EMF Reference Project

Developer Guide

EC Modeling & Simulation

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This document contains information about Altran’s EMF Reference Project (a.k.a. MDE Skeleton) MDE Asset. The purpose of this project is to represent a typical MDE Eclipse IDE solution and to act as a showcase on how to use MDE Assets.

Chapter 1. Overview

This document is under construction.

Chapter 2. Development Environment

2.1. Git workflow

TODO explain Gitflow Workflow

2.2. Initial Git directory structure

2.2.1. Prerequisites

As described in the previous section we tend to use the Git workflow branching model. In this model the central repo holds two main branches with an infinite lifetime:

- `master`
- `develop`

Before creating an initial directory structure, please make sure that these branches are available in the remote repository and configured correctly, i.e., both protected and `develop` marked as the default branch.

2.2.2. Bootstrapping a git repository

When the prerequisites are met, you can start with bootstrapping the repository with its initial content. The EMF Reference Project provides a script that provisions the repository with the correct directory structure and content to build an empty Eclipse RCP application that can be used for further development. The bootstrapped application will contain a developer documentation plugin that provides the instructions on setting up a development environment.

The listing below shows how to use the EMF Reference Project bootstrap script. In this example, the `LArch` repository is used as an example and the callouts below the listing explain the steps in more detail.

Listing 1. Bootstrapping a git repository to build an Eclipse RCP

```
user@machine MINGW64 ~/git
$ git clone git@gitlab.acidspace.nl:cge-coe-mde/larch.git ①
Cloning into 'larch'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (3/3), done.

user@machine MINGW64 ~/git
$ git clone git@gitlab.acidspace.nl:cge-coe-mde/mde-skeleton.git -b BOOTSTRAP-2020-06
②
Cloning into 'mde-skeleton'...
```

```
remote: Enumerating objects: 1407, done.
remote: Counting objects: 100% (50/50), done.
remote: Compressing objects: 100% (37/37), done.
remote: Total 1407 (delta 16), reused 33 (delta 9), pack-reused 1357
Receiving objects: 100% (1407/1407), 902.82 KiB | 1.45 MiB/s, done.
Resolving deltas: 100% (631/631), done.
Note: switching to '5c0c33b3e79fb107b4f582ebaf2d28d5fbf980a1'.

You are in 'detached HEAD' state. You can look around, make experimental
changes and commit them, and you can discard any commits you make in this
state without impacting any branches by switching back to a branch.

If you want to create a new branch to retain commits you create, you may
do so (now or later) by using -c with the switch command. Example:

  git switch -c <new-branch-name>

Or undo this operation with:

  git switch -

Turn off this advice by setting config variable advice.detachedHead to false


user@machine MINGW64 ~/git
$ ./mde-skeleton/bootstrap.sh LArch nl.cge.mde.larch larch/ ③
Bootstrapping the LArch project with prefix nl.cge.mde.larch in:
/c/Users/user/git/larch

Processing file /c/Users/user/git/larch/.acidcli.yml
...

Committing changes
warning: LF will be replaced by CRLF in README.adoc.
The file will have its original line endings in your working directory
...
[develop eeff333] Bootstrapped the LArch project, using the skeleton as provided by
Capgemini Engineering.
 61 files changed, 2717 insertions(+), 92 deletions(-)
 create mode 100644 .acidcli.yml
...

Done, please review the last commit and push it to ACIDSpace using the following
commands: ④
> cd /c/Users/user/git/larch
> git status
> git push

Then read the README.adoc to learn how to setup a development environment or how to
build the code locally, see
https://gitlab.acidspace.nl/cge-coe-mde/larch/-/blob/develop/README.adoc
```

```
After a successful local build, the built products can be found at:
/c/Users/user/git/larch/products/nl.cge.mde.larch.package.product/target/products
```

① Clone the empty git repository that will be bootstrapped. It is assumed that the `develop` branch is set as default branch of the repository. In this example, the repository is cloned into a sub-directory called `larch`.

② Clone the MDE skeleton repository to download the bootstrap script. The tag, i.e., `-b BOOTSTRAP-2020-06`, specifies the version of Eclipse that is used for the RCP. For a list of available versions, please see the available tags. The repository is cloned into a sub-directory called `mde-skeleton`.

③ Running the `bootstrap.sh` copies all required data to the target repository and adapts it for your project. The script takes 3 parameters:

1. The name of the product
2. The prefix that will be used. This should be unique for your product.
3. The directory where the target repository is cloned, see step 1.

④ When the script is done, a commit has been created such that it can be pushed. When the commit is pushed, the product is built automatically in ACIDSpace and both the README of the repository and its Gitlab pages will contain information on how to setup an Eclipse development environment. The output of the script provides pointers on how to manually build your product on your local system from the command line, please read section Build code with Maven before running a command line build.

The directory structure of the target repository will look like:

Initial Git directory structure

Directory	**Description**
.mvn	Contains Maven configuration
.settings	Contains Eclipse configuration
documentation	This directory contains all bundles with documentation about the product and/or project.
documentation/<*prefix*>.guide.developer	The generated developer guide is available as PDF, Eclipse Help and via the GitLab pages of your project.
features	This directory contains all features that are provided by the project.
plugins	This directory contains all plugins that are provided by the project, initially empty.
products	This directory contains the configuration of the built Eclipse RCP.
products/<*prefix*>.package.branding	Defines the look-and-feel of the product, like splash screen and about content.

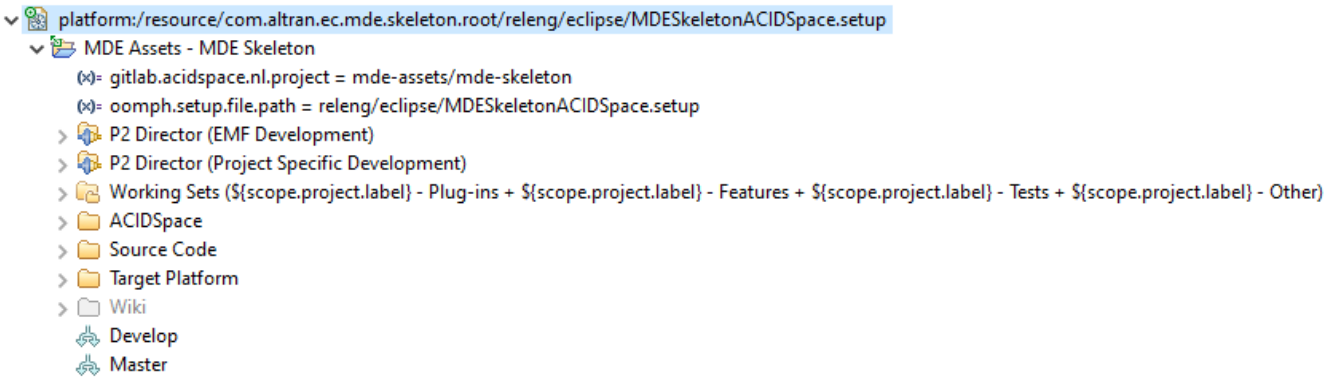
Directory	Description
products/<*prefix*>.package.feature	Defines the content of the RCP, typically all features in the `features` directory.
products/<*prefix*>.package.product	Defines the product and the layour of the P2 repository.
releng	This directory contains artifacts that are related to release-engineering.
releng/eclipse	Contains pre-configured Eclipse launch targets and Oomph setup file
releng/<*prefix*>.parent	The Maven parent pom defines the configuration for this project.
releng/<*prefix*>.target	The target platform manages the used 3rd party dependecies of the project.
tests	This directory contains all tests that are provided by the project, initially empty.

