Getting Started

Ocean Software Development Framework for Techlog
Version 2019

Schlumberger

Contents

Welcome to Ocean for Techlog

Ocean for Techlog is an application development framework, part of the Ocean suite of Schlumberger software platform frameworks, focused on wellbore data processing and visualization. It allows the application developers to extend the functionality and workflows of the Techlog platform.

The Ocean framework provides a productive development environment that allows the developers to focus on science.

Ocean plug-ins are loaded on-demand by the Techlog end-user as libraries (dll) using the Techlog module manager.

A plug-in integrates in Techlog menus and workflows like native modules. They may appear as:

- activities started for instance through a menu item, which decide by themselves when they are finished. They are displayed as tasks in Techlog, such that you can monitor and possibly stop them manually.
- activities like worksteps which run within a Techlog workflow.

All the code snippets in this document have been built with Ocean for Techlog 2019.1.

Ocean for Techlog Advantage

Ocean is built in the Qt (cute) environment. Qt is a cross-platform application framework that is widely used for developing application software with a graphical user interface. Qt uses standard C++ but makes extensive use of a special code generator (called the Meta Object Compiler, or moc) together with several macros to enrich the language. For software developers, the use of Qt is seen as a productivity enhancement.

Ocean is designed to promote code reusability for maintenance efficiency and robustness. The Ocean Framework enables independent development of decoupled modules. These modules can then be deployed independently of the main Techlog application. This enhances robustness while preserving the evolution of the Techlog platform.

Ocean also promotes the independence of data display and data access. Traditional applications produce data and provide sophisticated rendering and interactions for this data. This isolates them from other applications. In Ocean, data access and data display are not handled by the same classes. This promotes code reuse and data sharing in the same graphical environment. For instance, the **Logview** window simultaneously shows data processed by Petrophysics, Acoustics, and Geology modules. It becomes an essential tool for asset team collaboration.

Ocean for Techlog Architecture

Ocean for Techlog provides lifecycle management, a runtime environment, and a public API for plug-ins to interoperate with Techlog functionalities. Figure 1 shows how Ocean for Techlog provides the glue between Techlog and the plug-ins.

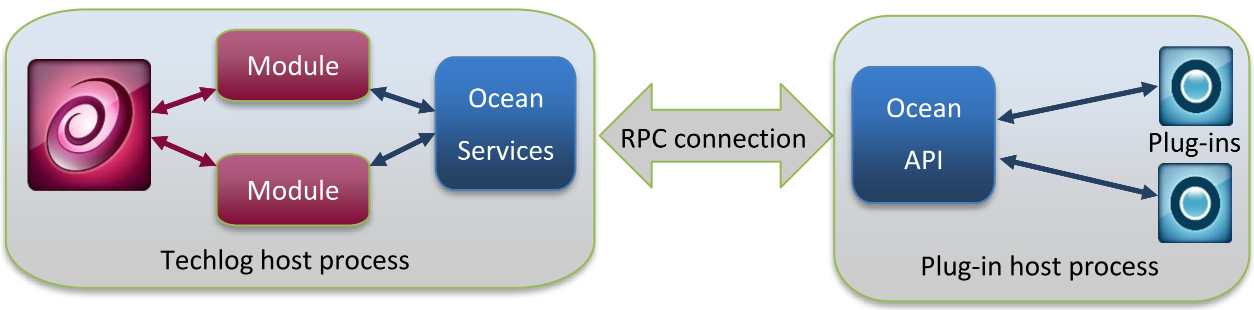


Figure 1 Ocean for Techlog architecture: Plug-in isolation

The Ocean for Techlog architecture is based on native C++ and the Qt framework, with plug-ins running outside of the main Techlog process. Each plug-in running in its own process provides stability and compatibility as it:

- allows plug-ins to run in debug mode with the release version of Techlog
- avoids conflicts between third-party libraries used by the different plug-ins
- allows debugging, fixing, recompiling and rerunning a plug-in without having to restart Techlog
- allows binary compatibility over multiple versions of Techlog and Qt
- allows isolation of Techlog in case of a crash of one plug-in

The Ocean for Techlog public API (**Slb.Ocean.Techlog.dll**) is the host for Ocean applications and is the environment in which the Ocean module needs to run. The public API provides:

- the domain objects and their data source
- the graphical environment in which the applications will display their data
- a common look and feel for all application user interface components

Access to the Techlog data model

The Ocean for Techlog API accesses these data types and properties of the Techlog data model:

- Well
- Dataset
- Variable (Well logs)
- Data properties
- Zonation

You extend the Techlog data model by creating new data objects which are called *plug-in domain objects*.

See the “Plug-in domain object” section in *Ocean for Techlog Developer Guide - Plugin Domain Object - Importer&Exporter* for more information on how to implement a plug-in domain object with Ocean for Techlog.

Ocean for Techlog UI Infrastructure

The Ocean for Techlog API does not limit itself to accessing the Data domain of Techlog. It also provides a rich environment for integrating the Ocean module with the graphic environment familiar to Techlog users.

The User Interface API provides functionality to customize many elements of the Techlog window system.

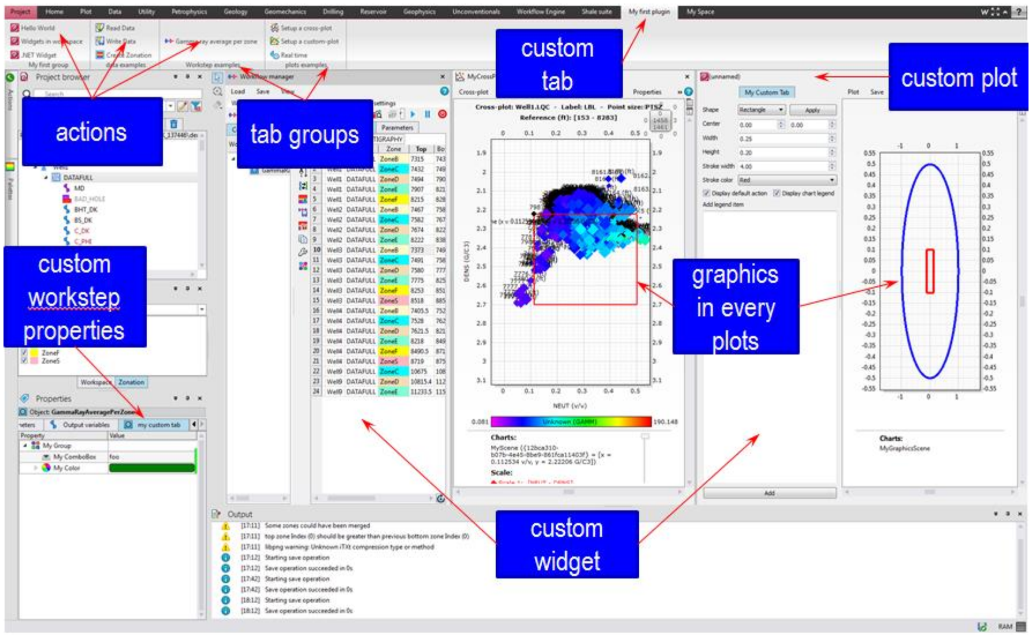


Figure 2 Techlog UI extensibility

Ocean provides the capability to extend Techlog’s user interface functionality for the GUI to be tailored to the needs of new applications. Figure 2 shows some examples of what is customizable with the Ocean API:

- Menu bar extensions:
  - Adding new tabs, groups and menus to the tbar (Techlog ribbon) or extending native Techlog menus
- Windows:
  - Adding custom windows (Qt widgets) in the Techlog workspace
- Plots:
  - Adding custom plots
  - Customizing native and custom plots by adding graphic items
  - Adding user interactions through graphic items
  - Extending the menu bar, tool bar and context menu of native and custom plots with custom tools
- Workflow manager

- Adding a custom user interface to an Ocean workstep
- Extending worktep properties (Techlog properties editor) with a custom properties tab

- Importer and Exporter
  - Extending import and export functionalities of the Techlog platform

Ocean for Techlog plug-in identity and activities

The **`PluginIdentity`** is an interface that the developer implements to declare some information about the plug-in, its list of activities, and the menu items used to trigger those activities.

This is the main entry point class of the plug-in and this class, compiled into the library, provides identity and support information on the plug-in.

Once the plug-in library is deployed into the **Extensions** folder of Techlog (it could be in the **Techlog**, **Company** or **User** folder), the end-user can enable or disable it in the Techlog module manager accessible through the **Navigation pane > Licensing** menu, and click on the **Open the module manager** button.

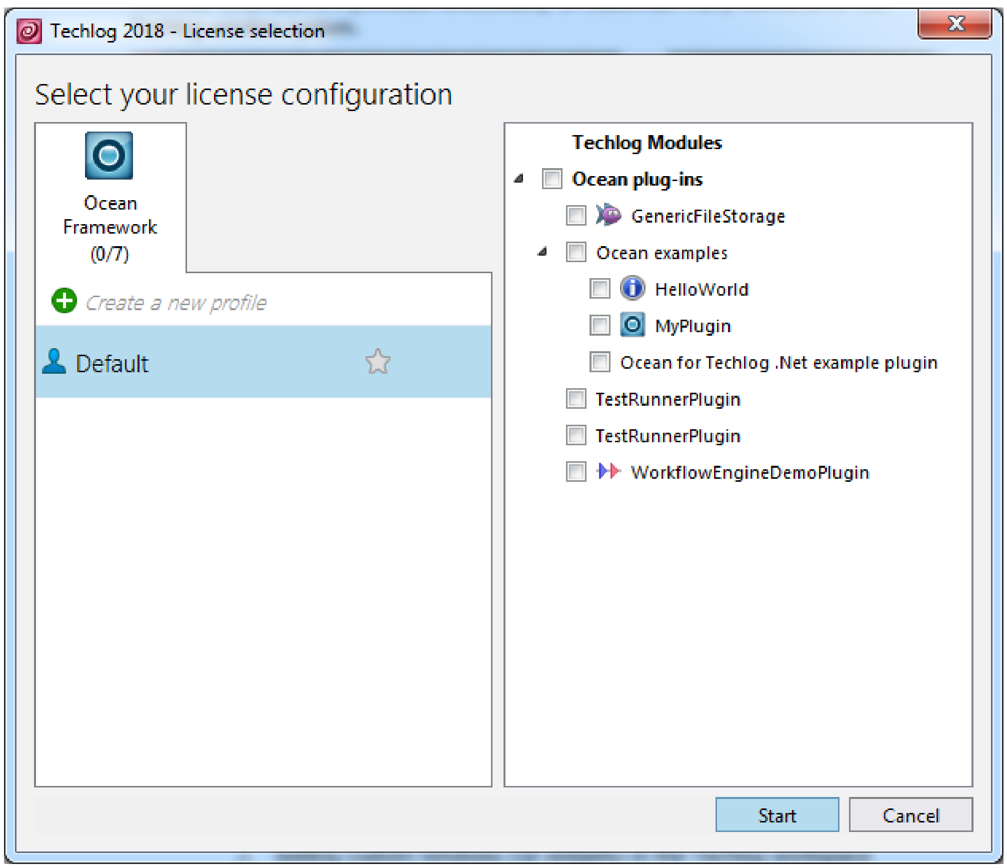


Figure 3 Techlog module manager

The module manager in Techlog manages the integration of the plug-in activities into Techlog: it loads and queries the plug-in, creates actions that launch the plug-in activities, and links them to menu items in Techlog.

In Techlog, a module is a set of functionalities associated with a license feature. A plug-in can contribute its activities into some Techlog modules. For instance, a plug-in can contribute an environmental correction workstep (associated with the environmental correction license), and can also add some geology-related processing to the WBI (wellbore imaging) module, that is available only if the user has also a WBI license. This means that the integration into the Techlog menus is dynamic, based on the Techlog modules enabled by the user, and therefore subject to license checks.

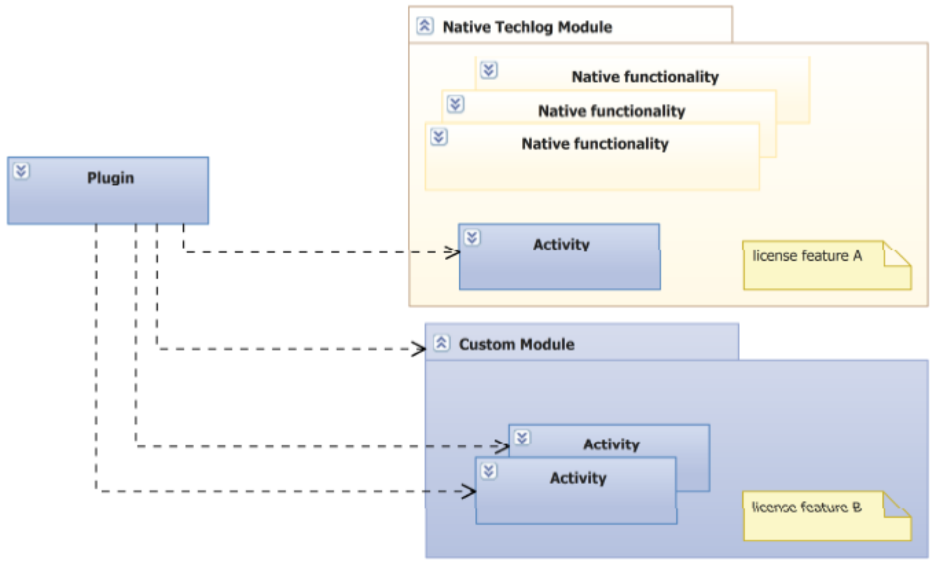


Figure 4 Plug-ins contribute activities to modules (native or custom); modules can be licensed.

All the activities of a given plug-in run in a single process, and multiple instances of a given activity can run in that same process. This way, activities within a given plug-in can communicate between each other (for instance, multiple worksteps forming a workflow).

Ocean framework license

Ocean for Techlog is sold under a license feature called **Ocean_Framework** that makes **tlBase**, **tlAdvancedPlotting** and **tlPython** modules available.

Ocean_Framework license feature gives access to the Ocean for Petrel and Ocean for Studio development frameworks as well. You need to provide a dongle id when you order the license through the Ocean store.

Creating or opening a Techlog project with an Ocean framework license marks the project as tainted.

- Plots and reports accessing data from a tainted project have a watermark.
- Data export is prohibited.
- Once the project is tainted it can’t be open with a regular Techlog license.

Qt LGPL notice

The Ocean framework is distributed with Qt LGPL 5.9.1 libraries. Per requirement of LGPL components used, you must provide with your plug-in a notice that LGPL code is being used. Do this by deploying with your plug-in dll (plug-in folder) the **LGPL.txt** file and the appropriately edited **README.txt** file that are shipped with the Ocean framework.

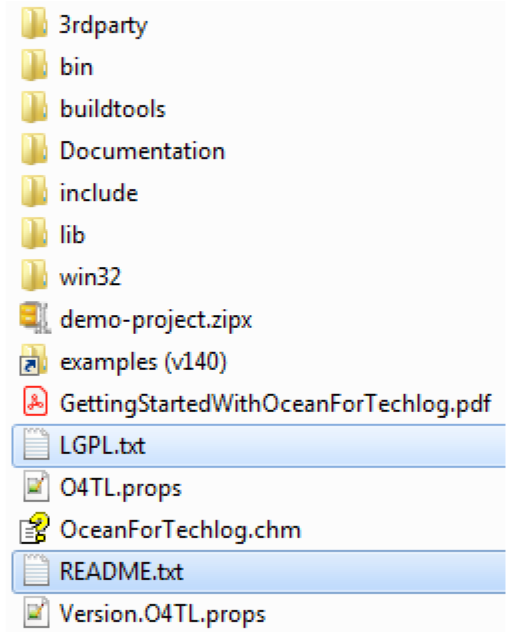


Figure 5 LGPL notice files

See the "Deploy folders and files with the plug-in dll" section on page 70 for more information on how to deploy additional files in the plug-in folder.

Open and modify the **README.txt** files before deploying it with your plug-in, changing the "Ocean for Techlog Software" with the name of the plug-in at the beginning of the file.

Microsoft Visual Studio compilers supported with Ocean

The Ocean framework is deployed with libraries built with mvsc140 (Visual Studio 2015) compiler versions. This means that you can build your Ocean for Techlog plug-in with only the Visual Studio compiler 2015 version.

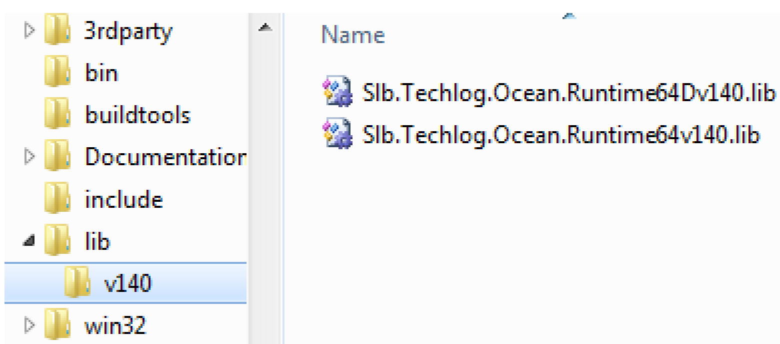


Figure 6 Ocean libraries mvsc140

Binary compatibility

The commercial Ocean APIs from a Techlog major version release are binary compatible with all of the Techlog minor version releases. The best practice is to build your plug-in on the Ocean Framework major version so it will run on any minor releases of the same major Techlog version.

Note: If the plug-in depends on a new feature or a fix in a minor release you can build your plug-in against that Ocean framework minor release, but users of your plug-in will then have to adopt the corresponding Techlog minor release in order to run your plug-in.

Note: In the Ocean framework 2019.1 release it has been decided to not break the binary compatibility with previous 2018 releases. This means that a 2018 plug-in doesn't need to be rebuild with 2019.1 Ocean framework to be discovered and run in Techlog 2019.1 release.

Stability promise

The stability promise says that the Ocean API will be stable for minimum two years or two release cycles.

In order to implement new features or adopt new designs, the Ocean API may change over time. Any APIs that are going to be removed are marked with the "Deprecated" attribute, and include when the deprecation happened and what the replacement API is. The API remains available as "Deprecated" for a minimum of one release cycle before the API is fully removed, and the plug-in code must be updated in this time frame.

For example, the **`userHorizontalLimit`** method of the **`LineTrackItem`** class was deprecated in the 2017 release.

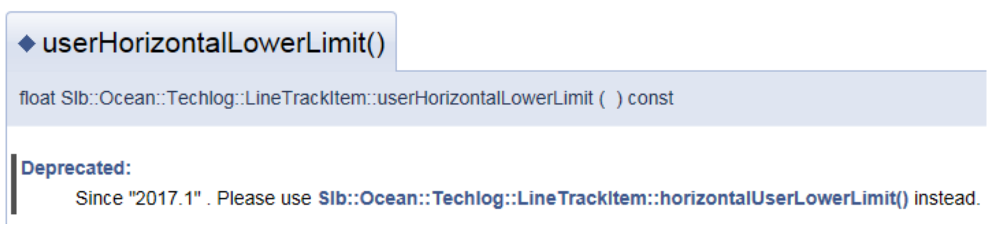


Figure 7 Deprecated API

Any plug-ins using the deprecated **`userHorizontalLimit`** method must be changed to use the replacement method **`horizontalUserLowerLimit`** instead.

Since you might not have the time or resources to change your plug-in immediately, in the 2017 release both the new API **`horizontalUserLowerLimit`** and the old API **`userHorizontalLimit`** are available. In the 2018.1 release, the old API **`userHorizontalLimit`** is removed and is no longer available for use.

Install and setup the Ocean for Techlog development environment

Ocean for Techlog installation

The Ocean development environment is setup by Ocean for Techlog installer.

The installer first checks if the Techlog version corresponding to the Ocean Framework is installed on the user machine. The Ocean for Techlog package may be located anywhere on the disk.

1. Browse the installation folder and click **Next** in the dialog window. (See Figure 8.)

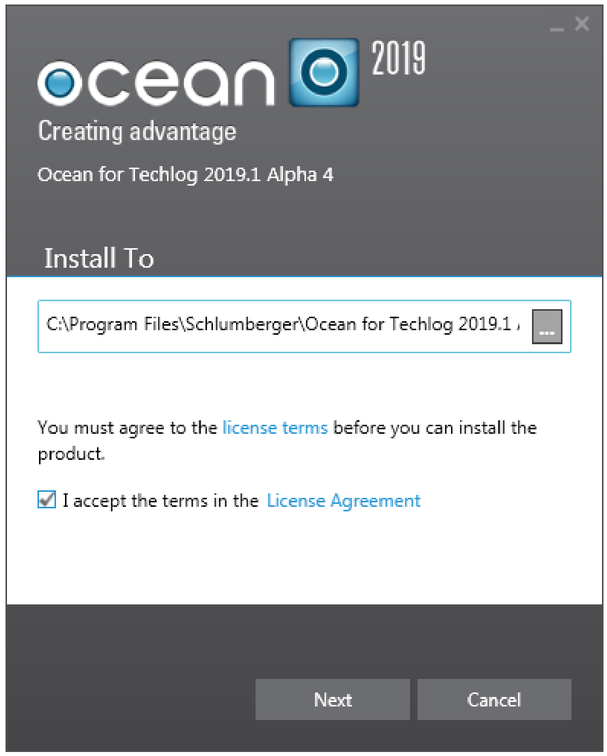


Figure 8 Ocean for Techlog install location

The installer checks:

- corresponding Techlog version is installed
- Visual Studio 2015 or 2017 is installed with v140 compiler.

