>
<th>Java Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>int8</td>
<td>byte</td>
</tr>
<tr>
<td>uint8</td>
<td></td>
</tr>
<tr>
<td>short</td>
<td>short</td>
</tr>
<tr>
<td>int16</td>
<td></td>
</tr>
<tr>
<td>unsigned short</td>
<td></td>
</tr>
<tr>
<td>uint16</td>
<td></td>
</tr>
<tr>
<td>long</td>
<td>int</td>
</tr>
<tr>
<td>int32</td>
<td></td>
</tr>
<tr>
<td>unsigned long</td>
<td></td>
</tr>
<tr>
<td>uint32</td>
<td></td>
</tr>
<tr>
<td>long long</td>
<td>long</td>
</tr>
<tr>
<td>int64</td>
<td></td>
</tr>
<tr>
<td>unsigned long long</td>
<td></td>
</tr>
<tr>
<td>uint64</td>
<td></td>
</tr>
</tbody>
</table>

7.2.4.1.2 Floating-Point Types

IDL floating-point types shall be mapped as shown in Table 7.3.

Table 7.3: Floating-Point Types Mapping

<table>
<thead>
<tr>
<th>IDL Type</th>
<th>Java Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>float</td>
<td>float</td>
</tr>
<tr>
<td>double</td>
<td>double</td>
</tr>
<tr>
<td>long double</td>
<td>java.math.BigDecimal</td>
</tr>
</tbody>
</table>

7.2.4.1.3 Char Types

The IDL char shall be mapped to the Java primitive type char.

7.2.4.1.4 Wide Char Types

The IDL wchar shall be mapped to the Java primitive type char.

7.2.4.1.5 Boolean Types

The IDL boolean type shall be mapped to the Java boolean, and the IDL constants TRUE and FALSE shall be mapped to the corresponding Java boolean literals true and false.

7.2.4.1.6 Octet Type

The IDL type octet, an 8-bit quantity, shall be mapped to the Java type byte.

---

2 IDL characters are 8-bit quantities representing elements of a character set while Java characters are 16-bit unsigned quantities representing Unicode characters.
7.2.4.2 Template Types

7.2.4.2.1 Sequences

7.2.4.2.1.1 Sequence of Basic Types

IDL sequences of Basic Types shall be mapped to the interfaces shown in Table 7.4. Each interface provides a type-specific sequence interface to the underlying sequence primitives, facilitating a more performant implementation when compared to the List<E> generic list interface.

<table>
<thead>
<tr>
<th>IDL Type</th>
<th>Java Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>sequence&lt;boolean&gt;</td>
<td>BooleanSeq extends java.util.List&lt;Boolean&gt;</td>
</tr>
<tr>
<td>sequence&lt;char&gt;</td>
<td>CharSeq extends java.util.List&lt;Char&gt;</td>
</tr>
<tr>
<td>sequence&lt;wchar&gt;</td>
<td>CharSeq extends java.util.List&lt;Char&gt;</td>
</tr>
<tr>
<td>sequence&lt;octet&gt;</td>
<td>ByteSeq extends java.util.List&lt;Byte&gt;</td>
</tr>
<tr>
<td>sequence&lt;int8&gt;</td>
<td>ByteSeq extends java.util.List&lt;Byte&gt;</td>
</tr>
<tr>
<td>sequence&lt;uint8&gt;</td>
<td>ByteSeq extends java.util.List&lt;Byte&gt;</td>
</tr>
<tr>
<td>sequence&lt;int16&gt;</td>
<td>ShortSeq extends java.util.List&lt;Short&gt;</td>
</tr>
<tr>
<td>sequence&lt;short&gt;</td>
<td>ShortSeq extends java.util.List&lt;Short&gt;</td>
</tr>
<tr>
<td>sequence&lt;int32&gt;</td>
<td>IntegerSeq extends java.util.List&lt;Integer&gt;</td>
</tr>
<tr>
<td>sequence&lt;long&gt;</td>
<td>IntegerSeq extends java.util.List&lt;Integer&gt;</td>
</tr>
<tr>
<td>sequence&lt;int32&gt;</td>
<td>IntegerSeq extends java.util.List&lt;Integer&gt;</td>
</tr>
<tr>
<td>sequence&lt;unsigned long&gt;</td>
<td>LongSeq extends java.util.List&lt;Long&gt;</td>
</tr>
<tr>
<td>sequence&lt;long&gt;</td>
<td>LongSeq extends java.util.List&lt;Long&gt;</td>
</tr>
<tr>
<td>sequence&lt;long&gt;</td>
<td>LongSeq extends java.util.List&lt;Long&gt;</td>
</tr>
<tr>
<td>sequence&lt;double&gt;</td>
<td>DoubleSeq extends java.util.List&lt;Double&gt;</td>
</tr>
<tr>
<td>sequence&lt;long double&gt;</td>
<td>BigDecimalSeq extends java.util.List&lt;BigDecimal&gt;</td>
</tr>
</tbody>
</table>

These type-specific interfaces shall be defined as follows for every primitive type:

```java
package org.omg.type;

interface <InterfaceName> extends java.util.List<MappedType> {
    public <InterfaceName>(int initialCapacity);
    public <InterfaceName>(<PrimitiveType>[] array);
}
```
public void add(<PrimitiveType> element);
public void add(int index, <PrimitiveType> element);

public <PrimitiveType> add(<PrimitiveType>[] elements);
public <PrimitiveType> add(<PrimitiveType>[] elements, int index);
public <PrimitiveType> add(<PrimitiveType>[] elements, int index, int count);

public <PrimitiveType> get(int index);
public void set(int index, <PrimitiveType> element);
public void set(int dstIndex, <PrimitiveType>[] elements,
  int srcIndex, int length);

public <PrimitiveType>[] toArray(<PrimitiveType>[] array);
struct MyType {
  sequence<long> long_sequence;
  sequence<Foo> foo_sequence;
};

would map to the following Java according to the **IDL Naming Scheme**:

```java
import java.util.List;

public class Foo implements java.io.Serializable {
  ...
}

public class MyType implements java.io.Serializable {
  public MyType() {...}
  public MyType(LongSeq long_sequence, List<Foo> foo_sequence) {...}
  public LongSeq get_long_sequence() {...}
  public void set_long_sequence(LongSeq long_sequence) {...}
  public List<Foo> get_foo_sequence() {...}
  public void set_foo_sequence(List<Foo> foo_sequence) {...}
}
```

or to the following Java when using the **Java Naming Scheme**:

```java
import java.util.List;

public class Foo implements java.io.Serializable {
  ...
}

public class MyType implements java.io.Serializable {
  public MyType() {...}
  public MyType(LongSeq longSequence, List<Foo> fooSequence) {...}
  public LongSeq getLongSequence() {...}
  public void setLongSequence(LongSeq longSequence) {...}
  public List<Foo> getFooSequence() {...}
  public void setFooSequence(List<Foo> fooSequence) {...}
}
```

### 7.2.4.2.2 Strings

The IDL **string**, both bounded and unbounded variants, shall be mapped to **java.lang.String**. Range checking for characters in the **string** as well as bounds checking of the **string** shall raise a **java.lang.IndexOutOfBoundsException** exception if necessary.

### 7.2.4.2.3 Wstrings

The IDL **wstring**, both bounded and unbounded variants, shall be mapped to **java.lang.String**. Range checking for characters in the **string** as well as bounds checking of the **string** shall raise a **java.lang.IndexOutOfBoundsException** exception if necessary.

