MapStruct 1.2.0.Final Reference Guide
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### **Preface**

This is the reference documentation of MapStruct, an annotation processor for generating typesafe, performant and dependency-free bean mapping code. This guide covers all the functionality provided by MapStruct. In case this guide doesn't answer all your questions just join the MapStruct Google group to get help.

You found a typo or other error in this guide? Please let us know by opening an issue in the MapStruct GitHub repository, or, better yet, help the community and send a pull request for fixing it!

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# 1. Introduction

MapStruct is a Java annotation processor for the generation of type-safe bean mapping classes.

All you have to do is to define a mapper interface which declares any required mapping methods. During compilation, MapStruct will generate an implementation of this interface. This implementation uses plain Java method invocations for mapping between source and target objects, i.e. no reflection or similar.

Compared to writing mapping code from hand, MapStruct saves time by generating code which is tedious and error-prone to write. Following a convention over configuration approach, MapStruct uses sensible defaults but steps out of your way when it comes to configuring or implementing special behavior.

Compared to dynamic mapping frameworks, MapStruct offers the following advantages:

- Fast execution by using plain method invocations instead of reflection
- Compile-time type safety: Only objects and attributes mapping to each other can be mapped, no accidental mapping of an order entity into a customer DTO etc.
- Clear error-reports at build time, if
  - mappings are incomplete (not all target properties are mapped)
  - mappings are incorrect (cannot find a proper mapping method or type conversion)

# 2. Set up

MapStruct is a Java annotation processor based on JSR 269 and as such can be used within command line builds (javac, Ant, Maven etc.) as well as from within your IDE.

It comprises the following artifacts:

• org.mapstruct:mapstruct: contains the required annotations such as @Mapping; On Java 8 or later, use org.mapstruct:mapstruct-jdk8 instead which takes advantage of language improvements

introduced in Java 8

• *org.mapstruct:mapstruct-processor*: contains the annotation processor which generates mapper implementations

# 2.1. Apache Maven

For Maven based projects add the following to your POM file in order to use MapStruct:

Example 1. Maven configuration

```
cproperties>
    <org.mapstruct.version>1.2.0.Final/org.mapstruct.version>
</properties>
<dependencies>
    <dependency>
        <groupId>org.mapstruct</groupId>
        <artifactId>mapstruct-jdk8</artifactId>
        <version>${org.mapstruct.version}</version>
    </dependency>
</dependencies>
<build>
    <plugins>
        <plugin>
           <groupId>org.apache.maven.plugins</groupId>
           <artifactId>maven-compiler-plugin</artifactId>
           <version>3.5.1
           <configuration>
                <source>1.8</source>
                <target>1.8</target>
                <annotationProcessorPaths>
                   <path>
                       <groupId>org.mapstruct
                       <artifactId>mapstruct-processor</artifactId>
                       <version>${org.mapstruct.version}</version>
                   </path>
                </annotationProcessorPaths>
           </configuration>
        </plugin>
    </plugins>
</build>
```

If you are working with the Eclipse IDE, make sure to have a current version of the M2E plug-in. When importing a Maven project configured as shown above, it will set up the MapStruct annotation processor so it runs right in the IDE, whenever you save a mapper type. Neat, isn't it?

To double check that everything is working as expected, go to your project's properties and select "Java Compiler" → "Annotation Processing" → "Factory Path". The MapStruct processor JAR should be listed and enabled there. Any processor options configured via the compiler plug-in (see below) should be listed under "Java Compiler" → "Annotation Processing".



If the processor is not kicking in, check that the configuration of annotation processors through M2E is enabled. To do so, go to "Preferences" → "Maven" → "Annotation Processing" and select "Automatically configure JDT APT". Alternatively, specify the following in the properties section of your POM file: <m2e.apt.activation>jdt\_apt</m2e.apt.activation>.

Also make sure that your project is using Java 1.6 or later (project properties  $\rightarrow$  "Java Compiler"  $\rightarrow$  "Compile Compliance Level"). It will not work with older versions.

#### 2.2. Gradle

Add the following to your Gradle build file in order to enable MapStruct:

Example 2. Gradle configuration

```
plugins {
    ...
    id 'net.ltgt.apt' version '0.8'
}
dependencies {
    ...
    compile 'org.mapstruct:mapstruct-jdk8:1.2.0.Final'
    apt 'org.mapstruct:mapstruct-processor:1.2.0.Final'
}
...
```

You can find a complete example in the mapstruct-examples project on GitHub.

### 2.3. Apache Ant

Add the javac task configured as follows to your *build.xml* file in order to enable MapStruct in your Ant-based project. Adjust the paths as required for your project layout.

You can find a complete example in the mapstruct-examples project on GitHub.

# 2.4. Configuration options

The MapStruct code generator can be configured using annotation processor options.

When invoking javac directly, these options are passed to the compiler in the form *-Akey=value*. When using MapStruct via Maven, any processor options can be passed using an options element within the configuration of the Maven processor plug-in like this:

```
<plugin>
   <groupId>org.apache.maven.plugins
   <artifactId>maven-compiler-plugin</artifactId>
   <version>3.5.1
   <configuration>
       <source>1.8</source>
       <target>1.8</target>
       <annotationProcessorPaths>
           <path>
               <groupId>org.mapstruct
               <artifactId>mapstruct-processor</artifactId>
               <version>${org.mapstruct.version}</version>
           </path>
       </annotationProcessorPaths>
       <compilerArgs>
           <compilerArg>
               -Amapstruct.suppressGeneratorTimestamp=true
           </compilerArg>
           <compilerArg>
               -Amapstruct.suppressGeneratorVersionInfoComment=true
           </compilerArg>
       </compilerArgs>
   </configuration>
</plugin>
```

#### Example 5. Gradle configuration

```
compileJava {
   options.compilerArgs = [
        '-Amapstruct.suppressGeneratorTimestamp=true',
        '-Amapstruct.suppressGeneratorVersionInfoComment=true'
   ]
}
...
```

The following options exist:

Table 1. MapStruct processor options

Option	Purpose	Default
mapstruct. suppressGeneratorTimes tamp	If set to true, the creation of a time stamp in the @Generated annotation in the generated mapper classes is suppressed.	false
mapstruct. suppressGeneratorVersi onInfoComment	If set to true, the creation of the comment attribute in the @Generated annotation in the generated mapper classes is suppressed. The comment contains information about the version of MapStruct and about the compiler used for the annotation processing.	false
mapstruct.defaultCompo nentModel	The name of the component model (see Retrieving a mapper) based on which mappers should be generated. Supported values are: *default: the mapper uses no component model, instances are typically retrieved via Mappers#getMapper(Class) * cdi: the generated mapper is an application-scoped CDI bean and can be retrieved via @Inject * spring: the generated mapper is a singleton-scoped Spring bean and can be retrieved via @Autowired * jsr330: the generated mapper is annotated with {@code @Named} and can be retrieved via @Inject, e.g. using Spring If a component model is given for a specific mapper via @Mapper#componentModel(), the value from the annotation takes precedence.	default
mapstruct.unmappedTarg etPolicy	The default reporting policy to be applied in case an attribute of the target object of a mapping method is not populated with a source value. Supported values are: * ERROR: any unmapped target property will cause the mapping code generation to fail * WARN: any unmapped target property will cause a warning at build time * IGNORE: unmapped target properties are ignored If a policy is given for a specific mapper via @Mapper#unmappedTargetPolicy(), the value from the annotation takes precedence.	WARN

# 2.5. Using MapStruct on Java 9

MapStruct can be used with Java 9, but as that Java version has not been finalized yet, support for it is experimental.

A core theme of Java 9 is the modularization of the JDK. One effect of this is that a specific module needs to be enabled for a project in order to use the <code>javax.annotation.Generated</code> annotation. <code>Generated</code> is added by MapStruct to generated mapper classes to tag them as generated code, stating the date of generation, the generator version etc.

To allow usage of the <code>@Generated</code> annotation the module <code>java.annotations.common</code> must be enabled. When using Maven, this can be done like this:

```
export MAVEN_OPTS="--add-modules java.annotations.common"
```

If the <code>@Generated</code> annotation is not available, MapStruct will detect this situation and not add it to generated mappers.

# 3. Defining a mapper

In this section you'll learn how to define a bean mapper with MapStruct and which options you have to do so.

# 3.1. Basic mappings

To create a mapper simply define a Java interface with the required mapping method(s) and annotate it with the org.mapstruct.Mapper annotation:

Example 6. Maven configuration

```
@Mapper
public interface CarMapper {

    @Mappings({
        @Mapping(source = "make", target = "manufacturer"),
            @Mapping(source = "numberOfSeats", target = "seatCount")
    })
    CarDto carToCarDto(Car car);

@Mapping(source = "name", target = "fullName")
PersonDto personToPersonDto(Person person);
}
```

The @Mapper annotation causes the MapStruct code generator to create an implementation of the CarMapper interface during build-time.

In the generated method implementations all readable properties from the source type (e.g. Car) will be copied into the corresponding property in the target type (e.g. CarDto). If a property has a different name in the target entity, its name can be specified via the <code>@Mapping</code> annotation.



The property name as defined in the JavaBeans specification must be specified in the <code>@Mapping</code> annotation, e.g. <code>seatCount</code> for a property with the accessor methods <code>getSeatCount()</code> and <code>setSeatCount()</code>.



When using Java 8 or later, you can omit the <code>@Mappings</code> wrapper annotation and directly specify several <code>@Mapping</code> annotations on one method.

To get a better understanding of what MapStruct does have a look at the following implementation of the carToCarDto() method as generated by MapStruct:

```
// GENERATED CODE
public class CarMapperImpl implements CarMapper {
    @Override
    public CarDto carToCarDto(Car car) {
        if ( car == null ) {
            return null;
        }
        CarDto carDto = new CarDto();
        if ( car.getFeatures() != null ) {
            carDto.setFeatures( new ArrayList<String>( car.getFeatures() ) );
        }
        carDto.setManufacturer( car.getMake() );
        carDto.setSeatCount( car.getNumberOfSeats() );
        carDto.setDriver( personToPersonDto( car.getDriver() ) );
        carDto.setPrice( String.valueOf( car.getPrice() ) );
        if ( car.getCategory() != null ) {
            carDto.setCategory( car.getCategory().toString() );
        carDto.setEngine( engineTtoEngineDto( car.getEngine() ) );
        return carDto;
    }
    @Override
    public PersonDto personToPersonDto(Person person) {
        //...
    private EngineDto engineToEngineDto(Engine engine) {
        if ( engine == null ) {
            return null;
        }
        EngineDto engineDto = new EngineDto();
        engineDto.setHorsePower(engine.getHorsePower());
        engineDto.setFuel(engine.getFuel());
        return engineDto;
    }
}
```

The general philosophy of MapStruct is to generate code which looks as much as possible as if you had written it yourself from hand. In particular this means that the values are copied from source

to target by plain getter/setter invocations instead of reflection or similar.