2. Click **Next** in the dialog window. (See Figure 9.)

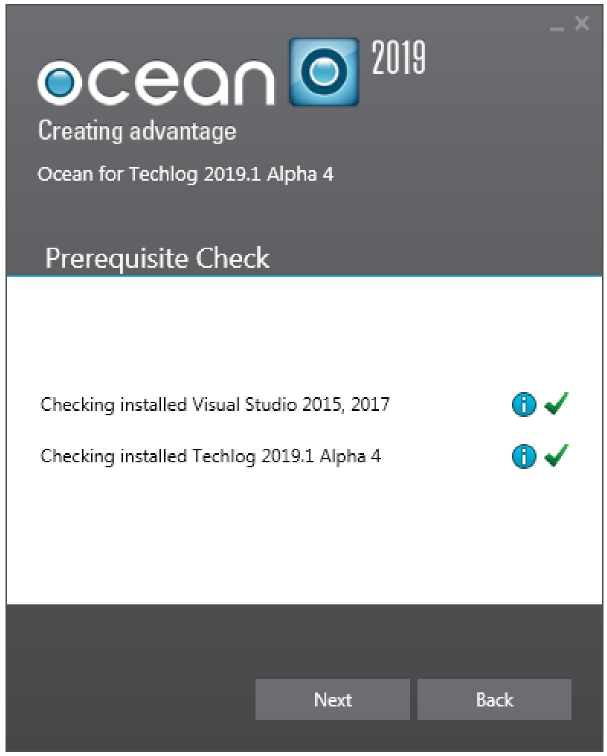


Figure 9 Techlog and VS 2015 or 2017 (compiler v140) are installed

If you have already a Techlog user folder defined on your system (**TLUSERDIR** environment variable), the sample plug-ins are deployed to this folder. Otherwise the installer deploys sample plug-ins to the user profile's AppData in order to avoid any UAC (User Account Control) issues.

See the "Ocean for Techlog environment variables" section on page 15 for more information on how to setup Ocean environment variables.

The installer shows Visual Studio components installed with Ocean.

3. Select all components and click **Install** in the dialog window. (See Figure 10.)

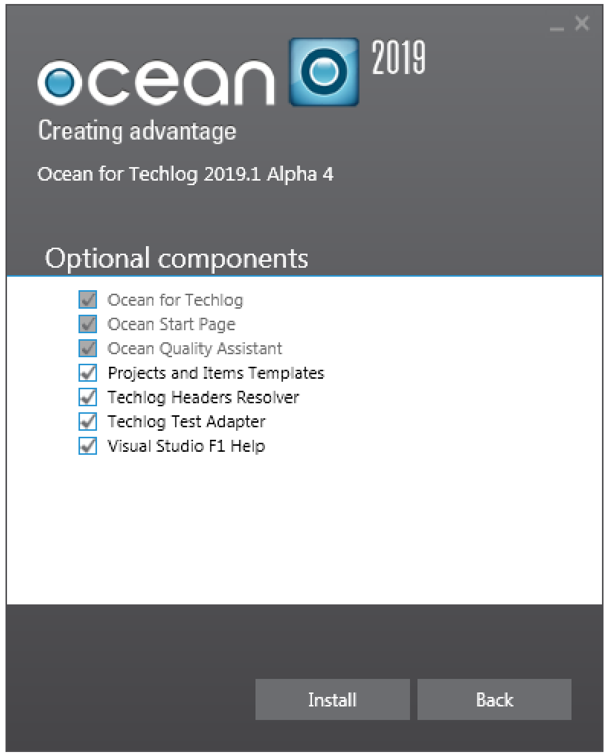


Figure 10 Visual Studio components

4. After the installation a reboot may be required to get all Ocean for Techlog Visual Studio extensions properly installed. (See Figure 11.)

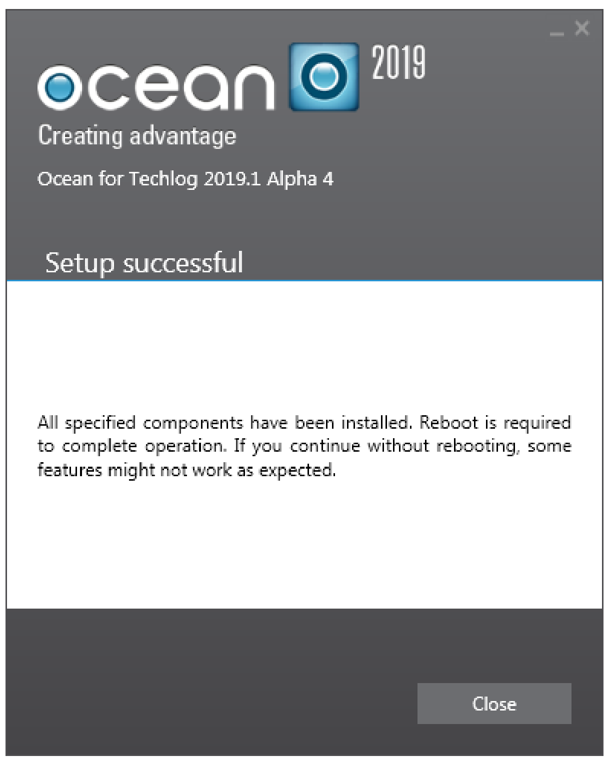


Figure 11 Setup successful

Ocean for Techlog package content

The Ocean for Techlog Framework is deployed by the installer. The Ocean for Techlog package has this folders hierarchy installed on your disk when installed:

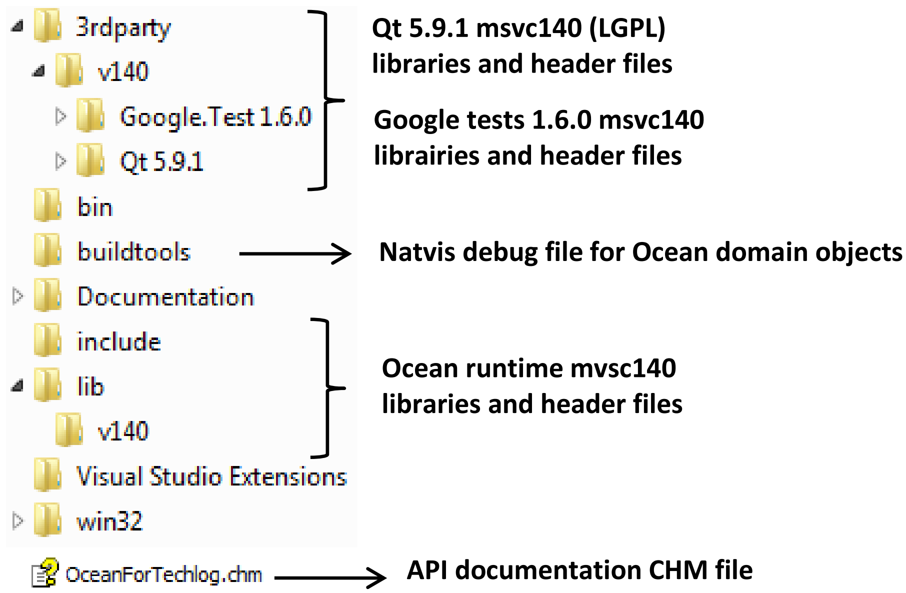


Figure 12 Ocean for Techlog package content

Plug-ins are built on Qt. The Ocean for Techlog Framework installer comes with the Qt LGPL 5.9.1 version. It contains QtCore and QtGui libraries (the 2 most basic Qt libraries). Those libraries are compatible with the Visual Studio compiler v140 (Visual Studio 2015).

The Ocean for Techlog API exposes these objects:

- Base classes: **`QObject`** (plug-in classes are **`QObject`** and in particular they expose their event handlers as Qt's slots methods), **`QWidget`** (a simple way of providing a custom GUI is by implementing a **`QWidget`**)
- Basic types: **`QString`**, **`QVariant`**, **`QImage`**, **`QColor`**, etc.
- Containers: **`QList`**, **`QMap`**, **`QHash`**, etc.
- Enums: **`Qt::PenStyle`**, etc.

Google.Test 1.6.0 x64 libraries are provided with Ocean framework in order to create an Ocean test plug-in. Google test librairies are shipped in a v140 folder to build your test plug-in with the Visual Studio compiler v140. See the "Create unit tests for your plug-in" section on page 42 for more information on how to create Google tests for an Ocean plug-in.

The Ocean framework libraries are deployed in a v140 folder. It contains libraries built with Visual Studio compiler v140 with which the plug-in links to build with the v140 compiler.

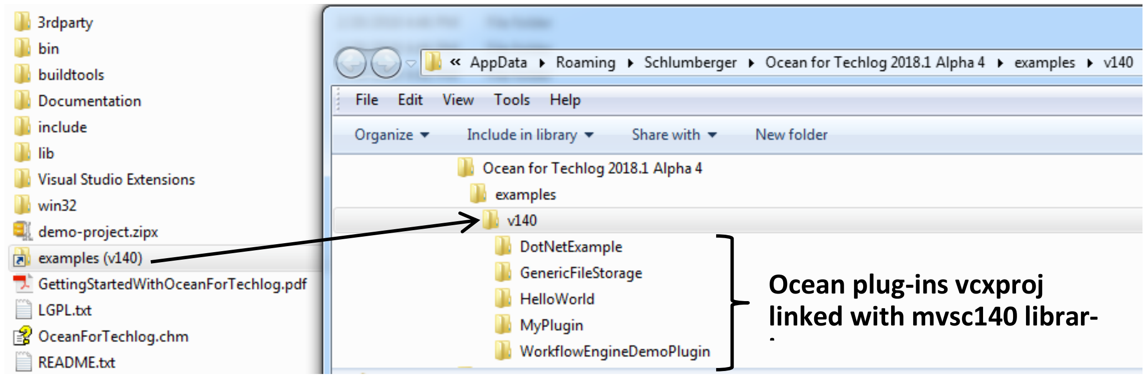


Figure 13 Ocean plug-in examples

The Ocean framework installer deploys in the Ocean package home folder an example folder link. The "examples (v140)" points to Visual Studio plug-in projects that link with Ocean libraries and use the Visual Studio compiler v140. All these examples are deployed in the **%appdata%\Schlumberger\Ocean for Techlog 2019.1** directory.

The examples **v140** folder includes these plug-ins:

- **HelloWorld**: a simple plug-in useful to test your Ocean for Techlog development environment.
- **DotNetExample**: shows how to integrate a .NET library in Techlog using Qt and Ocean framework.
- **MyPlugin**: some code examples of each API exposed in Ocean for Techlog
  - Read and write data access
  - Create a workstep, add it and run it in a Techlog workflow
  - Plot examples as Logview, cross-plots, custom plots
  - Custom UI examples
- **GenericFileStorage**: some plug-in domain objects (custom domain objects) code samples

The plug-in examples listed previously are built in release mode and deployed by the Ocean framework installer into the **Extensions** folder of Techlog **User** folder. You can modify the path to the Techlog User folder through the **TLUSERDIR** environment variable or directly in Techlog through the **Options** window dialog.

This is described in the "Ocean for Techlog environment variables" section.

The same known **Extensions** location can be added within Techlog's multi-level folder organization: **Techlog** and **Company**. This allows the plug-in to be deployed along with the Techlog installation, or on the Company's shared drive to reach many users.

It is not recommended for a plug-in developer to deploy a plug-in directly at the company or Techlog level for these reasons:

- content of the Company folder is usually handled by a dedicated team within the company

- Techlog extensions folder hosts plug-ins deployed with the Techlog baseline as native Techlog modules

Ocean for Techlog environment variables

In order to build your plug-ins the Ocean installer sets the **TechlogSDKHome2019_1** environment variable which is the root folder path where the Ocean for Techlog framework is installer on your disk (e.g. **C:\Program Files\Schlumberger\Ocean for Techlog 19.1**).

To see the demo plug-ins installed with the Ocean package in the Techlog module manager, the user folder parameter is needed to say where deployed the plug-ins are.

If there is no user folder set on your machine, the installer sets the **%AppData%\Schlumberger\Ocean for Techlog 2019.1\techlog** folder as user folder and deploys the sample plug-ins in this folder. Sample plug-in code is also deployed in the **%AppData%\Schlumberger\Ocean for Techlog 2019.1\examples**

You can change it anytime through Techlog **Options** window (**Navigation pane > Options > Folders**).

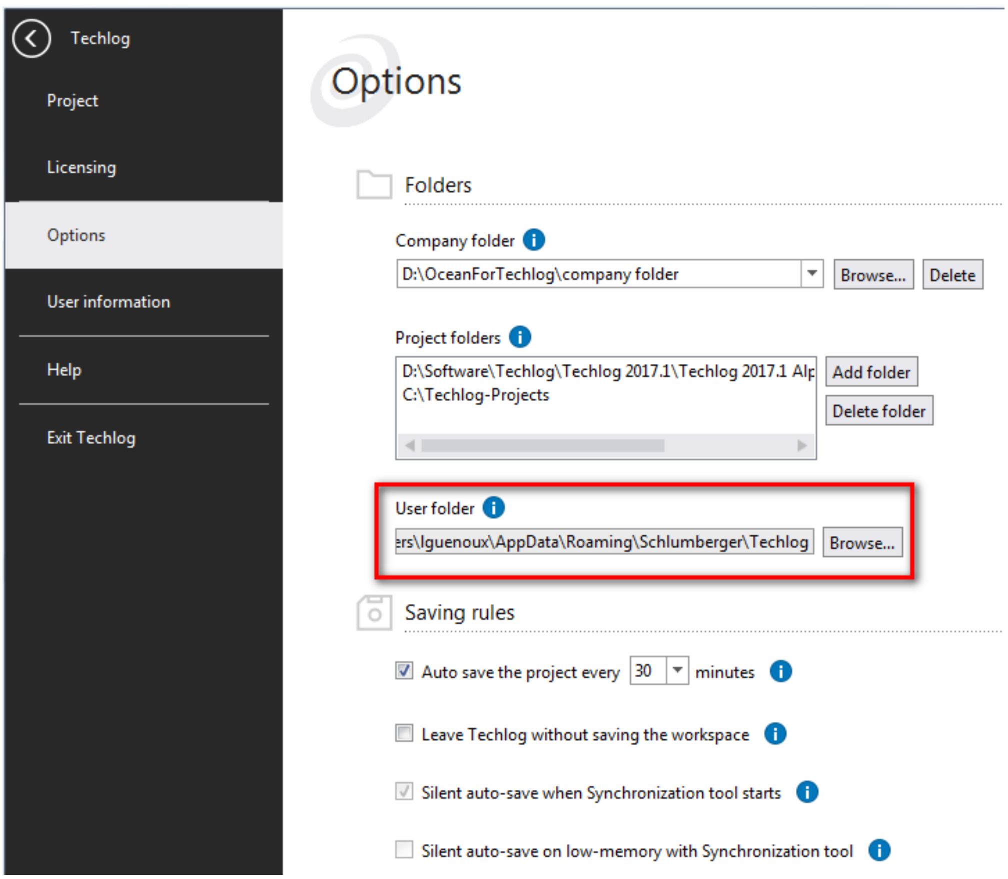


Figure 14 Techlog user folder

This parameter is set through the **TLUSERDIR** environment variable:

- **TLUSERDIR**=*%TechlogSDKHome%|techlog* if you want to use the **User** folder as your target build area.

Close and re-open any explorer window to propagate the new environment variable settings.

Ocean for Techlog property sheets

Property sheets (.props files) are deployed with the Ocean framework and are used to setup Ocean and Qt property values needed by the plug-in project to be build in Visual Studio.

Two main property sheets deployed at the **TechlogSDKHome2019_1** root folder:

- **Version.O4TL.props** defines:
    - The Techlog version (2019.1) used by all plug-ins built with this Ocean framework package.
    - The path to **QTDIR** folder that contains the version of Qt libraries shipped with the Ocean for Techlog framework.
    - The path to **GTests** folder that contains the version of GTests libraries shipped with the Ocean for Techlog framework.
- **O4TL.props** includes other property sheets as:
    - **AdditionalDependencies.O4TL.props** and **Include.O4TL.props** deployed in **TechlogSDKHome2019_1\bin** folder and used to defines Ocean for Techlog libraries and header files in the Visual Studio plug-in project.
    - **AdditionalDependencies.QT.props** and **Include.QT.props** deployed in **TechlogSDKHome2019_1\3rdparty\v140\Qt 5.9.1** folder and used to defines Qt libraries and header files in the Visual Studio plug-in project.
    - **AdditionalDependencies.GTests.props** and **Include.GTests.props** deployed in **TechlogSDKHome2019_1\3rdparty\v140\Google.Test 1.6.0** folder and used to defines Google Tests libraries and header files in the Visual Studio test plug-in project.

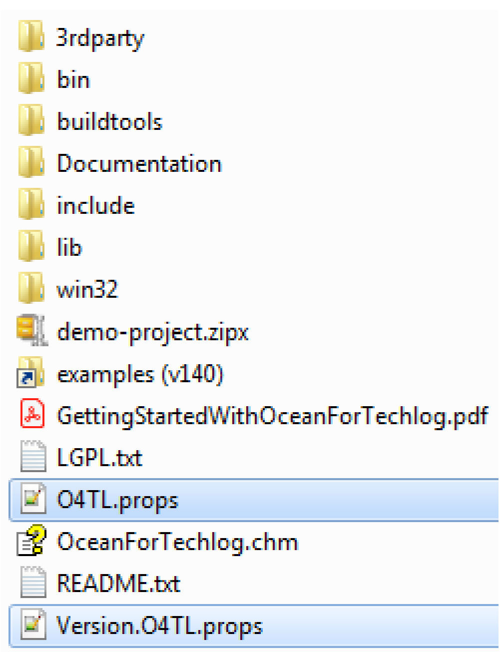


Figure 15 Ocean for Techlog main property sheets

Note: The main Ocean for Techlog property sheets are included to the Visual Studio plug-in project template and wizard installed with the Ocean framework to Visual Studio. Please don't modify those files as they contain the needed Ocean and Qt property values needed to build a valid plug-in for Techlog 2019.1 release. See the "Creating the Plug-in and Activity with Visual Studio" section on page 22 for more information on how to create a plug-in by template in Visual Studio.

Test the Ocean for Techlog development environment

First test if **TechlogSDKHome** is properly set up and the Techlog user folder is pointing to the **Extensions** folder of the Ocean for Techlog development package. Perform these steps:

1. Run Techlog and click on the **Open the module manager** button from the **Navigation pane > Licensing** menu:

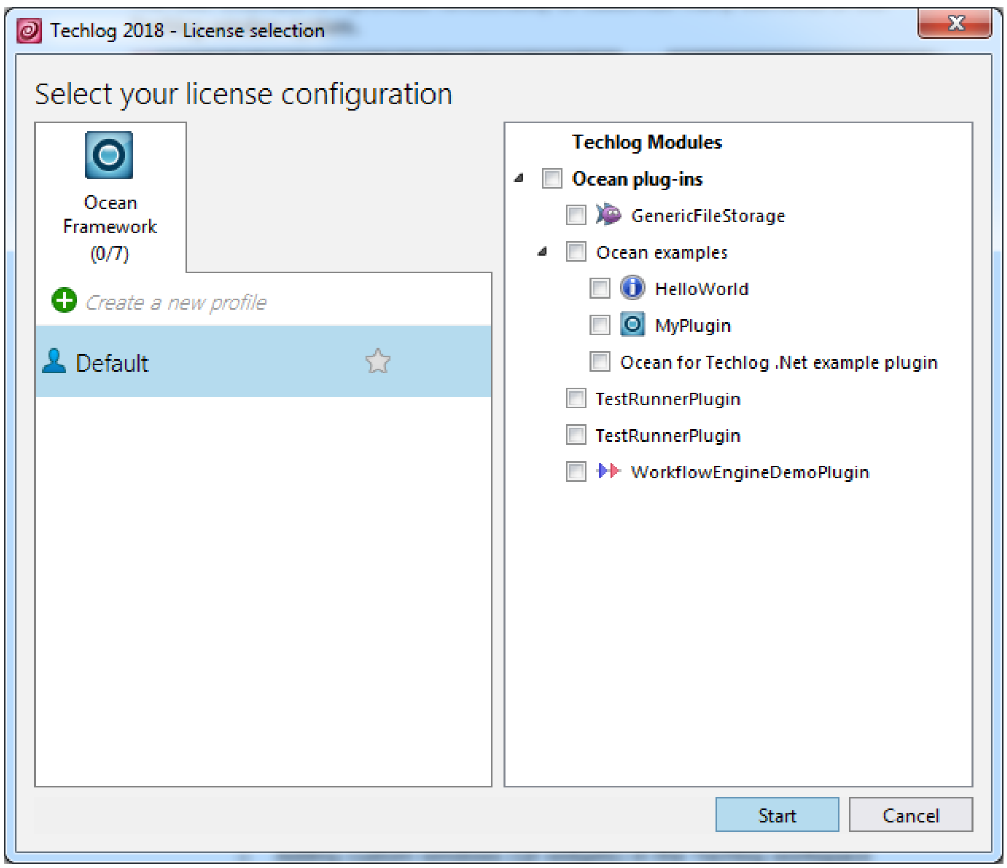


Figure 16 Release plug-ins deployed with Ocean Framework

The module manager scans the **Extensions** folder of the Ocean for Techlog package and the example plug-ins built in release mode and shipped with the Ocean framework are displayed as in Figure 16.

2. Go to **%TechlogSDKHome2019_1%\examples\v140\HelloWorld** folder.

3. Open **HelloWorld.vcxproj** with Visual Studio and build the project in debug x64 mode.

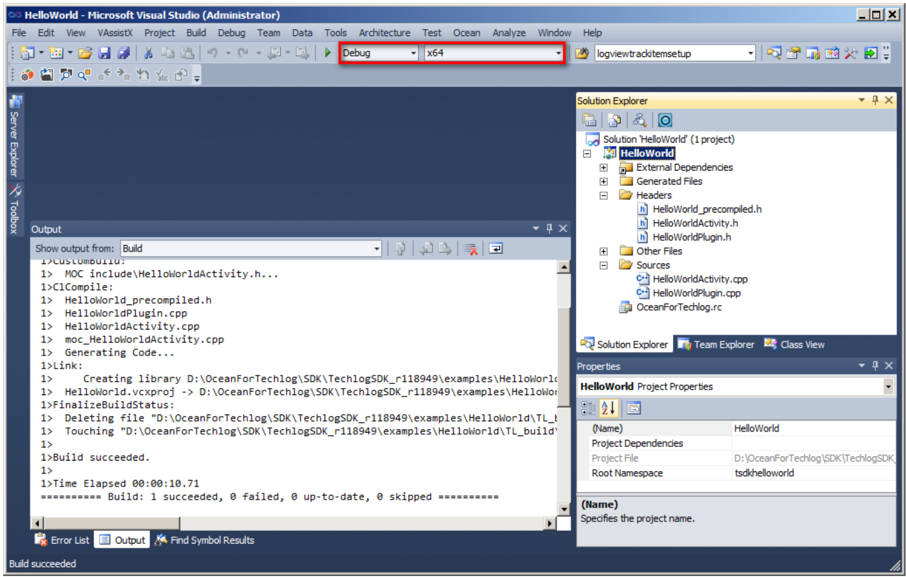


Figure 17 HelloWorld build in debug x64

The project must build successfully and a new debug x64 library of the HelloWorld project is generated in the **Extensions** folder of the Techlog user folder.

