

Hello World Tutorial

Introduction

This guide describes how to create a simple "Hello World" Java Algorithm using CShell's Algorithm Development wizard in Eclipse.

Video Overview

For quick reference, please view this video overview of creating a basic CShell/Sci2 plugin development environment:

[CShell Hello World Plugin Overview](#)

Prerequisites

You will want to be familiar with the basics of Java CShell Algorithms described in [CShell Basics](#). Be sure your development environment is set up as described in [Setting Up the Development Environment](#).

It may be helpful to have the [CShell Specification](#) available to you for reference purposes.

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Downloading and Installing CShell

The first thing you'll need to do is download the latest release of CShell. We recommend doing that from the nightly build repository, located at <http://cshell.org/nightly/>. You'll probably want to download the latest build, which should be at the bottom of the page with the current date in the directory name. For example, for tonight's nightly build (9/19/2013), the directory name was 2.0.0.201309190007NGT/. Within that directory, you'll want to select the archive file that corresponds with your operating system and computer architecture (32 or 64 bit).

Once you download the archive file, extract the files in it to a directory. Then, go into the directory and look for an application "cshell". On Windows, you'll want to create a shortcut to that file, then right click that shortcut and go to `Properties`. At the end of the `Target` field, you'll want to add " `-console -clean`". These flags will start CShell with a developer console, and clean the cache every time it loads so that new plugins are more easily detected. Here is an example of the target line for my particular PC:

```
C:\Users\username\Downloads\cshell-N-2.0.0.201309190007NGT-win32.win32.x86\cshell.exe -console -clean
```

Creating an Algorithm

Creating a CShell Algorithm is a simple process with our CShell Algorithm Development wizards. To create a CShell Java Algorithm Project, go to `File` -> `New` -> `Project...` and expand the CShell group of wizards.

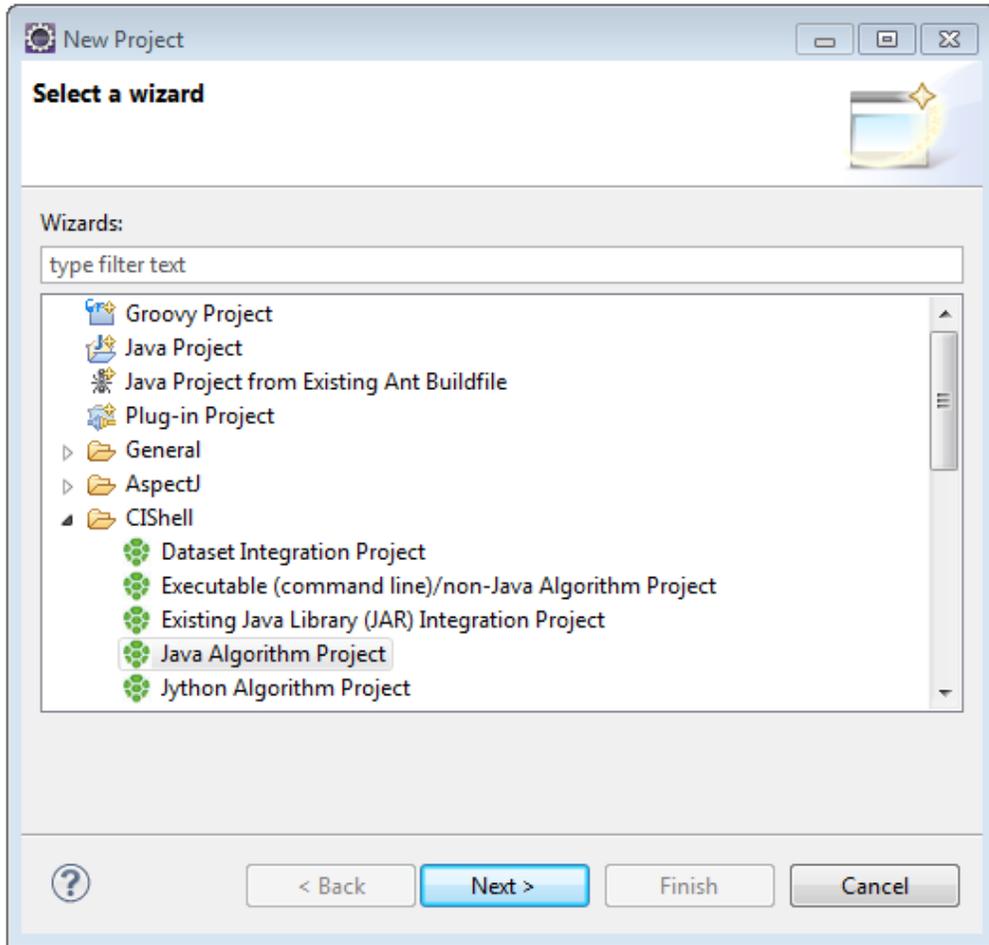


Figure 1: Available CShell Algorithm Projects.