As the example shows the generated code takes into account any name mappings specified via <code>@Mapping</code>. If the type of a mapped attribute is different in source and target entity, MapStruct will either apply an automatic conversion (as e.g. for the *price* property, see also Implicit type conversions) or optionally invoke / create another mapping method (as e.g. for the *driver* / *engine* property, see also Mapping object references). MapStruct will only create a new mapping method if and only if the source and target property are properties of a Bean and they themselves are Beans or simple properties. i.e. they are not <code>Collection</code> or <code>Map</code> type properties.

Collection-typed attributes with the same element type will be copied by creating a new instance of the target collection type containing the elements from the source property. For collection-typed attributes with different element types each element will be mapped individually and added to the target collection (see Mapping collections).

MapStruct takes all public properties of the source and target types into account. This includes properties declared on super-types.

# 3.2. Adding custom methods to mappers

In some cases it can be required to manually implement a specific mapping from one type to another which can't be generated by MapStruct. One way for this is to implement such method on another class which then is used by mappers generated by MapStruct (see Invoking other mappers).

Alternatively, when using Java 8 or later, you can implement custom methods directly in a mapper interface as default methods. The generated code will invoke the default methods if the argument and return types match.

As an example let's assume the mapping from Person to PersonDto requires some special logic which can't be generated by MapStruct. You could then define the mapper from the previous example like this:

Example 8. Mapper which defines a custom mapping with a default method

```
@Mapper
public interface CarMapper {

    @Mappings({...})
    CarDto carToCarDto(Car car);

    default PersonDto personToPersonDto(Person person) {
        //hand-written mapping logic
    }
}
```

The class generated by MapStruct implements the method carToCarDto(). The generated code in carToCarDto() will invoke the manually implemented personToPersonDto() method when mapping

the driver attribute.

A mapper could also be defined in form of an abstract class instead of an interface and implement custom methods directly in this mapper class. In this case MapStruct will generate an extension of the abstract class with implementations of all abstract methods. An advantage of this approach over declaring default methods is that additional fields could be declared in the mapper class.

The previous example where the mapping from Person to PersonDto requires some special logic could then be defined like this:

Example 9. Mapper defined by an abstract class

```
@Mapper
public abstract class CarMapper {

    @Mappings(...)
    public abstract CarDto carToCarDto(Car car);

    public PersonDto personToPersonDto(Person person) {
        //hand-written mapping logic
    }
}
```

MapStruct will generate a sub-class of CarMapper with an implementation of the carToCarDto() method as it is declared abstract. The generated code in carToCarDto() will invoke the manually implemented personToPersonDto() method when mapping the driver attribute.

# 3.3. Mapping methods with several source parameters

MapStruct also supports mapping methods with several source parameters. This is useful e.g. in order to combine several entities into one data transfer object. The following shows an example:

Example 10. Mapping method with several source parameters

```
@Mapper
public interface AddressMapper {

    @Mappings({
          @Mapping(source = "person.description", target = "description"),
          @Mapping(source = "address.houseNo", target = "houseNumber")
     })
    DeliveryAddressDto personAndAddressToDeliveryAddressDto(Person person, Address address);
}
```

The shown mapping method takes two source parameters and returns a combined target object. As

with single-parameter mapping methods properties are mapped by name.

In case several source objects define a property with the same name, the source parameter from which to retrieve the property must be specified using the <code>@Mapping</code> annotation as shown for the <code>description</code> property in the example. An error will be raised when such an ambiguity is not resolved. For properties which only exist once in the given source objects it is optional to specify the source parameter's name as it can be determined automatically.



Specifying the parameter in which the property resides is mandatory when using the <code>@Mapping</code> annotation.



Mapping methods with several source parameters will return null in case all the source parameters are null. Otherwise the target object will be instantiated and all properties from the provided parameters will be propagated.

MapStruct also offers the possibility to directly refer to a source parameter.

Example 11. Mapping method directly referring to a source parameter

```
@Mapper
public interface AddressMapper {

    @Mappings({
        @Mapping(source = "person.description", target = "description"),
        @Mapping(source = "hn", target = "houseNumber")
    })
    DeliveryAddressDto personAndAddressToDeliveryAddressDto(Person person, Integer hn);
}
```

In this case the source parameter is directly mapped into the target as the example above demonstrates. The parameter hn, a non bean type (in this case <code>java.lang.Integer</code>) is mapped to houseNumber.

### 3.4. Updating existing bean instances

In some cases you need mappings which don't create a new instance of the target type but instead update an existing instance of that type. This sort of mapping can be realized by adding a parameter for the target object and marking this parameter with <code>@MappingTarget</code>. The following shows an example:

```
@Mapper
public interface CarMapper {
    void updateCarFromDto(CarDto carDto, @MappingTarget Car car);
}
```

The generated code of the updateCarFromDto() method will update the passed Car instance with the properties from the given CarDto object. There may be only one parameter marked as mapping target. Instead of void you may also set the method's return type to the type of the target parameter, which will cause the generated implementation to update the passed mapping target and return it as well. This allows for fluent invocations of mapping methods.

Collection- or map-typed properties of the target bean to be updated will be cleared and then populated with the values from the corresponding source collection or map.

### 3.5. Mappings with direct field access

MapStruct also supports mappings of public fields that have no getters/setters. MapStruct will use the fields as read/write accessor if it cannot find suitable getter/setter methods for the property.

A field is considered as a read accessor if it is public or public final. If a field is static it is not considered as a read accessor.

A field is considered as a write accessor only if it is public. If a field is final and/or static it is not considered as a write accessor.

Small example:

```
public class Customer {
    private Long id;
    private String name;
    //getters and setter omitted for brevity
}
public class CustomerDto {
    public Long id;
    public String customerName;
}
@Mapper
public interface CustomerMapper {
    CustomerMapper MAPPER = Mappers.getMapper( CustomerMapper.class );
    @Mapping(source = "customerName", target = "name")
    Customer toCustomer(CustomerDto customerDto);
    @InheritInverseConfiguration
    CustomerDto fromCustomer(Customer customer);
}
```

For the configuration from above, the generated mapper looks like:

```
// GENERATED CODE
public class CustomerMapperImpl implements CustomerMapper {
    @Override
    public Customer toCustomer(CustomerDto customerDto) {
       // ...
        customer.setId( customerDto.id );
        customer.setName( customerDto.customerName );
        // ...
    }
    @Override
    public CustomerDto fromCustomer(Customer customer) {
        customerDto.id = customer.getId();
        customerDto.customerName = customer.getName();
        // ...
    }
}
```

You can find the complete example in the mapstruct-examples-field-mapping project on GitHub.

# 4. Retrieving a mapper

# 4.1. The Mappers factory

Mapper instances can be retrieved via the org.mapstruct.factory.Mappers class. Just invoke the getMapper() method, passing the interface type of the mapper to return:

Example 15. Using the Mappers factory

```
CarMapper mapper = Mappers.getMapper( CarMapper.class );
```

By convention, a mapper interface should define a member called INSTANCE which holds a single instance of the mapper type:

```
@Mapper
public interface CarMapper {
    CarMapper INSTANCE = Mappers.getMapper( CarMapper.class );
    CarDto carToCarDto(Car car);
}
```

This pattern makes it very easy for clients to use mapper objects without repeatedly instantiating new instances:

Example 17. Accessing a mapper

```
Car car = ...;
CarDto dto = CarMapper.INSTANCE.carToCarDto( car );
```

Note that mappers generated by MapStruct are thread-safe and thus can safely be accessed from several threads at the same time.

# 4.2. Using dependency injection

If you're working with a dependency injection framework such as CDI (Contexts and Dependency Injection for Java<sup>TM</sup> EE) or the Spring Framework, it is recommended to obtain mapper objects via dependency injection as well. For that purpose you can specify the component model which generated mapper classes should be based on either via @Mapper#componentModel or using a processor option as described in Configuration options.

Currently there is support for CDI and Spring (the latter either via its custom annotations or using the JSR 330 annotations). See Configuration options for the allowed values of the componentModel attribute which are the same as for the mapstruct.defaultComponentModel processor option. In both cases the required annotations will be added to the generated mapper implementations classes in order to make the same subject to dependency injection. The following shows an example using CDI:

Example 18. A mapper using the CDI component model

```
@Mapper(componentModel = "cdi")
public interface CarMapper {
    CarDto carToCarDto(Car car);
}
```

The generated mapper implementation will be marked with the <code>@ApplicationScoped</code> annotation and thus can be injected into fields, constructor arguments etc. using the <code>@Inject</code> annotation:

Example 19. Obtaining a mapper via dependency injection

```
@Inject
private CarMapper mapper;
```

A mapper which uses other mapper classes (see Invoking other mappers) will obtain these mappers using the configured component model. So if CarMapper from the previous example was using another mapper, this other mapper would have to be an injectable CDI bean as well.

# 5. Data type conversions

Not always a mapped attribute has the same type in the source and target objects. For instance an attribute may be of type int in the source bean but of type Long in the target bean.

Another example are references to other objects which should be mapped to the corresponding types in the target model. E.g. the class Car might have a property driver of the type Person which needs to be converted into a PersonDto object when mapping a Car object.

In this section you'll learn how MapStruct deals with such data type conversions.

# 5.1. Implicit type conversions

MapStruct takes care of type conversions automatically in many cases. If for instance an attribute is of type int in the source bean but of type String in the target bean, the generated code will transparently perform a conversion by calling String#valueOf(int) and Integer#parseInt(String), respectively.

Currently the following conversions are applied automatically:

- Between all Java primitive data types and their corresponding wrapper types, e.g. between int and Integer, boolean and Boolean etc. The generated code is null aware, i.e. when converting a wrapper type into the corresponding primitive type a null check will be performed.
- Between all Java primitive number types and the wrapper types, e.g. between int and long or byte and Integer.



Converting from larger data types to smaller ones (e.g. from long to int) can cause a value or precision loss. There will be an option for raising a warning in such cases in a future MapStruct version.