Note: In this screenshot you can see that the expected plug-in structure folder is **VendorName/PluginName/TechlogVersion/PluginVersion/**. If this structure folder is not respected the plug-in is not loaded in Techlog.

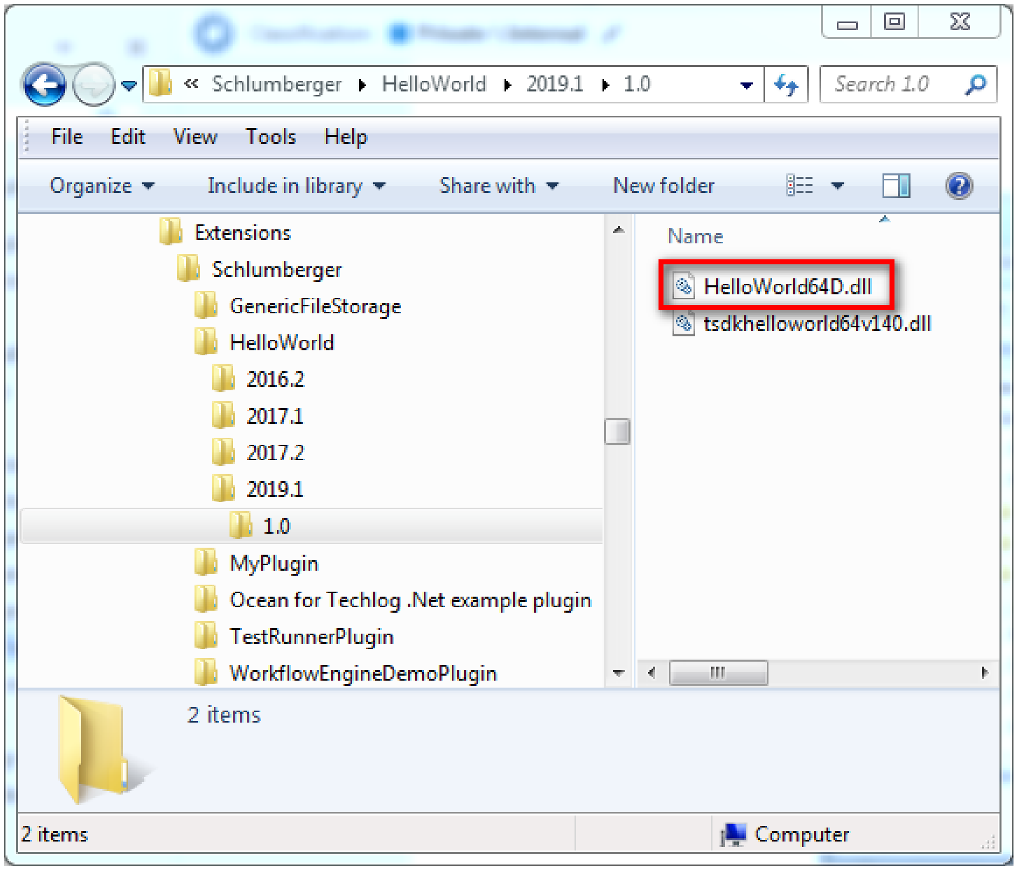


Figure 18 HelloWorld debug x64 library

4. In Techlog, open the module manager, right-click on **Ocean plug-ins** and click **Refresh plug-ins** in the context menu. The new **HelloWorld debug x64** plug-in appears in the **Ocean plug-ins** group as in Figure 19. Since there is one HelloWorld plug-in dll deployed by the Ocean framework installer in the same plug-in folder (HelloWorld release plug-in v140), once the HelloWorld plug-in is built in debug v140 and deployed, you see two HelloWorld plug-ins in the module manager with the same name "HelloWorld". Next to the plug-in you can click on the information icon and check the corresponding plug-in dll name in the information pane of the module manager.

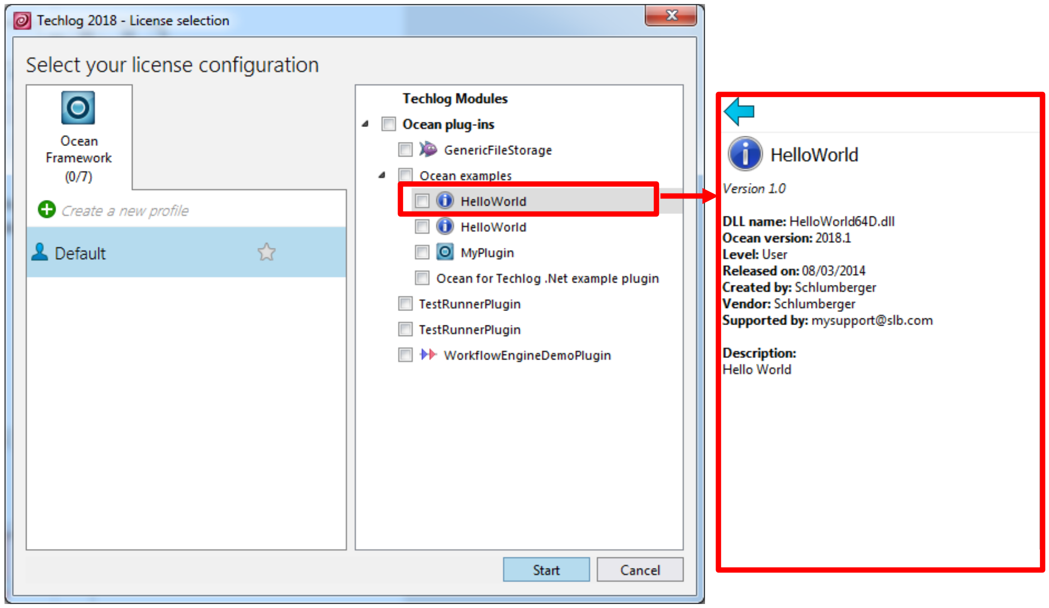


Figure 19 HelloWorld64D plug-in

After you refresh the list of plug-ins in the module manager, if you get these error messages for some plug-ins built in debug mode, it means that the Techlog plug-in debug host process executable and its dependencies have not been deployed properly in ***bin64/pluginhost*** *folder of Techlog installation folder. Please re-install the Ocean framework.*

Error: Plugin 'myplugin64D.dll': can't find corresponding plugin host file.

Error: Can't launch plugin host for plugin 'myplugin64D.dll': host process not running.

5. Enable the plug-in and click the Hello World action menu in the new HelloWorld plug-in added in Techlog. "Hello Plugin World!" is displayed in the Techlog **Output** console.

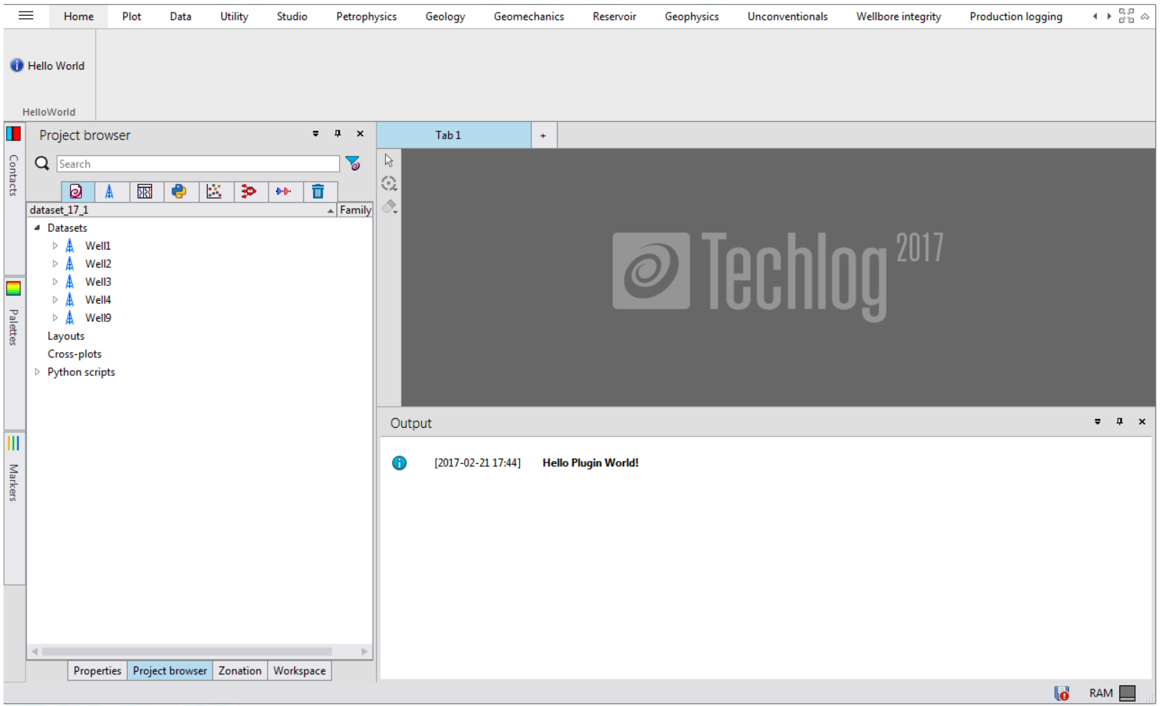


Figure 20 HelloWorld64D activity running

Writing your first plug-in

The Ocean for Techlog framework provides a development and runtime environment for wellbore centric data manipulation, interpretation, and visualization applications. You have the ability to create workflows that interoperate with or extend the commercial Techlog Interactive Suite and the capability to extend the scope of Techlog to address new petrotechnical domains. This chapter describes the procedure of creating a simple plug-in.

Writing the plug-in

In your first plug-in you will add a new menu item into a new tab and group in Techlog. Clicking on this menu item will trigger an activity that prints all the well, dataset and variable names found in the current project.

There are three main steps for creating your first plug-in. Each step will be detailed in the sections that follow. The steps are:

1. Run the Ocean for Techlog Plug-in Wizard in Visual Studio to create the plug-in.
2. Inspect the files created by the Wizard.
3. Modify the code to add the processing logic.

Creating the Plug-in and Activity with Visual Studio

To create the project, plug-in, and activity using Visual Studio:

1. Start Visual Studio.
2. Create a new project by selecting **File > New Project**.
3. In the Project types area, under **Visual C++** project type, select **Ocean > Techlog 2019.1**.

   Note: Since Ocean 2016.1, you can have two different versions installed on the user machine (the current version and the previous version); in this case, a 2018.1 version and a 2019.1 version.

4. Select the **Ocean Plug-in** template.
5. Provide the name “MyFirstPlugin” for the project.
6. Click **OK** to start the Wizard.

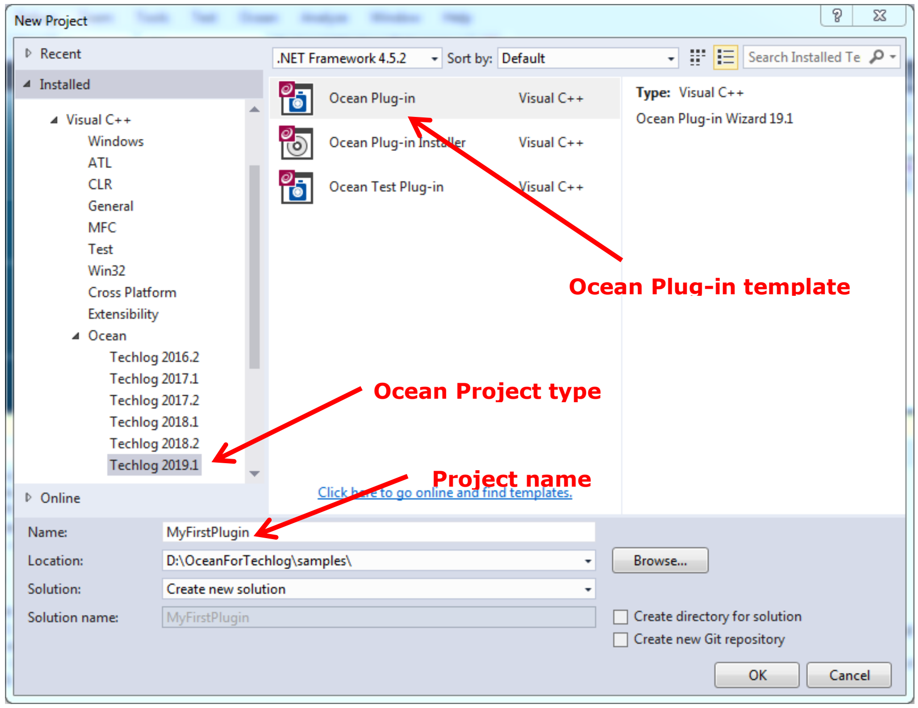


Figure 21 New project window

It is generally a good practice to use a descriptive plug-in name.

7. Change the name of your plug-in to “MyFirstPlugin”.
8. Change the “Vendor name”, “Plug-in version”, “Support e-mail”, “Crash dump e-mail” and “Description” fields as appropriate (See Figure 22).
9. Note that “Vendor name”, “Plug-in name” and “Plug-in version” are mandatory plug-in information.
10. Click **Finish**.

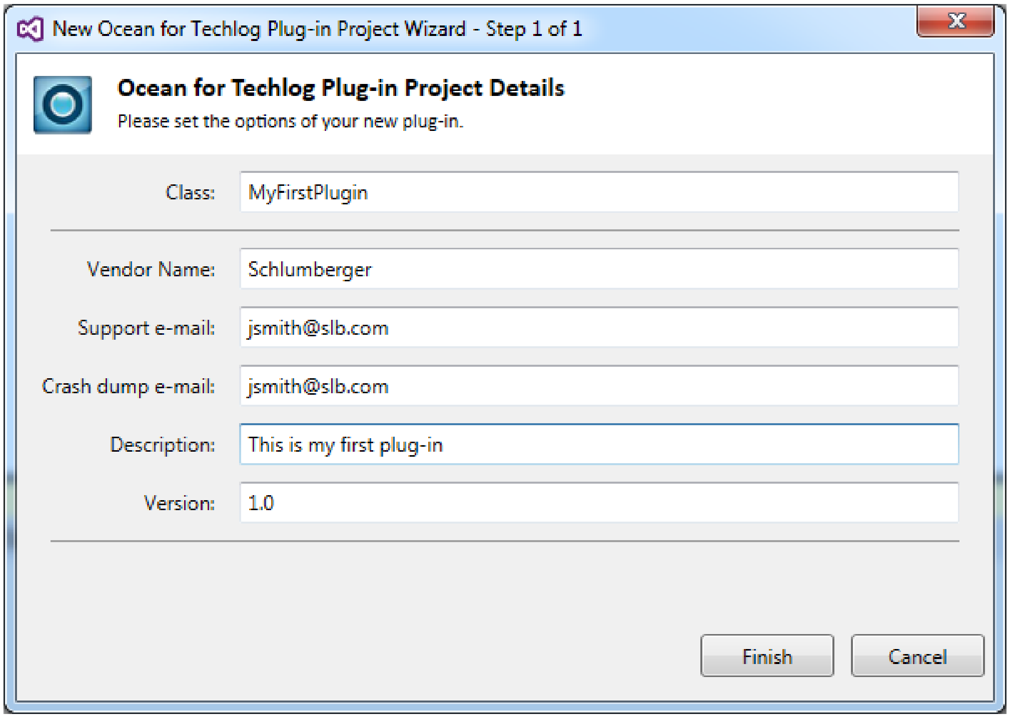


Figure 22 Plug-in wizard

The wizard creates the project with the main plug-in class.

1. Add a new plug-in activity by right-clicking on the project in the Solution Explorer and selecting **Add > New Item** in the context menu.
2. In the Item types area, under **Visual C++** item type, select **Ocean > Techlog 2019.1**.
3. Select the **Ocean Activity** template.
4. Provide the name “ReadDataActivity” for the activity.
5. Click **Add** in the dialog (See Figure 23.)

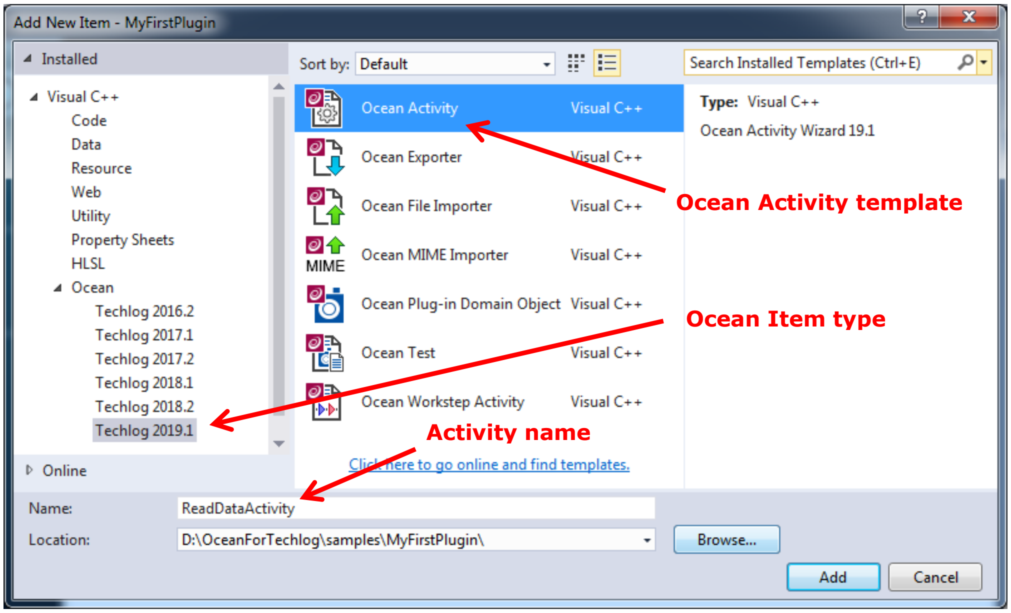


Figure 23 New activity window

Note: You also have the ability to create:

- An **Ocean Exporter**. This adds to the project the skeleton code of a plug-in exporter. See the "Exporter implementation" section in *Ocean for Techlog Developer Guide - Plugin Domain Object - Importer&Exporter* for more information on how to implement a plug-in domain object with Ocean.
- An **Ocean File Importer**. This adds to the project the skeleton code of a plug-in file importer. See the "FileImporter implementation" section in *Ocean for Techlog Developer Guide - Plugin Domain Object - Importer&Exporter* for more information on how to implement a plug-in domain object with Ocean.
- An **Ocean MIME Importer**. This adds to the project the skeleton code of a plug-in MIME importer. See the "MimeImporter implementation" section in *Ocean for Techlog Developer Guide - Plugin Domain Object - Importer&Exporter* for more information on how to implement a plug-in domain object with Ocean.
- An **Ocean Plug-in Domain Object**. This adds to the project the skeleton code of a plug-in domain object. See the "Plug-in domain object" section in *Ocean for Techlog Developer Guide - Plugin Domain Object - Importer&Exporter* for more information on how to implement a plug-in domain object with Ocean.
- An **Ocean Workstep Activity**. This adds to the project an activity class that instantiates a Workstep in the Techlog Application Workflow Interface with its signals and slots. See the "Workflow and worksteps" section in *Ocean for Techlog Developer Guide – Basics* for more information on how to implement an Ocean workstep.

6. Change the "Tab title", "Group title", "Action menu text" and "Action menu tooltip" fields as appropriate (See Figure 24). These fields are used to create the plug-in menu in Techlog toolbar that triggers the Ocean activity.
7. Click **Finish**.

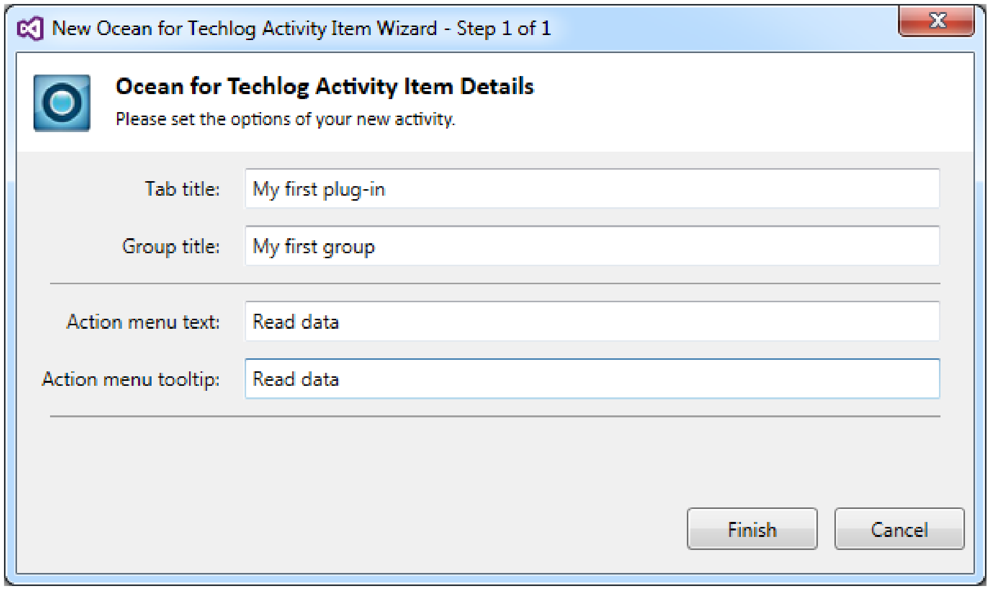


Figure 24 New activity wizard

The wizard adds the activity class to the project.

If Intellisense is disabled in Visual Studio, Ocean template items are not accessible and an error message is raised. In ***Tools > Options*** *menu of Visual Studio,* ***Disable database*** *has to be turned off.*

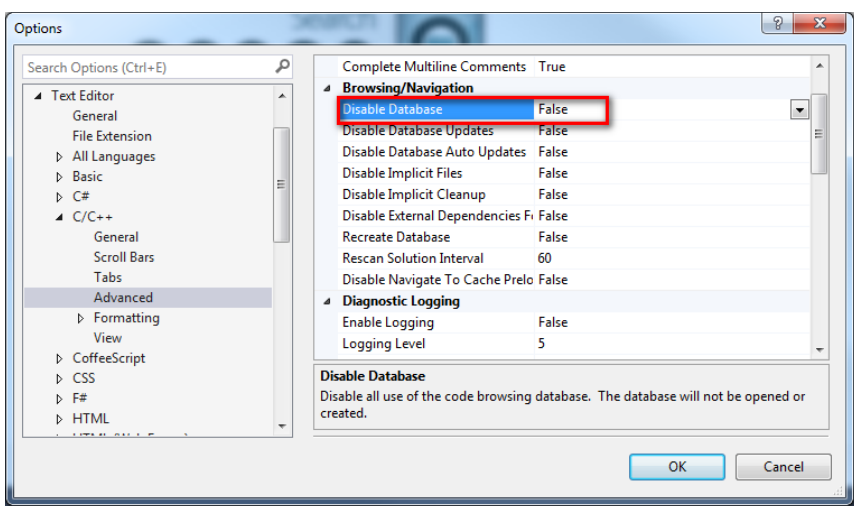


Figure 25 Disable database

Inspecting the files

The Ocean for Techlog Wizard creates a solution named "MyFirstPlugin" with a project named "MyFirstPlugin" in the Visual Studio Solution Explorer. The project will contain header and source file for the **`Plugin`** class that was created, and the **`Activity`** class (See Figure 26).