Select *Java Algorithm Project* and press **Next >**. On the next screen, fill in a project name and press **Next >**. As a convention, we usually make the project name, package name, and symbolic name identical for CShellplugins, as you will see in the following steps.

The next page, Bundle Properties, requires input about your algorithm bundle. The *Bundle Name* (Bundle-Name) is a name for your algorithm bundle as a whole, which can just be the name of the algorithm. The *Bundle Symbolic Name* (Bundle-SymbolicName) is the name CShell will use to refer to this plugin internally. The *Bundle Version* (Bundle-Version) should be the version number of your algorithm. Use the default values, and click **Next >** to go to the Algorithm Properties page.

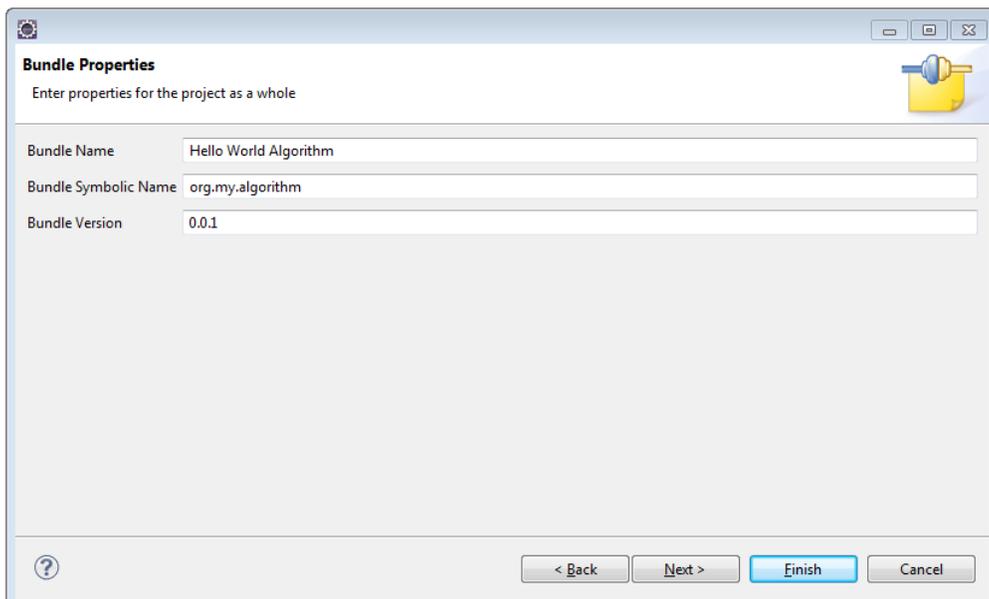


Figure 2: Bundle Properties.

The Algorithm Properties page requires input about your algorithm. *Algorithm Name* (label) is the name of your algorithm as it will appear in a CShell application's menu. *Algorithm Description* (description) will be used as documentation to describe what your algorithm does in CShell. *Algorithm Class Name* will be the name of the Java Algorithm class generated. It is conventional to have all algorithm classes end with "*Algorithm*" in CShell. *Algorithm Package* will be the Java package of the Algorithm class that will be generated. This should be the same as the project name.

Change the Algorithm Name to `Hello World`, the Algorithm Description to `Prints 'Hello World!' to the Console`, and the Algorithm Class Name to `HelloWorldAlgorithm`. The package can stay as `org.my.algorithm`. Click **Next >** to go to the second Algorithm Properties page.