• Between all Java primitive types (including their wrappers) and String, e.g. between int and String or Boolean and String. A format string as understood by java.text.DecimalFormat can be specified.

#### Example 20. Conversion from int to String

```
@Mapper
public interface CarMapper {

    @Mapping(source = "price", numberFormat = "$#.00")
    CarDto carToCarDto(Car car);

    @IterableMapping(numberFormat = "$#.00")
    List<String> prices(List<Integer> prices);
}
```

- Between enum types and String.
- Between big number types (java.math.BigInteger, java.math.BigDecimal) and Java primitive types (including their wrappers) as well as String. A format string as understood by java.text.DecimalFormat can be specified.

#### Example 21. Conversion from BigDecimal to String

```
@Mapper
public interface CarMapper {
    @Mapping(source = "power", numberFormat = "#.##E0")
    CarDto carToCarDto(Car car);
}
```

- Between JAXBElement<T> and T, List<JAXBElement<T>> and List<T>
- Between java.util.Calendar/java.util.Date and JAXB's XMLGregorianCalendar
- Between java.util.Date/XMLGregorianCalendar and String. A format string as understood by java.text.SimpleDateFormat can be specified via the dateFormat option as this:

```
@Mapper
public interface CarMapper {

    @Mapping(source = "manufacturingDate", dateFormat = "dd.MM.yyyy")
    CarDto carToCarDto(Car car);

    @IterableMapping(dateFormat = "dd.MM.yyyy")
    List<String> stringListToDateList(List<Date> dates);
}
```

- Between Jodas org.joda.time.DateTime, org.joda.time.LocalDateTime, org.joda.time.LocalDate, org.joda.time.LocalTime and String. A format string as understood by java.text.SimpleDateFormat can be specified via the dateFormat option (see above).
- Between Jodas org.joda.time.DateTime and javax.xml.datatype.XMLGregorianCalendar, java.util.Calendar.
- Between Jodas org.joda.time.LocalDateTime, org.joda.time.LocalDate and javax.xml.datatype.XMLGregorianCalendar, java.util.Date.
- Between java.time.ZonedDateTime, java.time.LocalDateTime, java.time.LocalDate, java.time.LocalTime from Java 8 Date-Time package and String. A format string as understood by java.text.SimpleDateFormat can be specified via the dateFormat option (see above).
- Between java.time.ZonedDateTime from Java 8 Date-Time package and java.util.Date where, when mapping a ZonedDateTime from a given Date, the system default timezone is used.
- Between java.time.LocalDateTime from Java 8 Date-Time package and java.util.Date where timezone UTC is used as the timezone.
- Between java.time.LocalDate from Java 8 Date-Time package and java.util.Date where timezone UTC is used as the timezone.
- Between java.time.ZonedDateTime from Java 8 Date-Time package and java.util.Calendar.
- Between java.sql.Date and java.util.Date
- Between java.sql.Time and java.util.Date
- Between java.sql.Timestamp and java.util.Date
- When converting from a String, omitting Mapping#dateFormat, it leads to usage of the default pattern and date format symbols for the default locale. An exception to this rule is XmlGregorianCalendar which results in parsing the String according to XML Schema 1.0 Part 2, Section 3.2.7-14.1, Lexical Representation.

### 5.2. Mapping object references

Typically an object has not only primitive attributes but also references other objects. E.g. the Car class could contain a reference to a Person object (representing the car's driver) which should be mapped to a PersonDto object referenced by the CarDto class.

In this case just define a mapping method for the referenced object type as well:

Example 23. Mapper with one mapping method using another

```
@Mapper
public interface CarMapper {
    CarDto carToCarDto(Car car);
    PersonDto personToPersonDto(Person person);
}
```

The generated code for the carToCarDto() method will invoke the personToPersonDto() method for mapping the driver attribute, while the generated implementation for personToPersonDto() performs the mapping of person objects.

That way it is possible to map arbitrary deep object graphs. When mapping from entities into data transfer objects it is often useful to cut references to other entities at a certain point. To do so, implement a custom mapping method (see the next section) which e.g. maps a referenced entity to its id in the target object.

When generating the implementation of a mapping method, MapStruct will apply the following routine for each attribute pair in the source and target object:

- If source and target attribute have the same type, the value will be simply copied from source to target. If the attribute is a collection (e.g. a List) a copy of the collection will be set into the target attribute.
- If source and target attribute type differ, check whether there is another mapping method which has the type of the source attribute as parameter type and the type of the target attribute as return type. If such a method exists it will be invoked in the generated mapping implementation.
- If no such method exists MapStruct will look whether a built-in conversion for the source and target type of the attribute exists. If this is the case, the generated mapping code will apply this conversion.
- If no such method was found MapStruct will try to generate an automatic sub-mapping method that will do the mapping between the source and target attributes.
- If MapStruct could not create a name based mapping method an error will be raised at build time, indicating the non-mappable attribute and its path.



In order to stop MapStruct from generating automatic sub-mapping methods, one can use <code>@Mapper( disableSubMappingMethodsGeneration = true )</code>.



During the generation of automatic sub-mapping methods Shared configurations will not be taken into consideration, yet. Follow issue #1086 for more information.

# 5.3. Controlling nested bean mappings

As explained above, MapStruct will generate a method based on the name of the source and target property. Unfortunately, in many occasions these names do not match.

The '.' notation in an <code>@Mapping</code> source or target type can be used to control how properties should be mapped when names do not match. There is an elaborate example in our examples repository to explain how this problem can be overcome.

In the simplest scenario there's a property on a nested level that needs to be corrected. Take for instance a property fish which has an identical name in FishTankDto and FishTank. For this property MapStruct automatically generates a mapping: FishDto fishToFishDto(Fish fish). MapStruct cannot possibly be aware of the deviating properties kind and type. Therefore this can be addressed in a mapping rule: <code>@Mapping(target="fish.kind", source="fish.type")</code>. This tells MapStruct to deviate from looking for a name kind at this level and map it to type.

Example 24. Mapper controlling nested beans mappings I

```
@Mapper
public interface FishTankMapper {

    @Mappings({
        @Mapping(target = "fish.kind", source = "fish.type"),
        @Mapping(target = "fish.name", ignore = true),
        @Mapping(target = "ornament", source = "interior.ornament"),
        @Mapping(target = "material.materialType", source = "material"),
        @Mapping(target = "quality.report.organisation.name", source =
"quality.report.organisationName")
    })
    FishTankDto map( FishTank source );
}
```

The same constructs can be used to ignore certain properties at a nesting level, as is demonstrated in the second <code>@Mapping</code> rule.

MapStruct can even be used to "cherry pick" properties when source and target do not share the same nesting level (the same number of properties). This can be done in the source – and in the target type. This is demonstrated in the next 2 rules: <code>@Mapping(target="ornament", source="interior.ornament")</code> and <code>@Mapping(target="material.materialType", source="material")</code>.

The latter can even be done when mappings first share a common base. For example: all properties that share the same name of Quality are mapped to QualityDto. Likewise, all properties of Report are mapped to ReportDto, with one exception: organisation in OrganisationDto is left empty (since there is no organization at the source level). Only the name is populated with the organisationName from Report. This is demonstrated in @Mapping(target="quality.report.organisation.name", source="quality.report.organisationName")

Coming back to the original example: what if kind and type would be beans themselves? In that case MapStruct would again generate a method continuing to map. Such is demonstrated in the next example:

Example 25. Mapper controlling nested beans mappings II

```
@Mapper
public interface FishTankMapperWithDocument {

    @Mappings({
          @Mapping(target = "fish.kind", source = "fish.type"),
          @Mapping(target = "fish.name", expression = "java(\"Jaws\")"),
          @Mapping(target = "plant", ignore = true ),
          @Mapping(target = "ornament", ignore = true ),
          @Mapping(target = "material", ignore = true),
          @Mapping(target = "quality.document", source = "quality.report"),
          @Mapping(target = "quality.document.organisation.name", constant =

"NoIdeaInc" )
     })
     FishTankWithNestedDocumentDto map( FishTank source );
}
```

Note what happens in <code>@Mapping(target="quality.document"</code>, <code>source="quality.report"</code>). DocumentDto does not exist as such on the target side. It is mapped from <code>Report</code>. MapStruct continues to generate mapping code here. That mapping itself can be guided towards another name. This even works for constants and expression. Which is shown in the final example: <code>@Mapping(target="quality.document.organisation.name"</code>, <code>constant="NoIdeaInc"</code>).

MapStruct will perform a null check on each nested property in the source.



Instead of configuring everything via the parent method we encourage users to explicitly write their own nested methods. This puts the configuration of the nested mapping into one place (method) where it can be reused from several methods in the upper level, instead of re-configuring the same things on all of those upper methods.



In some cases the ReportingPolicy that is going to be used for the generated nested method would be IGNORE. This means that it is possible for MapStruct not to report unmapped target properties in nested mappings.

### 5.4. Invoking other mappers

In addition to methods defined on the same mapper type MapStruct can also invoke mapping methods defined in other classes, be it mappers generated by MapStruct or hand-written mapping methods. This can be useful to structure your mapping code in several classes (e.g. with one

mapper type per application module) or if you want to provide custom mapping logic which can't be generated by MapStruct.

For instance the Car class might contain an attribute manufacturingDate while the corresponding DTO attribute is of type String. In order to map this attribute, you could implement a mapper class like this:

Example 26. Manually implemented mapper class

In the @Mapper annotation at the CarMapper interface reference the DateMapper class like this:

Example 27. Referencing another mapper class

```
@Mapper(uses=DateMapper.class)
public class CarMapper {
    CarDto carToCarDto(Car car);
}
```

When generating code for the implementation of the carToCarDto() method, MapStruct will look for a method which maps a Date object into a String, find it on the DateMapper class and generate an invocation of asString() for mapping the manufacturingDate attribute.

Generated mappers retrieve referenced mappers using the component model configured for them. If e.g. CDI was used as component model for CarMapper, DateMapper would have to be a CDI bean as well. When using the default component model, any hand-written mapper classes to be referenced by MapStruct generated mappers must declare a public no-args constructor in order to be instantiable.

# 5.5. Passing the mapping target type to custom mappers

When having a custom mapper hooked into the generated mapper with <code>@Mapper#uses()</code>, an additional parameter of type <code>Class</code> (or a super-type of it) can be defined in the custom mapping method in order to perform general mapping tasks for specific target object types. That attribute must be annotated with <code>@TargetType</code> for MapStruct to generate calls that pass the <code>Class</code> instance representing the corresponding property type of the target bean.