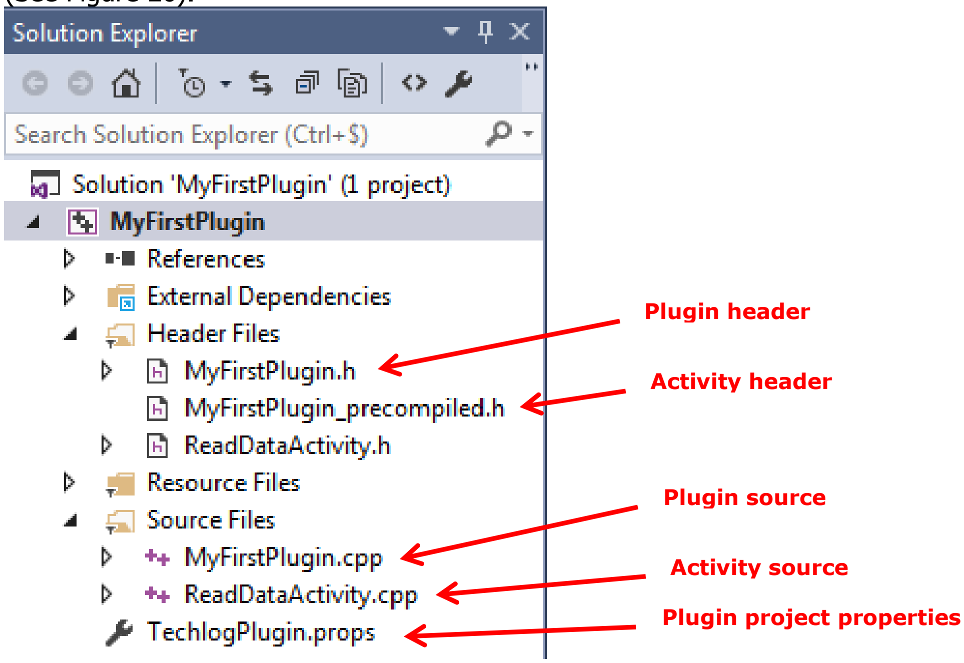


Figure 26 Example project header and source files in Solution Explorer

Plugin

The main plug-in class derives from **`PluginIdentity`** interface class.

`PluginIdentity` is derived from **`IPlugin`** class (plug-in interface) that exposes these virtual methods:

```
class IPlugin
{
public:
  virtual void getInformation(PluginInformation
  &pluginInformation) const = 0;

  virtual void getActivities(PluginActivities
  &activities) const = 0;

  virtual void getMenu(PluginMenu &menu) const = 0;
};
```

Implement the plug-in identity interface to declare:

- Information about the plug-in (**`getInformation`**)
- A list of activities (**`getActivities`**)

- Menu items used to trigger those activities (**getMenu**)

```
#pragma once
#include "tsdkpluginidentity.h"

class MyFirstPlugin : public PluginIdentity
{
  Q_OBJECT
  Q_PLUGIN_METADATA( IID TSDK_PLUGIN_INTERFACE_ID )
public:
  virtual void getInformation(Slb::Ocean::Techlog::PluginInformation&
  pluginInformation)
  const override;
  virtual void getActivities(Slb::Ocean::Techlog::PluginActivities&
  activities)
  const override;
  virtual void getMenu(Slb::Ocean::Techlog::PluginMenu& menu) const
  override;
};
```

These three methods must be implemented in the source file that first includes the plug-in and activity header files and **Slb::Ocean::Techlog** namespace at the beginning of **MyFirstPlugin.cpp** file.

```
#include "tsdkplugininformation.h"
#include "tsdkpluginactivities.h"
#include "tsdkpluginmenu.h"
#include "tsdkpluginmenutab.h"
#include "tsdkpluginmenuaction.h"
#include "tsdkpluginmenugroup.h"
#include "MyFirstPlugin.h"

// Please include here your activity header files
#include "ReadDataActivity.h"
// #include "Activity.h"
/*****ACTIVITIES*INCLUDE*****/

using namespace Slb::Ocean::Techlog;
```

The **getInformation** method contains properties which provide information to the plug-in. These include vendor name, plug-in name, plug-in version, description, release date, plug-in icon, creator, support email, crash dump email, plug-in license feature and Techlog license feature dependencies. The contents of **getInformation** should look something like:

```
void MyFirstPlugin::getInformation(PluginInformation& pluginInformation)
const
{
  pluginInformation.setVendorName(PLUGIN_VENDOR_NAME);
```

```
  pluginInformation.setName(PLUGIN_NAME);
  pluginInformation.setVersion(PLUGIN_VERSION);
  pluginInformation.setDescription("This is my first plug-in");
  pluginInformation.setReleaseDate("20/02/2018");
  pluginInformation.setIcon(QIcon("ocean.png"));
  pluginInformation.setCreator(PLUGIN_VENDOR_NAME);
  pluginInformation.setSupportEmail("jsmith@slb.com");
  pluginInformation.setCrashDumpEmail("jsmith@slb.com");
}
```

The plug-in property values as PLUGIN_VENDOR_NAME, PLUGIN_NAME and PLUGIN_VERSION are stored in the **TechlogPlugin.props** file. This property sheet contains Techlog plug-in properties stored at the Visual Studio project level. Those values can be changed directly editing the file.

Note: The plug-in vendor name, name and version values passed to the `setVendorName`, `setName` and `setVersion` functions of the `PluginInformation` class have to match the plug-in structure folder names **VendorName**/**PluginName**/**TechlogVersion**/**PluginVersion**/. If this structure folder is not respected the plug-in is not loaded by the Techlog module manager.

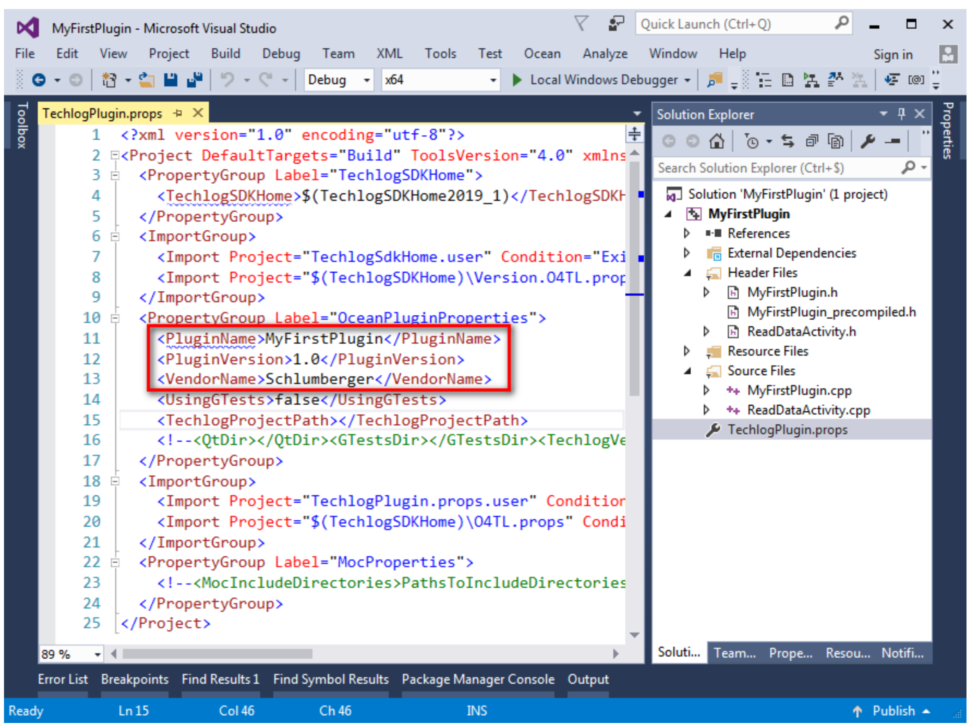


Figure 27 Ocean plug-in project properties

By right-clicking on the project in the Solution Explorer and selecting **Ocean plug-in properties** item in the context menu, Ocean plug-in project property values can be overriden at the Visual Studio user level through the **Ocean plug-in propertie** dialog window.

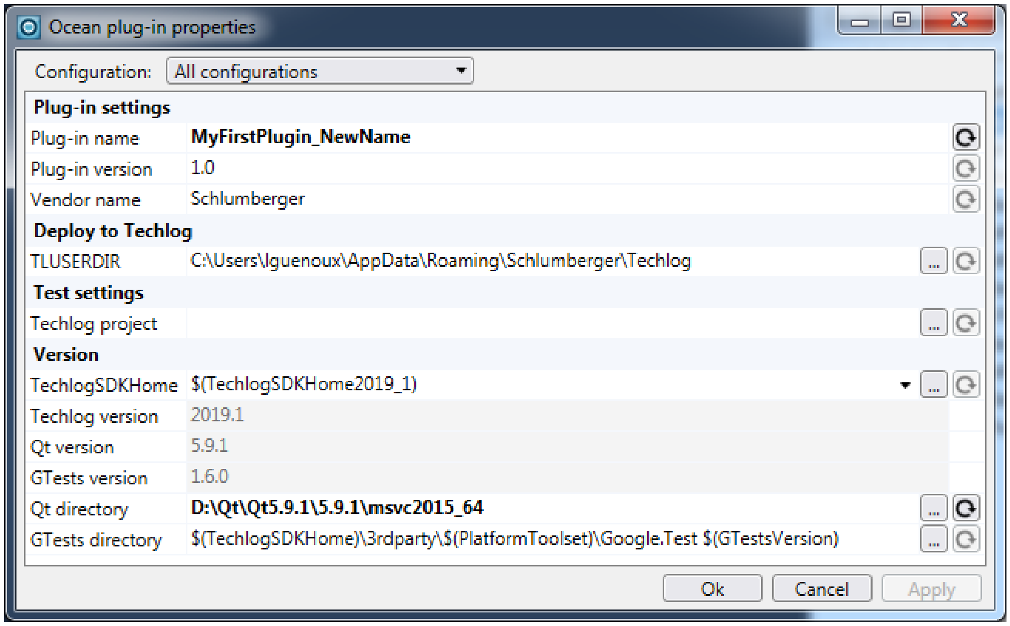


Figure 28 Ocean plug-in properties dialog window

Project property values modified through the **Ocean plug-in properties** dialog window doesn't change the default project property values stored in the **Techlog-Plugin.props** file. A new property sheet named **TechlogPlugin.props.user** is created in the project directory that contains those new values.

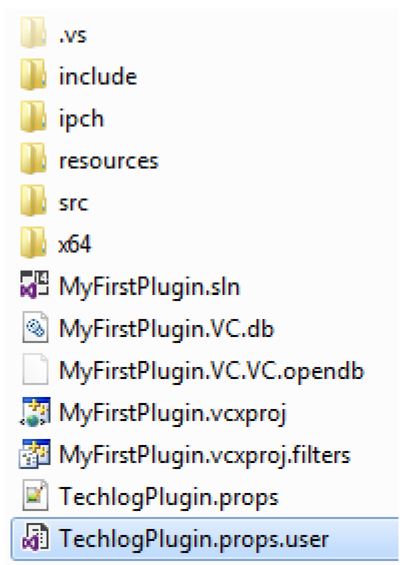


Figure 29 Ocean plug-in user property sheet

Property values stored in the **TechlogPlugin.props.user** file have the highest priority at the build time. Property values defined at the user level can be rollback to the project level property values using  buttons in the **Ocean plug-in properties** dialog window.

Note: The best practice is to share only the **TechlogPlugin.props** in a source control common to all members of a team that are collaborating on a plug-in project development.

In the **`getActivities`** method, **`ReadDataActivity`** is added to the plug-in activity. The wizard had declared for this activity a unique id (GUID) and **`ReadDataActivity`** is identified as unique by its GUID in the list of activities of the plug-in.

```
static QString
ReadDataActivityId(QLatin1String("f1007f1e-1ce3-477e-a47f-d91f4e7e1b7b
"));
```

```
void MyFirstPlugin::getActivities(PluginActivities& activities) const
{
// Please fill this method with your activities with lines like this
:
  activities.add( TSDK_ACTIVITY( ReadDataActivity, ReadDataActivityId ) );
  // activities.add(TSDK_ACTIVITY(Activity, actionId));
  /*****ACTIVITIES*REGISTRATION*PLACE*****/
}
```

The wizard implements the **`getMenu`** method in **MyFirstPlugin.cpp**; this method is used to add custom menus to Techlog.

Menu items are used to trigger activities.

The sequence to customize the TBar (Ribbon) is summarized using the **`PluginMenu`** API exposed with Ocean:

1. **`PluginMenuTab`**: create new menu area for the plug-in
2. **`PluginMenuGroup`**: new menu group created and added to the new **`PluginMenuTab`** object
3. **`PluginMenuAction`**: new menu action created and added to the new **`PluginMenuGroup`** object and instantiated with an action id
4. **`PluginMenu`**: new **`PluginMenuTab`** object added the Techlog main menu

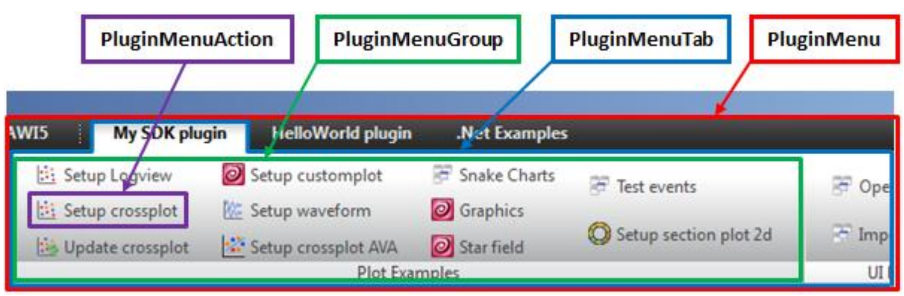


Figure 30 Plug-in menu classes

See the "Plug-in information and menu" section in *Ocean for Techlog Developer Guide – Basics* for more information on how to extend Techlog menus.

To link **ReadDataActivity** with the **PluginMenuAction** that triggers this activity, the wizard instantiates the **PluginMenuAction** object passing to the constructor the unique identifier (GUID) of the activity declared at the beginning of **MyFirst-Plugin.cpp.**

```
void MyFirstPlugin::getMenu( PluginMenu& menu ) const
{
  PluginMenuTab tab ("PluginArea");
  tab.setTitle("My first plug-in");

  PluginMenuGroup group ("PluginGroup");
  group.setTitle("My first group");

  PluginMenuAction actionReadData (ReadDataActivityId);
  actionReadData.setText("Read data");

  group.addAction(actionReadData);
  tab.addGroup(group);
  menu.addTab(tab);
}
```

Activity

This new action menu triggers the **ReadDataActivity**. This class inherits from the **AbstractActivity** interface class which is the base class for any Ocean for Techlog plug-in activity.

```
class AbstractActivity : QObject
{
public:
  virtual void run() = 0;
  virtual void dispose();
  ...
};
```

The **run** method is the main method of an activity, called when the user clicks on the corresponding menu item.

Override the **dispose** method if you need to cleanup resources before the activity is unloaded.

The **AbstractActivity** is a **QObject** so every activity declared in a plug-in is a **QObject,** but you need to add a **Q_OBJECT** macro in your activity class to tell the meta-object compiler to compile the signals and slots.

```
class ReadDataActivity : public Slb::Ocean::Techlog::AbstractActivity
{
  Q_OBJECT;
```

```
private:
  void run();
};
```

Writing the algorithm code

Once the skeleton of the plug-in has been created, you need to implement the plug-in logic that will be triggered when the user clicks on the action menu declared in the **`getMenu`** method of the plug-in identity class (main plug-in class).

You add the custom algorithm code overriding the **`run`** method of the **`AbstractActivity`** interface.

```
#include "ReadDataActivity.h"

using namespace Slb::Ocean::Techlog;

void ReadDataActivity::run()
{
  // TODO: Implement the action menu logic here.
}
```

To write the algorithm code:

Access the APIs from the **`Slb::Ocean::Techlog`** namespace.

Code the **`run`** method. The work for the activity is completed:

Read the current main project using the **`Session::current().mainProject()`** API. The **`Project`** class exposes a function **`wells`**, which provides navigation to the well collections in the project. Parse through all the wells and for each well parse through all the datasets using the **`datasets`** public function exposed in the **`Well`** class.

Get for each dataset from the corresponding properties exposed in the **`Dataset`** class:

- Its **`name`**
- Its size; use the **`rowCount`** public method which returns the number of rows of the dataset (and therefore of all its variables)

Print the well name, dataset name and size from the main Techlog project using **`Session::current().currentWorkspace()`** API. The **`Workspace`** class exposes the **`logEvent`** method to print message into Techlog output console with some different output levels listed in **`LogLevel`** enumeration class:

- **`Debug`**
- **`Information`**
- **`Warning`**
- **`Error`**

For each dataset parse through all its variables using the **`variables`** public function exposed in the **`Dataset`** class.

Get for each variable from the corresponding properties exposed in the **`Variable`** class:

- Its **`name`**
- Its **`unit`**
- Its **`family`**

And print its property values in the Techlog **Output** console using the **`logEvent`** method of the current **`Workspace`** with a **`LogLevel`** set to **`Information`**.

Call **`stop`** method inherited from **`AbtractActivity`** interface class at the end of your activity **`run`** method to stop the plug-in activity. Otherwise, the plug-in will stay in the background until the user manually stops the plug-in task in the workspace manager of Techlog (Figure 31) or stops Techlog.

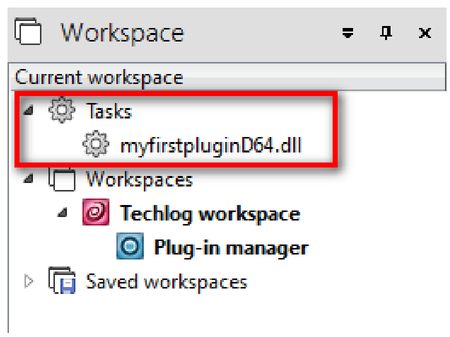


Figure 31 Techlog workspace manager

This example shows the complete activity source code:

```
#include "ReadDataActivity.h"

#include "tsdklock.h"
#include "tsdkloglevel.h"
#include "tsdkvariableenums.h"

using namespace Slb::Ocean::Techlog;

void ReadDataActivity::run()
{
  // TODO: Implement the action menu logic here.

  // Lock all
  Lock lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);

  // Get the current workspace from the current session
  Workspace workspace = Session::current().currentWorkspace();
  // Get the main project from the current session
  Project proj = Session::current().mainProject();
```

```
  // Iterate on all the wells in the project
  foreach (Well well, proj.wells())
  {
    // iterate on all the datasets of the current well in the loop
    foreach(Dataset dataset, well.datasets())
    {
      // Get the name and size of the current dataset in the loop
      QString datasetName = dataset.name();
      QString datasetSize = QString::number(dataset.rowCount());
      // Display well name and dataset infos in Techlog output console
      workspace.logEvent(LogLevelInformation,
      QString("<b>Well name = %1, Dataset name = %2, Dataset size = %3</b>")
     .arg(well.name()).arg(datasetName).arg(datasetSize));

     // iterate on all the variables of the current dataset in the loop
     foreach(Variable var, dataset.variables())
     {
       // Get the name, unit and family of the current variable in the loop
       QString varName = var.name();
       QString varUnit = var.unit();
       QString varFamily = var.family();
       // Display variable infos in Techlog output console
       workspace.logEvent(LogLevelInformation,
       QString("Variable name = %1,Variable unit = %2,Variable family = %3")
       .arg(varName).arg(varUnit).arg(varFamily));
     }
   }
  }
  // release objects locked
  lock.release();

  // Stop the plug-in activity
  stop();
}
```

Running the plug-in

You have just completed the modification of the **run** method. In this section, you will finish building the solution and run your plug-in in Techlog.

Build your solution in Visual Studio in release 64 bit. This creates a new folder for the plug-in in the deployment folder (**Extensions** folder) of the Ocean framework. This plug-in folder contains the new plug-in library. When it starts the module manager scans the **Extensions** folder and shows the new library in the list of available plug-ins. The plug-in menu is added to Techlog when the plug-in is enabled in the module manager. The activity runs as a separate process when the user clicks on the action menu; at this moment the plug-in appears as a new task in the list of tasks of the current workspace of Techlog.

Open the Techlog module manager and enable **MyFirstPlugin**. **My first plug-in** tab is added to the Techlog native tabs. This tab contains only one group **My first group** and this group contains only one action menu **Read Data** (Figure 32).

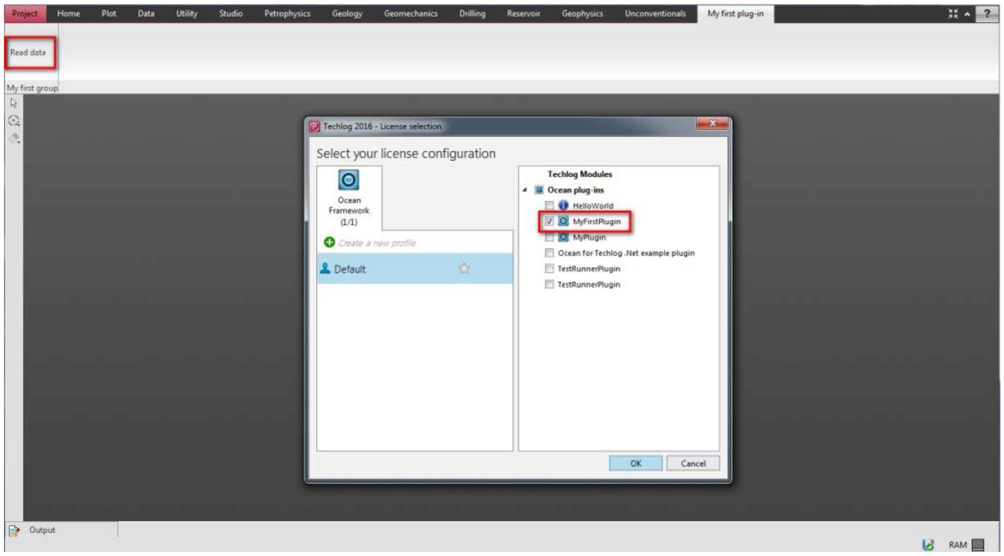


Figure 32 Enable MyFirstPlugin in the module manager

Import the Techlog fundamentals dataset deployed with the Ocean framework (*%TechlogSDKHome%\demo-project*) and click on the **Read Data** action menu. The **Read Data** activity shows all the wells, datasets and variables in the Techlog message log (Figure 33).