### 7.2.4.2.4 Fixed Type

The IDL **fixed** type shall be mapped to the Java **java.math.BigDecimal** class. Range checking shall raise a **java.lang.ArithmeticException** if necessary.
7.2.4.3 Constructed Types

7.2.4.3.1 Structures

An IDL **struct** shall be mapped to a Java **public class** of the same name. The class shall provide the following:

- implements `java.io.Serializable`
- a public accessor (getter) method for each member
- a public modifier (setter) method for each member
- a public constructor that accepts parameters for each member (the all values constructor)
- a public constructor that takes no parameters (the default constructor)

The all values constructor shall initialize member fields from the corresponding parameter.

The default constructor shall initialize member fields as follows:

- All primitive members shall be left as initialized by the Java default initialization.
- All string members shall be initialized to the empty string ("").
- All array members shall be initialized to an array of declared size whose elements are initialized with their default constructor.
- All sequence members shall be initialized to zero-length sequences of the corresponding type.
- All other members shall be initialized to an object created with their respective default constructor.
- These rules may be modified by annotations as described in clause 8.

The name of the accessor and modifier methods shall follow the pattern `get_<MemberName>()` and `set_<MemberName>()` when using the **IDL Naming Scheme**, and `get<MemberName>()` and `set<MemberName>()` when using the **Java Naming Scheme**. The accessor return type shall match the member type and the modifier method shall accept a parameter of the member type.

For example, the following IDL:

```idl
struct S1 {
    long long_variable;
    short short_variable;
    long long longlong_variable;
    string URL;
};
```

would map to the following Java according to the **IDL Naming Scheme**:

```java
public class S1 implements java.io.Serializable {
    public S1() {...}
    public S1(int long_variable, short short_variable,
              long longlong_variable, String URL) {...}
    public int get_long_variable() {...}
    public void set_long_variable(int long_variable) {...}
    public short get_short_variable() {...}
    public void set_short_variable(short short_variable) {...}
    public long get_longlong_variable() {...}
    public void set_longlong_variable(long longlong_variable) {...}
}
```

3 Implementers of this specification may override the default Java serialization by providing an implementation of the `writeObject()` and `readObject()` method.
public String get_URL() {...}
public void set_URL(String URL) {...}
}

or to the following Java when using the Java Naming Scheme:

public class S1 implements java.io.Serializable {
    public S1() {...}
    public S1(int longVariable, short shortVariable,
        long longLongVariable, String URL) {...}
    public int getLongVariable() {...}
    public void setLongVariable(int longVariable) {...}
    public short getShortVariable() {...}
    public void setShortVariable(short shortVariable) {...}
    public long getLongLongVariable() {...}
    public void setLongLongVariable(long longLongVariable) {...}
    public String getURL() {...}
    public void setURL(String URL) {...}
}

7.2.4.3.2 Unions

An IDL union shall be mapped to a Java public final class with the same name.

The class shall implement java.io.Serializable and provide the following:

- A public default constructor, which shall set the discriminator to the default value for the discriminator type. If this selects a branch, then the selected member shall also be set to the default value for the member type.
- A public accessor method for the discriminator, named get_discriminator() when using the IDL Naming Scheme or getDiscriminator() when using the Java Naming Scheme.
- A public accessor method for each member.
- A public modifier method for each member.
- For each member that has more than one case label, an additional public modifier method that takes the discriminator value.
- A public modifier method for the member corresponding to the default label, if present.
- A public default modifier method, if needed.

The normal name conflict resolution rule shall apply (i.e., prepend an "_" to the discriminator if there is a name clash with the mapped union type name or any of the field names).

The member accessor and modifier methods shall be named get_<MemberName>() and set_<MemberName>() when using the IDL Naming Scheme, and get<MemberName>() and set<MemberName>() when using the Java Naming Scheme. The accessor method return type shall match the member type. The modifier method shall accept a parameter of the member type. Accessor methods shall raise a java.lang.IllegalArgumentException exception if a value is passed for the discriminator that is not among the case labels for the member.

If there is more than one case label corresponding to a member, an extra modifier method (set_<MemberName>() or set<MemberName>(), depending on the naming scheme) that takes an explicit discriminator parameter of the discriminator type shall be generated. The extra modifier method shall throw a java.lang.IllegalArgumentException exception when a value is passed for the discriminator that is not among the case labels for the member.
If a member corresponds to the default case label, its simple modifier shall set the discriminant to the first available
default value starting from a 0 index of the discriminant type. In addition, an extra modifier that takes an explicit
discriminator parameter shall be generated. The extra modifier method shall throw a
java.lang.IllegalArgumentException exception when a value is passed for the discriminator that is not among
the case labels for the default branch.

Two default modifier methods, both named __default(), are generated if there is no explicit default case label, and
the set of case labels does not completely cover the possible values of the discriminant. The first modifier method shall
take no arguments, return void, and set the discriminant to the first available default value starting from a 0 index of the
discriminant type. The second modifier method method shall take a discriminator parameter of the discriminator
type and return void. Both methods shall leave the union with a discriminator value set, and the value member
uninitialized.

For example, the following IDL:

```idl
union U1 switch (octet) {
    case 1:  long long_variable;
    case 2:
    case 3:  short short_variable;
    default: octet octet_variable;
}
```

would map to the following Java according to the IDL Naming Scheme:

```java
final public class U1 implements java.io.Serializable {
    public U1() {...}
    public byte get_discriminator() {...}
    public int get_long_variable() {...}
    public void set_long_variable(int long_variable) {...}
    public short get_short_variable() {...}
    public void set_short_variable(short short_variable) {...}
    public void set_short_variable(short short_variable, byte discriminator) {...}
    public byte get_octet_variable() {...}
    public void set_octet_variable(byte octet_variable) {...}
    public void set_octet_variable(byte octet_variable, byte discriminator) {...}
}
```

or to the following Java when using the Java Naming Scheme:

```java
final public class U1 implements java.io.Serializable {
    public U1() {...}
    public byte getDiscriminator() {...}
    public int getLongVariable() {...}
    public void setLongVariable(int val) {...}
    public short getShortVariable() {...}
    public void setShortVariable(short shortVariable) {...}
    public void setShortVariable(short shortVariable, byte discriminator) {...}
    public byte getOctetVariable() {...}
    public void setOctetVariable(byte octetVariable) {...}
    public void setOctetVariable(byte octetVariable, byte discriminator) {...}
}
```

Accordingly, the following IDL:

```idl
union U2 switch (long) {
    case 1:  short short_variable;
    case 2:  long long_variable;
}
```

would map to the following Java according to the IDL Naming Scheme:
final public class U2 implements java.io.Serializable {
    public U2() {...}
    public int get_discriminator() {...}
    public int get_short_variable() {...}
    public void set_short_variable(short short_variable) {...}
    public long get_long_variable() {...}
    public void set_long_variable(long long_variable) {...}
    public void __default() {...}
    public void __default(int discriminator) {...}
}

or to the following Java when using the Java Naming Scheme:

final public class U2 implements java.io.Serializable {
    public U2() {...}
    public int getDiscriminator() {...}
    public int getShortVariable() {...}
    public void setShortVariable(short shortVariable) {...}
    public long getLongVariable() {...}
    public void setLongVariable(long longVariable) {...}
    public void __default() {...}
    public void __default(int discriminator) {...}
}

7.2.4.3.3 Enumerations

An IDL enum shall be mapped to a Java public enum with the same name as the IDL enum type.