2.3. How to create an Oomph setup file

This section describes the typical steps to take for creating an Oomph setup file for a project. An Oomph setup file enables the Eclipse Installer to automate the installation of Eclipse development environments. For more generic information on (authoring) Oomph, please read the Eclipse Oomph Authoring Wiki

If you have used the bootstrap.sh script when creating your repository, the `releng/eclipse` directory will already contain a setup file and a lot of the steps below will already have been performed. It is still wise to review the generated setup file using the steps below.

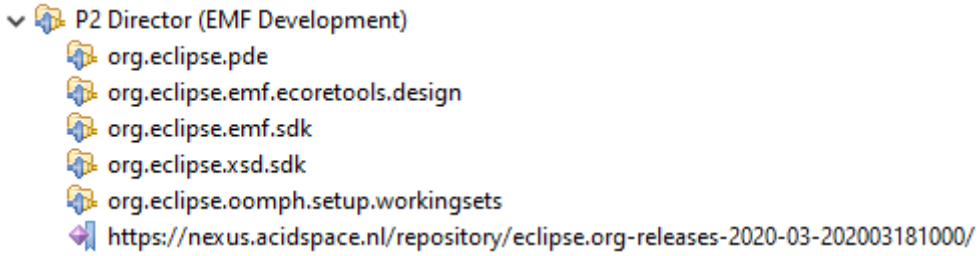
The easiest way to create an Oomph setup file is to either use the bootstrap.sh script (for a new git repository) or download the setup file of this MDE Skeleton and use it as a base. The downloaded setup file should be renamed to `<project_name>ACIDSpace.setup` and it is recommended to save it in the `releng/eclipse` directory in your git repository, also see the Initial Git directory structure. After opening the setup file in Eclipse, the model tree looks like:



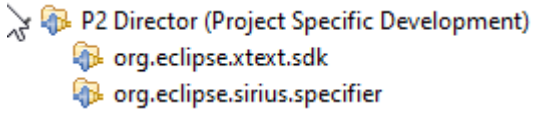
Please perform the following steps to tailor the setup file for your project:

If the Properties view is not yet visible, open it using the context menu on one of the tree nodes **Show Properties View**

1. Select the `MDE Assets - MDE Skeleton` node and modify its properties in the Properties View
   a. `Name`: `acidspace.<gitlab_project_name>`
   b. `Label`: `<project_name>`
   c. `Description`: `<project_description>`
2. Modify the `Value` property of `gitlab.acidspace.nl.project` to the relative path of your project in ACIDSpace GitLab.
3. Modify the `Value` property of `oomph.setup.file.path` to `releng/eclipse/<project_name>ACIDSpace.setup`.
4. The last two tree nodes specify the streams (i.e. branches) for which a development environment can be set up. All nodes in the tree can also be moved within a stream node allowing different configurations per stream. Typically the `master` and `develop` streams are defined, allowing customizations in the development environment on the develop branch without impacting the master release branch.
   Please note that developing on another branch (e.g. a feature branch) is supported, just Checkout another branch.
5. Expand the `P2 Director (EMF Development)` node



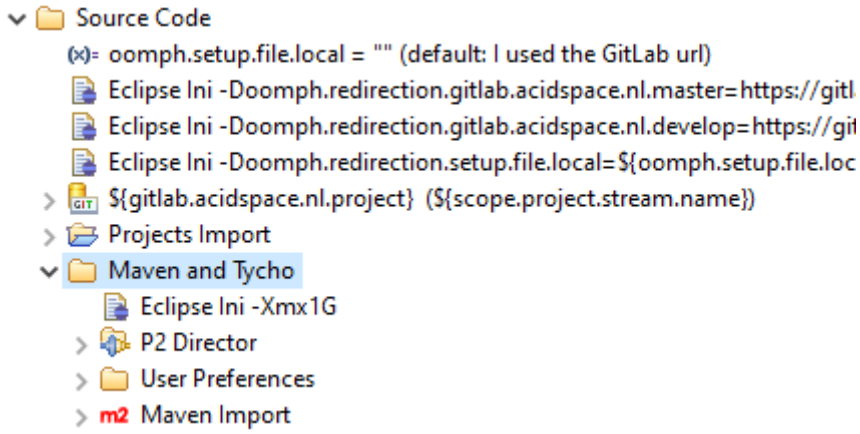
   a. The common requirements for EMF development are contained in this subtree. The last node specifies the ACIDSpace proxy location for the required Eclipse version. Please review the Eclipse version and adapt the url if applicable.
6. Expand the `P2 Director (Project Specific Development)` node



   a. The MDE Skeleton adds e.g. Xtext and Sirius as additional requirements. Please add all requirements for the development environment for your project to this section. Optionally you can also add additional repositories that provide your required artifacts.

Opening the `Repository Explorer` view by means of the context menu **Explore** on a repository node, allows you to easily drag and drop your requirements in the tree.

7. Expand the `Source Code` node



a. Most items are preconfigured and do not need attention bu if your project does not support Maven and Tycho, please disable the `Maven and Tycho` node by means of its context menu **Disabled**

8. Expand the `Target Platform` node

a. We support two ways for Specifying an Eclipse target platform. Please read the section and enable the node for the chosen solution.

b. If you choose to use a `Modular Target Platform`, please update the `location` of the `TargetDefinitionGenerator` to the correct location in your git repository. The content of the target platform can be authored within the sub tree of the `Modular Target Platform` node.

Whenever the Oomph setup file is modified, an Eclipse Oomph refresh is required to apply the changes to the current workspace, use the menu **Help › Perform Setup Tasks...** .

2.4. How to setup a development environment

To start developing for MDE Skeleton, please perform the following steps:

1. Start with downloading the `Eclipse Installer` from: https://www.eclipse.org/downloads/packages/installer
2. Start the `Eclipse Installer`
3. Select the `advanced mode`

   [Oomph 01 advanced mode] | *http://help.eclipse.org/2022-12/topic/org.eclipse.egit.doc/help/EGit/Contributor_Guide/images/Oomph-01-advanced-mode.png*

4. On the Product Page

a. Select `Eclipse Platform`
b. Product Version: `2022-12`
c. Click **[Next >]**

5. On the Projects Page
   a. (*One time only*) Click the [DULKrP4IGs7HGSVqoXcwRFgPxZQ=] icon to add the MDE Skeleton project.
      i. Catalog: `Eclipse Projects`
      ii. Resource URIs: `https://raw.githubusercontent.com/altran-mde/mde-skeleton/refs/heads/develop/releng/eclipse/MDESkeletonGitHub.setup`
      iii. Click **[OK]**

Though using the Resource URI above is preferred, it is known that for some users the URI didn't work and they got an error: *The URI ... does not contain a valid product*. In this case the setup file can also be downloaded and added by clicking **[Browse File System...]**.

      iv. Enter your GitLab credentials when asked for
   b. Select `MDE Skeleton` in the tree
   c. Select stream `develop` in the table
   d. Click **[Next >]**
6. On the Variables Page
   a. Review all variables values, especially the `Installation folder name` and `Root install folder`
   b. Click **[Next >]**
7. On the Confirmation Page
   a. Click **[Finish]**

Your development environment will now be prepared. Please accept all licenses and certificates and provide your GitLab credentials when asked for.