For instance, the CarDto could have a property owner of type Reference that contains the primary key of a Person entity. You could now create a generic custom mapper that resolves any Reference objects to their corresponding managed JPA entity instances.

Example 28. Mapping method expecting mapping target type as parameter

```
@ApplicationScoped // CDI component model
public class ReferenceMapper {
    @PersistenceContext
    private EntityManager entityManager;
    public <T extends BaseEntity> T resolve(Reference reference, @TargetType
Class<T> entityClass) {
        return reference != null ? entityManager.find( entityClass, reference
.getPk() ) : null;
    }
    public Reference toReference(BaseEntity entity) {
        return entity != null ? new Reference( entity.getPk() ) : null;
    }
}
@Mapper(componentModel = "cdi", uses = ReferenceMapper.class )
public interface CarMapper {
    Car carDtoToCar(CarDto carDto);
}
```

MapStruct will then generate something like this:

```
//GENERATED CODE
@ApplicationScoped
public class CarMapperImpl implements CarMapper {
    @Inject
    private ReferenceMapper referenceMapper;
    @Override
    public Car carDtoToCar(CarDto carDto) {
        if ( carDto == null ) {
            return null;
        }
        Car car = new Car();
        car.setOwner( referenceMapper.resolve( carDto.getOwner(), Owner.class ) );
        // ...
        return car;
   }
}
```

### 5.6. Passing context or state objects to custom methods

Additional *context* or *state* information can be passed through generated mapping methods to custom methods with <code>@Context</code> parameters. Such parameters are passed to other mapping methods, <code>@ObjectFactory</code> methods (see Object factories) or <code>@BeforeMapping</code> / <code>@AfterMapping</code> methods (see Mapping customization with before-mapping and after-mapping methods) when applicable and can thus be used in custom code.

<code>@Context</code> parameters are also searched for <code>@BeforeMapping</code> / <code>@AfterMapping</code> methods, which are called on the provided context parameter value if applicable.

**Note:** no null checks are performed before calling before/after mapping methods on context parameters. The caller needs to make sure that null is not passed in that case.

For generated code to call a method that is declared with <code>@Context</code> parameters, the declaration of the mapping method being generated needs to contain at least those (or assignable) <code>@Context</code> parameters as well. The generated code will not create new instances of missing <code>@Context</code> parameters nor will it pass a literal <code>null</code> instead.

Example 30. Using <code>@Context</code> parameters for passing data down to hand-written property mapping methods

```
public abstract CarDto toCar(Car car, @Context Locale translationLocale);

protected OwnerManualDto translateOwnerManual(OwnerManual ownerManual, @Context Locale locale) {
    // manually implemented logic to translate the OwnerManual with the given Locale
}
```

MapStruct will then generate something like this:

#### Example 31. Generated code

```
//GENERATED CODE
public CarDto toCar(Car car, Locale translationLocale) {
    if ( car == null ) {
        return null;
    }

    CarDto carDto = new CarDto();

    carDto.setOwnerManual( translateOwnerManual( car.getOwnerManual(), translationLocale );
    // more generated mapping code
    return carDto;
}
```

### 5.7. Mapping method resolution

When mapping a property from one type to another, MapStruct looks for the most specific method which maps the source type into the target type. The method may either be declared on the same mapper interface or on another mapper which is registered via <code>@Mapper#uses()</code>. The same applies for factory methods (see Object factories).

The algorithm for finding a mapping or factory method resembles Java's method resolution algorithm as much as possible. In particular, methods with a more specific source type will take precedence (e.g. if there are two methods, one which maps the searched source type, and another one which maps a super-type of the same). In case more than one most-specific method is found, an error will be raised.



When working with JAXB, e.g. when converting a String to a corresponding JAXBElement<String>, MapStruct will take the scope and name attributes of @XmlElementDecl annotations into account when looking for a mapping method. This makes sure that the created JAXBElement instances will have the right QNAME value. You can find a test which maps JAXB objects here.

# 5.8. Mapping method selection based on qualifiers

In many occasions one requires mapping methods with the same method signature (apart from the name) that have different behavior. MapStruct has a handy mechanism to deal with such situations: <code>Qualifier</code> (org.mapstruct.Qualifier). A 'qualifier' is a custom annotation that the user can write, 'stick onto' a mapping method which is included as used mapper and can be referred to in a bean property mapping, iterable mapping or map mapping. Multiple qualifiers can be 'stuck onto' a method and mapping.

So, let's say there is a hand-written method to map titles with a String return type and String argument amongst many other referenced mappers with the same String return type - String argument signature:

Example 32. Several mapping methods with identical source and target types

```
public class Titles {

   public String translateTitleEG(String title) {
        // some mapping logic
   }

   public String translateTitleGE(String title) {
        // some mapping logic
   }
}
```

And a mapper using this handwritten mapper, in which source and target have a property 'title' that should be mapped:

Example 33. Mapper causing an ambiguous mapping method error

```
@Mapper( uses = Titles.class )
public interface MovieMapper {
    GermanRelease toGerman( OriginalRelease movies );
}
```

Without the use of qualifiers, this would result in an ambiguous mapping method error, because 2

qualifying methods are found (translateTitleEG, translateTitleGE) and MapStruct would not have a hint which one to choose.

Enter the qualifier approach:

Example 34. Declaring a qualifier type

```
import org.mapstruct.Qualifier;

@Qualifier
@Target(ElementType.TYPE)
@Retention(RetentionPolicy.CLASS)
public @interface TitleTranslator {
}
```

And, some qualifiers to indicate which translator to use to map from source language to target language:

Example 35. Declaring qualifier types for mapping methods

```
import org.mapstruct.Qualifier;

@Qualifier
@Target(ElementType.METHOD)
@Retention(RetentionPolicy.CLASS)
public @interface EnglishToGerman {
}

import org.mapstruct.Qualifier;

@Qualifier
@Target(ElementType.METHOD)
@Retention(RetentionPolicy.CLASS)
public @interface GermanToEnglish {
}
```

Please take note of the retention TitleTranslator on class level, EnglishToGerman, GermanToEnglish on method level!

Then, using the qualifiers, the mapping could look like this:

```
@Mapper( uses = Titles.class )
public interface MovieMapper {

    @Mapping( target = "title", qualifiedBy = { TitleTranslator.class,
    EnglishToGerman.class } )
    GermanRelease toGerman( OriginalRelease movies );
}
```

Example 37. Custom mapper qualifying the methods it provides



Please make sure the used retention policy equals retention policy CLASS (@Retention(RetentionPolicy.CLASS)).



A class / method annotated with a qualifier will not qualify anymore for mappings that do not have the qualifiedBy element.



The same mechanism is also present on bean mappings: @BeanMapping#qualifiedBy: it selects the factory method marked with the indicated qualifier.

In many occasions, declaring a new annotation to aid the selection process can be too much for what you try to achieve. For those situations, MapStruct has the <code>@Named</code> annotation. This annotation is a pre-defined qualifier (annotated with <code>@Qualifier</code> itself) and can be used to name a Mapper or, more directly a mapping method by means of its value. The same example above would look like:

```
@Named("TitleTranslator")
public class Titles {

    @Named("EnglishToGerman")
    public String translateTitleEG(String title) {
        // some mapping logic
    }

    @Named("GermanToEnglish")
    public String translateTitleGE(String title) {
        // some mapping logic
    }
}
```

#### Example 39. Mapper using named

```
@Mapper( uses = Titles.class )
public interface MovieMapper {

    @Mapping( target = "title", qualifiedByName = { "TitleTranslator",
    "EnglishToGerman" } )
    GermanRelease toGerman( OriginalRelease movies );
}
```



Although the used mechanism is the same, the user has to be a bit more careful. Refactoring the name of a defined qualifier in an IDE will neatly refactor all other occurrences as well. This is obviously not the case for changing a name.

# 6. Mapping collections

The mapping of collection types (List, Set etc.) is done in the same way as mapping bean types, i.e. by defining mapping methods with the required source and target types in a mapper interface. MapStruct supports a wide range of iterable types from the Java Collection Framework.

The generated code will contain a loop which iterates over the source collection, converts each element and puts it into the target collection. If a mapping method for the collection element types is found in the given mapper or the mapper it uses, this method is invoked to perform the element conversion. Alternatively, if an implicit conversion for the source and target element types exists, this conversion routine will be invoked. The following shows an example:

#### Example 40. Mapper with collection mapping methods

```
@Mapper
public interface CarMapper {
    Set<String> integerSetToStringSet(Set<Integer> integers);
    List<CarDto> carsToCarDtos(List<Car> cars);
    CarDto carToCarDto(Car car);
}
```

The generated implementation of the integerSetToStringSet performs the conversion from Integer to String for each element, while the generated carsToCarDtos() method invokes the carToCarDto() method for each contained element as shown in the following:

```
//GENERATED CODE
@Override
public Set<String> integerSetToStringSet(Set<Integer> integers) {
    if ( integers == null ) {
        return null;
    }
    Set<String> set = new HashSet<String>();
    for ( Integer integer : integers ) {
        set.add( String.valueOf( integer ) );
    }
    return set;
}
@Override
public List<CarDto> carsToCarDtos(List<Car> cars) {
    if ( cars == null ) {
        return null;
    }
   List<CarDto> list = new ArrayList<CarDto>();
    for ( Car car : cars ) {
        list.add( carToCarDto( car ) );
    return list;
}
```

Note that MapStruct will look for a collection mapping method with matching parameter and return type, when mapping a collection-typed attribute of a bean, e.g. from Car#passengers (of type List<PersonDto>).

Example 42. Usage of collection mapping method to map a bean property

```
//GENERATED CODE
carDto.setPassengers( personsToPersonDtos( car.getPassengers() ) );
...
```

Some frameworks and libraries only expose JavaBeans getters but no setters for collection-typed properties. Types generated from an XML schema using JAXB adhere to this pattern by default. In this case the generated code for mapping such a property invokes its getter and adds all the

mapped elements:

Example 43. Usage of an adding method for collection mapping

```
//GENERATED CODE
carDto.getPassengers().addAll( personsToPersonDtos( car.getPassengers() ) );
...
```



It is not allowed to declare mapping methods with an iterable source and a noniterable target or the other way around. An error will be raised when detecting this situation.