The Java enum type shall include a list of the enumerators, a private member to hold the value, and a private
constructor to initialize the enumerators with the constant value and name. Additionally, the Java enum type shall have
the helper method valueOf(int) to get an enumerator instance from an int.

For example, the IDL:

    enum AnEnum {
        @value(1) one,
        @value(2) two
    };

would map to the following Java according to the IDL Naming Scheme:

    public enum AnEnum {
        one(1),
        two(2);
        private int value;
        private AnEnum(int value) {
            this.value = value;
        }
        public int getValue() {
            return value;
        }
        public static AnEnum valueOf(int v) {
            // return one, two, or raise java.lang.RuntimeException
        }
    }

or to the following Java when using the Java Naming Scheme:

    public enum AnEnum {
        ONE(1),
        TWO(2);
    }
private int value;
private AnEnum(int value) {
    this.value = value;
}
public int getValue() {
    return value;
}
public static AnEnum valueOf(int v) {
    // return ONE, TWO, or raise java.lang.RuntimeException
}

7.2.4.3.4  Constructed Recursive Types

Constructed recursive types are supported by mapping the involved types directly to Java as described elsewhere in clause 7.

7.2.4.4  Arrays

An IDL array shall be mapped to a Java array of the mapped element type. In the mapping, everywhere the array type is needed, an array of the mapped element type shall be used. Bound violations for the array shall raise a java.lang.IndexOutOfBoundsException exception.

For example the IDL declaration:\n\[
\text{const long foo_array_length = 200;}
\]
\[
\text{struct S2 {}
        long array1[100];
        short array2[10];
        Foo array3[foo_array_length];
        Bar array4[12];
    };
\]
would map to the following Java according to the IDL Naming Scheme:

```java
public final class foo_array_length {
    public final static double value = 200;
}

public class S2 implements java.io.Serializable {
    public S2() {...}
    public S2(int[] array1, short[] array2, Foo[] array3, Bar[] array4) {...}
    public int[] get_array1() {...}
    public void set_array1(int[] array1) {...}
    public short[] get_array2() {...}
    public void set_array2(short[] array2) {...}
    public Foo[] get_array3() {...}
    public void set_array3(Foo[] array3) {...}
    public Bar[] get_array4() {...}
    public void set_array4(Bar[] array4) {...}
}
```

or to the following Java when using the Java Naming Scheme:

```java
public final class FooArrayLength {
    public final static double value = 200;
}
```

---

4 The length of the array can be made available in the mapped Java source code, by bounding the IDL array with an IDL constant, which will be mapped as per the rules for constants. For example, see foo_array_length in the example above.
public class S2 implements java.io.Serializable {
    public S2() {...}
    public S2(int[] array1, short[] array2, Foo[] array3, Bar[] array4) {...}
    public int[] getArray1() {...}
    public void setArray1(int[] array1) {...}
    public short[] getArray2() {...}
    public void setArray2(short[] array2) {...}
    public Foo[] getArray3() {...}
    public void setArray3(Foo[] array3) {...}
    public Bar[] getArray4() {...}
    public void setArray4(Bar[] array4) {...}
}

7.2.4.5 Native Types

IDL provides a declaration to define an opaque type whose representation is specified by the language mapping. This language mapping specification does not define any native types.

7.2.4.6 Naming Data Types [typedef]

Java does not have a typedef construct; therefore, the IDL typedef does not result in any Java types. The use of an IDL typedef type shall be replaced with the type referenced by the typedef type. This rule shall apply recursively.

For example the IDL declaration:

typedef long Length;

struct S3 {
    Length member_length;
};

would map to the following Java according to the IDL Naming Scheme:

    public class S3 implements java.io.Serializable {
        public S3() {...}
        public S3(int member_length) {...}
        public int get_member_length() {...}
        public void set_member_length(int member_length) {...}
    }

or to the following Java when using the Java Naming Scheme:

    public class S3 implements java.io.Serializable {
        public S3() {...}
        public S3(int memberLength) {...}
        public int getMemberLength() {...}
        public void setMemberLength(int memberLength) {...}
    }

That is, the typedef type Length is replaced with IDL long (i.e., the type it references) which then maps to Java as int.

Annotations on an IDL typedef shall be applied to uses of the typedef in other type declarations. For example the IDL declaration:

typedef @max(100) long Length;

struct MyType {
    Length a;
    sequence<Length> lengths;
};
shall be mapped as if the IDL declaration had been:

```java
struct MyType {
    @max(100) long a;
    sequence<@max(100) long> lengths;
};
```

### 7.3 Any

The IDL `any` type shall be mapped to `org.omg.type.Any` type. The implementation of the `org.omg.type.Any` is middleware specific, and should include operations that allow programmers to insert and access the value contained in an `any` instance as well as the actual type of that value.

### 7.4 Interfaces – Basic

Each IDL `interface` shall be mapped to a Java `public interface` with the same name. The Java `interface` shall be defined in the `package` corresponding to the IDL `module` of the interface. If the IDL `interface` derives from other IDL `interfaces`, then the Java `interface` shall be declared to extend the Java classes resulting from the mapping of the base `interfaces`.

Each `attribute` defined in the IDL `interface` shall map to two methods in the Java interface: One method to get the attribute and the other to set the attribute. The name of the get and set methods shall be `get_<AttributeName>()` and `set_<AttributeName>()`, when using the IDL Naming Scheme, and `get<AttributeName>()` and `set<AttributeName>()` when using the Java Naming Scheme. The get method shall take no parameters and its return type shall match the type of the `attribute`. The set method shall take one parameter of the type of the `attribute`, and shall return no value. If the `attribute` is `readonly`, the set method shall be omitted.

Each operation defined in the IDL `interface` shall map to a method in the Java `interface`. The name of the method shall be the same as the name of the IDL operation. The number and order of the method arguments shall be as defined in the IDL. The types of arguments to the method shall be mapped according to the mapping rules specified in this chapter, and their name shall be the name of the IDL argument. The method declaration shall specify any exceptions listed in the IDL with a `throws` clause. Any `out` or `inout` arguments shall be mapped to their `Holder` types.

For example, the following IDL:

```idl
interface AnInterface {
    attribute long long_attribute;
    readonly attribute long long_ro_attribute;
    void op1(in long in_param, inout long inout_param, out long out_param);
};
```

would map to the following Java according to the IDL Naming Scheme:

```java
public interface AnInterface {
    public AnInterface() {...}
    public AnInterface(int long_attribute, int long_ro_attribute) {...}
    public void get_long_attribute() {...}
    public void set_long_attribute(int long_attribute) {...}
    public int get_long_ro_attribute() {...}
    public abstract void op1(int in_param,
        org.omg.type.Holder<Integer> inout_param,
        org.omg.type.Holder<Integer> out_param);
}
```

or to the following Java when using the Java Naming Scheme:

```java
public interface AnInterface {
    public AnInterface() {...}
    public void getLongAttribute() {...}
    public void setLongAttribute(int long_attribute) {...}
    public int getLongRoAttribute() {...}
    public abstract void op1(int in_param,
        org.omg.type.Holder<Integer> inout_param,
        org.omg.type.Holder<Integer> out_param);
}
```
public AnInterface(int longAttribute, int longRoAttribute) {...}
public int getLongAttribute() {...}
public void setLongAttribute(int longAttribute) {...}
public int getLongRoAttribute() {...}
public abstract void op1(int inParam,
                         org.omg.type.Holder<Integer> inOutParam,
                         org.omg.type.Holder<Integer> outParam);
}

7.4.1 Exceptions
An IDL exception shall be mapped to a Java class extending the java.lang.RuntimeException class with the same name as the IDL exception. Any members in the IDL exception are mapped to members in the Java class following the rules of the IDL struct mapping defined in 7.2.4.3.1. The mapped exception shall also include constructors that follow the rules of the IDL struct mapping as well.