2.4.1. Build code with Maven

Please perform the steps in this section if you want to build your code using Maven on your local system. The code can built using Maven from either the command line or from within Eclipse, please read the "**Use**" items of the Maven documentation before running Maven the first time.

In our CI/CD the credentials of a project are stored in the `TECHNICAL_USER` and `TECHNICAL_PASSWORD` environment variables. In order to be able to use the Maven `settings.xml` both in CI/CD and on your local system, you should also set these environment variables on your local system.

It is strongly advised to store an encrypted password in the `TECHNICAL_PASSWORD` environment variable for security reasons. Maven supports server password encryption, see https://maven.apache.org/guides/mini/guide-encryption.html.

The `releng/eclipse` directory contains pre-configured Eclipse launch targets to build your code using Maven from within Eclipse.

The root Maven `pom.xml` for the MDE Skeleton project is located in the root of the local git repository. Just open a command line at that location and type the following command to build the code:

```
$ mvn clean verify -s settings.xml
```

2.4.2. Checkout another branch

Typically you will develop your feature in a feature branch. To start working on a feature, start by creating an issue in GitLab. From the issue, a feature branch can be created using the GitLab web UI. Make sure to prefix you branch name with `feature/`.

When the feature branch is created, you can continue with fetching the new branch in your Eclipse development environment, see Fetching from upstream. Then continue by switching to the new branch, see Checking out an existing Branch

Whenever you switch to an existing branch, it is strongly advised to perform an Eclipse Oomph refresh by using the menu **Help › Perform Setup Tasks...**  . This ensures that your development environment is reconfigured to match the requirements for that branch.

Chapter 3. Using third-party products (3PP)

Developing an Eclipse (e.g. EMF) based solution typically requires third-party products (3PP) that need to be downloaded from remote repositories. The stability and availability of these remote repositories is often not guaranteed. For this reason it is recommended to use a proxy server, e.g. a Nexus or Artifactory.

Please note that these proxies might not be accessible by our clients nor by the users of our clients' solutions. Therefore we should be aware that though these proxies should be configured in our development environments (i.e. Eclipse and CI/CD), our built solutions should depend on publicly available repositories. The sources of some of our solutions (i.e. MDE Assets) are hosted both in our intranet as in a public GitHub. For these solutions, it is important that they can benefit from the proxy within the intranet without modifying the sources, meaning that the proxies should be an additional configuration.

This section describes the best practices on how to configure the usage of proxy servers in the development environment our Eclipse solutions. The following assumptions are considered when using proxies:

1. The built Eclipse solution should be configured to use the publicly available repositories, and should have no dependencies on ACIDSpace (unless decided differently).
   The Target Platform defines what your project will be built and launched against. See the best practices for Specifying an Eclipse target platform.
2. Eclipse Oomph is used for setting up a development environment.
   As development is typically done in the intranet, it is recommended that the Oomph setup files refer to the proxies.
3. When building the solution in CI/CD it is recommended to use the proxies.
   Our solutions are typically build using Maven, which can be configured with mirrors that reroute the public repository urls to their proxy equivalents. Section Using repository mirrors in Maven explains how to configure Maven.

3.1. Specifying an Eclipse target platform

For more detailed information on Eclipse target platforms, see https://wiki.eclipse.org/PDE/Target_Definitions

The Target Platform defines what your project will be built and launched against. We typically use Eclipse Oomph to setup an development environment. Within our Oomph setup file, two ways of specifying a target platform are supported, either by use of Oomph Targlets or by using the Eclipse CBI target platform definition DSL.

If your target platform contains repositories that require authentication, the Eclipse CBI target platform definition DSL should be used.

Using the Eclipse CBI target platform definition DSL is preferred. The DSL comes with an integrated Eclipse editor to author target platform files with a `tpd` file extension. Specifying the Eclipse CBI

target-platform.tpd shows how configure the target platform for both an public repository and a proxy repository that is hosted on the intranet.

For more information on authoring Eclipse CBI `tpd` files, see https://github.com/eclipse-cbi/targetplatform-dsl#readme

Listing 2. Specifying the Eclipse CBI target-platform.tpd

```
target "CBI Target Platform"

with configurePhase source requirements

location "https://download.eclipse.org/releases/2022-12/202212071000" { ①
    // Eclipse - EMF
    org.eclipse.sdk.feature.group lazy
    org.eclipse.emf.sdk.feature.group lazy
}

location "https://altran-mde.github.io/espilce-commons-staging/" espilce-commons-p2 {
②
    org.espilce.commons.emf.registry.feature.feature.group lazy
    org.espilce.commons.resource.feature.feature.group lazy
}
```

① **Public repository** - Preferably, the built Eclipse solution should be configured to use publicly available repositories.

② **ACIDSpace repository** - If and only if an artifact is available within ACIDSpace only, we need to specify the ACIDSpace repository url. Repositories that are hosted by ACIDSpace typically require authentication. Specifying a repository id (i.e. `espilce-commons-p2`) allows you to configure the credentials in the Maven settings file as described in Using repository mirrors in Maven.

Whenever an Eclipse CBI `tpd` file is updated, its target platform should be regenerated by means of the context menu **Create TargetDefinition File** on the `tpd` file. When that is done, the generated target file should be activated by means of an Eclipse Oomph refresh, using the menu **Help › Perform Setup Tasks...**

3.2. Using repository mirrors in Maven

You may want to use an alternative mirror for a particular repository without changing the project files. Some reasons to use a mirror are:

- There is a synchronized mirror on the internet that is geographically closer and faster
- You want to replace a particular repository with your own internal repository which you have greater control over
- **You want to run a repository manager to provide a local cache to a mirror and need to use its URL instead**

For more detailed information on using mirrors for repositories in Maven, see https://maven.apache.org/guides/mini/guide-mirror-settings.html

Defining mirrors in settings.xml shows how to configure Maven to use repository proxies instead of the public repositories. In this example both the Maven central as the Eclipse 2022-12 P2 repositories are rerouted to repository proxies.