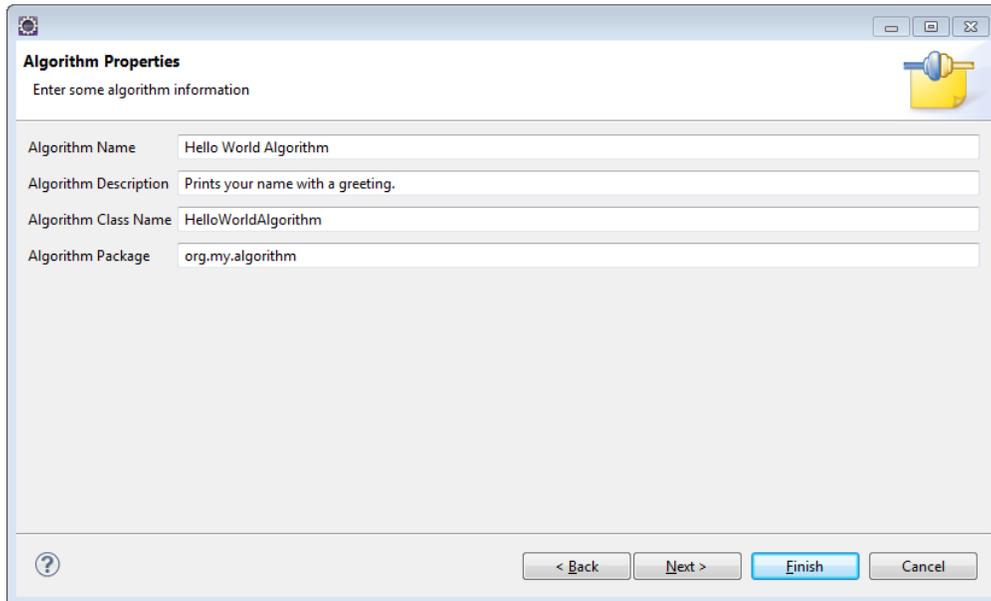


Figure 3: Algorithm Properties.

The second Algorithm Properties page requires input about how the algorithm will work. *Data the algorithm will take in* (in_data) says what data the algorithm will take in (if any) to process. *Data the algorithm will produce* (out_data) says what data the algorithm will return if any. If your algorithm will not be creating its own GUI (i.e., visualizations) and meets the requirements for a remoteable algorithm, check *Remoteable Algorithm* (remoteable). If your algorithm should be visible on a CShell application's menu bar, check *On the menu* and fill in *Menu path* and *Menu item placement* (menu_path). This says where to place the algorithm on the menu. It is a '/' separated path, that also says where on the specific submenu to place the algorithm. See the OSGi specification for more details.

For this tutorial we should set both data taken in and data produced to `null`. Check the *On the menu* checkbox, and set the Menu path to `AwesomeAlgorithms/additions`. Because of a documented *issue* with CShell, the menu path always has to end in `/additions` for the plugin to show up on the CShell menu bar. When you boot up CShell, it should appear next to File, Tools, etc, as `"AwesomeAlgorithms"`.

When you are finished, click **Next >** to go to the Algorithm Parameters page.

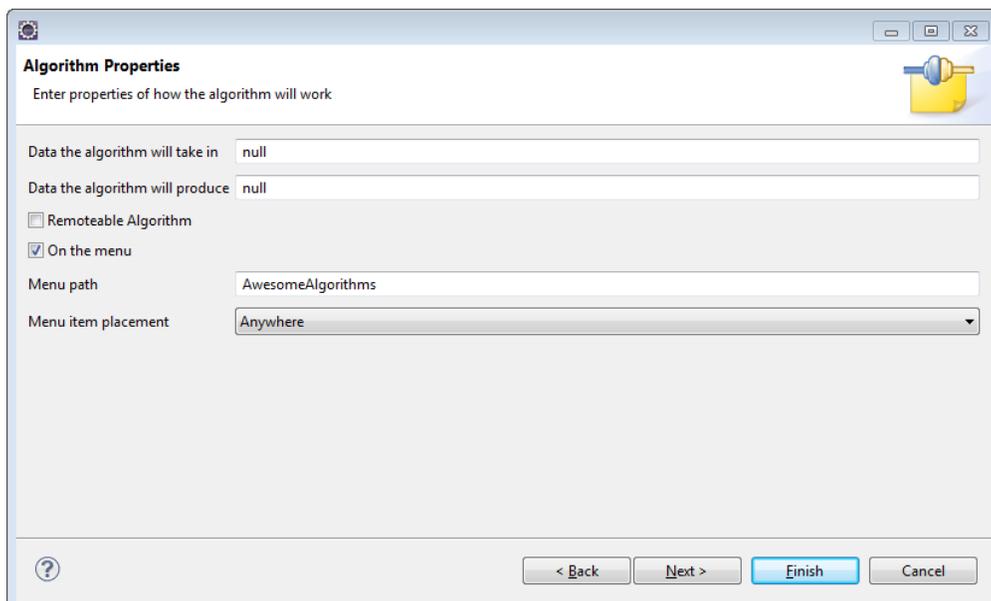


Figure 4: More Algorithm Properties.