For example, the following IDL:

```idl
exception CustomException {
    long error_code;
};
interface InterfaceException {
    void op1(in long in_param) raises(AnException);
};
```

would map to the following Java according to the IDL Naming Scheme:

```java
public class CustomException extends java.lang.RuntimeException {
    public CustomException() {...}
    public CustomException(int error_code) {...}
    public int get_error_code() {...}
    public void set_error_code(int error_code) {...}
}

public interface InterfaceException {
    void op1(int in_param) throws CustomException;
}
```

or to the following Java when using the Java Naming Scheme:

```java
public class CustomException extends java.lang.RuntimeException {
    public CustomException() {...}
    public CustomException(int errorCode) {...}
    public int getErrorCode() {...}
    public void setErrorCode(int errorCode) {...}
}

public interface InterfaceException {
    void op1(int inParam) throws CustomException;
}
```

7.4.2 Interface Forward Declaration
An interface forward declaration has no mapping to the Java language.
7.5 Interfaces – Full

This building block complements Interfaces – Basic adding the ability to embed in the interface body additional declarations such as types, exceptions, and constants. The embedded elements (types, exceptions, and constants) shall be mapped to a public declaration within the scope of the Java interface.

For example, the following IDL:

```idl
interface FullInterface {
    struct S {
        long a;
    };
    const double PI = 3.14;
    void op1(in S s_in);
}
```

would map to the following Java according to the IDL Naming Scheme:

```java
public interface FullInterface {
    public class S implements java.io.Serializable {
        public S() {...}
        public S(int a) {...}
        public int get_a() {...}
        public void set_a(int a) {...}
    }

    public final class PI {
        public final static double value = 3.14;
    }
    public void op1(S s_in);
}
```

or to the following Java when using the Java Naming Scheme:

```java
public interface FullInterface {
    public class S implements java.io.Serializable {
        public S() {...}
        public S(int a) {...}
        public int getA() {...}
        public void setA(int a) {...}
    }

    public final class PI {
        public final static double value = 3.14;
    }
    public void op1(S sIn);
}
```

7.6 Value Types

An IDL `valuetype` type shall be mapped to two Java classes:

- A helper abstract class with the suffix `Abstract` (the “abstract” class).
- A class with the same name as the IDL `valuetype` (the “non-abstract” class).

The mapped non-abstract class shall inherit from the abstract class. If the IDL `valuetype` inherits from a base `valuetype`, the mapped abstract class shall inherit from the non-abstract class that resulted from mapping the base `valuetype`. If the IDL `valuetype` supports an `interface` type, then the mapped abstract class shall `implement` the corresponding mapped Java interface.
The **valuetype** members shall be mapped onto the abstract class the same way as class members, with the addition that **private** members are protected with the Java **protected** access modifier. The **valuetype** operations shall be mapped onto the abstract class the same way as for interfaces. Each **valuetype** initializer (i.e., **factory** operation) is mapped onto the abstract class to a method returning **void** and accepting the specified **in** parameters.

The non-abstract class has @**Override** for all the methods in the abstract class and any implemented interfaces, and it is expected to fill them. These operations have empty implementations (or throw a not-implemented exception).

References to the value type from other classes map to references to the non-abstract class.

For example, the following IDL:

```idl
valuetype VT1 {
    attribute long a_long_attr;
    void vt_op(in long p_long);
    public long a_public_long;
    private long a_private_long;
    factory vt_factory (in long a_long, in short a_short);
};
interface MyInterface {
    void op();
};
valuetype VT2 : VT1 supports MyInterface {
    public long third_long;
};
```

would map to the following Java according to the **IDL Naming Scheme**:

```java
public abstract class VT1Abstract {
    public int a_long_attr;
    public abstract void vt_op(int p_long);
    public int a_public_long;
    protected int a_private_long;
    public abstract void vt_factory(int a_long, short a_short);
}
public class VT1 extends VT1Abstract {
    public VT1() {...}
    @Override
    public void vt_op(int p_long) {...}
    @Override
    public void vt_factory(int a_long, short a_short) {...}
}
public interface MyInterface {
    ...
}
public abstract class VT2Abstract extends VT1 implements MyInterface {
    ...
}
public class VT2 extends VT2Abstract {
    ...
}
```

or to the following Java when using the **Java Naming Scheme**:

```java
public abstract class VT1Abstract {
    public int aLongAttr;
    public abstract void vtOp(int pLong);
    public int aPublicLong;
    protected int aPrivateLong;
    public abstract void vtFactory(int aLong, short aShort);
}
public class VT1 extends VT1Abstract {
    public VT1() {...}
}
```
@Override
public void vtOp(int pLong) {...}
@Override
public void vtFactory(int aLong, short aShort) {...}
}
public interface MyInterface {
    ...
}
public abstract class VT2Abstract extends VT1 implements MyInterface {
    ...
}
public class VT2 extends VT2Abstract {
    ...
}

7.7 CORBA-Specific – Interfaces
CORBA-specific mappings are defined in clause A.1 of Annex A: Platform-Specific Mappings.

7.8 CORBA-Specific – Value Types
CORBA-specific mappings are defined in clause A.1 of Annex A: Platform-Specific Mappings.

7.9 Components – Basic
Basic components have no direct language mapping; they shall be mapped to intermediate IDL, as specified in [IDL4], and mapped to Java accordingly.

7.10 Components – Homes
Homes have no direct language mapping; they shall be mapped to intermediate IDL, as specified in [IDL4], and mapped to Java accordingly.

7.11 CCM-Specific
CORBA-specific mappings are defined in clause A.1 of Annex A: Platform-Specific Mappings.

7.12 Components – Ports and Connectors
Ports and connectors have direct language mapping; they shall be mapped to intermediate IDL, as specified in [IDL4], and mapped to Java accordingly.

7.13 Template Modules
Template module instances have no direct language mapping; they shall be mapped to intermediate IDL, as specified in [IDL4], and mapped accordingly.
7.14  Extended Data Types

7.14.1  Structures with Single Inheritance

If the IDL struct inherits from a base IDL struct, then the Java class shall be declared to extend the base class that resulted from mapping the base IDL struct. The “all values” constructor for the derived struct’s Java class shall take as its first parameter a non-null instance of the base struct’s Java class.

For example, extending the IDL struct in clause 7.2.4.3.1 with the following:

```
struct S5 : S1 {
    float float_variable;
};
```

would map to the following Java according to the IDL Naming Scheme:

```
public class S5 extends S1 implements java.io.Serializable {
    public S5() {...}
    public S2(S1 parent, float float_variable) {...}
    public float get_float_variable() {...}
    public void set_float_variable(float float_variable) {...}
}
```

or to the following Java when using the Java Naming Scheme:

```
public class S5 extends S1 implements java.io.Serializable {
    public S5() {...}
    public S2(S1 parent, float floatVariable) {...}
    public float getFloatVariable() {...}
    public void setFloatVariable(float floatVariable) {...}
}
```

7.14.2  Union Discriminators

This IDL4 block adds int8, uint8, wchar and octet to the set of valid types for a discriminator. The mapping of these union discriminator types are covered in clause 7.2.4.3.2.