Listing 3. Defining mirrors in settings.xml

```
<settings xmlns="http://maven.apache.org/SETTINGS/1.1.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/SETTINGS/1.1.0
                      http://maven.apache.org/xsd/settings-1.1.0.xsd">
  <mirrors>
    <!-- Maven mirrors -->
    <mirror>
      <id>mde-assets-maven-central</id>
      <name>Maven Central Proxy</name>
      <url>https://nexus.acidspace.nl/repository/mde-assets/</url>
      <mirrorOf>central</mirrorOf> ①
    </mirror>
    <!-- P2 target platform mirrors -->
    <mirror>
      <url>https://nexus.intranet.company/repository/eclipse.org-releases-2022-12-
202212071000</url>
      <mirrorOf>https://download.eclipse.org/releases/2022-12/202212071000</mirrorOf>
②
      <mirrorOfLayouts>p2</mirrorOfLayouts>
      <layout>p2</layout>
    </mirror>
  </mirrors>
  <servers>
    <!-- Maven mirrors -->
    <server>
      <id>mde-assets-maven-central</id> ③
      <configuration>
        <timeout>10000</timeout>
      </configuration>
      <username>${env.TECHNICAL_USER}</username> ④
      <password>${env.TECHNICAL_PASSWORD}</password>
    </server>
    <!-- Intranet servers in target platform -->
    <server>
      <id>espilce-commons-p2</id> ⑤
      <configuration>
        <timeout>10000</timeout>
      </configuration>
      <username>${env.TECHNICAL_USER}</username>
      <password>${env.TECHNICAL_PASSWORD}</password>
    </server>
```

```
  </servers>
</settings>
```

① **Maven repository mirror** - For Maven repository mirrors, the `<mirrorOf>` specifies the ID of the repository you are using a mirror of and the `<url>` specifies the location of the mirror, i.e. the proxy.
If a mirror requires authentication, a `<server>` section also needs to be configured.

② **Eclipse P2 repository mirror** - The `<layout>` specifies a mirror of an Eclipse P2 repository. In this layout, the `<mirrorOf>` specifies the url prefix of the repository to mirror.

③ **Additional configuration for mirrors** *(Optional)* - If a mirror requires authentication, a `<server>` section also needs to be configured. The `<id>` specifies the id of the server (i.e. mirror) for which these settings are applicable.

④ **Credentials** - In CI/CD the credentials of a project can be stored in environment variables like `TECHNICAL_USER` and `TECHNICAL_PASSWORD`. If a server requires authentication, the credentials can be specified using these environment variables. Please read section Build code with Maven on how to setup a local machine for using Maven.

⑤ **Intranet repositories** - When using proprietary artifacts that are developed and published in intranet only, authentication is required to download the artifacts. The `<id>` of the server should match the id as specified in the target platform, for more information see Specifying an Eclipse target platform.

3.3. Bundling a JRE with your RCP

If your solution builds an Eclipse (RCP) application, you can make this application even more portable by including a Java™ JRE that is used to run the Eclipse application. This technique saves the user the troubles of installing a JRE themselves or having a JRE installed that is not compatible with your Eclipse application. Eclipse JustJ provides fully-functional Java™ runtimes that can be redistributed by Eclipse Projects. This section describes how such an Eclipse JustJ JRE is bundled with the MDE Skeleton.

If you have used the bootstrap.sh script with a `BOOTSTRAP-nnnn-nn-JREnn` tag to bootstrap your repository, the steps in this section already have been performed. As such, you can also learn how to e.g. configure an Eclipse JustJ JRE17 in combination with Tycho 2.6.0 at tag BOOTSTRAP-2022-12-JRE17.

Start with Specifying an Eclipse target platform for Eclipse JustJ, see the code snippet below. Please note that Eclipse JustJ provides different download locations for different JRE versions, see https://download.eclipse.org/justj/jres/ for more information.

When using Maven, don't forget to configure an Eclipse P2 repository mirror for this repository as described in Using repository mirrors in Maven, also see settings.xml

Listing 4. Adding Eclipse JustJ to the target-platform.tpd

```
location "https://download.eclipse.org/justj/jres/17/updates/release" {
```

```
    org.eclipse.justj.openjdk.hotspot.jre.full.feature.group lazy
}
```

Now you can simply bundle the Eclipse JustJ JRE by adding it as a dependency in the packaging feature of your Eclipse (RCP) application, see the code snippet below.

Listing 5. Adding Eclipse JustJ to the pacaging feature.xml

```
<feature
      id="com.altran.ec.mde.skeleton.package.feature"
      label="EMF Reference Project - Packaging Feature"
      version="0.0.1.qualifier"
      provider-name="Capgemini Engineering"
      plugin="com.altran.ec.mde.skeleton.package.branding">

   <includes
         id="com.altran.ec.mde.skeleton.feature"
         version="0.0.0"/>

   <requires>
      <import feature="org.eclipse.platform" version="4.26" match="greaterOrEqual"/>
      <import feature="org.eclipse.justj.openjdk.hotspot.jre.full" version="11"
match="greaterOrEqual"/> ①
      <import feature="org.eclipse.jdt" version="3.18" match="greaterOrEqual"/>
   </requires>

   <plugin
         id="com.altran.ec.mde.skeleton.package.branding"
         download-size="0"
         install-size="0"
         version="0.0.0"/>

   <plugin
         id="org.slf4j.binding.log4j12"
         download-size="0"
         install-size="0"
         version="0.0.0"
         fragment="true"
         unpack="false"/>

   <plugin
         id="com.altran.ec.mde.skeleton.logging"
         download-size="0"
         install-size="0"
         version="0.0.0"
         fragment="true"/>

</feature>
```

① This line adds the Eclipse JustJ JRE as a dependency to your Eclipse application.

When using Maven, its target platform configuration must be updated in the parent pom, see the code snippet below. The configuration in the example is specifically for use with Tycho 1.7.0. For newer versions of Tycho this configuration is even easier, please read the Eclipse JustJ documentation.

For Maven it is very important that the Eclipse product file of your application (i.e. eclipse.product) does not specify an execution environment. Otherwise the Eclipse JustJ JRE jars will be published to your update site, which is undesirable. Please ensure that the `<vm></vm>` section is empty in your eclipse.product file.

Listing 6. Configuring Eclipse JustJ in the Maven parent pom.xml

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <artifactId>com.altran.ec.mde.skeleton.parent</artifactId>
  <name>EMF Reference Project - Tycho Parent</name>
  <build>
    <plugins>
      <plugin>
        <groupId>org.eclipse.tycho</groupId>
        <artifactId>target-platform-configuration</artifactId>
        <configuration>
          <!-- Eclipse JustJ configuration for Maven Tycho 2.6 -->
          <!-- See https://www.eclipse.org/justj/?page=documentation -->
          <executionEnvironment>org.eclipse.justj.openjdk.hotspot.jre.full-
17</executionEnvironment>
        </configuration>
      </plugin>
    </plugins>
  </build>
</project>
```

Chapter 4. Using MDE Assets

This section acts as a quick reference guide on using MDE Assets in an MDE solution. The focus is mainly on the integration part and for more information on the usage of an particular MDE Asset, please read its user, developer or programmer guide.

For an MDE solution, an MDE Asset is a third-party-product and as such the general guidelines as documented in *Using third-party products (3PP)* should be followed when using an MDE Asset.

4.1. EcoreDoc

EcoreDoc generates AsciiDoctor files to document Ecore metamodels, similar to JavaDoc. AsciiDoctor can be rendered as HTML, PDF, or Eclipse Help. EcoreDoc can be used as Maven Plugin, standalone command-line tool, Java API, or Eclipse Plug-in.

In this quick reference guide EcoreDoc is used by means of its Maven plugin to generate *Fowler Statemachine EcoreDoc* from the Statemachine.ecore file.

The EcoreDoc Maven plugin can be used by adding the code snippet below to your Maven pom file.

Listing 7. Configuring EcoreDoc in pom.xml