# 6.1. Mapping maps

Also map-based mapping methods are supported. The following shows an example:

Example 44. Map mapping method

```
public interface SourceTargetMapper {
    @MapMapping(valueDateFormat = "dd.MM.yyyy")
    Map<String, String> longDateMapToStringStringMap(Map<Long, Date> source);
}
```

Similar to iterable mappings, the generated code will iterate through the source map, convert each value and key (either by means of an implicit conversion or by invoking another mapping method) and put them into the target map:

```
//GENERATED CODE
@Override
public Map<Long, Date> stringStringMapToLongDateMap(Map<String, String> source) {
    if ( source == null ) {
        return null;
    }
    Map<Long, Date> map = new HashMap<Long, Date>();
    for ( Map.Entry<String, String> entry : source.entrySet() ) {
        Long key = Long.parseLong( entry.getKey() );
        Date value:
        try {
            value = new SimpleDateFormat( "dd.MM.yyyy" ).parse( entry.getValue()
);
        }
        catch( ParseException e ) {
            throw new RuntimeException( e );
        }
        map.put( key, value );
    }
    return map;
}
```

## 6.2. Collection mapping strategies

MapStruct has a CollectionMappingStrategy, with the possible values: ACCESSOR\_ONLY, SETTER\_PREFERRED, ADDER\_PREFERRED and TARGET\_IMMUTABLE.

In the table below, the dash - indicates a property name. Next, the trailing s indicates the plural form. The table explains the options and how they are applied to the presence/absense of a set-s, add- and / or get-s method on the target object:

*Table 2. Collection mapping strategy options* 

Option	Only target set-s Available	Only target add- Available	Both set-s / add- Available	No set-s / add- Available	Existing Target(@Target Type)
ACCESSOR_ONLY	set-s	get-s	set-s	get-s	get-s
SETTER_PREFERR ED	set-s	add-	set-s	get-s	get-s

Option	Only target set-s Available	Only target add- Available	Both set-s / add- Available	No set-s / add- Available	Existing Target(@Target Type)
ADDER_PREFERRE D	set-s	add-	add-	get-s	get-s
TARGET_IMMUTAB LE	set-s	exception	set-s	exception	set-s

Some background: An adder method is typically used in case of generated (JPA) entities, to add a single element (entity) to an underlying collection. Invoking the adder establishes a parent-child relation between parent - the bean (entity) on which the adder is invoked - and its child(ren), the elements (entities) in the collection. To find the appropriate adder, MapStruct will try to make a match between the generic parameter type of the underlying collection and the single argument of a candidate adder. When there are more candidates, the plural setter / getter name is converted to singular and will be used in addition to make a match.

The option DEFAULT should not be used explicitly. It is used to distinguish between an explicit user desire to override the default in a <code>@MapperConfig</code> from the implicit Mapstruct choice in a <code>@Mapper</code>. The option <code>DEFAULT</code> is synonymous to <code>ACCESSOR\_ONLY</code>.



When working with an adder method and JPA entities, Mapstruct assumes that the target collections are initialized with a collection implementation (e.g. an ArrayList). You can use factories to create a new target entity with intialized collections instead of Mapstruct creating the target entity by its constructor.

# 6.3. Implementation types used for collection mappings

When an iterable or map mapping method declares an interface type as return type, one of its implementation types will be instantiated in the generated code. The following table shows the supported interface types and their corresponding implementation types as instantiated in the generated code:

Table 3. Collection mapping implementation types

Interface type	Implementation type
Iterable	ArrayList
Collection	ArrayList
List	ArrayList
Set	HashSet
SortedSet	TreeSet
NavigableSet	TreeSet
Мар	HashMap
SortedMap	TreeMap

Interface type	Implementation type	
NavigableMap	TreeMap	
ConcurrentMap	ConcurrentHashMap	
ConcurrentNavigableMap	ConcurrentSkipListMap	

# 7. Mapping Streams

The mapping of java.util.Stream is done in a similar way as the mapping of collection types, i.e. by defining mapping methods with the required source and target types in a mapper interface.

The generated code will contain the creation of a Stream from the provided Iterable/array or will collect the provided Stream into an Iterable/array. If a mapping method or an implicit conversion for the source and target element types exists, then this conversion will be done in Stream#map(). The following shows an example:

Example 46. Mapper with stream mapping methods

```
@Mapper
public interface CarMapper {
    Set<String> integerStreamToStringSet(Stream<Integer> integers);
    List<CarDto> carsToCarDtos(Stream<Car> cars);
    CarDto carToCarDto(Car car);
}
```

The generated implementation of the <a href="integerStreamToStringSet">integer to String</a> for each element, while the generated <a href="carToCarDtos">carToCarDtos</a>() method invokes the <a href="carToCarDto">carToCarDto</a>() method for each contained element as shown in the following:

```
//GENERATED CODE
@Override
public Set<String> integerStreamToStringSet(Stream<Integer> integers) {
    if ( integers == null ) {
        return null;
    }
    return integers.stream().map( integer -> String.valueOf( integer ) )
        .collect( Collectors.toCollection( HashSet<String>::new ) );
}
@Override
public List<CarDto> carsToCarDtos(Stream<Car> cars) {
    if ( cars == null ) {
        return null;
    }
    return integers.stream().map( car -> carToCarDto( car ) )
        .collect( Collectors.toCollection( ArrayList<CarDto>::new ) );
}
```



If a mapping from a Stream to an Iterable or an array is performed, then the passed Stream will be consumed and it will no longer be possible to consume it.

The same implementation types as in Implementation types used for collection mappings are used for the creation of the collection when doing Stream to Iterable mapping.

# 8. Mapping Values

## 8.1. Mapping enum types

MapStruct supports the generation of methods which map one Java enum type into another.

By default, each constant from the source enum is mapped to a constant with the same name in the target enum type. If required, a constant from the source enum may be mapped to a constant with another name with help of the <code>@ValueMapping</code> annotation. Several constants from the source enum can be mapped to the same constant in the target type.

The following shows an example:

```
@Mapper
public interface OrderMapper {

    OrderMapper INSTANCE = Mappers.getMapper( OrderMapper.class );

    @ValueMappings({
            @ValueMapping(source = "EXTRA", target = "SPECIAL"),
            @ValueMapping(source = "STANDARD", target = "DEFAULT"),
            @ValueMapping(source = "NORMAL", target = "DEFAULT")
    })
    ExternalOrderType orderTypeToExternalOrderType(OrderType orderType);
}
```

#### Example 49. Enum mapping method result

```
// GENERATED CODE
public class OrderMapperImpl implements OrderMapper {
    @Override
    public ExternalOrderType orderTypeToExternalOrderType(OrderType orderType) {
        if ( orderType == null ) {
            return null;
        }
        ExternalOrderType externalOrderType_;
        switch ( orderType ) {
            case EXTRA: externalOrderType_ = ExternalOrderType.SPECIAL;
            case STANDARD: externalOrderType_ = ExternalOrderType.DEFAULT;
            break;
            case NORMAL: externalOrderType = ExternalOrderType.DEFAULT;
            case RETAIL: externalOrderType_ = ExternalOrderType.RETAIL;
            case B2B: externalOrderType_ = ExternalOrderType.B2B;
            break;
            default: throw new IllegalArgumentException( "Unexpected enum
constant: " + orderType );
        return externalOrderType_;
   }
}
```

By default an error will be raised by MapStruct in case a constant of the source enum type does not have a corresponding constant with the same name in the target type and also is not mapped to another constant via <code>@ValueMapping</code>. This ensures that all constants are mapped in a safe and predictable manner. The generated mapping method will throw an IllegalStateException if for some reason an unrecognized source value occurs.

MapStruct also has a mechanism for mapping any remaining (unspecified) mappings to a default. This can be used only once in a set of value mappings. It comes in two flavors: <any\_REMAINING> and <any\_UNMAPPED>.

In case of source <any\_REMAINING> MapStruct will continue to map a source enum constant to a target enum constant with the same name. The remainder of the source enum constants will be mapped to the target specified in the <code>@ValueMapping</code> with <any\_REMAINING> source.

MapStruct will **not** attempt such name based mapping for <ANY\_UNMAPPED> and directly apply the target specified in the @ValueMapping with <ANY\_UNMAPPED> source to the remainder.

MapStruct is able to handle null sources and null targets by means of the <**NULL>** keyword.



Constants for <ANY\_REMAINING>, <ANY\_UNMAPPED> and <NULL> are available in the MappingConstants class.

Finally @InheritInverseConfiguration and @InheritConfiguration can be used in combination with @ValueMappings.

Example 50. Enum mapping method, <NULL> and <ANY\_REMAINING>

```
@Mapper
public interface SpecialOrderMapper {

    SpecialOrderMapper INSTANCE = Mappers.getMapper( SpecialOrderMapper.class );

    @ValueMappings({
        @ValueMapping( source = MappingConstants.NULL, target = "DEFAULT" ),
        @ValueMapping( source = "STANDARD", target = MappingConstants.NULL ),
        @ValueMapping( source = MappingConstants.ANY_REMAINING, target = "SPECIAL"
)
    })
    ExternalOrderType orderTypeToExternalOrderType(OrderType orderType);
}
```

```
// GENERATED CODE
public class SpecialOrderMapperImpl implements SpecialOrderMapper {
    public ExternalOrderType orderTypeToExternalOrderType(OrderType orderType) {
        if ( orderType == null ) {
            return ExternalOrderType.DEFAULT;
        }
        ExternalOrderType externalOrderType_;
        switch ( orderType ) {
            case STANDARD: externalOrderType_ = null;
            case RETAIL: externalOrderType_ = ExternalOrderType.RETAIL;
            case B2B: externalOrderType_ = ExternalOrderType.B2B;
            break:
            default: externalOrderType_ = ExternalOrderType.SPECIAL;
        }
        return externalOrderType_;
   }
}
```

**Note:** MapStruct would have refrained from mapping the RETAIL and B2B when <ANY\_UNMAPPED> was used instead of <ANY\_REMAINING>.



The mapping of enum to enum via the <code>@Mapping</code> annotation is **DEPRECATED**. It will be removed from future versions of MapStruct. Please adapt existing enum mapping methods to make use of <code>@ValueMapping</code> instead.

# 9. Object factories

By default, the generated code for mapping one bean type into another or updating a bean will call the default constructor to instantiate the target type.

Alternatively you can plug in custom object factories which will be invoked to obtain instances of the target type. One use case for this is JAXB which creates <code>ObjectFactory</code> classes for obtaining new instances of schema types.