Note: Opening a Techlog project with an Ocean framework license will taint the project.

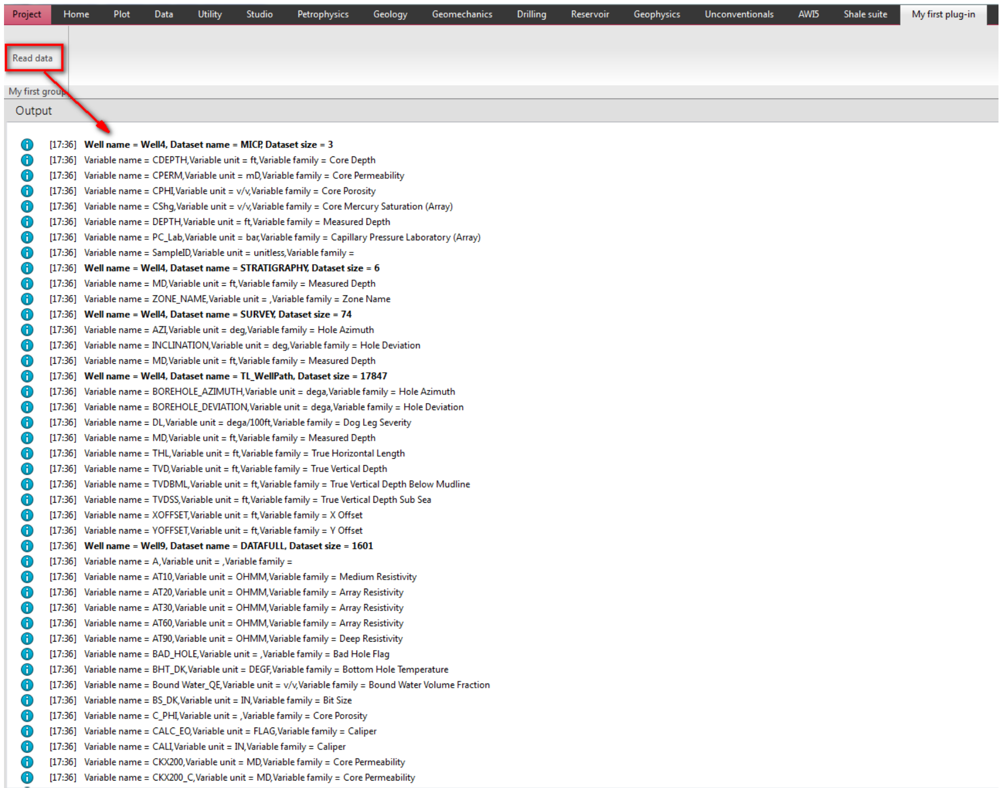


Figure 33 Read Data activity ouput messages

You have now written, built, and run your first Ocean for Techlog plug-in.

Debug the plug-in

To debug the plug-in you have to build it in debug mode. Go to the Visual Studio solution and change the build mode from release x64 to debug x64. Still in Visual Studio open the **ReadDataActivity.cpp** file and into the `run` method of the activity add a breakpoint on the first line.

Re-build the solution, close and reopen Techlog.

A new library called **MyFirstPlugin64D.dll** is generated in the plug-in folder. Then go back to Techlog, open the module manager and refresh the plug-in list (right click on **Ocean plug-ins**). The new plug-in for debugging appears in the module manager in the **Ocean plug-ins**. Disable the release version and enable the debug one.

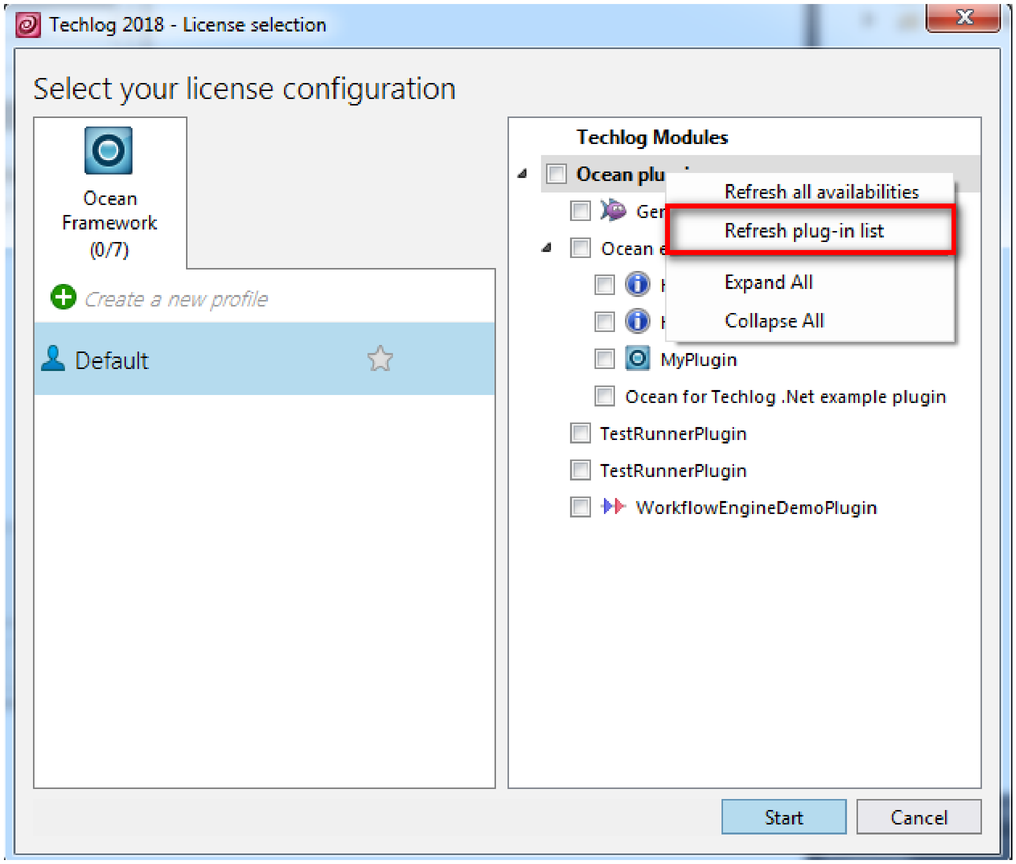


Figure 34 Refresh plug-in list

Press the **Ctrl+Alt** keys and click on the **Read Data** action menu. The **Visual Studio Just-In-Time debugger** pops up and asks you to select from the list a Visual Studio solution debugger to attach to the plug-in host, which for a plug-in built in 64 bit is **techlogpluginhost64D.exe**. Select **MyFirstPlugin** in the list and click **Yes** as shown in Figure 35.

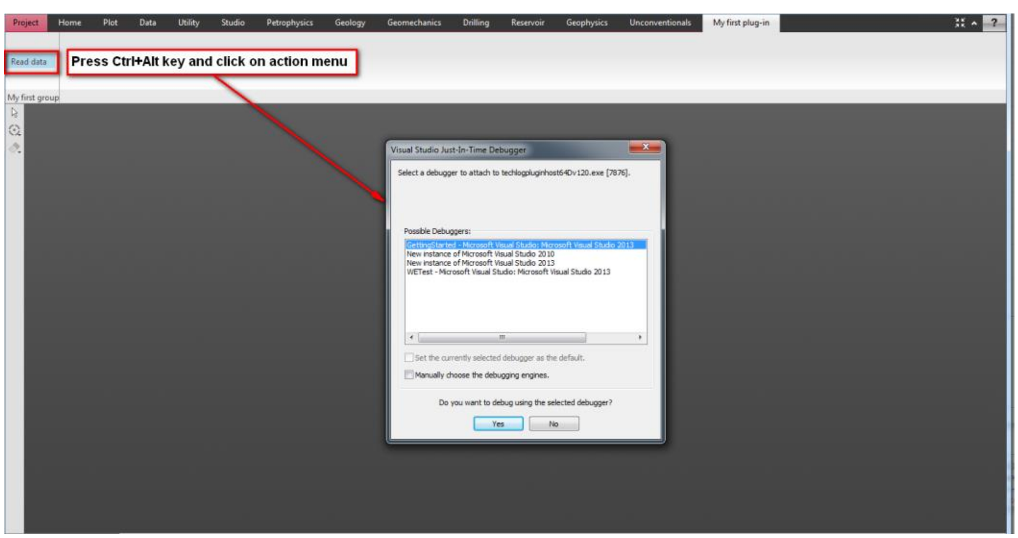


Figure 35 Debug the plug-in

The debugger stops on the first line of the `run` activity method where the breakpoint has been added.

If Visual Studio complains about a **Managed** application please **Manually choose the debugging engines** turning on this option in the **Visual Studio Just-In-Time debugger** window. A popup shows up listing all the available debugger engines, enable the **Managed** debugger for which version of the .NET framework you want to debug. Unless you're debugging a .NET based plug-in, you can not attach the .NET/Managed debugger at all.

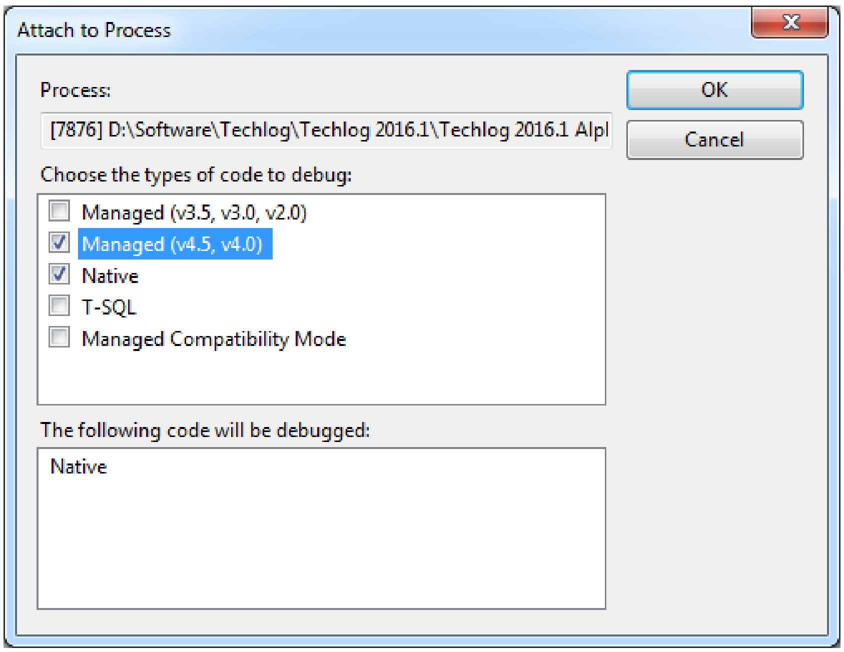


Figure 36 Visual Studio debugger engines

Auto enabled the plug-in

Enable the plug-in at Techlog start-up by adding a file named **auto_enabled** (no extension) into the plug-in folder that contains the plug-in dll.

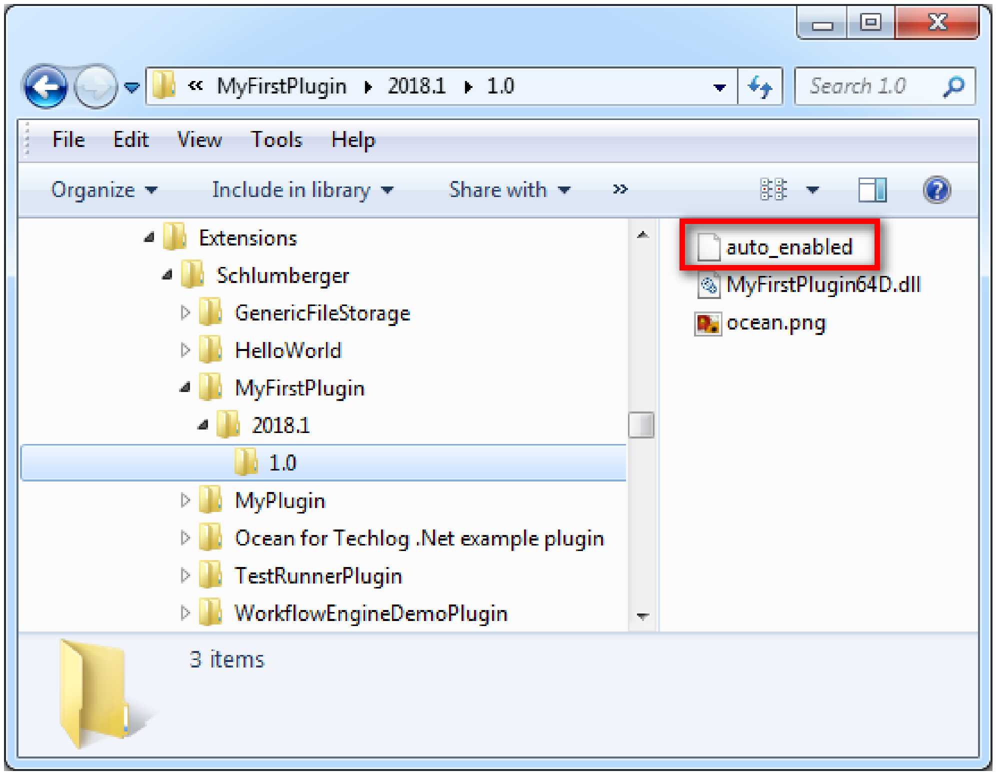


Figure 37 auto_enabled file

This file is a flag that tells Techlog to enable the plug-in in the Techlog module manager. The auto enabled plug-in no longer appears in the module manager under the **Ocean plug-ins** node and all the plug-in menus are added automatically to the Techlog ribbon when Techlog starts.

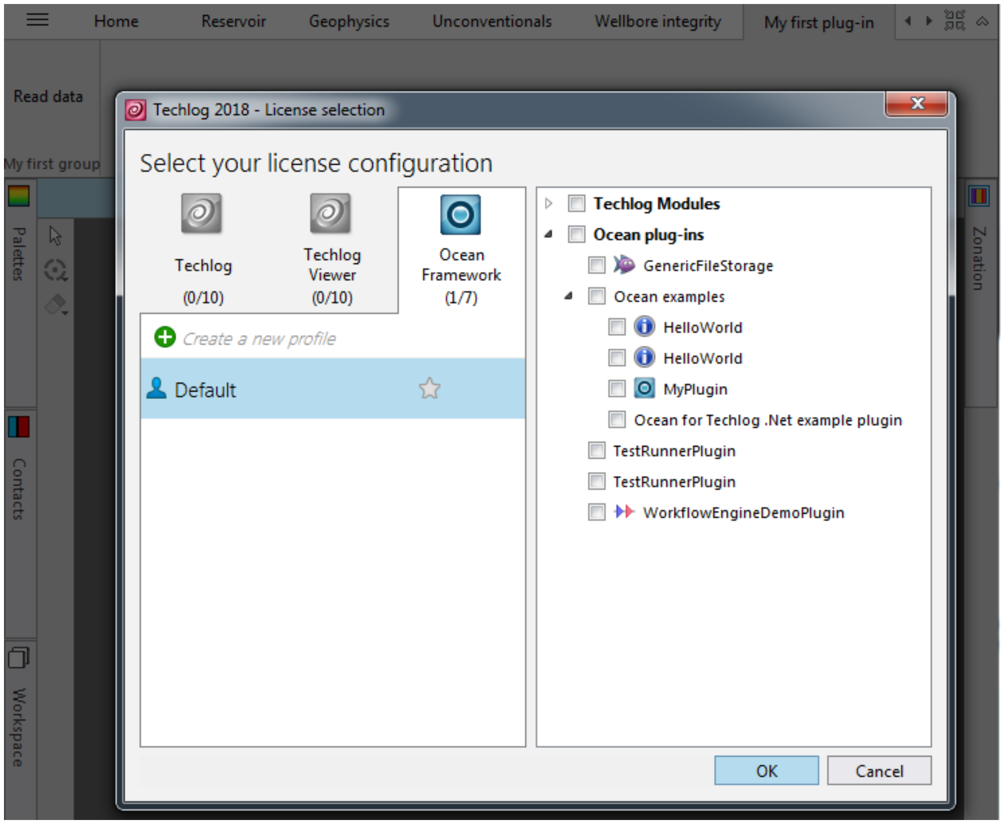


Figure 38 auto enabled plug-in not visible in module manager

Note: The Techlog plug-in host process on which the auto enabled plug-in runs doesn't appear anymore in the list of processes of the Windows task manager.

Techlog Viewer plug-in development (Schlumberger Internal only)

The Techlog Viewer is software to facilitate display and interaction with data.

Techlog Viewer specific

To allow your plug-in to run on Techlog Viewer, call the **`setTechlogViewerActivity`** function in the **`PluginInformation`** class, with the activity ID as the parameter.

```
class PluginInformation
{
public:
  ...
  void setTechlogViewerActivity(const QString
  &techlogViewerActivity)
};
```

This is an example:

```
static QString
ReadDataActivityId(QLatin1String("f1007f1e-1ce3-477e-a47f-d91f4e7e1b7b
"));
void MyFirstPlugin::getInformation(PluginInformation& pluginInformation)
const
{
  pluginInformation.setTechlogViewerActivity(ReadDataActivityId);
}
```

Note: Techlog Viewer is single well by design; developing a plug-in that uses several wells will result in an assert being displayed in the Techlog Viewer output window.

Signed plug-ins

Having a signature on the plug-in is not necessary for internal development only.

However a .sign file is mandatory if any external deployment is planned.

To generate the signature file, please contact the Techlog Platform Product Champion - *ERivoliier@slb.com* -

Create unit tests for your plug-in

By exposing a couple of basic concepts, Ocean for Techlog enables plug-in developers to write and run automated tests using their unit testing framework of choice while still giving the unit tests access to the full functionality of Ocean for Techlog. The tutorial "Unit Testing Techlog Plug-ins" in the **OceanForTechlog.chm** file shipped with the Ocean package outlines how to get started and how to integrate the tests into a continuous integration environment.

Please refer to this tutorial for more details on how to create unit tests with Ocean for Techlog.

Creating a Test plug-in with Visual Studio

To create a Test plug-in project using Visual Studio:

Add a new test plug-in project to the solution that contains an Ocean plug-in project by right clicking on the solution in the Solution Explorer and selecting **Add > New Project** in the context menu. In the Project types area, under **Visual C++** project type, select **Ocean > Techlog 2019.1**. Then select the **Ocean Test Plug-in** template.

Note: A test project cannot be created in an empty Visual Studio solution. The test project wizard uses the main plug-in project in the solution.

Provide the name "TestMyFirstPlugin" for the project. Click **OK** to start the Wizard (see Figure 39).

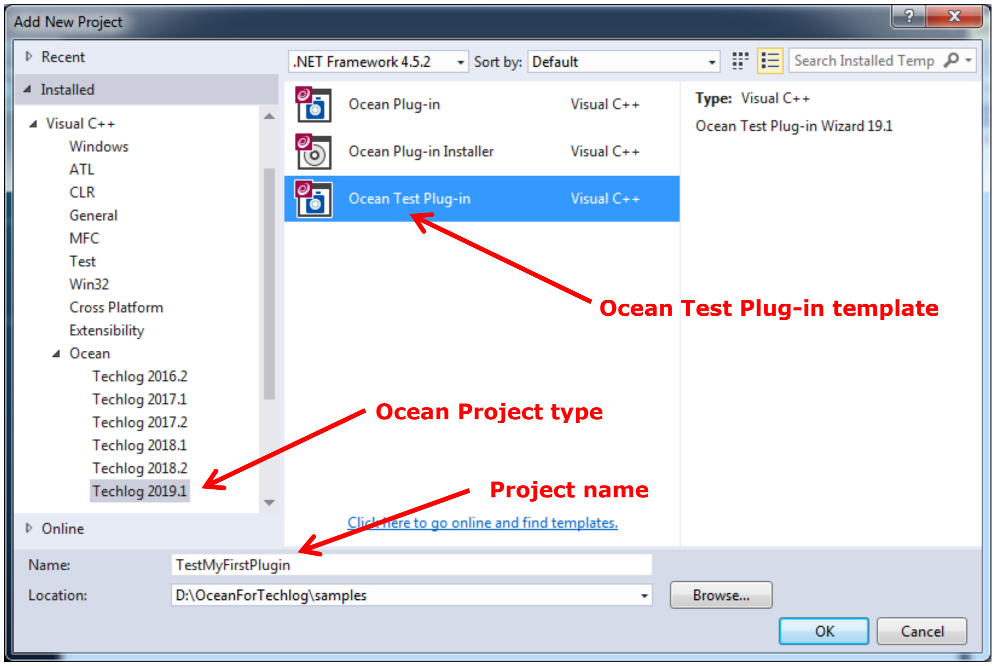


Figure 39 New project window

The test plug-in wizard opens (see Figure 40).

Set these inputs:

- **Class:** test plug-in class name
- **Vendor name:** the name of the plug-in owner
- **Version:** the plug-in version
- **Techlog project:** the Techlog project data that you want to use to run your unit tests. It is an optional input. If you don't specify any Techlog project, tests will be run in Techlog with a temporary project.
- **Main project:** select the Ocean plug-in in the solution that you want to test. The Ocean plug-in will be a dependent library of the Test plug-in.

Click **Finish** in the dialog.