7.14.3  Additional Template Types

7.14.3.1  Maps

An IDL map shall be mapped to a Java generic java.util.Map instantiated with the Java equivalent key type and value type. In the mapping, everywhere the map type is needed, a Map of the key type and value type shall be used. If the IDL type of the key or the value is a Basic Type, the mapped type shall be the Java boxed type specified in the table below. For example, if the IDL key type is int32, the map shall have key of type Integer.

<table>
<thead>
<tr>
<th>IDL Basic Type</th>
<th>Java Boxed Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>Boolean</td>
</tr>
<tr>
<td>char</td>
<td>Char</td>
</tr>
<tr>
<td>wchar</td>
<td></td>
</tr>
</tbody>
</table>

Table 7.5: Mapping of Map key type
<table>
<thead>
<tr>
<th>IDL Basic Type</th>
<th>Java Boxed Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>octet</td>
<td>Byte</td>
</tr>
<tr>
<td>int8</td>
<td></td>
</tr>
<tr>
<td>uint8</td>
<td></td>
</tr>
<tr>
<td>int16</td>
<td>Short</td>
</tr>
<tr>
<td>short</td>
<td></td>
</tr>
<tr>
<td>uint16</td>
<td>Integer</td>
</tr>
<tr>
<td>unsigned short</td>
<td></td>
</tr>
<tr>
<td>int32</td>
<td>Integer</td>
</tr>
<tr>
<td>long</td>
<td></td>
</tr>
<tr>
<td>uint32</td>
<td>Long</td>
</tr>
<tr>
<td>unsigned long</td>
<td></td>
</tr>
<tr>
<td>int64</td>
<td>Long</td>
</tr>
<tr>
<td>long long</td>
<td></td>
</tr>
<tr>
<td>uint64</td>
<td>java.math.BigInteger</td>
</tr>
<tr>
<td>unsigned long long</td>
<td></td>
</tr>
<tr>
<td>float</td>
<td>Float</td>
</tr>
<tr>
<td>double</td>
<td>Double</td>
</tr>
<tr>
<td>long double</td>
<td>java.math.BigDecimal</td>
</tr>
</tbody>
</table>

Bounds checking shall raise a `java.lang.IndexOutOfBoundsException` exception if necessary.

For example the IDL declaration:

```
struct S4 {
  map<long, string> map1;
  map<string, Foo> map2;
};
```

would map to the following Java according to the **IDL Naming Scheme**:

```java
public class S4 implements java.io.Serializable {
  public S4() { ... }
  public S4(java.lang.Map<Integer, String> map1,
             java.lang.Map<String, Foo> map2) { ... }
  public java.lang.Map<Integer, String> get_map1() { ... }
  public void set_map1(java.lang.Map<Integer, String> map1) { ... }
  public java.lang.Map<String, Foo> get_map2() { ... }
  public void set_map2(java.lang.Map<String, Foo> map2) { ... }
}
```

or to the following Java when using the **Java Naming Scheme**:

```java
public class S4 implements java.io.Serializable {
  public S4() { ... }
  public S4(java.lang.Map<Integer, String> map1,
             java.lang.Map<Integer, Foo> map2) { ... }
  public java.lang.Map<Integer, String> getMap1() { ... }
  public void setMap1(java.lang.Map<Integer, String> map1) { ... }
  public java.lang.Map<Integer, Foo> getMap2() { ... }
  public void setMap2(java.lang.Map<Integer, Foo> map2) { ... }
}
```
public java.lang.Map<String, Foo> getMap2() {...}
public void setMap2(java.lang.Map<String, Foo> map2) {...}
}

7.14.3.2 Bitsets
An IDL `bitset` shall map to Java as a `public class` with the same name.

The class shall contain accessor and modifier methods for each named `bitfield` in the set. The name of the accessor and modifier methods shall follow the pattern `get_<BitfieldName>()` and `set_<BitfieldName>()` when using the IDL Naming Scheme, and `get<BitfieldName>()` and `set<BitfieldName>()` when using the Java Naming Scheme. The accessor method return type shall match the member type and the modifier method shall accept a parameter of the member type.

The IDL type of each `bitfield` member, if not specified in the IDL, shall take as default value the smallest type able to store the bit field with no loss (i.e. `boolean` if size is 1, `octet` if it is between 2 and 8, `unsigned short` if it is between 9 and 16, `unsigned long` if it is between 17 and 32 and `unsigned long long` if it is between 33 and 64).

For example the IDL declaration:
```
bitset MyBitset {
  bitfield<3> a;
  bitfield<1> b;
  bitfield<4>;
  bitfield<12, short> d;
};
```
would map to the following Java according to the IDL Naming Scheme:

```
public class MyBitset {
  public byte get_a() {...}
  public void set_a(byte a) {...}
  public boolean get_b() {...}
  public void set_b(boolean b) {...}
  public short get_c() {...}
  public void set_c(short c) {...}
  public short set_d() {...}
  public void get_d(short d) {...}
}
```

or to the following Java when using the Java Naming Scheme:

```
public class MyBitset {
  public byte getA() {...}
  public void setA(byte a) {...}
  public boolean getB() {...}
  public void setB(boolean b) {...}
  public short getC() {...}
  public void setC(short c) {...}
  public short setD() {...}
  public void getD(short d) {...}
}
```

7.14.3.3 Bitmask type
The IDL `bitmask` type shall map to a Java `enum` and a `java.util.BitSet`. The Java `enum` name shall be the IDL `bitmask` name with the `Flags` suffix appended.

The Java `enum` shall contain a member for each named member of the IDL `bitmask`. The value of each Java `enum` member is dictated by the position property (@position) of the corresponding IDL `bitmask` member. If no position
is specified for a literal, the Java `enum` literal shall be set to the value of the next power of 2, relative to the previous literal. The `enum` constants can be used to set, clear, and or test individual bits in the `java.util.BitSet` instance.

If the size (number of bits) exceeds that specified by the `@bit_bound` annotation, a `java.lang.IndexOutOfBoundsException` exception shall be raised.

For example:

```java
bitmask MyBitMask {
    flag0, flag1, flag2
};

struct BitmaskExample {
    MyBitMask a_bitset;
};
```

would map to the following Java according to the IDL Naming Scheme:

```java
enum MyBitMaskFlags {
    flag0, flag1, flag2
}

class BitmaskExample implements java.io.Serializable {
    java.util.BitSet a_bitset;
}
```

or to the following Java when using the Java Naming Scheme:

```java
enum MyBitMaskFlags {
    FLAG0, FLAG1, FLAG2
}

class BitmaskExample implements java.io.Serializable {
    java.util.BitSet aBitset;
}
```

7.15 Anonymous Types

No impact to the Java language mapping.

7.16 Annotations

7.16.1 Defining Annotations

User-defined annotations may be propagated to the generated code. If user defined annotations are mapped to Java, then the following requirements apply.