To make use of custom factories register them via <code>@Mapper#uses()</code> as described in <code>Invoking other mappers</code>, or implement them directly in your mapper. When creating the target object of a bean mapping, <code>MapStruct will look</code> for a parameterless method, a method annotated with <code>@ObjectFactory</code>, or a method with only one <code>@TargetType</code> parameter that returns the required target

type and invoke this method instead of calling the default constructor:

#### Example 52. Custom object factories

```
public class DtoFactory {
    public CarDto createCarDto() {
        return // ... custom factory logic
    }
}
```

```
public class EntityFactory {
    public <T extends BaseEntity> T createEntity(@TargetType Class<T>
    entityClass) {
        return // ... custom factory logic
    }
}
```

```
@Mapper(uses= { DtoFactory.class, EntityFactory.class } )
public interface CarMapper {
    CarMapper INSTANCE = Mappers.getMapper( CarMapper.class );
    CarDto carToCarDto(Car car);
    Car carDtoToCar(CarDto carDto);
}
```

```
//GENERATED CODE
public class CarMapperImpl implements CarMapper {
    private final DtoFactory dtoFactory = new DtoFactory();
    private final EntityFactory entityFactory = new EntityFactory();
    @Override
    public CarDto carToCarDto(Car car) {
       if ( car == null ) {
            return null;
        }
        CarDto carDto = dtoFactory.createCarDto();
        //map properties...
        return carDto;
    }
    @Override
    public Car carDtoToCar(CarDto carDto) {
        if ( carDto == null ) {
            return null;
        Car car = entityFactory.createEntity( Car.class );
        //map properties...
        return car;
    }
}
```

#### Example 53. Custom object factories with update methods

```
@Mapper(uses = { DtoFactory.class, EntityFactory.class, CarMapper.class } )
public interface OwnerMapper {

   OwnerMapper INSTANCE = Mappers.getMapper( OwnerMapper.class );

   void updateOwnerDto(Owner owner, @MappingTarget OwnerDto ownerDto);

   void updateOwner(OwnerDto ownerDto, @MappingTarget Owner owner);
}
```

```
//GENERATED CODE
public class OwnerMapperImpl implements OwnerMapper {
    private final DtoFactory dtoFactory = new DtoFactory();
    private final EntityFactory entityFactory = new EntityFactory();
    private final OwnerMapper ownerMapper = Mappers.getMapper( OwnerMapper.class
);
    @Override
    public void updateOwnerDto(Owner owner, @MappingTarget OwnerDto ownerDto) {
        if ( owner == null ) {
            return;
        }
        if ( owner.getCar() != null ) {
            if ( ownerDto.getCar() == null ) {
                ownerDto.setCar( dtoFactory.createCarDto() );
            }
            // update car within ownerDto
        }
        else {
            ownerDto.setCar( null );
        }
       // updating other properties
    }
    @Override
    public void updateOwner(OwnerDto ownerDto, @MappingTarget Owner owner) {
        if ( ownerDto == null ) {
            return;
        }
        if ( ownerDto.getCar() != null ) {
            if ( owner.getCar() == null ) {
                owner.setCar( entityFactory.createEntity( Car.class ) );
            }
            // update car within owner
        }
        else {
            owner.setCar( null );
        }
       // updating other properties
    }
}
```

In addition, annotating a factory method with <code>@ObjectFactory</code> lets you gain access to the mapping sources. Source objects can be added as parameters in the same way as for mapping method. The <code>@ObjectFactory</code> annotation is necessary to let MapStruct know that the given method is only a factory method.

#### Example 54. Custom object factories with @ObjectFactory

```
public class DtoFactory {
    @ObjectFactory
    public CarDto createCarDto(Car car) {
        return // ... custom factory logic
    }
}
```

# 10. Advanced mapping options

This chapter describes several advanced options which allow to fine-tune the behavior of the generated mapping code as needed.

### 10.1. Default values and constants

Default values can be specified to set a predefined value to a target property if the corresponding source property is null. Constants can be specified to set such a predefined value in any case. Default values and constants are specified as String values and are subject to type conversion either via built-in conversions or the invocation of other mapping methods in order to match the type required by the target property.

A mapping with a constant must not include a reference to a source property. The following example shows some mappings using default values and constants:

```
@Mapper(uses = StringListMapper.class)
public interface SourceTargetMapper {
    SourceTargetMapper INSTANCE = Mappers.getMapper( SourceTargetMapper.class );
    @Mappings( {
        @Mapping(target = "stringProperty", source = "stringProp", defaultValue =
"undefined"),
        @Mapping(target = "longProperty", source = "longProp", defaultValue = "-1
"),
        @Mapping(target = "stringConstant", constant = "Constant Value"),
        @Mapping(target = "integerConstant", constant = "14"),
        @Mapping(target = "longWrapperConstant", constant = "3001"),
        @Mapping(target = "dateConstant", dateFormat = "dd-MM-yyyy", constant =
"09-01-2014"),
        @Mapping(target = "stringListConstants", constant = "jack-jill-tom")
    Target sourceToTarget(Source s);
}
```

If s.getStringProp() == null, then the target property stringProperty will be set to "undefined" instead of applying the value from s.getStringProp(). If s.getLongProperty() == null, then the target property longProperty will be set to -1. The String "Constant Value" is set as is to the target property stringConstant. The value "3001" is type-converted to the Long (wrapper) class of target property longWrapperConstant. Date properties also require a date format. The constant "jack-jill-tom" demonstrates how the hand-written class StringListMapper is invoked to map the dash-separated list into a List<String>.

## 10.2. Expressions

By means of Expressions it will be possible to include constructs from a number of languages.

Currently only Java is supported as language. This feature is e.g. useful to invoke constructors. The entire source object is available for usage in the expression. Care should be taken to insert only valid Java code: MapStruct will not validate the expression at generation-time, but errors will show up in the generated classes during compilation.

The example below demonstrates how two source properties can be mapped to one target:

The example demonstrates how the source properties time and format are composed into one target property TimeAndFormat. Please note that the fully qualified package name is specified because MapStruct does not take care of the import of the TimeAndFormat class (unless it's used otherwise explicitly in the SourceTargetMapper). This can be resolved by defining imports on the @Mapper annotation.

Example 57. Declaring an import

## 10.3. Determining the result type

When result types have an inheritance relation, selecting either mapping method (@Mapping) or a factory method (@BeanMapping) can become ambiguous. Suppose an Apple and a Banana, which are both specializations of Fruit.

```
@Mapper( uses = FruitFactory.class )
public interface FruitMapper {

    @BeanMapping( resultType = Apple.class )
    Fruit map( FruitDto source );
}

public class FruitFactory {

    public Apple createApple() {
        return new Apple( "Apple" );
    }

    public Banana createBanana() {
        return new Banana( "Banana" );
    }
}
```

So, which Fruit must be factorized in the mapping method Fruit map(FruitDto source);? A Banana or an Apple? Here's were the @BeanMapping#resultType comes in handy. It controls the factory method to select, or in absence of a factory method, the return type to create.



The same mechanism is present on mapping: <code>@Mapping#resultType</code> and works like you expect it would: it selects the mapping method with the desired result type when present.



The mechanism is also present on iterable mapping and map mapping. @IterableMapping#elementTargetType is used to select the mapping method with the desired element in the resulting Iterable. For the @MapMapping a similar purpose is served by means of #MapMapping#keyTargetType and MapMapping#valueTargetType.

## 10.4. Controlling mapping result for 'null' arguments

MapStruct offers control over the object to create when the source argument of the mapping method equals null. By default null will be returned.

However, by specifying nullValueMappingStrategy = NullValueMappingStrategy.RETURN\_DEFAULT on @BeanMapping, @IterableMapping, @MapMapping, or globally on @Mapper or @MappingConfig, the mapping result can be altered to return empty **default** values. This means for:

• Bean mappings: an 'empty' target bean will be returned, with the exception of constants and

expressions, they will be populated when present.

- **Primitives**: the default values for primitives will be returned, e.g. false for boolean or 0 for int.
- Iterables / Arrays: an empty iterable will be returned.
- Maps: an empty map will be returned.

The strategy works in a hierarchical fashion. Setting nullValueMappingStrategy on mapping method level will override @Mapper#nullValueMappingStrategy, and @Mapper#nullValueMappingStrategy will override @MappingConfig#nullValueMappingStrategy.

# 10.5. Controlling checking result for 'null' properties in bean mapping

MapStruct offers control over when to generate a null check. By default (nullValueCheckStrategy = NullValueCheckStrategy.ON\_IMPLICIT\_CONVERSION) a null check will be generated for:

- direct setting of source value to target value when target is primitive and source is not.
- applying type conversion and then:
  - a. calling the setter on the target.
  - b. calling another type conversion and subsequently calling the setter on the target.
  - c. calling a mapping method and subsequently calling the setter on the target.

First calling a mapping method on the source property is not protected by a null check. Therefor generated mapping methods will do a null check prior to carrying out mapping on a source property. Handwritten mapping methods must take care of null value checking. They have the possibility to add 'meaning' to null. For instance: mapping null to a default value.

The option nullValueCheckStrategy = NullValueCheckStrategy.ALWAYS will always include a null check when source is non primitive, unless a source presence checker is defined on the source bean.

The strategy works in a hierarchical fashion. @Mapper#nullValueCheckStrategy will override @MappingConfig#nullValueCheckStrategy.

## 10.6. Source presence checking

Some frameworks generate bean properties that have a source presence checker. Often this is in the form of a method hasXYZ, XYZ being a property on the source bean in a bean mapping method. MapStruct will call this hasXYZ instead of performing a null check when it finds such hasXYZ method.



The source presence checker name can be changed in the MapStruct service provider interface (SPI). It can also be deactivated in this way.

## 10.7. Exceptions

Calling applications may require handling of exceptions when calling a mapping method. These exceptions could be thrown by hand-written logic and by the generated built-in mapping methods or type-conversions of MapStruct. When the calling application requires handling of exceptions, a throws clause can be defined in the mapping method:

Example 59. Mapper using custom method declaring checked exception

```
@Mapper(uses = HandWritten.class)
public interface CarMapper {
    CarDto carToCarDto(Car car) throws GearException;
}
```

The hand written logic might look like this:

Example 60. Custom mapping method declaring checked exception

```
public class HandWritten {
    private static final String[] GEAR = {"ONE", "TWO", "THREE", "OVERDRIVE",
    "REVERSE"};

    public String toGear(Integer gear) throws GearException, FatalException {
        if ( gear == null ) {
            throw new FatalException("null is not a valid gear");
        }

        if ( gear < 0 && gear > GEAR.length ) {
            throw new GearException("invalid gear");
        }
        return GEAR[gear];
    }
}
```

MapStruct now, wraps the FatalException in a try-catch block and rethrows an unchecked RuntimeException. MapStruct delegates handling of the GearException to the application logic because it is defined as throws clause in the carToCarDto method:

```
// GENERATED CODE
@Override
public CarDto carToCarDto(Car car) throws GearException {
    if ( car == null ) {
        return null;
    }

    CarDto carDto = new CarDto();
    try {
        carDto.setGear( handWritten.toGear( car.getGear() ) );
    }
    catch ( FatalException e ) {
        throw new RuntimeException( e );
    }

    return carDto;
}
```

Some **notes** on null checks. MapStruct does provide null checking only when required: when applying type-conversions or constructing a new type by invoking its constructor. This means that the user is responsible in hand-written code for returning valid non-null objects. Also null objects can be handed to hand-written code, since MapStruct does not want to make assumptions on the meaning assigned by the user to a null object. Hand-written code has to deal with this.