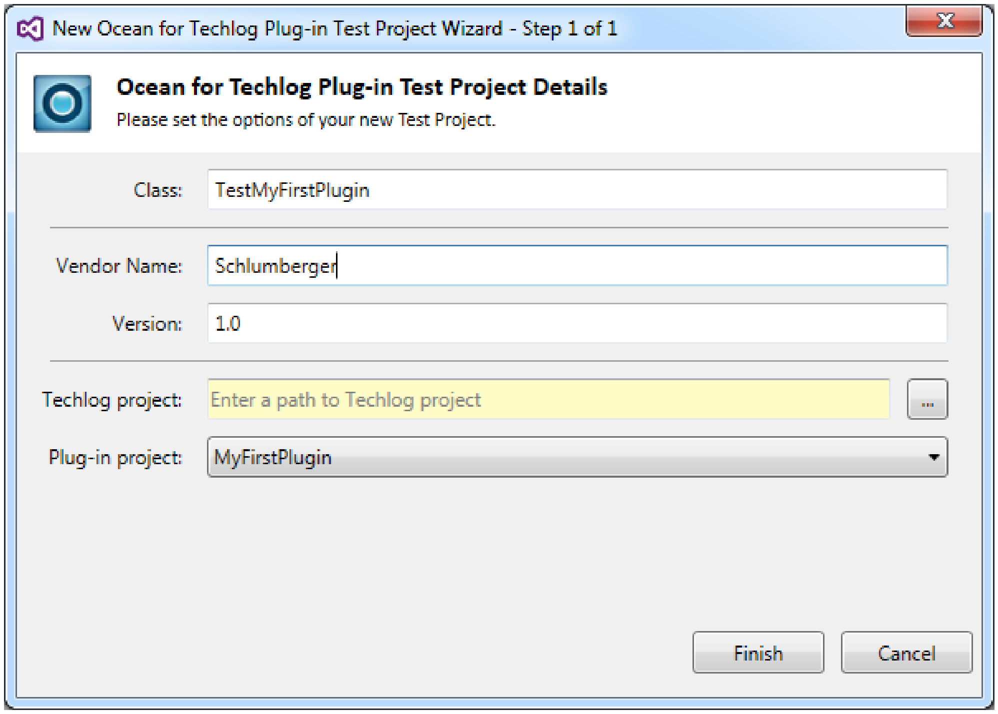


Figure 40 Test Plug-in wizard

Note: The path to the "3rdparty" folder of the Ocean package that contains Google test libraries (debug and release folders) and header files (include folder) is added to the project by the wizard.

See the "Techlog Test Adapter" section on page 52 for more information on how to access and modify test settings and run plug-in unit tests with the Techlog Test Adapter.

Inspecting the files

The Ocean Test Plug-in Wizard adds a project named "TestMyFirstPlugin" in the Visual Studio Solution Explorer. The project contains header and source file for the Test Plugin class that was created, and the test activity and runner classes (see Figure 41.)

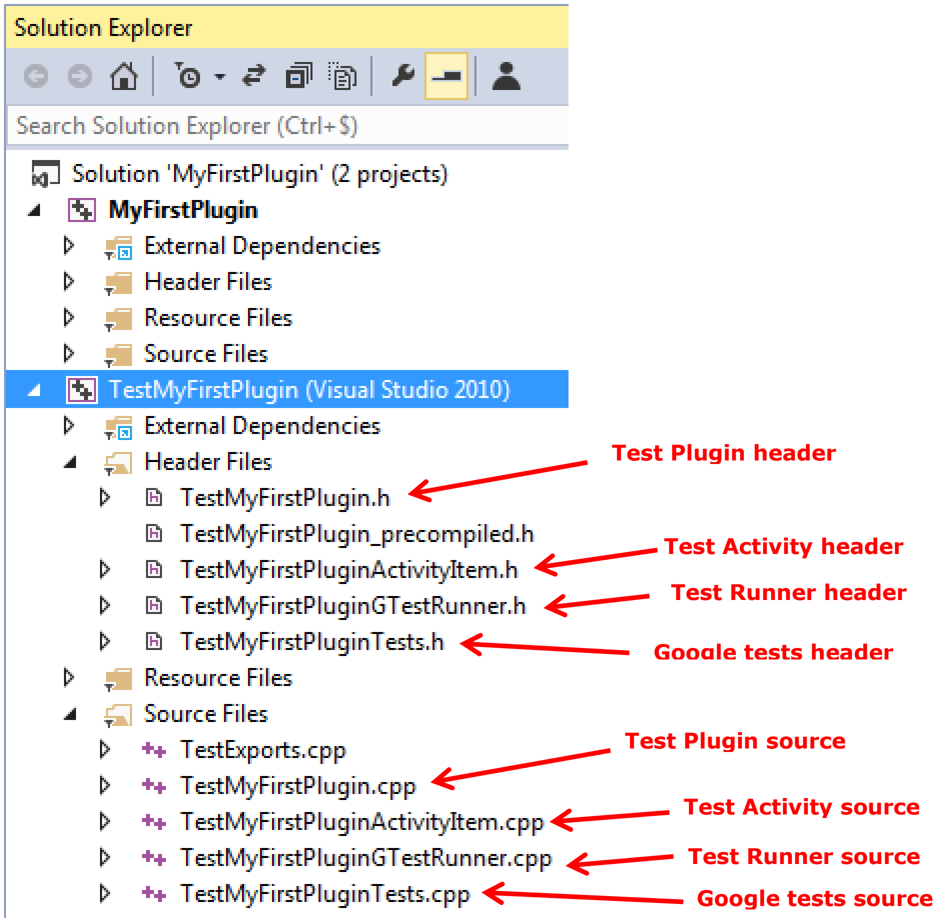


Figure 41 Test plug-in header and source files in Solution Explorer

The Test Activity runs all the Google tests implemented in the Test plug-in through the Test runner utility class.

Implement the tests

The Google test API provides a number of options you may consider depending on your requirements. Refer to the official Google test online documentation at http://code.google.com/p/googletest/.

In **TestMyFirstPluginTests.cpp** file, there are two types of Google tests created by the wizard.

The first one uses the `TEST` macro to define the test.

`TEST` has two parameters: the test case name and the test name. After using the macro, define your test logic between a pair of braces. Use a bunch of macros to indicate the success or failure of a test.

In this example, the test creates a well in Techlog project, sets its color property to blue and checks if the color is correctly set.

```
TEST(GTestName1, OkTest)
{
  Lock lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);
  Project project = Session::current().mainProject();
```

```
  Well well = Well::create("MyWell", project);
  Droid wellDroid = well.droid();
  well.setColor(Qt::blue);
  lock.release();

  lock = LOCK_CREATE_THEN_ACQUIRE_OR_RETURN(lock, wellDroid);
  well = DomainObject::get(wellDroid).tryCast<Well>();

  if (well.isNull())
  {
    ASSERT_FALSE(well.isNull());
    lock.release();
    return;
  }

  EXPECT_EQ(well.color(), Qt::blue);

  lock.release();

  lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);
  well.erase();
  lock.release();
}
```

The second one uses the **TEST_F** macro that defines a Google test fixture.

A test fixture is a place to hold objects and functions shared by all tests in a test case. Using a test fixture avoids duplicating the test code necessary to initialize and cleanup those common objects for each test. It is also useful for defining commonly used sub-routines that your tests may need.

In this example "MyWell" is initialized in **SetUp** method called before the test is run. Check in the test fixture if the color of "MyWell" is blue. "MyWell" is erased in **TearDown** method called after the test is run.

```
void TestMyFirstPluginTest::SetUp()
{
  Lock lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);
  Project project = Session::current().mainProject();
  Well well = Well::create("MyWell", project);
  well.setColor(Qt::blue);
  lock.release();
}

void TestMyFirstPluginTest::TearDown()
{
  Lock lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);
  Project project = Session::current().mainProject();
  Well well = project.wells().get("MyWell");
```

```
  well.erase();
  lock.release();
}

TEST_F(TestMyFirstPluginTest, WellColor)
{
  Lock lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);
  Project project = Session::current().mainProject();
  Well well = project.wells().get("MyWell");

  if (well.isNull())
  {
    ASSERT_FALSE(well.isNull());
    lock.release();
    return;
  }

  EXPECT_EQ(well.color(), Qt::blue);

  lock.release();
}
```

The Ocean test plug-in project is created in a Visual Studio solution that already hosts an Ocean plug-in project to allow the developer to make calls to the Ocean plug-in methods in Google tests.

In this example, **`ReadDataActivity`** of **`MyFirstPlugin`** has a public method to remove from a Techlog **`Variable`** all the missing values. Test this plug-in functionality by calling it from a Google test in my test plug-in.

```
Variable ReadDataActivity::removeMissingValues(Variable variable)
{
  Lock lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);
  Dataset dataset = variable.dataset();
  Well well = dataset.well();

  Variable ref = dataset.findReferenceVariable();

  QVector<float> resultVarValues;
  QVector<float> resultRefValues;

  int rowCount = variable.rowCount();

  for (int i = 0; i < rowCount; i++)
  {
    if (variable.getFloatValue(i) != Absent::MissingValue)
    {
      resultVarValues.append(variable.getFloatValue(i));
```

```
      resultRefValues.append(ref.getFloatValue(i));
    }
  }

  Dataset resultDataset =
  Dataset::create(QString("%1_result").arg(dataset.name()),
  ref.name(), ref.format(), resultVarValues.count(), well);

  Variable resultRef = resultDataset.findReferenceVariable();
  resultRef.setFamily(ref.family());
  resultRef.setUnit(ref.unit());
  resultRef.setFloatValues(resultRefValues);

  Variable resultVar =
  Variable::create(variable.name(), resultDataset,
  variable.format(), VariableTypeContinuous, 1);
  resultVar.setFamily(variable.family());
  resultVar.setUnit(variable.unit());
  resultVar.setFloatValues(resultVarValues);

  lock.release();

  return resultVar;
}
```

The first thing to do is to export the `ReadDataActivity` class when **MyFirstPlugin** is built and import `ReadDataActivity` class when **TestMyFirstPlugin** is built. Do this by adding a conditional compilation tag in **C/C++ > Preprocessor > Preprocessor Definitions** to **MyFirstPlugin** project settings (see figure 42).

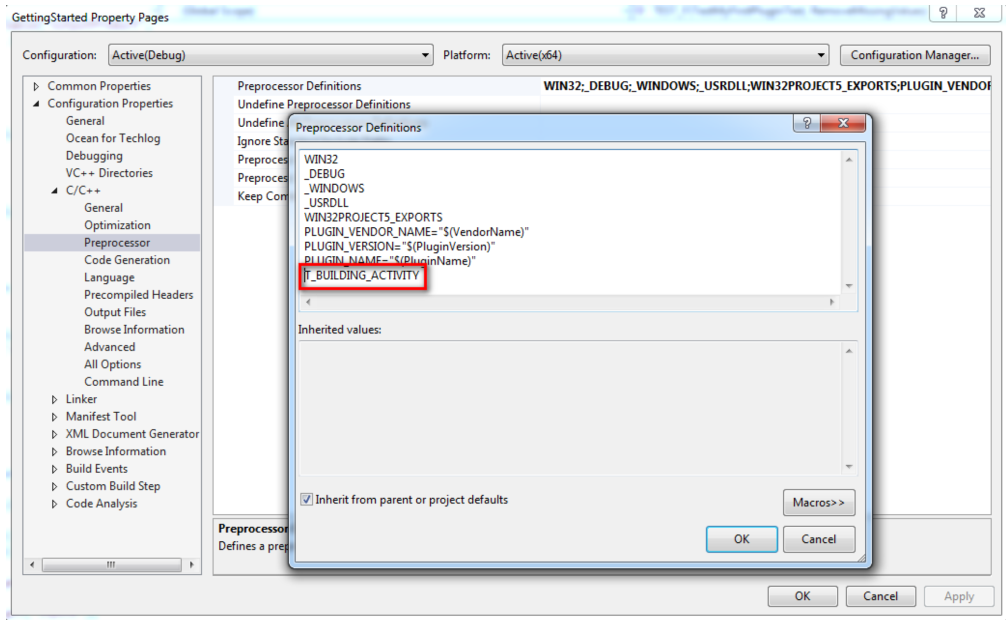


Figure 42 Add conditional compilation tag in Ocean plug-in settings

Then in **ReadDataActivity** header file, add this code:

```
#ifdef T_BUILDING_ACTIVITY
#   define DllExport __declspec( dllexport )
#else
#   define DllExport __declspec( dllimport)
#endif

class DllExport ReadDataActivity : public
Slb::Ocean::Techlog::AbstractActivity
{
  Q_OBJECT;

private:
  void run();

public:
  Slb::Ocean::Techlog::Variable
  removeMissingValues(Slb::Ocean::Techlog::Variable variable);
};
```

The **`removeMissingValues`** function is imported by the Test plug-in; call it in a Google test.

```
TEST_F(TestMyFirstPluginTest, RemoveMissingValues)
{
  Lock lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);

  Project project = Session::current().mainProject();
```

```
  Variable variable =
  project.wells().get("Well1").datasets().get("DATAFULL").
  variables().get("GR");

  lock.release();

  ReadDataActivity *readDataActivity = new ReadDataActivity();
  Variable resultVar = readDataActivity->removeMissingValues(variable);

  lock = LOCK_CREATE_THEN_ACQUIRE_OR_RETURN(lock, resultVar);

  for (int i = 0; i < resultVar.rowCount(); i++)
  {
    if (resultVar.getDoubleValue(i) == Absent::MissingValue)
    {
      ASSERT_FALSE(true);
      lock.release();
      return;
    }
  }

  ASSERT_TRUE(true);

  lock.release();
}
```

In **`TearDown`** function the result dataset is erased after the test.

```
void TestMyFirstPluginTest::TearDown()
{
  Lock lock1 = LOCK_CREATE_AND_ACQUIRE_ALL(lock1);
  Dataset dataset =
  Session::current().mainProject().wells().get("Well1").datasets().
  find("DATAFULL_result");

  if (!dataset.isNull())
    dataset.erase();
  lock1.release();
}
```

Note: The test fixture **`TestWorkstep`** created by the Ocean Test plug-in wizard shows how to test AWI workstep method, waiting for the end of the processing in order to assert the results.

Run the tests

Once the solution is built **MyFirstPlugin** and **TestMyFirstPlugin** are listed by the Techlog module manager.

Open the module manager, refresh the list of plug-ins and enable **TestMyFirstPlugin**.

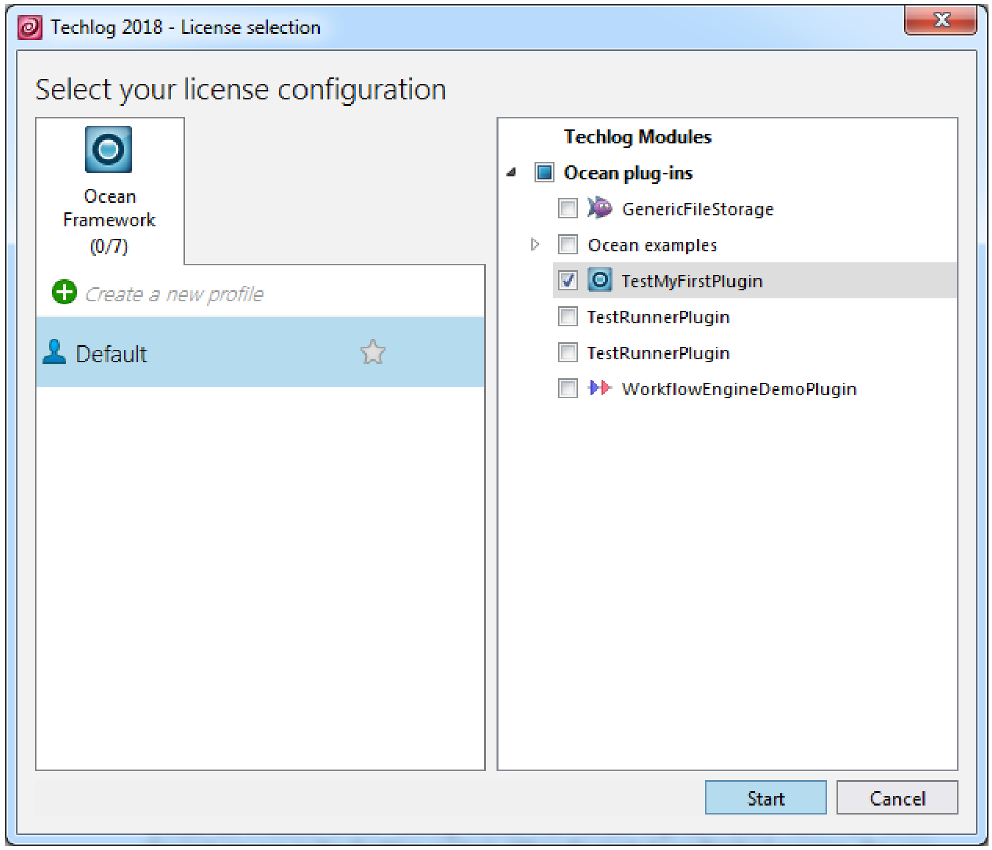


Figure 43 Enable test plug-in

GTest tab is added to the Techlog menus that contain a `gTest` action item from which the test are run in the Techlog context. When the tests have finished running, the user opens the result tests log file directly from the Techlog output console (see figure 44).

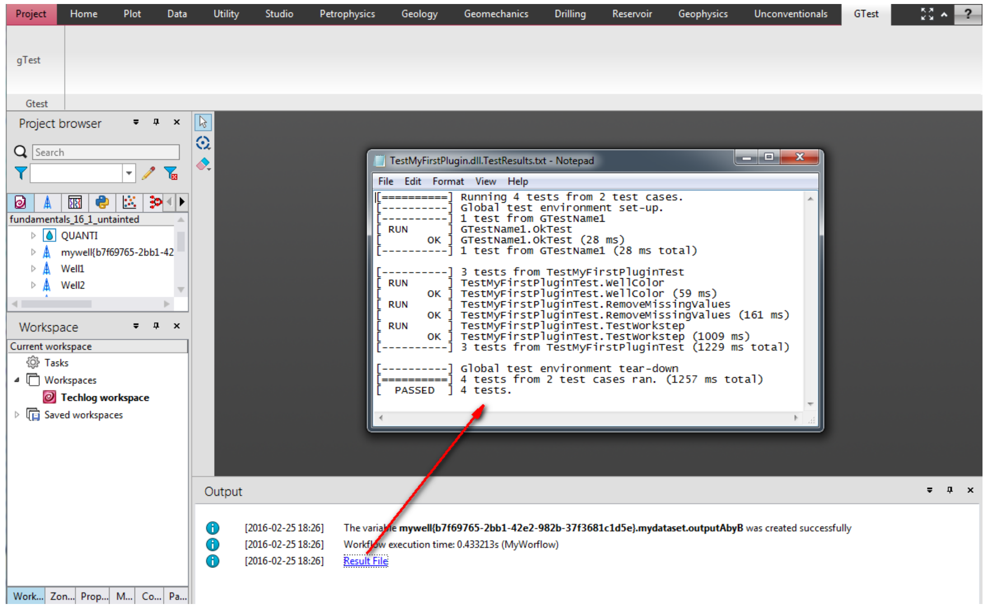


Figure 44 Gtest plug-in runs in Techlog context

You can also run the tests directly from Visual Studio through the Techlog Test Adapter.

See the "Techlog Test Adapter" section on page 52 for more information on how to run plug-in unit tests with the Techlog Test Adapter.

Techlog Test Adapter

Ocean plug-in tests can be run directly from Visual Studio development environment in the Techlog context using the Techlog Test Adapter. The aim of this chapter is to describe Techlog Test Adapter functionalities and what are different options offer to the plug-in developer to run Ocean plug-in tests through the Techlog Test Adapter directly into the Visual Studio development environment or on a build agent as VSTS or TeamCity.

Discover tests in Techlog Test Adapter

Once Google tests are implemented in the Ocean test plug-in, tests can be discovered by the Techlog Test Adapter and displayed in the Visual Studio Test Explorer as follow:

1) Set the **Default Processor Architecture** option to "x64" in **TEST** > **Test Settings** > **Default Processor Architecture** menu
2) Open the Visual Studio **Test Explorer** window from the **TEST** > **Windows** menu
3) Build the Visual Studio solution

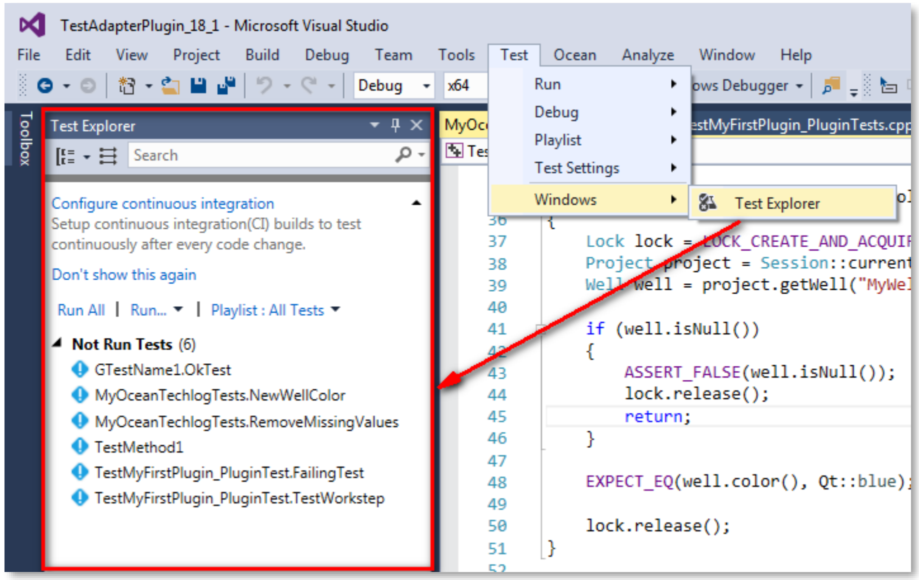


Figure 45 Tests in Test Explorer

Run tests with Techlog

When tests are run from the Visual Studio Test Explorer, the Techlog Test Adapter has now the capability to start Techlog to run plug-in unit tests in the Techlog context with some Techlog data. This only happens if the **Techlog Autorun** option is enabled in the **Ocean** > **Techlog Test Adapter** menu.