An IDL annotation type named `<AnnotationName>`, defining members `<Member1>` through `<MemberN>`, shall be represented by the following Java annotation types:

```java
public @interface <AnnotationName> {
    <Member1Type>  <Member1Name>() [ default <DefaultValue> ];
    ...
    <MemberNType>  <MemberNName>() [ default <DefaultValue> ];
}
```

```java
public @interface <AnnotationName>Group {
```

---

5 In addition to `set()`, `clear()`, and `get()` to operate on individual bits in the `bitset`, the `java.util.BitSet` implementation provides common logical operations such as AND, OR, XOR etc, which are also useful.
The `<MemberXType>` shall be the Java type corresponding to the type of the IDL member. If a default value is specified for a given member, it shall be reflected in the Java definition. Otherwise, the Java definition shall have no default value.

For example, the IDL user defined annotation,

```idl
@annotation MyAnnotation {
    boolean value default TRUE;
}
```

maps to Java like this:

```java
public @interface MyAnnotation {
    boolean value() default true;
}
public @interface MyAnnotationGroup {
    MyAnnotation[] getValue();
}
```

### 7.16.2 Applying User-Defined Annotations

For each IDL element to which a single instance user-defined annotation is applied, the corresponding Java element shall be annotated with the mapped Java annotation of the same name.

For example, the IDL user defined annotation,

```idl
@annotation MyAnnotation {
    boolean value default TRUE;
}
@MyAnnotation
struct AnnotatedStruct {
    long a_long;
}
```

would map to the following Java according to the IDL Naming Scheme:

```java
public @interface MyAnnotation {
    boolean value() default true;
}
public @interface MyAnnotationGroup {
    MyAnnotation[] value();
}
@MyAnnotation
public class AnnotatedStruct {
    public int a_long;
}
```

or to the following Java when using the Java Naming Scheme:

```java
public @interface MyAnnotation {
    boolean value() default true;
}
public @interface MyAnnotationGroup {
    MyAnnotation[] value();
}
@MyAnnotation
```
public class AnnotatedStruct {
    public int aLong;
}

For each IDL element to which multiple instances of the annotation are applied, the corresponding Java element shall be annotated with the mapped annotation bearing the Group suffix; each application of the user-defined annotation shall correspond to a member of the array in the group.

For example, the IDL user defined annotation,

```idl
@annotation MyAnnotation {
    boolean value default TRUE;
}
```

```idl
@MyAnnotation(true)
@MyAnnotation(false)
struct MultiAnnotatedStruct {
    long a_long;
}
```

would map to the following Java according to the IDL Naming Scheme:

```java
public @interface MyAnnotation {
    boolean value() default true;
}
public @interface MyAnnotationGroup {
    MyAnnotation[] value();
}

@MyAnnotationGroup({@MyAnnotation(value=true), @MyAnnotation(value=false)})
public class MultiAnnotatedStruct {
    public int a_long;
}
```

or to the following Java when using the Java Naming Scheme:

```java
public @interface MyAnnotation {
    boolean value() default true;
}
public @interface MyAnnotationGroup {
    MyAnnotation[] value();
}

@MyAnnotationGroup({@MyAnnotation(value=true), @MyAnnotation(value=false)})
public class MultiAnnotatedStruct {
    public int aLong;
}
```

### 7.17 Standardized Annotations

The IDL4 specification defines some annotations and assigns them to logical groups. These annotations may be applied to various constructs throughout the IDL specification, and their impact on the language mapping is dependent on the context in which they are applied. The following clauses summarize the impact these defined annotations have on the language mapping, and provide cross references to earlier document clauses where the details are given.

#### 7.17.1 Group of Annotations: General Purpose

Table 7.6 identifies the mapping impact of the IDL defined General Purpose Annotations.
Table 7.6: General Purpose Annotation Impact

<table>
<thead>
<tr>
<th>General Purpose Annotation</th>
<th>Impact on Language Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>@id</td>
<td>No impact on mapping</td>
</tr>
<tr>
<td>@autoid</td>
<td>No impact on mapping</td>
</tr>
<tr>
<td>@optional</td>
<td>Replaces type with boxed type, for Basic Types. No impact on other types.</td>
</tr>
<tr>
<td>@position</td>
<td>Impacts the mapping of bitmask. See clause 7.14.3.3.</td>
</tr>
<tr>
<td>@value</td>
<td>Impacts the mapping of enum. See clause 7.2.4.3.3.</td>
</tr>
<tr>
<td>@extensibility</td>
<td>No impact on mapping</td>
</tr>
<tr>
<td>@final</td>
<td>No impact on mapping</td>
</tr>
<tr>
<td>@mutable</td>
<td>No impact on mapping</td>
</tr>
<tr>
<td>@appendable</td>
<td>No impact on mapping</td>
</tr>
</tbody>
</table>

7.17.2 Group of Annotations: Data Modeling

Table 7.7 identifies the mapping impact of the IDL defined Data Modeling Annotations.

Table 7.7: Data Modeling Annotation Impact

<table>
<thead>
<tr>
<th>Data Modeling Annotation</th>
<th>Impact on Language Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>@key</td>
<td>No impact on mapping</td>
</tr>
<tr>
<td>@must_understand</td>
<td>No impact on mapping</td>
</tr>
<tr>
<td>@default_literal</td>
<td>Value used in default constructor</td>
</tr>
</tbody>
</table>

7.17.3 Group of Annotations: Units and Ranges

Table 7.8 identifies the mapping impact of the IDL defined Units and Ranges Annotations.

Table 7.8: Units And Ranges Annotation Impact

<table>
<thead>
<tr>
<th>Unit and Ranges Annotation</th>
<th>Impact on Language Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>@default</td>
<td>Value used in default constructor</td>
</tr>
<tr>
<td>@range</td>
<td>The provided value is tested in the member modifier (setter), and a java.lang.IllegalArgumentException is raised if the parameter does not meet requirements</td>
</tr>
<tr>
<td>Unit and Ranges Annotation</td>
<td>Impact on Language Mapping</td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>@min</td>
<td>The provided value is tested in the member modifier (setter), and a java.lang.IllegalArgumentException is raised if the parameter does not meet requirements</td>
</tr>
<tr>
<td>@max</td>
<td>The provided value is tested in the member modifier (setter), and a java.lang.IllegalArgumentException is raised if the parameter does not meet requirements</td>
</tr>
<tr>
<td>@unit</td>
<td>No impact on mapping</td>
</tr>
</tbody>
</table>

### 7.17.4 Group of Annotations: Data Implementation

Table 7.9 identifies the mapping impact of the IDL defined Data Implementation Annotations.

<table>
<thead>
<tr>
<th>Data Implementation Annotation</th>
<th>Impact on Language Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>@bit_bound</td>
<td>Impacts the mapping of bitmask. See clause 7.14.3.3.</td>
</tr>
<tr>
<td>@external</td>
<td>Replaces type with boxed type, for Basic Types. No impact on other types.</td>
</tr>
<tr>
<td>@nested</td>
<td>No impact on mapping</td>
</tr>
</tbody>
</table>

### 7.17.5 Group of Annotations: Code Generation

Table 7.10 identifies the mapping impact of the IDL defined Code Generation Annotations.

<table>
<thead>
<tr>
<th>Code Generation Annotation</th>
<th>Impact on Language Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>@verbatim</td>
<td>Copies verbatim text to the indicated output position when the indicated language is &quot;*&quot; or &quot;java&quot;.</td>
</tr>
</tbody>
</table>

### 7.17.6 Group of Annotations: Interfaces

Table 7.11 identifies the mapping impact of the IDL defined Interface Annotations.