The next page allows you to specify what additional input parameters are needed from the user. You can use the **Add** button to add as many extra inputs as needed. There are many different types of inputs including strings, numbers, files, and directories. When the algorithm is run, this information is used to create a GUI for the user to input responses. The *Unique ID* field for each input parameter will be used as a key to obtaining the values provided by the user (please make sure the *IDs* are unique). The *Name* field will label each input parameter on the GUI. The *Description* field will become the help text associated with each input parameter.

Select **Add** button to add a algorithm parameter and insert the following values into the input fields.

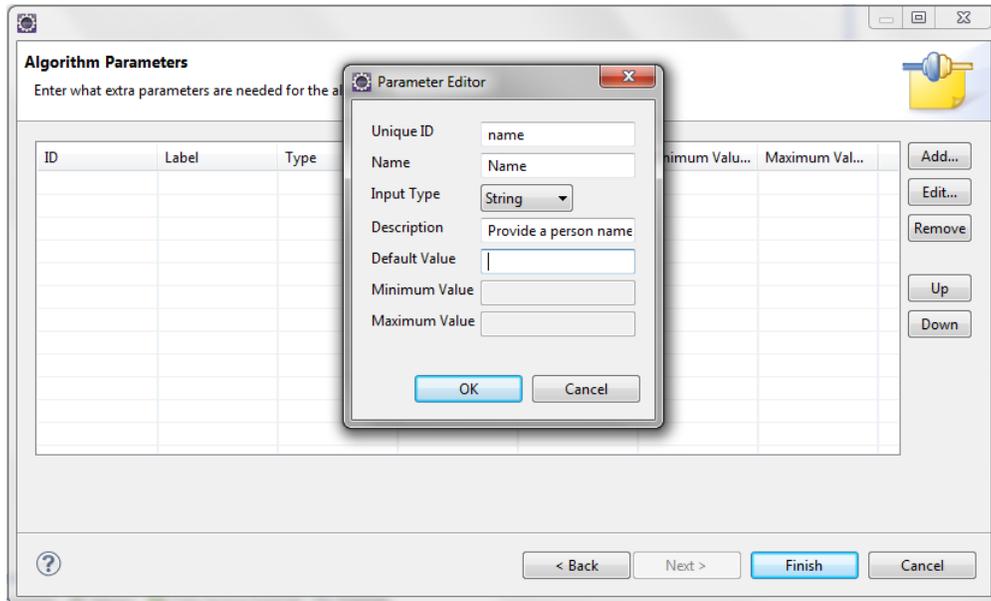


Figure 5: Algorithm Input Parameters.

Finally, press the **Finish** button to generate a new Java Algorithm project. This is what should appear in Eclipse:

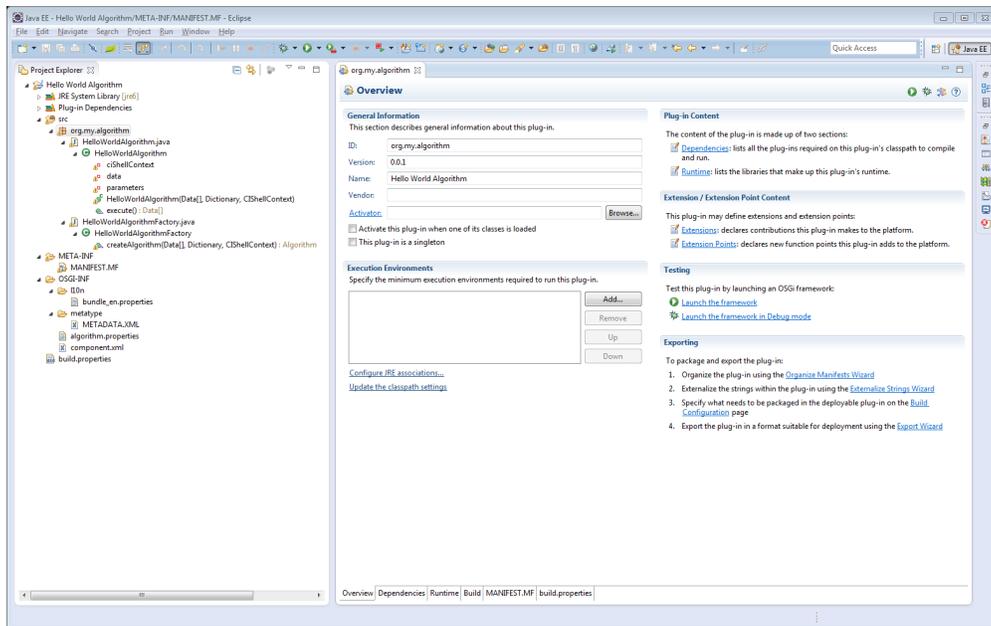


Figure 6: Resulting Java Algorithm project.

Several files are generated for the project:

- Two Java classes are generated, an **Algorithm** class and its associated **AlgorithmFactory** class.
- A **MANIFEST.MF** containing the Algorithm's bundle properties.
- A **bundle_en.properties** file for internationalization.
- A **METADATA.XML** file holding the Algorithm's user-entered input parameters (see [OSGi Compendium 'Metatype Service Specification' Section 105](#)
- An **algorithm.properties** file holding the algorithm's properties (see [CIShell Specification 'Service Metadata' Section 2.3.3](#)).
- A **component.xml** file which registers the algorithm to OSGi's Service Registry (see [OSGi Compendium 'Declarative Services Specification' Section 112](#)).
- A **build.properties** file which enumerates what files/directories are to be included when creating an OSGibundle from the project.

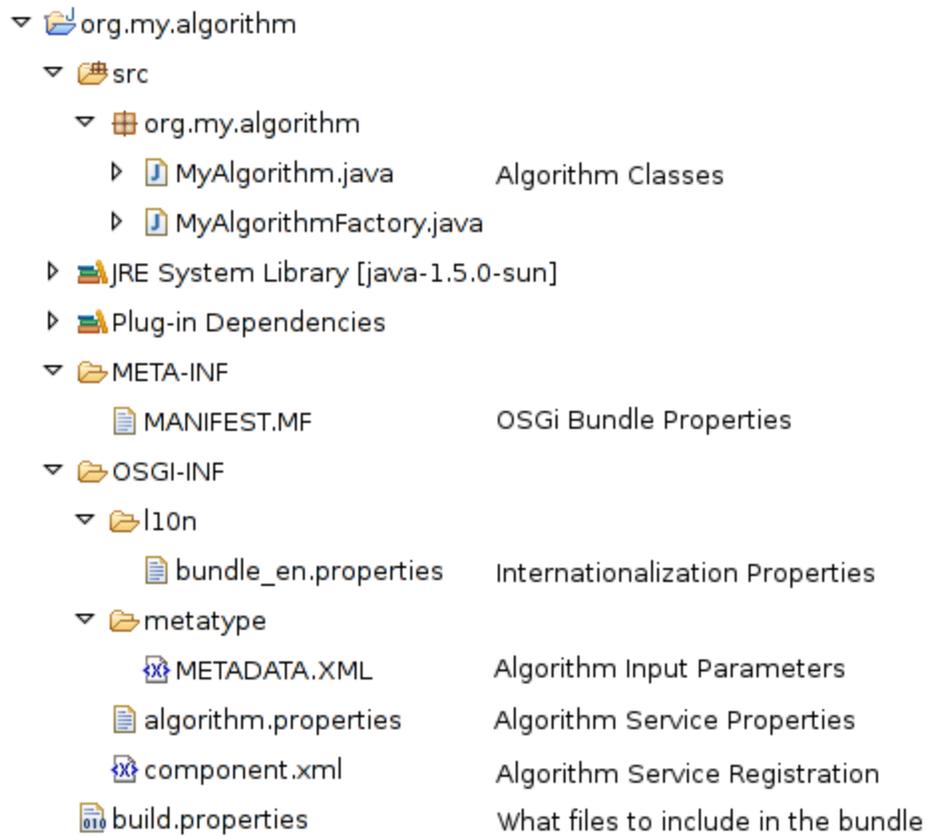


Figure 7: Files in the Algorithm project.