# 11. Reusing mapping configurations

This chapter discusses different means of reusing mapping configurations for several mapping methods: "inheritance" of configuration from other methods and sharing central configuration between multiple mapper types.

## 11.1. Mapping configuration inheritance

Method-level configuration annotations such as <code>@Mapping</code>, <code>@BeanMapping</code>, <code>@IterableMapping</code>, etc., can be <code>inherited</code> from one mapping method to a <code>similar</code> method using the annotation <code>@InheritConfiguration</code>:

```
@Mapper
public interface CarMapper {

    @Mapping(target = "numberOfSeats", source = "seatCount")
    Car carDtoToCar(CarDto car);

    @InheritConfiguration
    void carDtoIntoCar(CarDto carDto, @MappingTarget Car car);
}
```

The example above declares a mapping method <code>carDtoToCar()</code> with a configuration to define how the property <code>numberOfSeats</code> in the type <code>Car</code> shall be mapped. The update method that performs the mapping on an existing instance of <code>Car</code> needs the same configuration to successfully map all properties. Declaring <code>@InheritConfiguration</code> on the method lets <code>MapStruct</code> search for inheritance candidates to apply the annotations of the method that is inherited from.

One method A can inherit the configuration from another method B if all types of A (source types and result type) are assignable to the corresponding types of B.

Methods that are considered for inheritance need to be defined in the current mapper, a super class/interface, or in the shared configuration interface (as described in Shared configurations).

In case more than one method is applicable as source for the inheritance, the method name must be specified within the annotation: @InheritConfiguration( name = "carDtoToCar" ).

A method can use @InheritConfiguration and override or amend the configuration by additionally applying @Mapping, @BeanMapping, etc.



@InheritConfiguration cannot refer to methods in a used mapper.

## 11.2. Inverse mappings

In case of bi-directional mappings, e.g. from entity to DTO and from DTO to entity, the mapping rules for the forward method and the reverse method are often similar and can simply be inversed by switching source and target.

Use the annotation <code>@InheritInverseConfiguration</code> to indicate that a method shall inherit the inverse configuration of the corresponding reverse method.

```
@Mapper
public interface CarMapper {

    @Mapping(source = "numberOfSeats", target = "seatCount")
    CarDto carToDto(Car car);

    @InheritInverseConfiguration
    Car carDtoToCar(CarDto carDto);
}
```

Here the carDtoToCar() method is the reverse mapping method for carToDto(). Note that any attribute mappings from carToDto() will be applied to the corresponding reverse mapping method as well. They are automatically reversed and copied to the method with the @InheritInverseConfiguration annotation.

Specific mappings from the inversed method can (optionally) be overridden by ignore, expression or constant in the mapping, e.g. like this: <code>@Mapping(target = "numberOfSeats", ignore=true)</code>.

A method **A** is considered a **reverse** method of a method **B**, if the result type of **A** is the **same** as the single source type of **B** and if the single source type of **A** is the **same** as the result type of **B**.

Methods that are considered for inverse inheritance need to be defined in the current mapper, a super class/interface.

If multiple methods qualify, the method from which to inherit the configuration needs to be specified using the name property like this: @InheritInverseConfiguration(name = "carToDto").

Expressions and constants are excluded (silently ignored). Reverse mapping of nested source properties is experimental as of the 1.1.0.Beta2 release. Reverse mapping will take place automatically when the source property name and target property name are identical. Otherwise, <code>@Mapping</code> should specify both the target name and source name. In all cases, a suitable mapping method needs to be in place for the reverse mapping.



@InheritInverseConfiguration cannot refer to methods in a used mapper.

## 11.3. Shared configurations

MapStruct offers the possibility to define a shared configuration by pointing to a central interface annotated with <code>@MapperConfig</code>. For a mapper to use the shared configuration, the configuration interface needs to be defined in the <code>@Mapper#config</code> property.

The <code>@MapperConfig</code> annotation has the same attributes as the <code>@Mapper</code> annotation. Any attributes not given via <code>@Mapper</code> will be inherited from the shared configuration. Attributes specified in <code>@Mapper</code> take precedence over the attributes specified via the referenced configuration class. List properties such as <code>uses</code> are simply combined:

```
@MapperConfig(
    uses = CustomMapperViaMapperConfig.class,
    unmappedTargetPolicy = ReportingPolicy.ERROR
)
public interface CentralConfig {
}

@Mapper(config = CentralConfig.class, uses = { CustomMapperViaMapper.class } )
// Effective configuration:
// @Mapper(
// uses = { CustomMapperViaMapper.class, CustomMapperViaMapperConfig.class },
// unmappedTargetPolicy = ReportingPolicy.ERROR
// )
public interface SourceTargetMapper {
    ...
}
```

The interface holding the <code>@MapperConfig</code> annotation may also declare **prototypes** of mapping methods that can be used to inherit method-level mapping annotations from. Such prototype methods are not meant to be implemented or used as part of the mapper API.

```
@MapperConfig(
    uses = CustomMapperViaMapperConfig.class,
    unmappedTargetPolicy = ReportingPolicy.ERROR,
    mappingInheritanceStrategy = MappingInheritanceStrategy
.AUTO_INHERIT_FROM_CONFIG
public interface CentralConfig {
    // Not intended to be generated, but to carry inheritable mapping annotations:
    @Mapping(target = "primaryKey", source = "technicalKey")
    BaseEntity anyDtoToEntity(BaseDto dto);
}
@Mapper(config = CentralConfig.class, uses = { CustomMapperViaMapper.class } )
public interface SourceTargetMapper {
    @Mapping(target = "numberOfSeats", source = "seatCount")
   // additionally inherited from CentralConfig, because Car extends BaseEntity
and CarDto extends BaseDto:
    // @Mapping(target = "primaryKey", source = "technicalKey")
    Car toCar(CarDto car)
}
```

The attributes <code>@Mapper#mappingInheritanceStrategy()</code> / <code>@MapperConfig#mappingInheritanceStrategy()</code> configure when the method-level mapping configuration annotations are inherited from prototype methods in the interface to methods in the mapper:

- EXPLICIT (default): the configuration will only be inherited, if the target mapping method is annotated with @InheritConfiguration and the source and target types are assignable to the corresponding types of the prototype method, all as described in Mapping configuration inheritance.
- AUTO\_INHERIT\_FROM\_CONFIG: the configuration will be inherited automatically, if the source and target types of the target mapping method are assignable to the corresponding types of the prototype method. If multiple prototype methods match, the ambiguity must be resolved using @InheritConfiguration(name = ···).

# 12. Customizing mappings

Sometimes it's needed to apply custom logic before or after certain mapping methods. MapStruct provides two ways for doing so: decorators which allow for a type-safe customization of specific mapping methods and the before-mapping and after-mapping lifecycle methods which allow for a generic customization of mapping methods with given source or target types.

## 12.1. Mapping customization with decorators

In certain cases it may be required to customize a generated mapping method, e.g. to set an additional property in the target object which can't be set by a generated method implementation. MapStruct supports this requirement using decorators.



When working with the component model cdi, use CDI decorators with MapStruct mappers instead of the @DecoratedWith annotation described here.

To apply a decorator to a mapper class, specify it using the @DecoratedWith annotation.

Example 66. Applying a decorator

```
@Mapper
@DecoratedWith(PersonMapperDecorator.class)
public interface PersonMapper {

    PersonMapper INSTANCE = Mappers.getMapper( PersonMapper.class );

    PersonDto personToPersonDto(Person person);

    AddressDto addressToAddressDto(Address address);
}
```

The decorator must be a sub-type of the decorated mapper type. You can make it an abstract class which allows to only implement those methods of the mapper interface which you want to customize. For all non-implemented methods, a simple delegation to the original mapper will be generated using the default generation routine.

The PersonMapperDecorator shown below customizes the personToPersonDto(). It sets an additional attribute which is not present in the source type of the mapping. The addressToAddressDto() method is not customized.

```
public abstract class PersonMapperDecorator implements PersonMapper {
    private final PersonMapper delegate;
    public PersonMapperDecorator(PersonMapper delegate) {
        this.delegate = delegate;
    }
    @Override
    public PersonDto personToPersonDto(Person person) {
        PersonDto dto = delegate.personToPersonDto( person );
        dto.setFullName( person.getFirstName() + " " + person.getLastName() );
        return dto;
    }
}
```

The example shows how you can optionally inject a delegate with the generated default implementation and use this delegate in your customized decorator methods.

For a mapper with componentModel = "default", define a constructor with a single parameter which accepts the type of the decorated mapper.

When working with the component models spring or jsr330, this needs to be handled differently.