<table>
<thead>
<tr>
<th>Interface Annotation</th>
<th>Impact on Language Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>@service</td>
<td>Options are &quot;CORBA&quot;, &quot;DDS&quot;, &quot;*&quot;. Impact is middleware specific.</td>
</tr>
<tr>
<td>@oneway</td>
<td>Impact is middleware specific.</td>
</tr>
<tr>
<td>Interface Annotation</td>
<td>Impact on Language Mapping</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>@ami</td>
<td>Impact is middleware specific.</td>
</tr>
</tbody>
</table>
8 IDL to Java Language Mapping Annotations

This chapter defines specialized annotations that extend the standard set defined in [IDL4] to control the Java code generation.

8.1 @java_mapping Annotation

This annotation provides the means to customize the way a number of IDL constructs are mapped to the Java programming language. This annotation can therefore be used to modify the default mapping behavior of the mappings specified in chapter 7.

The IDL definition of the @java_mapping annotation is:

```idl
@annotation java_mapping {
    enum NamingConvention {
        IDL_NAMING_CONVENTION,
        JAVA_NAMING_CONVENTION
    };
    NamingConvention apply_naming_convention;
    string constants_container default "Constants";
    boolean promote_integer_width default FALSE;
    string string_type default "java.lang.String";
}
```

The behavior associated with each parameter is defined below.

8.1.1 apply_naming_convention Parameter

The `apply_naming_convention` specifies whether the IDL to Java language mapping shall apply the IDL Naming Scheme or the Java Naming Scheme when mapping IDL names to Java. In particular:

- If `apply_naming_convention` is `IDL_NAMING_CONVENTION`, the code generator shall generate type identifiers and names according to the IDL Naming Scheme, leaving the name of the corresponding IDL construct unchanged, as shown in Table 8.1.

- If `apply_naming_convention` is `JAVA_NAMING_CONVENTION`, the code generator shall generate type identifiers and names according to the Java Naming Scheme, following the rules defined in Table 8.1 for the corresponding IDL construct.

### Table 8.1: Type Identifier and Member Name Mapping According to apply_naming_convention Value

<table>
<thead>
<tr>
<th>IDL Construct</th>
<th>Java Mapping Naming Convention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION</td>
</tr>
<tr>
<td>Module Name</td>
<td>Name as in IDL definition</td>
</tr>
<tr>
<td>Constant Variable Name (for alternative mapping defined in Clause 7.2.3.1)</td>
<td>Name as in IDL definition</td>
</tr>
<tr>
<td>Structure Type Name</td>
<td>Name as in IDL definition</td>
</tr>
<tr>
<td>IDL Construct</td>
<td>Java Mapping Naming Convention</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Structure Member Name in Accessor/Modifier Methods</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Structure Member Name in Modifier Method Parameter</td>
<td>apply_naming_convention = JAVA_NAMING_CONVENTION, Name as in IDL definition, Name in Camel Case</td>
</tr>
<tr>
<td>Union Type Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Union Member Name in Accessor/Modifier Methods</td>
<td>apply_naming_convention = JAVA_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Union Member Name in Modifier Method Parameter</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Camel Case</td>
</tr>
<tr>
<td>Enumeration Type Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Enumeration Value Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in All Uppercase</td>
</tr>
<tr>
<td>Interface Type Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Interface Attribute Name in Accessor/Modifier Methods</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Interface Attribute Name in Modifier Method Parameter</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Camel Case</td>
</tr>
<tr>
<td>Interface Method Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Camel Case</td>
</tr>
<tr>
<td>Interface Method Parameter Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Camel Case</td>
</tr>
<tr>
<td>Exception Type Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Exception Member Name in Accessor/Modifier Methods</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Bitset Type Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Bitfield Name in Bitset Accessor/Modifier Methods</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
<tr>
<td>Bitfield Name in BitSet Modifier Method Parameter</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Camel Case</td>
</tr>
<tr>
<td>Bitmask Type Name</td>
<td>apply_naming_convention = IDL_NAMING_CONVENTION, Name as in IDL definition, Name in Pascal Case</td>
</tr>
</tbody>
</table>
8.1.2  constants_container Parameter

`constants_container` activates the alternative mapping for constants defined in Clause 7.2.3.1 and specifies the name of the Java class that holds the constants, changing it from its default value (i.e., `Constants`) to a user-defined value.

For example, the IDL `const` declarations below:

```java
@java_mapping(constants_container="MathematicalConstants")
module MY_MATH {
    const double PI = 3.141592;
    const double e = 2.718282;
}
```

would map to the following Java according to the IDL Naming Scheme:

```java
package MY_MATH;

public final class MathematicalConstants {
    public final static double PI = 3.141592;
    public final static double e = 2.718282;
}
```

or to the following Java when using the Java Naming Scheme:

```java
package my_math;

public final class MathematicalConstants {
    public final static double PI = 3.141592;
    public final static double E = 2.718282;
}
```

8.1.3  promote_integer_width Parameter

The lack of unsigned primitives in the Java language introduces a challenge when mapping the IDL `unsigned` integral types. For example, in order to support the full range of an IDL `unsigned short` which has a range of \([0, 65535]\), it is mapped to the Java primitive `int`, with range \([-2147483648, 2147483647]\), instead of the Java `short` which has a range of only \([-32768, 32767]\).

`promote_integer_width` specifies whether IDL `unsigned` integers shall be mapped to a Java primitive type of the same size or to a bigger type capable of holding the full range of the corresponding `unsigned` integer. By default, as specified in clause 7.2.4.1.1, integer width is preserved (i.e., `promote_integer_width` is `FALSE`).

Table 8.2 shows the mapping of IDL integer types according to the value of `promote_integer_width`.

<table>
<thead>
<tr>
<th>IDL Type</th>
<th>Java Type</th>
<th><code>promote_integer_width = FALSE</code></th>
<th><code>promote_integer_width = TRUE</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>int8</td>
<td>byte</td>
<td></td>
<td></td>
</tr>
<tr>
<td>uint8</td>
<td>byte</td>
<td></td>
<td>short</td>
</tr>
</tbody>
</table>

Table 8.2: Mapping of Integer Types According to `promote_integer_width`
<table>
<thead>
<tr>
<th>IDL Type</th>
<th>Java Type</th>
<th>promote_integer_width = FALSE</th>
<th>promote_integer_width = TRUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>short int16</td>
<td>short</td>
<td>short</td>
<td>short</td>
</tr>
<tr>
<td>unsigned short uint16</td>
<td>short</td>
<td>int</td>
<td>int</td>
</tr>
<tr>
<td>long int32</td>
<td>int</td>
<td>int</td>
<td>int</td>
</tr>
<tr>
<td>unsigned long uint32</td>
<td>int</td>
<td>long</td>
<td>long</td>
</tr>
<tr>
<td>long long int64</td>
<td>long</td>
<td>long</td>
<td>long</td>
</tr>
<tr>
<td>unsigned long long uint64</td>
<td>long</td>
<td>java.math.BigInteger</td>
<td>java.math.BigInteger</td>
</tr>
</tbody>
</table>

### 8.1.4 string_type Parameter

The **string_type** parameter defines the Java type IDL `string` and `wstring` types shall be mapped to. By default, as specified in clause 7.2.4.2.2 and 7.2.4.2.3, IDL `string` and `wstring` types are mapped to `java.lang.String` (i.e., `string_type = "java.lang.String"`).

Examples of alternative values for `string_type` may include "java.lang.StringBuilder" and "java.lang.StringBuffer".
Annex A: Platform-Specific Mappings

(normative)

A.1 CORBA-Specific Mappings

This clause describes platform-specific mapping rules that shall be followed when mapping IDL constructs to the Java programming language for CORBA. These mappings rules are built upon the platform-independent rules defined in Chapters 7 and 8 for the building blocks that compose the CORBA profiles defined in Clause 9.2 of [IDL4].