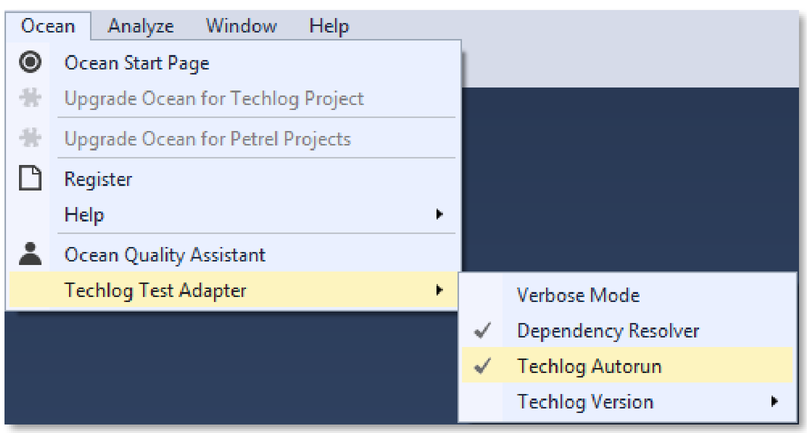


Figure 46 Techlog Autorun option

1) Techlog version

Through the **Techlog Version** option in the **Ocean** > **Techlog Test Adapter** menu the plug-in developer has the ability to control against which version of Techlog tests have to be run.

Note: Techlog version older than 2016.2 aren't supported by Techlog Test Adapter.

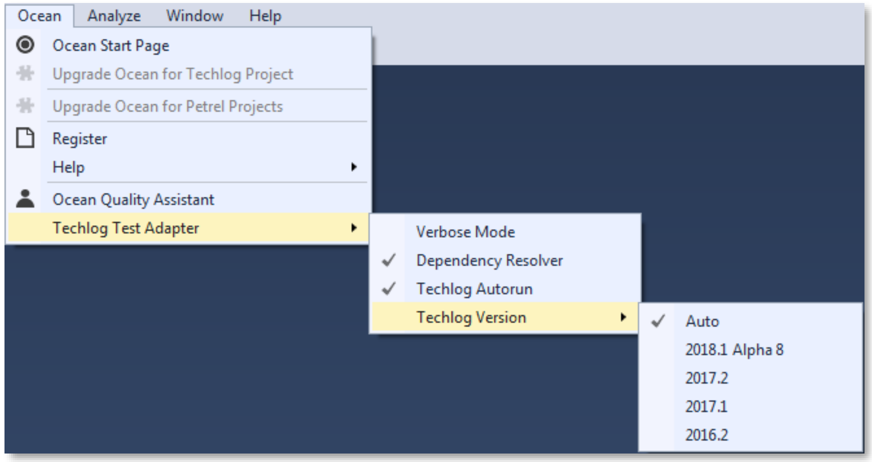
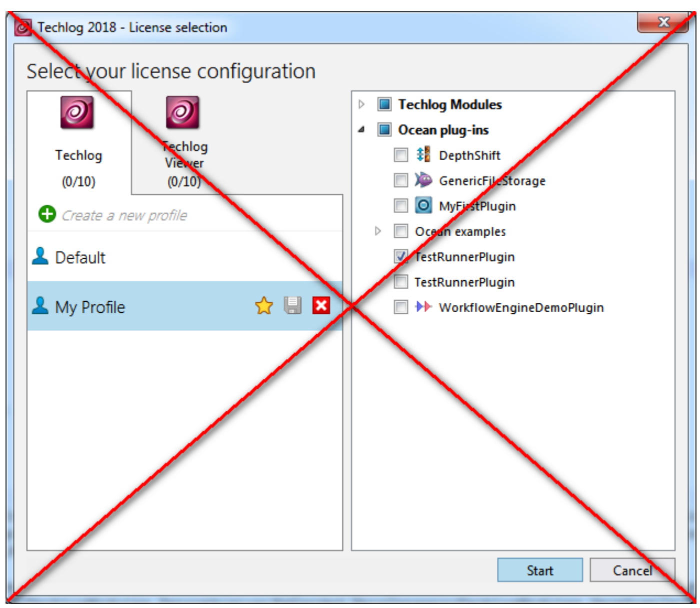


Figure 47 Techlog Version option

By default, the **Techlog Version** is set to "Auto". This means that the Techlog Test Adapter tries to find by itself the appropriate Techlog version to run Ocean plug-in tests. The Techlog version auto detection is done through properties that can be set to the Visual Studio solution at different priority levels.

Note: Techlog Test Adapter starts the Techlog with the right version, run the Ocean plug-in tests and close Techlog when all tests have been run.

*Ocean tests are run in Techlog through the **TestRunnerPlugin** that is shipped in debug and release modes with the Ocean framework. If one of these plug-ins is activated and saved in a favorite Techlog profile, then Techlog Test Adapter wouldn't be able to enable the right **TestRunnerPlugin** at the Techlog start and run Ocean tests. So please don't activate by default a **TestRunnerPlugin** in your favorite Techlog profile.*



The Techlog Test Adapter is looking first to a .runsettings file set to the Visual Studio solution. A .runsettings file is an XML file that tells the Techlog Test Adapter to run a Test plug-in dll with a given Techlog version and project. The expected format is shown below:

```xml
<?xml version="1.0" encoding="utf-8"?>
<RunSettings>
  <RunConfiguration>
    <TargetPlatform>x64</TargetPlatform>
  </RunConfiguration>
  <OceanSdk>
    <Techlog>
      <TestAdapter>
        <TestAssembly Name="TestMyFirstPlugin.dll"
           TechlogProjectPath="C:/Techlog-Projects/fundamentals_19_1.tlp"
           TechlogVersion="2019.1"/>
        <TestAssembly Name="TestMyFirstPlugin2.dll"
           TechlogProjectPath="C:/Techlog-Projects/fundamentals_18_1.tlp"
           TechlogVersion="2018.1"/>
      </TestAdapter>
    </Techlog>
  </OceanSdk>
</RunSettings>
```

Figure 48 .runsettings file example

Note: The file name doesn't matter, provided you use the extension ".runsettings".

The .runsettings file is added to the Visual Studio solution through the **Test Settings** > **Select Test Settings File** menu item.

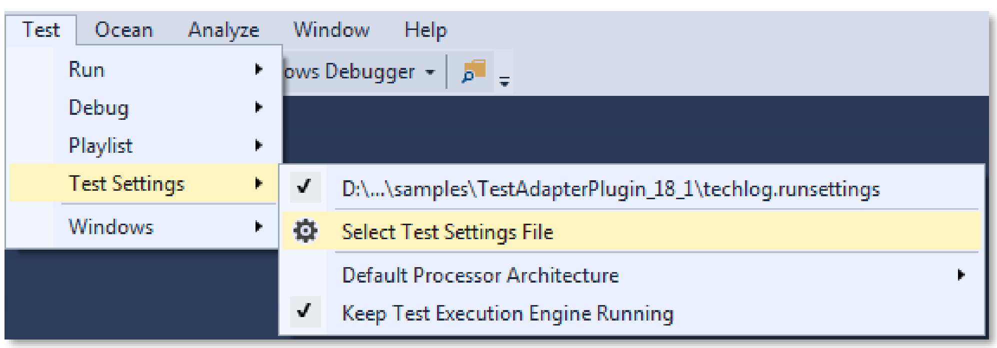


Figure 49 Add .runsettings file to the Visual Studio solution

The second place where the Techlog Test Adapter searches for Techlog version and project path to run Ocean plug-in tests is at the Test plug-in project properties level. From the **Ocean plug-in properties** dialog window you can define the **Techlog project** path. The **Techlog version** can't be modified through the **Ocean plug-in properties** dialog window as it is defined by into an Ocean for Techlog property sheet deployed with the Ocean framework.

See the "Ocean for Techlog property sheets" section on page 16 for more information on Ocean properties related to the Techlog version.

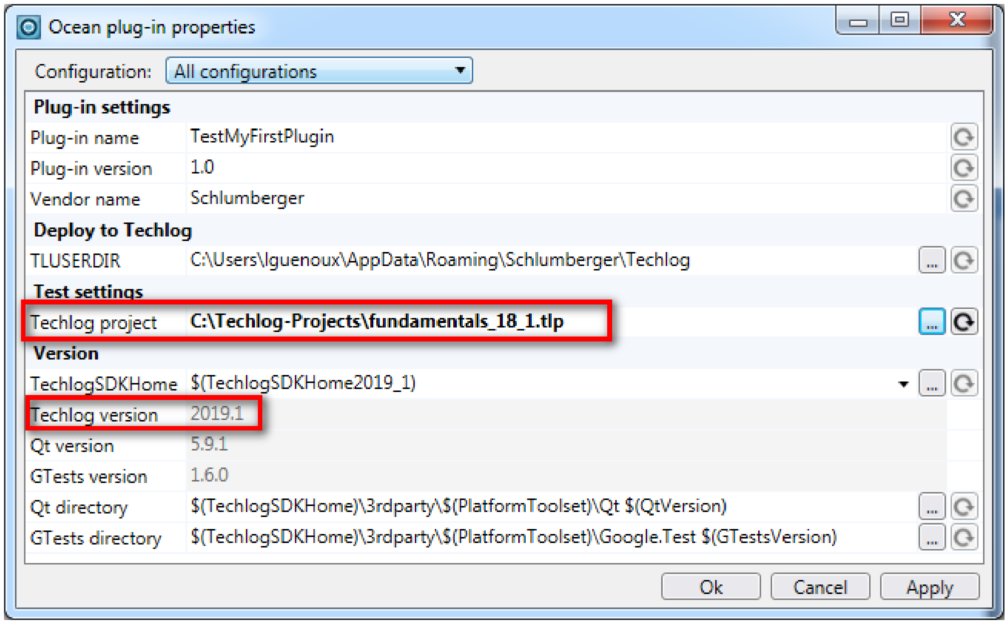


Figure 50 Test plug-in project properties

2) Code coverage

Through the **Code Coverage** option in the **Ocean** > **Techlog Test Adapter** menu the plug-in developer has the ability to enable / disable the code coverage of plug-in unit tests. This option is available in Visual Studio Enterprise only and it is disabled by default.

Note: Do not use Visual Studio native code coverage. This isn't compatible with Techlog Test Adapter.

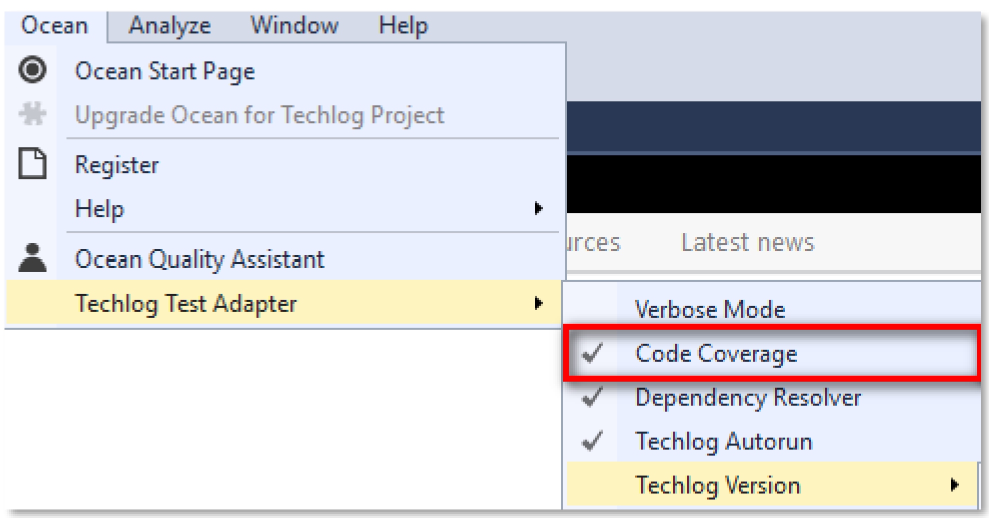


Figure 51 Code Coverage option

The Techlog Test Adapter produces at the end of the unit testing a .coverage file that contains detailed results on the plug-in code covered by the unit tests.

In order to get the Techlog Test Adapter code coverage running properly in Visual Studio, you have to set the **Profile** property to “Yes” in the project **Properties** > **Linker** > **Advanced** property page.

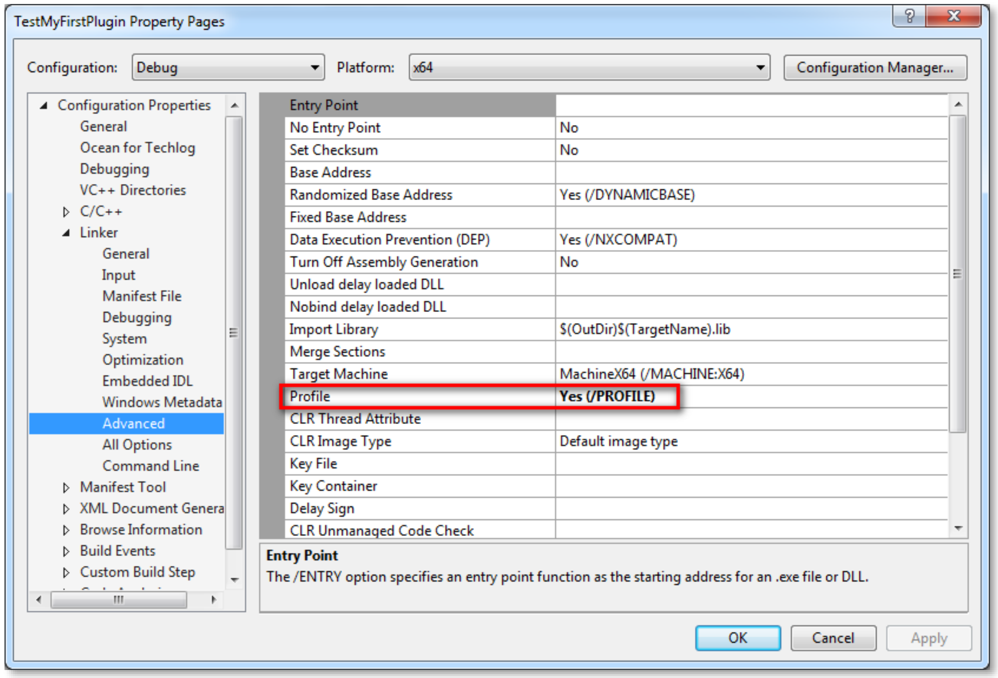


Figure 52 Profile property

The .coverage file is read by Visual Studio and displayed into the **Code Coverage Results** window.

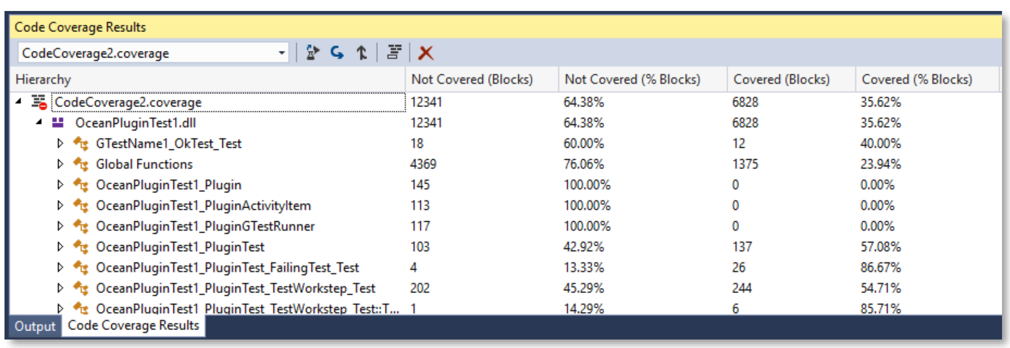


Figure 53 Code Coverage results in Visual Studio

3) Others Techlog Test Adapter options

Property	Description
Dependency Resolver	When the Dependency Resolver option is enabled, the missing plug-in dependencies are copied to test assembly folder before running tests. Enable by default.

Verbose Mode	The Verbose Mode is an option that when is enabled provides additional details in the Test output console of Visual Studio as to what the Techlog Test Adapter is doing.

Figure 54 Other Techlog Test Adapter options

Setup Techlog Test Adapter on a build agent

Through the Techlog Test Adapter you have the ability to run plug-in tests on a build agent as VSTS or TeamCity. This way you can setup a continuous integration environment for your plug-in through a build agent that is responsible to:

1) Build the plug-in solution

2) Run the unit tests associated to the plug-in through the Techlog Test Adapter

   a. With a targeted Techlog version

   b. With a targeted Techlog project or a temporary project

3) Get the plug-in code covered by unit tests through a summary XML file

The coverage summary XML file format is shown below:

```xml
<?xml version="1.0"?>
<CoverageReadResult xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <FullCoveredMethodsNumber>2021</FullCoveredMethodsNumber>
  <TotalMethodsNumber>5284</TotalMethodsNumber>
  <MethodCoveredLines>5519</MethodCoveredLines>
  <MethodNotCovaredLines>12905</MethodNotCovaredLines>
  <BlockCovered>10815</BlockCovered>
  <BlockNotCovered>27731</BlockNotCovered>
</CoverageReadResult>
```

Figure 55 Code coverage XML format

1) Techlog Test Adapter environment variables

In order to configure the build agent with all Techlog Test Adapter options describe previously in this document for the Visual Studio environment, the Techlog Test Adapter provides environment variables listed in the table below:

Variable	Short description
TLVERBOSEMODE	"Verbose Mode" option in the Visual Studio menu. Default value: "False"
TLCODECOVERAGE	"Code Coverage" option in the Visual Studio menu. Default value: "False" Remark: Only available if Visual Studio Enterprise is installed on the build agent.
TLAUTORUN	"Techlog Autorun" option in the Visual Studio menu. Default value: "True"

TLVERSION	"Techlog Version" option in the Visual Studio menu. Default value: "Auto" Remark: If the value is "Auto" or empty, the Techlog version is resolved from a .runsettings file.
TLPROJECTPATH	Absolute path to a Techlog project to be used to run tests (only if TLAUTORUN is set to "True"). Default value: empty Remark: If the value is empty, the Techlog project path is: 1) resolved from a .runsettings file. 2) not set and tests are run with a temporary project
TLXMLCOVERAGEFILEPATH	Absolute path to a summary XML file that contains unit testing code coverage results. Default value: empty Remark: Only available if Visual Studio Enterprise is installed on the build agent and TLCODECOVERAGE is set to "True".

Figure 56 Techlog Test Adapter environment variables

2) Build machine prerequisites

To create and configure build definition on a VSTS build agent to run plug-in tests through the Techlog Test Adapter follow the steps below.

Note: It is also possible to run Ocean plug-in tests with the Techlog Test Adapter on a **TeamCity** build agent.

Applications listed below need to be installed on the build machine:

- VSTS Build agent
- Visual Studio Enterprise 2015 or 2017 (with compiler v140)
- Schlumberger licensing tool with a valid Techlog license
- Techlog 2016.2, 2017.1, 2017.2, 2018.1, 2018.2 or 2019.1 (depending on which Techlog version you want to run the tests)
- Ocean for Techlog 2019.1

Note: It is only described in this document how to setup a build definition with the Techlog Test Adapter on a **VSTS** build agent. It is also possible to run Ocean plug-in tests with the Techlog Test Adapter on a **TeamCity** build agent.

3) VSTS build definition setup

Below are detailed steps explaining how to create and configure a build definition on VSTS that build the plug-in, run the tests in Techlog using Techlog Test Adapter and compute code coverage results.