```
<pluginRepositories>
  <!-- com.altran.general.emf.ecoredoc:ecoredoc-maven-plugin -->
  <pluginRepository> ①
    <id>ecoredoc-snapshots</id>
    <url>https://altran-mde.github.io/ecore_doc/maven-repo</url>
    <releases>
      <enabled>false</enabled>
    </releases>
    <snapshots>
      <enabled>true</enabled>
    </snapshots>
  </pluginRepository>
</pluginRepositories>

<build>
  <plugins>
    <plugin>
      <groupId>com.altran.general.emf.ecoredoc</groupId>
      <artifactId>ecoredoc-maven-plugin</artifactId>
      <version>0.10.0-SNAPSHOT</version>
      <executions>
        <execution>
          <phase>generate-sources</phase> ②
          <goals>
            <goal>ecoredoc</goal>
          </goals>
```

```
            <configuration>
              <resolve>true</resolve>
              <config> ③
                <renderDefaults>false</renderDefaults>
                <renderDiagrams>true</renderDiagrams>
                <diagramsOutputPath>images</diagramsOutputPath>
                <diagramsOutputFormat>png</diagramsOutputFormat>
              </config>
              <inputFiles>

<inputFile>../../plugins/org.eclipse.xtext.example.fowlerdsl/model/generated/Statemach
ine.ecore</inputFile>
              </inputFiles>
              <outputFile>${project.build.directory}/adoc-
gen/Statemachine.adoc</outputFile>
            </configuration>
          </execution>
        </executions>
      </plugin>
```

① The EcoreDoc maven plugin is deployed in its Maven repository in GitHub.

② Binds the `ecoredoc` goal to the `generate-sources` Maven build lifecycle phase.

③ The EcoreDoc Maven plugin can be configured by means of annotations in the ecore model or, as illustrated here,directly in the Maven pom file.

The example below adds the generated EcoreDoc to this developer guide as an appendix.

Listing 8. Include the generated EcoreDoc in mde-skeleton-developer-guide.adoc

```
ifndef::gendocdir[:gendocdir: {basedir}/target/adoc-gen]

[appendix]
== Fowler Statemachine EcoreDoc

include::{gendocdir}/Statemachine.adoc[lines=36..]
```

For more information on using EcoreDoc, please read the EcoreDoc user guide.

4.2. Espilce Commons

TODO

4.3. Espilce Periksa

Espilce Periksa is an EMF Validator framework. To start using Espilce Periksa, first it should be added to the the target platform, see the code snippet below.

Listing 9. Adding Espilce Periksa to the target-platform.tpd

```
location "https://altran-mde.github.io/espilce-periksa/2.1/repository/" {
    org.espilce.periksa.sdk.feature.group lazy
}
```

Then you can start writing the required validations. The quickest way to create validations using Espilce Periksa is to create a class containing static methods that are annotated with the `@Check` annotation. The first argument of the method is the model element to validate and the second argument injects the validation context as provided by Espilce Periksa. The example below adds a duplicate value error-validation for command names to the Fowler state-machine DSL Xtext example, and an info-validation for state names to start with a capital.

Using the `@Check` annotation requires a bundle dependency of `org.espilce.periksa.validation`.

Listing 10. Writing validations in StatemachineValidations.java using Espilce Periksa

```
public class StatemachineValidations {
  /**
   * The {@link Check @Check} annotation registers this method to validate all
   * instances of {@link Statemachine}. For each <code>statemachine</code> this
   * method is invoked.
   *
   * @param statemachine the state machine instance to validate
   * @param ctx          the check context used to report validation results
   */
  @Check ①
  public static void checkDuplicates(Statemachine statemachine, CheckContext context)
{
    ValidationLibrary.checkDuplicateValue(statemachine.getCommands(),
StatemachinePackage.Literals.COMMAND__NAME, context); ②
    // See java source for more validations...
  }

  @Check
  public static void checkNameStartsWithCapital(State state, CheckContext context) {
    if (!state.getName().isEmpty() && state.getName().charAt(0) != Character
.toUpperCase(state.getName().charAt(0))) {
      context.getReport().info("Name should start with upper case",
StatemachinePackage.Literals.STATE__NAME); ③
    }
  }
}
```

① The `@Check` annotation registers the method to validate all instances of `Statemachine` as per the first argument of the method. The method is invoked for each `statemachine` instance in the model.

② Espilce Periksa provides a `ValidationLibrary` containing reusable validations, e.g. validating duplicates in feature values.

③ The API of Espilce Periksa allows to easily report an `info`, `warning` or `error`.

Finally you need to register your model validations, such that they will be automatically invoked as part of validating each applicable model instance. The easiest way to do this is by means of an extension point that is provided by Espilce Periksa, as per the example below.

Listing 11. Registering validations in plugin.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<?eclipse version="3.4"?>
<plugin>
   <extension
         point="org.espilce.periksa.validation.registry.registrar">
      <ReflectiveValidator
            class=
"com.altran.ec.mde.skeleton.espilce.periksa.StatemachineValidations">
         <EPackage
               uri="http://www.eclipse.org/xtext/example/fowlerdsl/Statemachine">
         </EPackage>
      </ReflectiveValidator>
   </extension>
</plugin>
```

For more information on using Espilce Periksa, please read the Espilce Periksa programmer guide.

4.4. Espilce Polvi

Espilce Polvi provides a framework and utilities to implement model-to-text generators. To start using Espilce Polvi, first it should be added to the the target platform, see the code snippet below.

Listing 12. Adding Espilce Polvi to the target-platform.tpd

```
location "https://altran-mde.github.io/espilce-polvi/1.1/repository/" {
    // Runtime EMF integration
    org.espilce.polvi.emf.generator.feature.feature.group lazy
    // Runtime Xtext integration
    org.espilce.polvi.emf.generator.xtext.feature.feature.group lazy
    // MWE2 workflow generator fragment
    org.espilce.polvi.xtext.generator lazy
}
```

4.4.1. Creating an Espilce Polvi based model-to-text generator

In our MDE skeleton, the Xtext state-machine example already includes a Java code generator that is implemented using the API of Xtext. We want to use Espilce Polvi though, as it will support integrations with other frameworks and include additional features in the future. The API of

Espilce Polvi is based on the Xtext API and as such migrating an Xtext based generator to a Polvi based generator is trivial:

1. Espilce Polvi comes with an Xtext generator fragment that eases the integration. To use this generator fragment, first a dependency on `org.espilce.polvi.xtext.generator` needs to be added to the `additional.bundles` in `build.properties`

   Listing 13. Adding an Xtext generator fragment dependency in build.properties

   ```
   additional.bundles = org.eclipse.xtext.xbase,\
                        org.eclipse.xtext.common.types,\
                        org.eclipse.xtext.xtext.generator,\
                        org.eclipse.emf.codegen.ecore,\
                        org.eclipse.emf.mwe.utils,\
                        org.eclipse.emf.mwe2.launch,\
                        org.eclipse.emf.mwe2.lib,\
                        org.objectweb.asm,\
                        org.apache.commons.logging,\
                        org.apache.log4j,\
                        org.espilce.polvi.xtext.generator
   ```

2. Now the mwe2 workflow can be modified to generate a Polvi based generator skeleton, just change the type of the `generator` to `org.espilce.polvi.xtext.generator.PolviGeneratorFragment`

   Listing 14. Generating an Espilce Polvi generator skeleton in GenerateStatemachine.mwe2

   ```
       language = StandardLanguage {
         name = "org.eclipse.xtext.example.fowlerdsl.Statemachine"
         fileExtensions = "statemachine"

         generator = org.espilce.polvi.xtext.generator.PolviGeneratorFragment {
           generateXtendStub = true
         }
   ```

3. After running the mwe2 workflow a new code generator skeleton is generated, see StatemachinePolviGenerator.xtend. By default some commented code is generated, but in our class we only needed to copy the contents of the original Xtext example based code generator and added some imports to the meta-model classes.