### 12.1.1. Decorators with the Spring component model

When using <code>QDecoratedWith</code> on a mapper with component model <code>spring</code>, the generated implementation of the original mapper is annotated with the Spring annotation <code>QQualifier("delegate")</code>. To autowire that bean in your decorator, add that qualifier annotation as well:

```
public abstract class PersonMapperDecorator implements PersonMapper {
    @Autowired
    @Qualifier("delegate")
    private PersonMapper delegate;

    @Override
    public PersonDto personToPersonDto(Person person) {
        PersonDto dto = delegate.personToPersonDto( person );
        dto.setName( person.getFirstName() + " " + person.getLastName() );
        return dto;
    }
}
```

The generated class that extends the decorator is annotated with Spring's <code>@Primary</code> annotation. To autowire the decorated mapper in the application, nothing special needs to be done:

#### Example 69. Using a decorated mapper

```
@Autowired
private PersonMapper personMapper; // injects the decorator, with the injected
original mapper
```

### 12.1.2. Decorators with the JSR 330 component model

JSR 330 doesn't specify qualifiers and only allows to specifically name the beans. Hence, the generated implementation of the original mapper is annotated with <code>@Named("fully-qualified-name-of-generated-implementation")</code> (please note that when using a decorator, the class name of the mapper implementation ends with an underscore). To inject that bean in your decorator, add the same annotation to the delegate field (e.g. by copy/pasting it from the generated class):

```
public abstract class PersonMapperDecorator implements PersonMapper {
    @Inject
    @Named("org.examples.PersonMapperImpl_")
    private PersonMapper delegate;

@Override
    public PersonDto personToPersonDto(Person person) {
        PersonDto dto = delegate.personToPersonDto( person );
        dto.setName( person.getFirstName() + " " + person.getLastName() );
        return dto;
    }
}
```

Unlike with the other component models, the usage site must be aware if a mapper is decorated or not, as for decorated mappers, the parameterless @Named annotation must be added to select the decorator to be injected:

Example 71. Using a decorated mapper with JSR 330

```
@Inject
@Named
private PersonMapper personMapper; // injects the decorator, with the injected
original mapper
```



@DecoratedWith in combination with component model jsr330 is considered experimental as of the 1.0.0.CR2 release. The way the original mapper is referenced in the decorator or the way the decorated mapper is injected in the application code might still change.

# 12.2. Mapping customization with before-mapping and after-mapping methods

Decorators may not always fit the needs when it comes to customizing mappers. For example, if you need to perform the customization not only for a few selected methods, but for all methods that map specific super-types: in that case, you can use **callback methods** that are invoked before the mapping starts or after the mapping finished.

Callback methods can be implemented in the abstract mapper itself, in a type reference in Mapper#uses, or in a type used as @Context parameter.

```
@Mapper
public abstract class VehicleMapper {
    @BeforeMapping
    protected void flushEntity(AbstractVehicle vehicle) {
       // I would call my entity manager's flush() method here to make sure my
entity
        // is populated with the right @Version before I let it map into the DTO
    }
    @AfterMapping
    protected void fillTank(AbstractVehicle vehicle, @MappingTarget
AbstractVehicleDto result) {
        result.fuelUp( new Fuel( vehicle.getTankCapacity(), vehicle.getFuelType()
));
    }
    public abstract CarDto toCarDto(Car car);
}
// Generates something like this:
public class VehicleMapperImpl extends VehicleMapper {
    public CarDto toCarDto(Car car) {
        flushEntity( car );
        if ( car == null ) {
            return null;
        CarDto carDto = new CarDto();
        // attributes mapping ...
        fillTank( car, carDto );
        return carDto;
   }
}
```

If the <code>@BeforeMapping</code> / <code>@AfterMapping</code> method has parameters, the method invocation is only generated if the return type of the method (if non-void) is assignable to the return type of the mapping method and all parameters can be <code>assigned</code> by the source or target parameters of the mapping method:

 A parameter annotated with @MappingTarget is populated with the target instance of the mapping.

- A parameter annotated with @TargetType is populated with the target type of the mapping.
- Parameters annotated with @Context are populated with the context parameters of the mapping method.
- Any other parameter is populated with a source parameter of the mapping.

For non-void methods, the return value of the method invocation is returned as the result of the mapping method if it is not null.

As with mapping methods, it is possible to specify type parameters for before/after-mapping methods.

Example 73. Mapper with @AfterMapping hook that returns a non-null value

```
@Mapper
public abstract class VehicleMapper {
    @PersistenceContext
    private EntityManager entityManager;
    @AfterMapping
    protected <T> T attachEntity(@MappingTarget T entity) {
        return entityManager.merge(entity);
    }
    public abstract CarDto toCarDto(Car car);
}
// Generates something like this:
public class VehicleMapperImpl extends VehicleMapper {
    public CarDto toCarDto(Car car) {
       if ( car == null ) {
            return null;
        }
        CarDto carDto = new CarDto();
        // attributes mapping ...
        CarDto target = attachEntity( carDto );
        if ( target != null ) {
            return target;
        }
        return carDto;
    }
}
```

All before/after-mapping methods that can be applied to a mapping method will be used. Mapping

method selection based on qualifiers can be used to further control which methods may be chosen and which not. For that, the qualifier annotation needs to be applied to the before/after-method and referenced in BeanMapping#qualifiedBy or IterableMapping#qualifiedBy.

The order of the method invocation is determined primarily by their variant:

- 1. @BeforeMapping methods without an @MappingTarget parameter are called before any null-checks on source parameters and constructing a new target bean.
- 2. @BeforeMapping methods with an @MappingTarget parameter are called after constructing a new target bean.
- 3. @AfterMapping methods are called at the end of the mapping method before the last return statement.

Within those groups, the method invocations are ordered by their location of definition:

- 1. Methods declared on **@Context** parameters, ordered by the parameter order.
- 2. Methods implemented in the mapper itself.
- 3. Methods from types referenced in Mapper#uses(), in the order of the type declaration in the annotation.
- 4. Methods declared in one type are used after methods declared in their super-type.

**Important:** the order of methods declared within one type can not be guaranteed, as it depends on the compiler and the processing environment implementation.

# 13. Using the MapStruct SPI

# 13.1. Custom Accessor Naming Strategy

MapStruct offers the possibility to override the AccessorNamingStrategy via the Service Provide Interface (SPI). A nice example is the use of the fluent API on the source object GolfPlayer and GolfPlayerDto below.

```
public class GolfPlayer {
    private double handicap;
   private String name;
   public double handicap() {
        return handicap;
    }
    public GolfPlayer withHandicap(double handicap) {
        this.handicap = handicap;
        return this;
    }
   public String name() {
        return name;
    }
    public GolfPlayer withName(String name) {
        this.name = name;
        return this;
    }
}
```

```
public class GolfPlayerDto {
    private double handicap;
    private String name;
    public double handicap() {
        return handicap;
    }
    public GolfPlayerDto withHandicap(double handicap) {
        this.handicap = handicap;
        return this;
    }
    public String name() {
        return name;
    }
    public GolfPlayerDto withName(String name) {
        this.name = name;
        return this
    }
}
```

We want GolfPlayer to be mapped to a target object GolfPlayerDto similar like we 'always' do this:

Example 76. Source object with fluent API.

```
@Mapper
public interface GolfPlayerMapper {
    GolfPlayerMapper INSTANCE = Mappers.getMapper( GolfPlayerMapper.class );
    GolfPlayerDto toDto(GolfPlayer player);
    GolfPlayer toPlayer(GolfPlayerDto player);
}
```

This can be achieved with implementing the SPI org.mapstruct.ap.spi.AccessorNamingStrategy as in the following example. Here's an implemented org.mapstruct.ap.spi.AccessorNamingStrategy:

```
* A custom {@link AccessorNamingStrategy} recognizing getters in the form of
{@code property()} and setters in the
 * form of {@code withProperty(value)}.
*/
public class CustomAccessorNamingStrategy extends DefaultAccessorNamingStrategy {
    @Override
    public boolean isGetterMethod(ExecutableElement method) {
        String methodName = method.getSimpleName().toString();
        return !methodName.startsWith( "with" ) && method.getReturnType().getKind
() != TypeKind.VOID;
    @Override
    public boolean isSetterMethod(ExecutableElement method) {
        String methodName = method.getSimpleName().toString();
        return methodName.startsWith( "with" ) && methodName.length() > 4;
    }
    @Override
    public String getPropertyName(ExecutableElement getterOrSetterMethod) {
        String methodName = getterOrSetterMethod.getSimpleName().toString();
        return Introspector.decapitalize( methodName.startsWith( "with" ) ?
methodName.substring( 4 ) : methodName );
    }
}
```

The CustomAccessorNamingStrategy makes use of the DefaultAccessorNamingStrategy (also available in mapstruct-processor) and relies on that class to leave most of the default behaviour unchanged.

To use a custom SPI implementation, it must be located in a separate JAR file together with the file META-INF/services/org.mapstruct.ap.spi.AccessorNamingStrategy with the fully qualified name of your custom implementation as content (e.g. org.mapstruct.example.CustomAccessorNamingStrategy). This JAR file needs to be added to the annotation processor classpath (i.e. add it next to the place where you added the mapstruct-processor jar).



Fore more details: The example above is present in our examples repository (https://github.com/mapstruct/mapstruct-examples).

## 13.2. Mapping Exclusion Provider

MapStruct offers the possibility to override the MappingExclusionProvider via the Service Provider Interface (SPI). A nice example is to not allow MapStruct to create an automatic sub-mapping for a certain type, i.e. MapStruct will not try to generate an automatic sub-mapping method for an

excluded type.



The DefaultMappingExclusionProvider will exclude all types under the java or javax packages. This means that MapStruct will not try to generate an automatic sub-mapping method between some custom type and some type declared in the Java class library.

#### Example 78. Source object

```
public class Source {
    static class NestedSource {
        private String property;
        // getters and setters
    }
    private NestedSource nested;
    // getters and setters
}
```

#### Example 79. Target object

```
public class Target {
    static class NestedTarget {
        private String property;
        // getters and setters
    }
    private NestedTarget nested;
    // getters and setters
}
```

#### Example 80. Mapper definition

```
@Mapper
public interface ErroneousCustomExclusionMapper {
    Target map(Source source);
}
```

We want to exclude the NestedTarget from the automatic sub-mapping method generation.

```
import java.util.regex.Pattern;
import javax.lang.model.element.Name;
import javax.lang.model.element.TypeElement;
import org.mapstruct.ap.spi.MappingExclusionProvider;
public class CustomMappingExclusionProvider implements MappingExclusionProvider {
    private static final Pattern JAVA_JAVAX_PACKAGE = Pattern.compile( "^javax?
\\..*");
    @Override
    public boolean isExcluded(TypeElement typeElement) {
        Name name = typeElement.getQualifiedName();
        return name.length() != 0 && ( JAVA_JAVAX_PACKAGE.matcher( name ).matches
() ||
            name.toString().equals(
"org.mapstruct.ap.test.nestedbeans.exclusions.custom.Target.NestedTarget" ) );
    }
}
```

To use a custom SPI implementation, it must be located in a separate JAR file together with the file META-INF/services/org.mapstruct.ap.spi.MappingExclusionProvider with the fully qualified name of your custom implementation as content (e.g. org.mapstruct.example.CustomMappingExclusionProvider). This JAR file needs to be added to the annotation processor classpath (i.e. add it next to the place where you added the mapstruct-processor jar).