Writing the Java code for the Algorithm

You should now see an open project with the name `org.my.algorithm` in your Eclipse workspace. If you open the `src` folder in this project, you should see the package `org.my.algorithm`, which we created in the wizard. Expanding this package, you should see two classes: `HelloWorldAlgorithm.java`, and `HelloWorldAlgorithmFactory.java`. These two files are the basis of almost all Java algorithms in CShell.

Algorithms in CShell almost always have their own factory class, which helps to create the algorithm. Opening `HelloWorldAlgorithmFactory`, you can see that the algorithm factory has a `createAlgorithm` method, which creates and returns the **HelloWorldAlgorithm** object. Sometimes you will need to modify the `AlgorithmFactory`, but for this simple tutorial it does not need modification, so we can go straight to modifying the `HelloWorldAlgorithm` file itself.

The contents of `HelloWorldAlgorithm.java` should look like this:

HelloWorldAlgorithm.java

```
package org.my.algorithm;

import java.util.Dictionary;
import org.cishell.framework.CIShellContext;
import org.cishell.framework.algorithm.Algorithm;
import org.cishell.framework.algorithm.AlgorithmExecutionException;
import org.cishell.framework.data.Data;

public class HelloWorldAlgorithm implements Algorithm {
    private Data[] data;
    private Dictionary parameters;
    private CIShellContext context;

    public HelloWorldAlgorithm(Data[] data, Dictionary parameters, CIShellContext context) {
        this.data = data;
        this.parameters = parameters;
        this.context = context;
    }

    public Data[] execute() throws AlgorithmExecutionException {
        return null;
    }
}
```

In its current state this algorithm will run perfectly well in a CIShell tool, but we need to add a few lines to make it do something.

In order to print our "Hello World!" message to the console, we must get the *LogService* from the *CIShellContext*.

The full code for our simple Hello World algorithm is as follows:

HelloWorldAlgorithm.java

```
package org.my.algorithm;

import java.util.Dictionary;
import org.cishell.framework.CIShellContext;
import org.cishell.framework.algorithm.Algorithm;
import org.cishell.framework.algorithm.AlgorithmExecutionException;
import org.cishell.framework.data.Data;
import org.osgi.service.log.LogService;

public class HelloWorldAlgorithm implements Algorithm {
    private Data[] data;
    private Dictionary parameters;
    private CIShellContext ciShellContext;
    private LogService logger;

    public HelloWorldAlgorithm(Data[] data,
        Dictionary parameters,
        CIShellContext ciShellContext) {
        this.data = data;
        this.parameters = parameters;
        this.ciShellContext = ciShellContext;
        this.logger = (LogService) ciShellContext.getService(LogService.class.getName());
    }

    public Data[] execute() throws AlgorithmExecutionException {
        String name = (String) parameters.get("name");
        this.logger.log(LogService.LOG_INFO, "Hello World!\n Welcome " + name);
        this.logger.log(LogService.LOG_WARNING, "Warning msg");
        this.logger.log(LogService.LOG_ERROR, "Error msg");
        this.logger.log(LogService.LOG_DEBUG, "Debug msg");
        return null;
    }
}
```

In the constructor we obtain the *LogService* by passing its class name to the *getService* method of the *CIShellContext*. CIShell guarantees that the *LogService* and several other services will always be available using this technique. For more information see the [CIShell Specification](#).

Once we have obtained the *LogService* in the constructor, we are able to print our "Hello World!" message in the *execute()* method. (Incidentally, the constructor should not be used to perform the main work of the algorithm, as only the *execute* method is guaranteed to be called at the appropriate time. An algorithm may theoretically be constructed and held for a long period of time, but only executed much later).

The first argument, *LogService.LOG_INFO*, ensures that the message is only meant to be informative, in contrast with *LogService.WARNING*, which is used for non-fatal errors. Fatal errors (errors which cannot be recovered from) should be thrown as **AlgorithmExecutionExceptions**.

(It is also possible to simply use `System.out.println("Hello World!")` to print a message from a CIShell algorithm, but this message will be routed to the OSGi console instead of the standard user-visible CIShell console. To see the OSGi console, which can be useful for debugging purposes, start your CIShell tool as described in [Accessing the OSGi Console](#)).

Our "Hello World!" CIShell Algorithm is now complete.

Exporting an Algorithm for Use

To test the Algorithm, right click on the project name and click **Export**. In the new dialog expand the **Plug-in Development** category and select **Deployable plug-ins and fragments**, then click **Next >**.