4.4.2. Invoking an Espilce Polvi based model-to-text generator

The example below shows how to use Espilce Polvi to invoke a Java code generator.

Listing 15. Invoking an Espilce Polvi based code generator in GenerateCodeHandler.java

```
  private static void generateCode(IFile inputIFile, IProgressMonitor monitor) throws
CoreException {
    SubMonitor subMonitor = SubMonitor.convert(monitor, "Starting code generation...",
101);
```

```
    // Load input
    ResourceSet resourceSet = new ResourceSetImpl();
    URI inputlURI = URI.createPlatformResourceURI(inputIFile.getFullPath().toString(),
true);
    Resource inputResource = resourceSet.getResource(inputlURI, true);

    // Configure Polvi
    URIBasedFileSystemAccess fsa = new URIBasedFileSystemAccess(); ①
    IFolder outputFolder = inputIFile.getProject().getFolder("src-gen");
    fsa.setOutputPath(outputFolder.getFullPath().toString()); ②
    GeneratorContext ctx = new GeneratorContext(new ProgressMonitorAdapter(subMonitor
.split(100)));

    // Generate output
    StatemachinePolviGenerator generator = new StatemachinePolviGenerator(); ③
    generator.doGenerate(inputResource, fsa, ctx); ④

    // Refresh the output folder to detect the generated files
    outputFolder.refreshLocal(IResource.DEPTH_INFINITE, subMonitor.split(1));
  }
```

① `URIBasedFileSystemAccess` is used because an EMF URI is used as input in this case. Esplice Polvi also provides `JavaIoFileSystemAccess` for `java.io.File` input and `InMemoryFileSystemAccess` for in-memory output.

② Specifies the output location were generated files are saved.

③ The contents of the file are generated in the StatemachinePolviGenerator#toJavaCode(Statemachine) method.

For more information on how to implement model-to-text generators with Xtend, please read the Xtend-based Model-to-Text Generators Guide.

④ The file is generated using the `URIBasedFileSystemAccess` instance that is created in step 1.

4.5. Xtext/Sirius Integration

This asset enables Xtext editors to be used as direct editor for Sirius diagram elements or Sirius property widgets.

To start using Xtext/Sirius Integration, first it should be added to the the target platform, see the code snippet below.

Listing 16. Adding Xtext/Sirius Integration to the target-platform.tpd

```
location "https://altran-mde.github.io/xtext-sirius-integration.io/p2/1.1/" {
    com.altran.general.integration.xtextsirius.runtime.feature.feature.group lazy
}
```

Xtext/Sirius Integration also needs a feature from Yakindu Statecharts to be added to the target

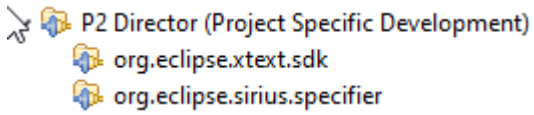
platform, see the code snippet below.

Listing 17. Adding Xtext/Sirius Integration dependencies to the target-platform.tpd

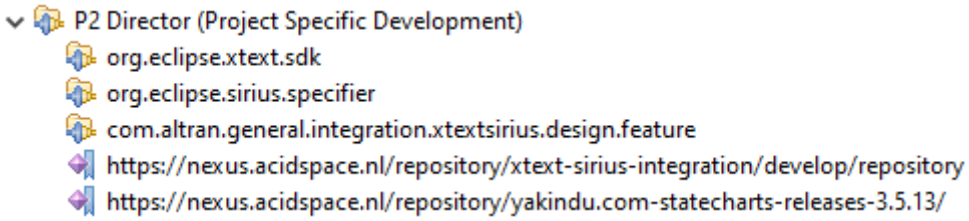
```
location "https://updates.yakindu.org/statecharts/releases/3.5.13" {
    org.yakindu.base.xtext.utils.jface.feature.group lazy
}
```

Because Xtext/Sirius Integration also provides development tools that need to be installed in Eclipse, the Oomph setup file needs to be updated. Open the setup file in Eclipse and perform the following steps:

1. Expand the `P2 Director (Project Specific Development)` node



2. Add a new `Requirement` for the Xtext/Sirius Integration design feature. Also add a `Repository` that contains the feature.
   Because the feature depends on a feature from Yakindu Statecharts, the `Repository` that contains it must be added too:



Now you can start using Xtext/Sirius Integration. The MDE skeleton already provides an example Xtext/Sirius direct edit descriptor in statemachine.odesign:

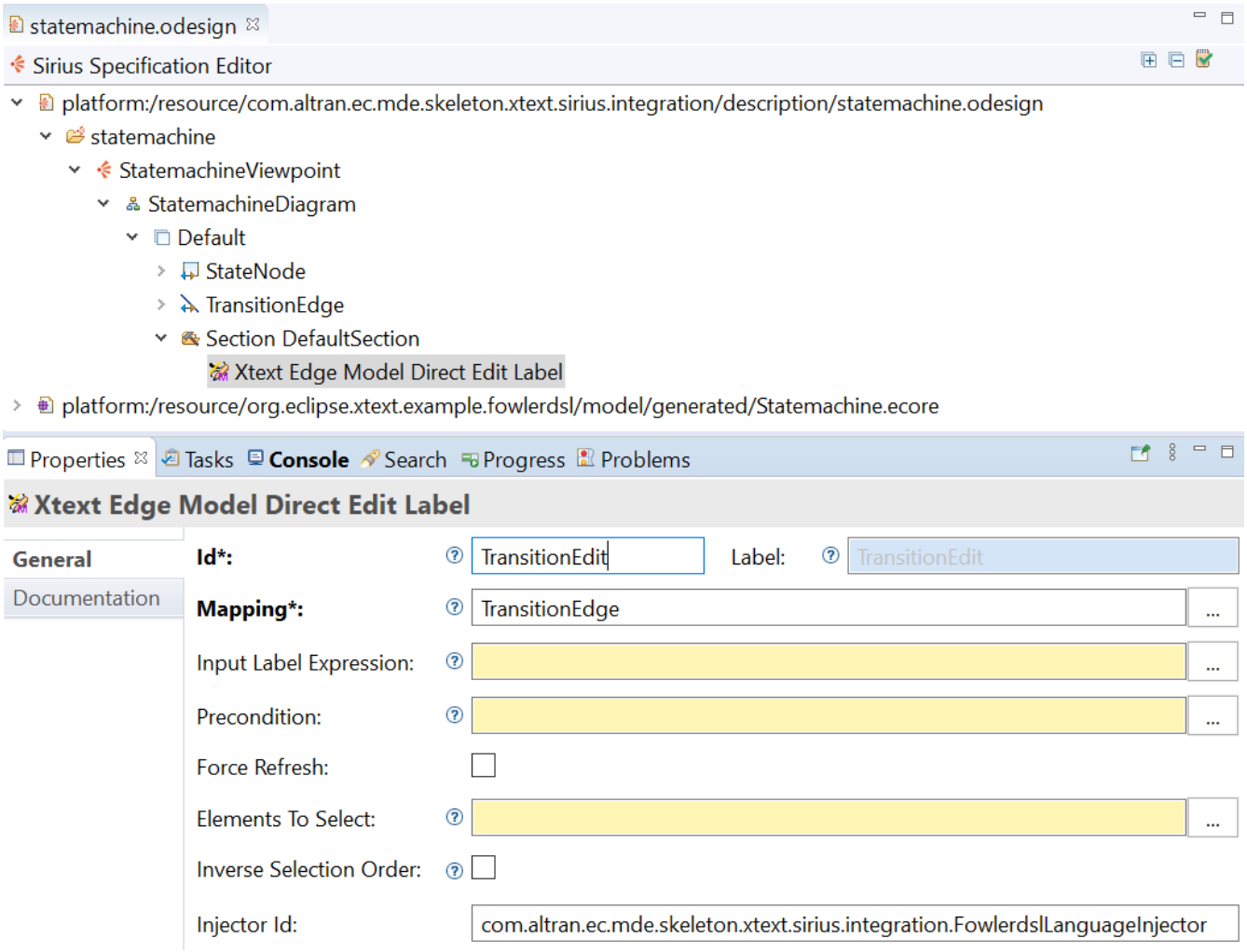


Figure 1. Authoring Sirius specification in statemachine.odesign

This descriptor makes it possible to use Xtext editing of `Transition` labels. In the properties of the descriptor the `Mapping` must to be set to the feature that the editor will be applied to. The `Injector Id` refers to the Xtext language injector that is specified in `plugin.xml` to access the Xtext language, see the code snippet below.

Listing 18. Specifying Xtext language injector in plugin.xml

```
  <extension
point="com.altran.general.integration.xtextsirius.runtime.xtextLanguageInjector">
     <injector

id="com.altran.ec.mde.skeleton.xtext.sirius.integration.FowlerdslLanguageInjector"
        class=
"com.altran.ec.mde.skeleton.xtext.sirius.integration.FowlerdslLanguageInjector"/> ①
  </extension>
```

① The `class` attribute of the `injector` refers to the implementation of the `IXtextLanguageInjector` interface that must be added to access the Xtext language, see the code snippet below.

Listing 19. Implementing IXtextLanguageInjector in FowlerdslLanguageInjector.java

```
package com.altran.ec.mde.skeleton.xtext.sirius.integration;
```

```
import org.eclipse.xtext.example.fowlerdsl.ui.internal.FowlerdslActivator;

import com.altran.general.integration.xtextsirius.runtime.IXtextLanguageInjector;
import com.google.inject.Injector;

public class FowlerdslLanguageInjector implements IXtextLanguageInjector {
  @Override
  public Injector getInjector() {
    return FowlerdslActivator.getInstance()
        .getInjector(FowlerdslActivator
.ORG_ECLIPSE_XTEXT_EXAMPLE_FOWLERDSL_STATEMACHINE);
  }
}
```

For more information on using Xtext/Sirius Integration, please read the Xtext/Sirius Integration User Guide.

4.6. Xtext Move Refactoring

This asset enables generic move refactoring for Xtext, updating all references in the workspace.

To start using Xtext Move Refactoring, first it should be added to the the target platform, see the code snippet below.

Listing 20. Adding Xtext Move Refactoring to the target-platform.tpd

```
location "https://altran-mde.github.io/xtext-move-refactoring/update-site/" {
    com.altran.general.xtext.refactoring.move.feature.feature.group lazy
}
```

To implement a move operation the `XtextMoveProcessor` class from the Xtext Move Refactoring asset must be used. This class is responsible for actually moving the elements. Additionally it may update other resources of the same domain which are affected by the move operation. For example, it also updates all references in the workspace to the element to be moved.

See the following example that implements move operations for the Fowler Statemachine. This example is implemented as a `dropAssistant` extension to the Model Explorer. States can be moved from one Statemachine to another using drag-and-drop.

Listing 21. Implementing move operations for States from the Fowler Statemachine in MoveDropAdapterAssistant.java using Xtext Move Refactoring

```
public class MoveDropAdapterAssistant extends CommonDropAdapterAssistant {

  @Override
  public IStatus validateDrop(final Object target, final int operation, final
TransferData transferType) {
    return Status.OK_STATUS;
  }
```

```
  @Override
  public IStatus handleDrop(final CommonDropAdapter aDropAdapter, final
DropTargetEvent aDropTargetEvent,
      final Object aTarget) {
    if (aDropTargetEvent.data instanceof TreeSelection) {
      TreeSelection treeSelection = (TreeSelection)aDropTargetEvent.data;
      Object aSource = treeSelection.getFirstElement();
      if (aSource instanceof State && aTarget instanceof Statemachine) {
        return moveElement((State) aSource, (Statemachine) aTarget);
      }
    }
    return Status.CANCEL_STATUS;
  }

  private IStatus moveElement(State source, Statemachine target) {
    final URI sourceUri = org.eclipse.emf.ecore.util.EcoreUtil.getURI(source);
    final URI targetUri = org.eclipse.emf.ecore.util.EcoreUtil.getURI(target);
    final String targetFeature = source.eContainingFeature().getName();

    return moveElement(sourceUri, targetUri, targetFeature);

  }

  private IStatus moveElement(URI source, URI target, String targetFeature) {
    final Injector injector = FowlerdslActivator.getInstance().getInjector
(FowlerdslActivator.ORG_ECLIPSE_XTEXT_EXAMPLE_FOWLERDSL_STATEMACHINE);

    final XtextMoveProcessor processor = injector.getInstance(XtextMoveProcessor.
class);
    final XtextMoveProcessorConfig config = new XtextMoveProcessorConfig(source,
target, targetFeature);
    try {
      processor.init(config);

      RefactoringStatus status = processor.checkInitialConditions(new
NullProgressMonitor()); ①
      if (!status.isOK()) {
        return Status.CANCEL_STATUS;
      }

      status = processor.checkFinalConditions(new NullProgressMonitor(), new
CheckConditionsContext()); ②
      if (!status.isOK()) {
        return Status.CANCEL_STATUS;
      }

      final Change change = processor.createChange(new NullProgressMonitor()); ③
      change.perform(new NullProgressMonitor()); ④

      return Status.OK_STATUS;
```

```
    } catch (OperationCanceledException e) {
      return Status.CANCEL_STATUS;
    } catch (CoreException e) {
      StatusManager.getManager().handle(e, Activator.PLUGIN_ID);
      return Status.CANCEL_STATUS;
    }
  }
}
```

① `checkInitialConditions` checks some initial conditions based on the element to be moved. For example, it is checked if all involved `EObjects` and their containers can be resolved.

② `checkFinalConditions` checks the final conditions based on the element to be moved. This is implemented by actually performing the move refactoring and reverting it afterwards.

③ `createChange` creates a `Change` object describing the workspace modifications the processor contributes to the overall move refactoring.

④ `change.perform` performs the change created in the previous step.