A.1.1 Exceptions

An IDL exception shall be mapped to a Java class following the mapping rules defined in Clause 7.4.1. The resulting Java class shall inherit from the org.omg.corba.UserException class, which is defined as follows:

```java
package org.omg.CORBA;
public class UserException extends java.lang.RuntimeException {}
```

For example, the following IDL:

```idl
exception AnException {
    long error_code;
}
```

would map to the following Java for CORBA according to the IDL Naming Scheme:

```java
public class AnException extends org.omg.CORBA.UserException {
    public AnException() {...}
    public AnException(int error_code) {...}
    public int get_error_code() {...}
    public void set_error_code() {...}
}
```

or to the following Java when using the Java Naming Scheme:

```java
public class AnException extends org.omg.CORBA.UserException {
    public AnException() {...}
    public AnException(int errorCode) {...}
    public int getErrorCode() {...}
    public void setErrorCode() {...}
}
```

A.1.2 TypeCode

A CORBA TypeCode represents type information. The IDL TypeCode type shall map to a Java public class named org.omg.CORBA.TypeCode according to the following definition:

```java
package org.omg.CORBA;

public class TypeCode {
    public static class Bounds extends UserException {
    }
    public static class BadKind extends UserException {
    }
    public boolean equal(TypeCode tc) {...}
    public boolean equivalent(TypeCode tc) {...}
}
```
public TypeCode get_compact_typecode() {...}
public TCKind kind() {...}
public String id() throws BadKind {...}
public String name() throws BadKind {...}
public int member_count() throws BadKind {...}
public String member_name(int index) throws BadKind, Bounds {...}
public TypeCode member_type(int index) throws BadKind, Bounds {...}
public Any member_label(int index) throws BadKind, Bounds {...}
public TypeCode discriminator_type() throws BadKind {...}
public int default_index() throws BadKind {...}
public int length() throws BadKind {...}
public TypeCode content_type() throws BadKind {...}
public short fixed_digits() throws BadKind {...}
public short fixed_scale() throws BadKind {...}
public Visibility member_visibility(int index) throws BadKind, Bounds {...}
public ValueModifier type_modifier() throws BadKind {...}
public TypeCode concrete_base_type() throws BadKind {...}
}

Except Any (which is defined Clause A.1.4) and TypeCode, all types used in the declaration of TypeCode shall be derived from their IDL definition in [CORBA-IFC] following the mapping rules defined in Chapter 7, applying the IDL Naming Scheme defined in Clause 7.1.1.1. The resulting Java definitions shall be placed in the org.omg.CORBA package.

NOTE—The use of IDL Naming Scheme is mandated here to define classes and interfaces that follow the PIDL names defined in [CORBA-IFC].

A.1.3 Object

The CORBA Object interface shall be mapped to Java according to the mapping rules for Interfaces – Full defined in Clause 7.5. The resulting Object interface shall be placed in the org.omg.CORBA package. The mapping of the CORBA Object interface shall be done according to the IDL Naming Scheme defined in Clause 7.1.1.1.

NOTE—The use of IDL Naming Scheme is mandated here to define classes and interfaces that follow the PIDL names defined in [CORBA-IFC].

A.1.4 Any

The IDL type any maps to a public class named org.omg.CORBA.Any with the following definition:

```java
package org.omg.CORBA;

public class Any {
    public boolean equal(Any a) {...}
    public TypeCode type() {...}
    public void type(TypeCode t) {...}
    public void insert_short(short value) {...}
    public short extract_short() {...}
    public void insert_long(int value) {...}
    public int extract_long() {...}
    public void insert_longlong(long value) {...}
    public long extract_longlong() {...}
    public void insert_ushort(short value) {...}

    public boolean equal(Any a) {...}
    public TypeCode type() {...}
    public void type(TypeCode t) {...}
    public void insert_short(short value) {...}
    public short extract_short() {...}
    public void insert_long(int value) {...}
    public int extract_long() {...}
    public void insert_longlong(long value) {...}
    public long extract_longlong() {...}
    public void insert_ushort(short value) {...}
}
```
public short extract_ushort() {...}
public void insert_ulong(int value) {...}

public int extract_ulong() {...}
public void insert_ulonglong(long value) {...}

public long extract_ulonglong() {...}
public void insert_float(float value) {...}
public float extract_float() {...}

public void insert_double(double value) {...}
public double extract_double() {...}

public void insert_boolean(boolean value) {...}
public boolean extract_boolean() {...}

public void insert_char(char value) {...}
public char extract_char() {...}

public void insert_wchar(char value) {...}
public char extract_wchar() {...}

public void insert_octet(byte value) {...}
public byte extract_octet() {...}

public void insert_any(Any value) {...}
public Any extract_any() {...}

public void insert_object(Object value) {...}
public Object extract_object() {...}
}

A.1.5 Interfaces

IDL interfaces shall be mapped to Java according to the mapping rules for Interfaces – Full defined in Clause 7.5.

A.1.6 Value Types

IDL valuetypes shall be mapped to Java according to the mapping rules for Value Types defined in Clause 7.6.

A.2 DDS-Specific Mappings

DDS requires no additional platform-specific language mappings. Implementations of this specification targeting DDS shall therefore be based solely on the IDL to Java mappings defined in chapters 7 and 8 for the building blocks that compose the DDS profiles defined in clause 9.3 of [IDL4].
This page intentionally left blank.
## Annex B: Building Block Traceability Matrix

(non-normative)

The building block traceability matrix provides an indication of where (which document clause) each IDL building block is addressed in this language mapping.

### Table B.1: Building Block Traceability Matrix

<table>
<thead>
<tr>
<th>Building Block</th>
<th>Clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core DataTypes</td>
<td>7.2 Core Data Types</td>
</tr>
<tr>
<td>Any</td>
<td>7.3 Any</td>
</tr>
<tr>
<td>Interfaces – Basic</td>
<td>7.4 Interfaces – Basic</td>
</tr>
<tr>
<td>Interfaces – Full</td>
<td>7.5 Interfaces – Full</td>
</tr>
<tr>
<td>Value Types</td>
<td>7.6 Value Types</td>
</tr>
<tr>
<td>CORBA-Specific – Interfaces</td>
<td>7.7 CORBA-Specific – Interfaces</td>
</tr>
<tr>
<td>CORBA-Specific – Value Types</td>
<td>7.8 CORBA-Specific – Value Types</td>
</tr>
<tr>
<td>Components – Basic</td>
<td>7.9 Components – Basic</td>
</tr>
<tr>
<td>Components – Homes</td>
<td>7.10 Components – Homes</td>
</tr>
<tr>
<td>CCM-Specific</td>
<td>7.11 CCM-Specific</td>
</tr>
<tr>
<td>Components – Ports and Connectors</td>
<td>7.12 Components – Ports and Connectors</td>
</tr>
<tr>
<td>Template Modules</td>
<td>7.13 Template Modules</td>
</tr>
<tr>
<td>Extended Data Types</td>
<td>7.14 Extended Data Types</td>
</tr>
<tr>
<td>Anonymous Types</td>
<td>7.15 Anonymous Types</td>
</tr>
<tr>
<td>Annotations</td>
<td>7.16 Annotations</td>
</tr>
</tbody>
</table>