On the next page, check the algorithm bundle to export as an OSGi Bundle and set the destination directory to be where a CIShell application is installed. Do not export to the */plugins* directory of a CIShell tool directly, even though this is the final destination of the plugin, as this will cause your plugin to be exporting to a *plugins* directory within the real *plugins* directory (Eclipse appends `/plugins` to the path of whichever directory you choose). Click **Finish** to export the algorithm bundle.

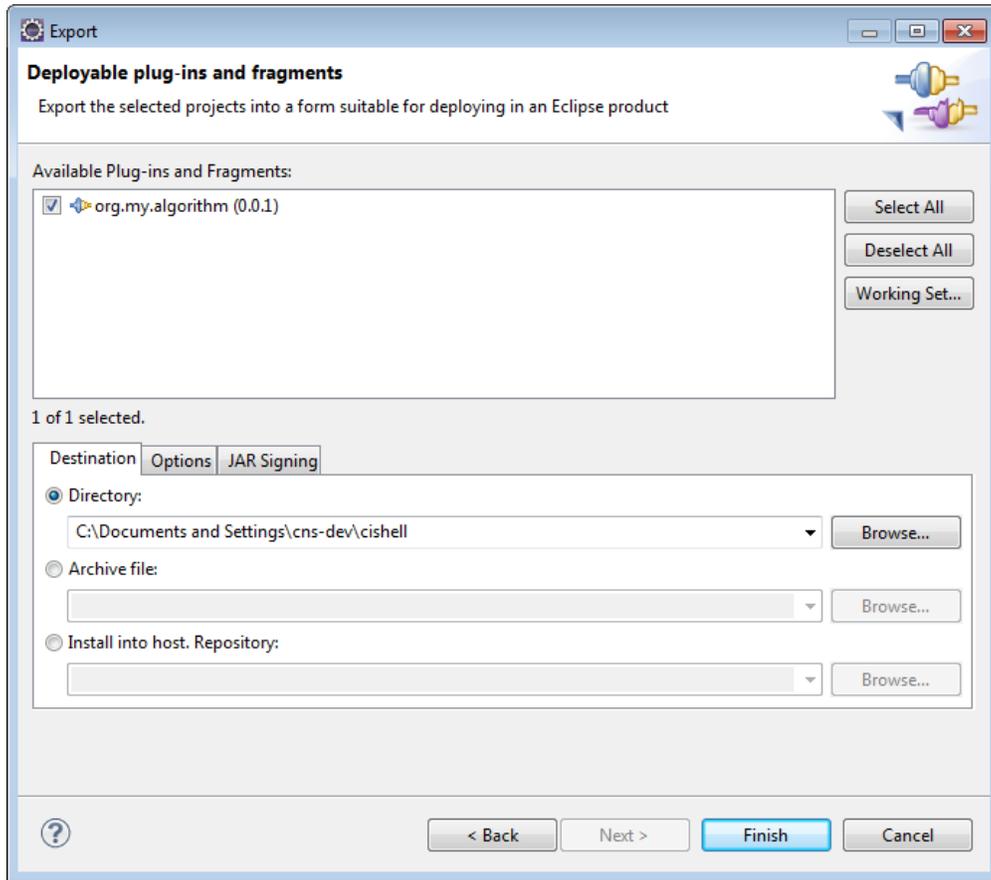


Figure 8: Algorithm Export.

We should now be able to run the CShell application and test the Algorithm. To see your algorithm in action, start your CShell tool, and choose the algorithm from the menu "AwesomeAlgorithms" which should appear along the top menu bar. The message "Hello World!" message, the error message and the warning message should be printed in the CShell Console.

The debug message is not showed in the CShell console. To view the debug message, you will need to open the OSGi console. See the Debugging Tips for this purpose.

Debugging Tips

If something goes wrong, and there is no obvious error message, first make sure that your plugin can be found in the CShell tool's `/plugins` directory. If the plugin is present, try starting CShell with the OSGi console, as described in [Accessing the OSGi console](#), and type "ss". This will list all the algorithms installed in your CShell tool. Find the id associated with that plugin, and try typing "start ID" where ID is the number (say, 129). If OSGi had some error while trying to start your plugin, attempting to restart it in this way should cause the error to be printed to the OSGi console.

If you need to export your plugin again, and have changed any properties, please run the CShell application with the `-clean` command-line switch (See [Accessing the OSGi console in CShell tools](#)).

Next Steps

Now that you've completed your first plugin, try developing a plugin to [manipulate tabular data](#).