Chapter 5. Testing RCP

RCP Testing Tool (RCPTT) is a project for GUI testing automation of Eclipse-based applications. RCPTT is fully aware about Eclipse Platform's internals, hiding this complexity from end users and allowing QA engineers to create highly reliable UI tests at great pace.

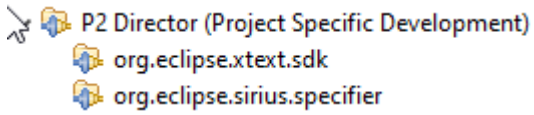
For detailed information on using RCPTT, see https://www.eclipse.org/rcptt/

Because RCPTT provides development tools that need to be installed in Eclipse, the Oomph setup file needs to be updated.

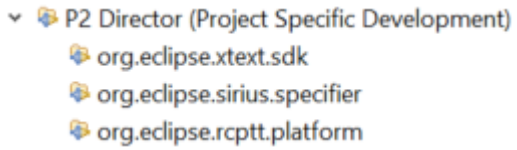
This step can be skipped when the MDE skeleton Oomph setup file is used as a base, as described in section How to create an Oomph setup file, because RCPTT is already included.

To add the RCPTT development tools, open the Oomph setup file in Eclipse and perform the following steps:

1. Expand the `P2 Director (Project Specific Development)` node



2. Add a new `Requirement` for the RCPTT platform feature.



Now RCPTT can be used. First create a new test project using the `RCP Testing Tool Project` wizard. After that the `Test Case` wizard can be used to add test cases. Now the test case can be recorded using the `Record` button. A popup will be shown to select the Application Under Test (AUT). Here your Eclipse product must be selected.

Create a resource filter for the `target` folder on your test project to avoid duplication errors when building with Maven.

The MDE skeleton already provides a RCPTT project that can be used for reference: com.altran.ec.mde.skeleton.xtext.refactoring.move.tests. Simply run its test cases by right-clicking the project and select **Run As › Test Cases** from the context menu. Then select `Eclipse RCPTT AUT` as Application Under Test and click **[OK]**. The Maven pom in the project shows how to configure RCPTT in Maven, for more information please read the RCPTT user guide.

Appendix A: Fowler Statemachine EcoreDoc

Ns Prefix

statemachine

Ns URI

http://www.eclipse.org/xtext/example/fowlerdsl/Statemachine

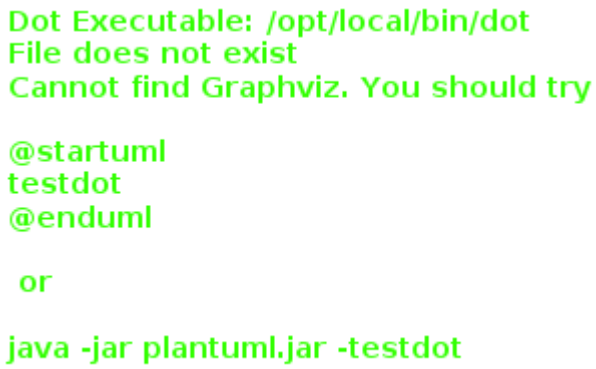


Figure 2. Class diagram of statemachine

A.1. Types

A.1.1. Class Command

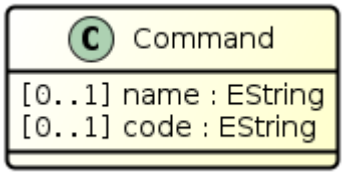


Figure 3. Class diagram of Command

Attributes

Name	Type	Properties	Description
code	EString		
name	EString		

Used at

- statemachine.State.actions
- statemachine.Statemachine.commands

A.1.2. Class Event

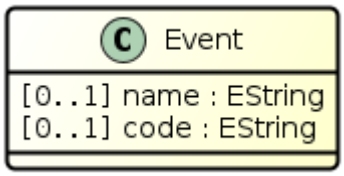


Figure 4. Class diagram of Event

Attributes

Name	Type	Properties	Description
code	EString		
name	EString		

Used at

- statemachine.Statemachine.events
- statemachine.Statemachine.resetEvents
- statemachine.Transition.event

A.1.3. Class State

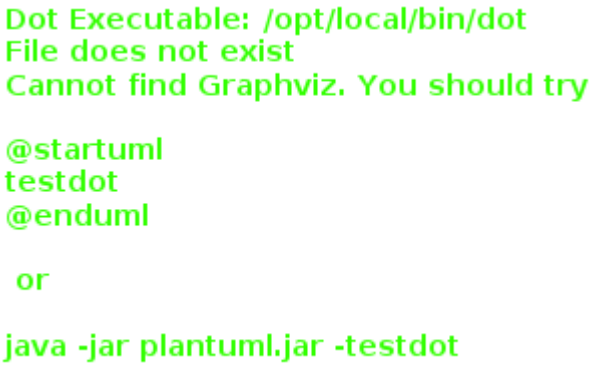


Figure 5. Class diagram of State

Attributes

Name	Type	Properties	Description
name	EString		

Containments

Name	Type	Properties	Description
transitions	statemachine.Transition	resolveProxies	

References

Name	Type	Properties	Description
actions	statemachine.Command	non-unique	

Used at

- statemachine.Statemachine.states
- statemachine.Transition.state

A.1.4. Class Statemachine

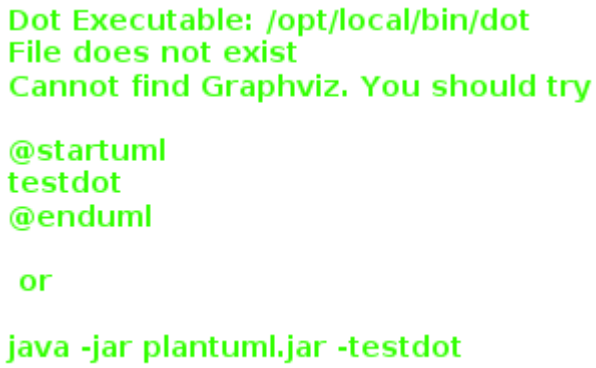


Figure 6. Class diagram of Statemachine

Attributes

Name	Type	Properties	Description
name	EString		

Containments

Name	Type	Properties	Description
commands	statemachine.Command	resolveProxies	
events	statemachine.Event	resolveProxies	
states	statemachine.State	resolveProxies	

References

Name	Type	Properties	Description
resetEvents	statemachine.Event	non-unique	

A.1.5. Class Transition

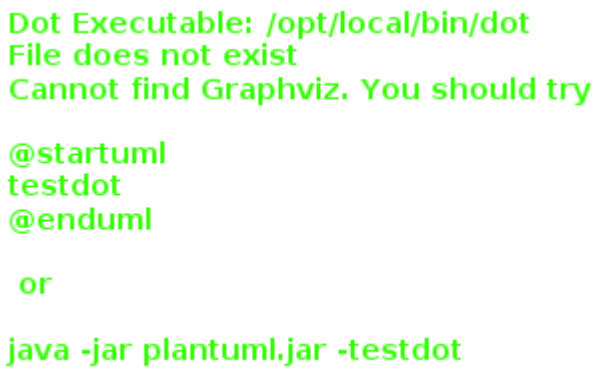


Figure 7. Class diagram of Transition

References

Name	Type	Properties	Description
`event`	`statemachine.Event`		
`state`	`statemachine.State`		

Used at

- `statemachine.State.transitions`