1) Connect to the VSTS page and go to **Build and Release** menu
2) Select the **Definitions** tab and click on **New** definition button

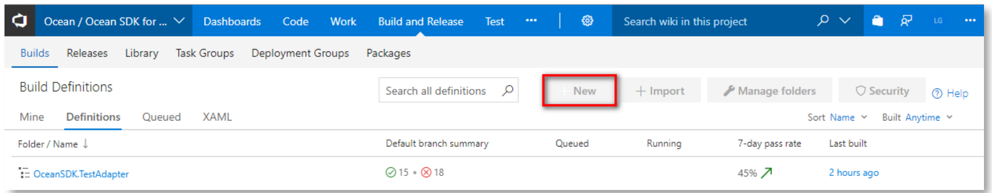


Figure 57 Create a new build definition

3) Select the source control where the Ocean plug-in solution is hosted.
VSTS Git source:
   a. Select a **Team project** in the drop down list to access VSTS Git repositories
   b. Select a **Repository** in the drop down list that that contains the plug-in solution
   c. Select the **Default branch**
   d. Click on the **Continue** button

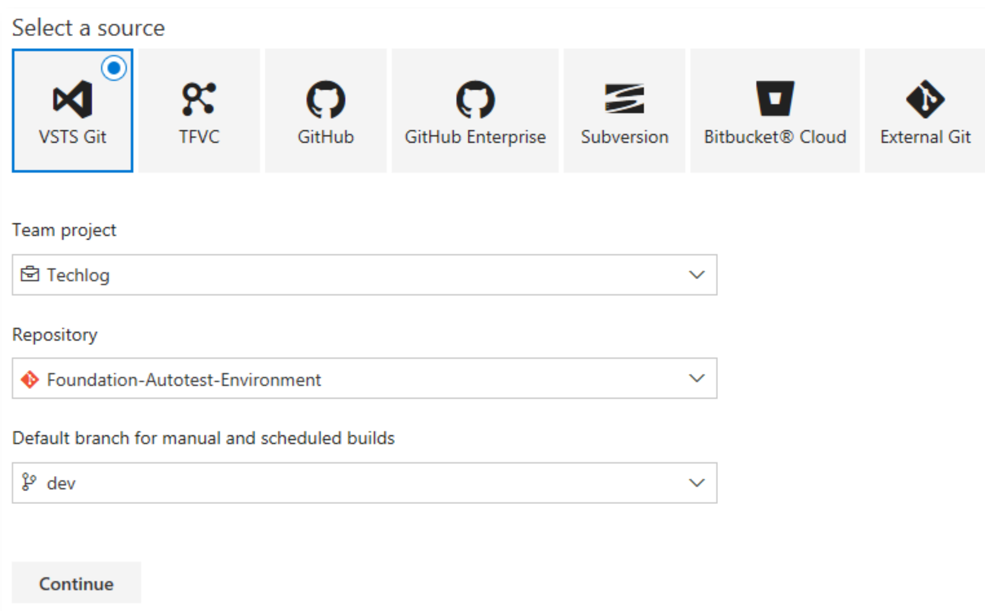


Figure 58 VSTS Git source

TFVC source:
   e. Enter the **Server path** to the repository that contains the plug-in solution
   f. Enter the **Local path** where this plug-in solution has to be copied on the build machine
   g. Click on the **Continue** button

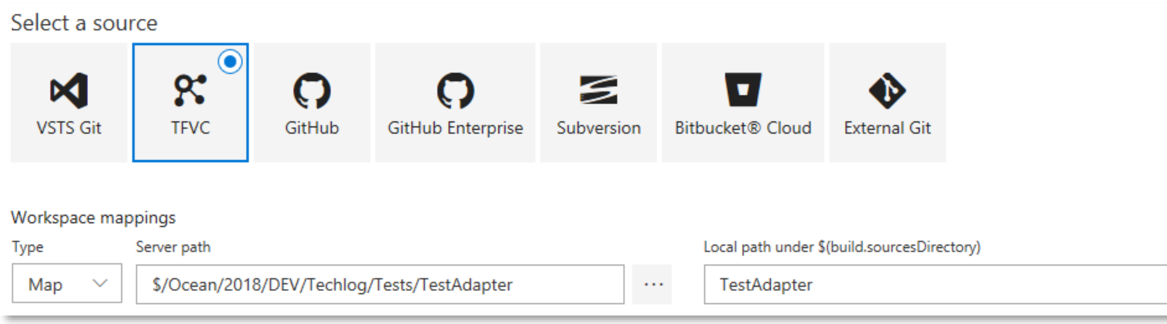


Figure 59 TFVC source

4) In the build definition template page select an **Empty process**

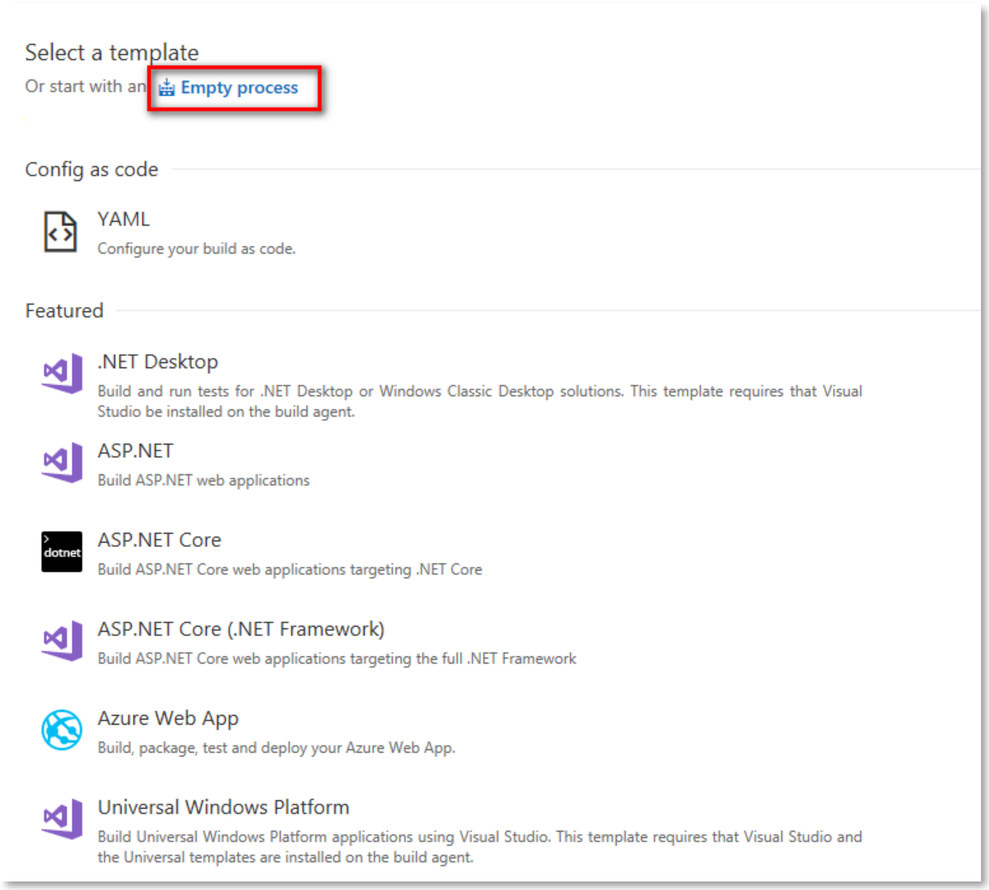


Figure 60 Build definition template page

5) The build definition is now created and you have to provide some settings to the process that will be run on the build agent:
    a. Provide a **Name** for the build definition
    b. Select an **Agent queue** in the drop down list

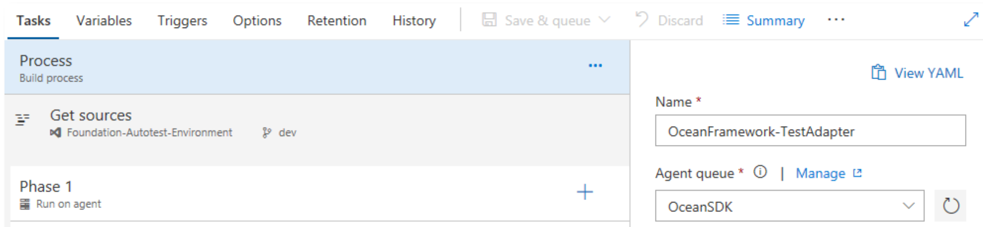


Figure 61 Build definition process settings

6) The build definition is created in VSTS with a default phase named "Phase 1". This is under this phase that you will add tasks that which plug-in solution to build in Visual Studio, the plug-in tests to run with the Techlog Test Adapter for a given Techlog version / project and compute code coverage results.

7) Add a **Visual Studio Build** task to the phase that is responsible to build the Ocean plug-in Visual Studio solution.

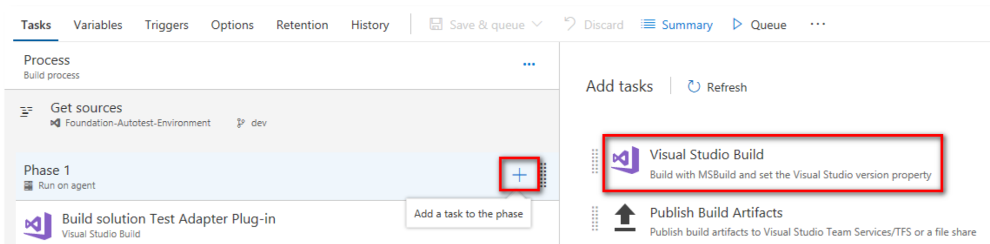


Figure 62 Add a Visual Studio Build task

8) Define **Visual Studio Build** solution parameters as:
   a. **Display name**
   b. **Solution**: relative path from repository root of the solution
   c. **Visual Studio Version**
   d. **MSBuild Arguments**: /p:Platform=x64
   e. **Platform**: x64
   f. **Configuration**: release or debug

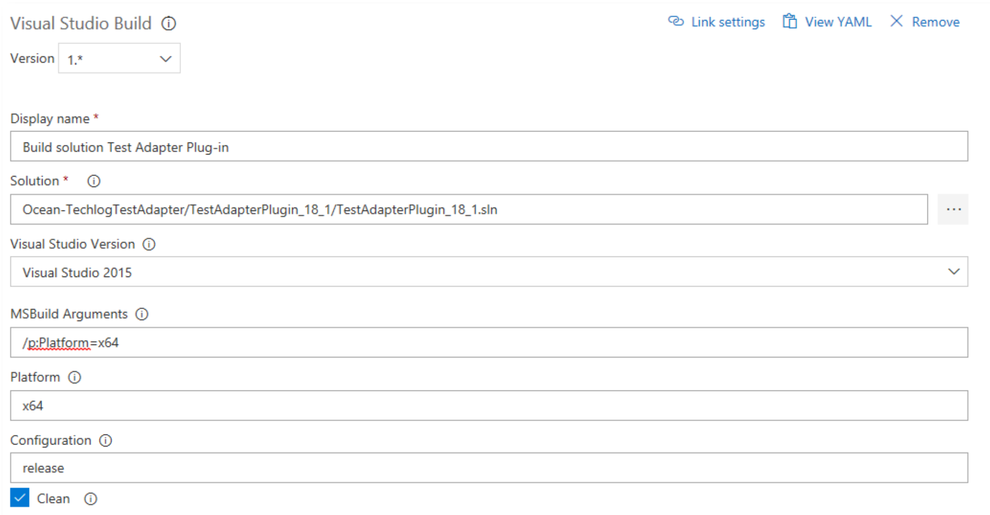


Figure 63 Visual Studio Build solution parameters

9) An optional step is to add an **Extract Files** task to the phase that is responsible to unzip a Techlog project hosted in your Ocean plug-in solution and used to run tests in Techlog.

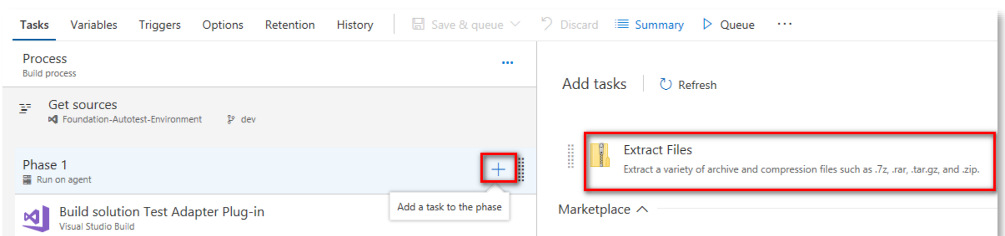


Figure 64 Add an Extract Files task

10) Define **Extract Files** parameters as:

   a. **Display name**
   b. **Archive file patterns**: relative path to the zip file from the plug-in solution repository
   c. **Destination folder**

Figure 65 Extract Files parameters

11) Add a **Visual Studio Test** task to the phase that is responsible to run the Ocean plug-in tests through the Techlog Test Adapter.

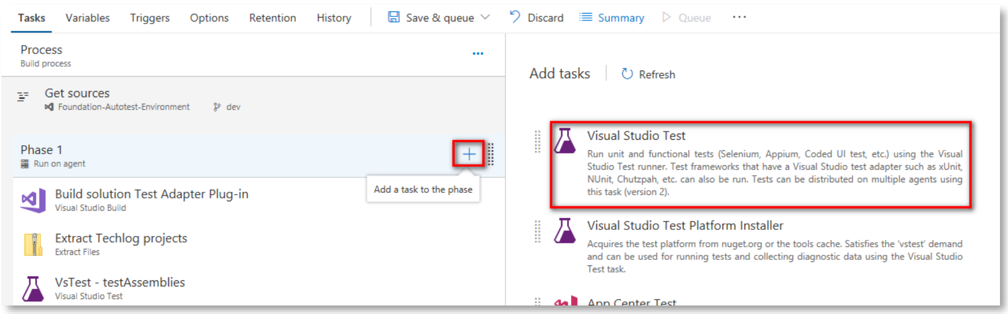


Figure 66 Add a Visual Studio Test task

12) Define **Visual Studio Test** parameters as:

a. **Display name**
b. **Select tests using**: Test assemblies
c. **Test assemblies**: relative path to test plug-ins output dll that contains Ocean unit tests. The file paths are relative to "Search folder" parameter
d. **Search folder**: folder to search for "Test assemblies" (relative path to the local build folder)
e. **Test platform version**
f. **Settings file**: path to .runsettings file to use with the tests that contains for each test assembly a Techlog version and a Techlog project against Ocean unit tests have to be run
g. **Path to custom test adapters**: directory path to the custom Techlog Test Adapter (e.g. C:\Program Files (x86)\Microsoft Visual Studio 15.0\Common7\IDE\Extensions\Slb.OceanSdk.Techlog.TestAdapter) (only if the "Test platform version" is set to "Visual Studio 2017")
h. **Build platform**: set to x64
i. **Code coverage enable**: this property is disabled as we don't want to use VSTS code coverage but the code coverage provided with the Techog Test Adapter
j. **Other console options**: /UseVsixExtensions:true /Platform:x64 (only if the "Test platform version" is set to "Visual Studio 2015")

*If the **Build platform** property isn't set to **x64** or the **.runsettings** file doesn't contain the tag **<TargetPlatform>x64</TargetPlatform>** then it is safer to add the **/Platform:x64** to the **Other console options** property.*

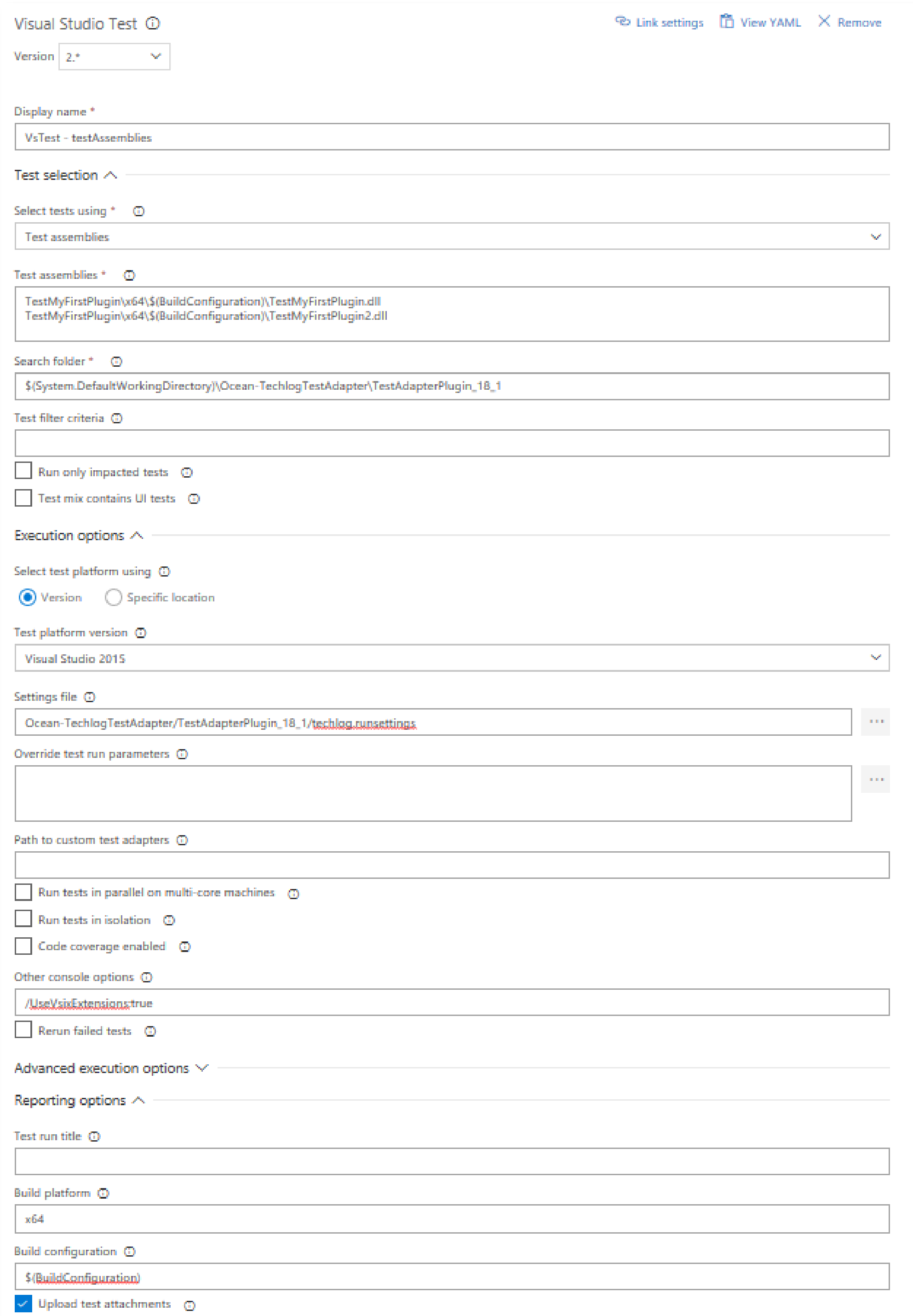


Figure 67 Visual Studio Test parameters

13) Add a **Publish Build Artifacts** task to the phase that is responsible to publish in artifacts of the build agent the results of the plug-in unit tests code coverage.

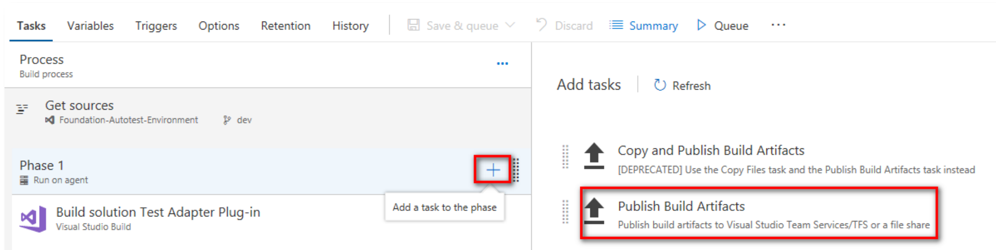


Figure 68 Add a Publish Build Artifacts task

14) Define **Publish Build Artifacts** parameters as:
    a. **Display name**
    b. **Path to publish**: the folder path to publish the code coverage results on the build machine or on the repository
    c. **Artifact name**

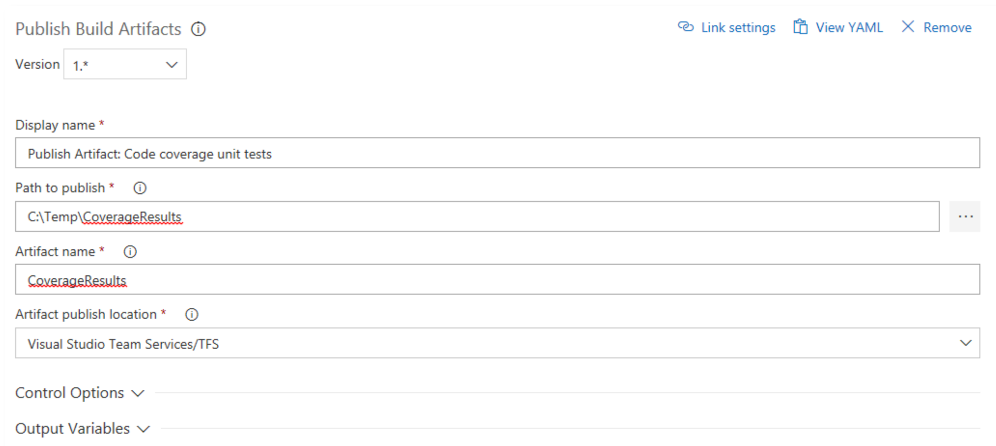


Figure 69 Publish Build Artifacts parameters

15) Add Techlog Test Adapter environment variables to the build definition (see **Error! Reference source not found.**). Build definition environment variables are available in all build definition tasks created previously.
    a. Click on **Variables** tab of the build definition
    b. Add Techlog Test Adapter environment variables to the page that the build agent needs to use to run Ocean plug-in tests in Techlog

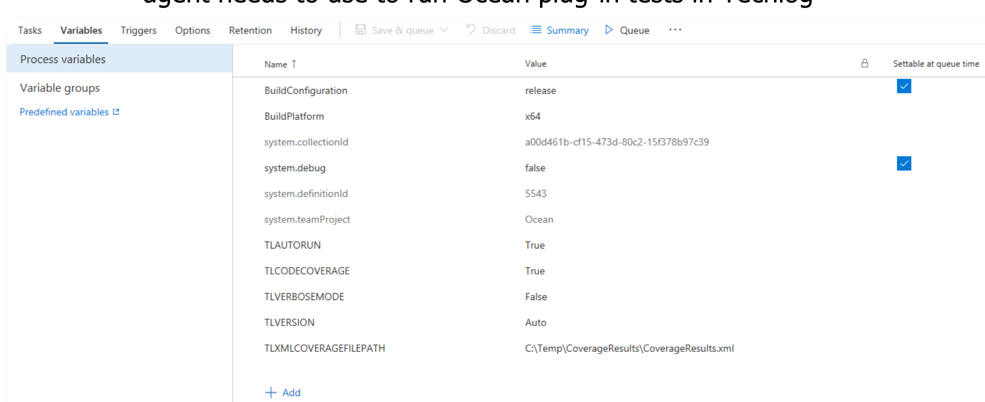


Figure 70 Build definition environment variables

16) Click on **Save & queue** button to queue the build definition on the build agent.

4) Unit test results

The build definition runs on the build agent and creates a build result that can be visualized in the **Builds** tab of the **Build and Release** menu. When you click on a recently built item in the **Queued** list, it shows you the unit test results as below:

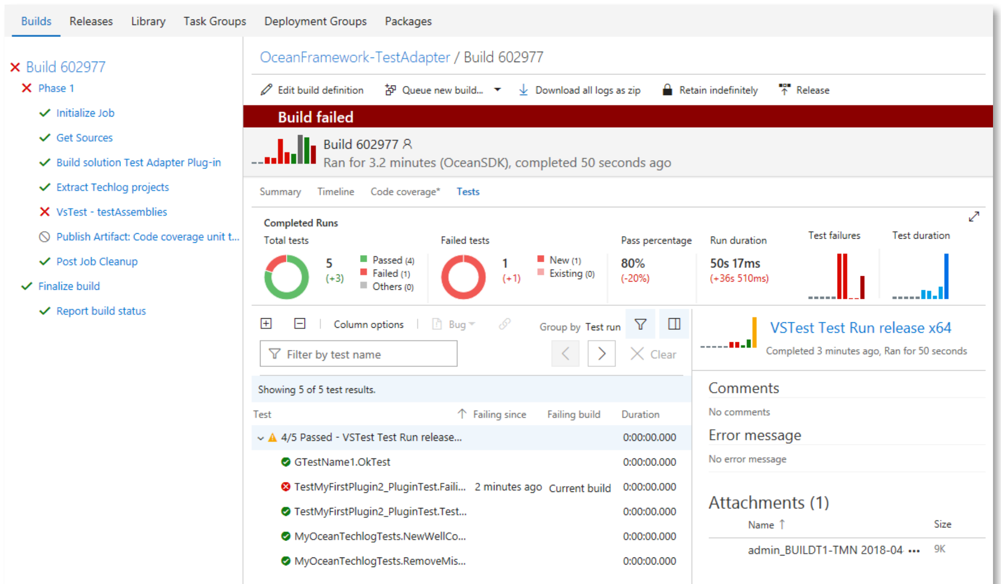


Figure 71 Build definition unit test results

Note: As you can see in Figure 72 the code coverage summary XML file generated by the Techlog Test Adapter isn't exploitable directly by VSTS and can't be displayed in this dashboard.

The code coverage summary XML file is created by the Techlog Test Adapter in the build artifacts.

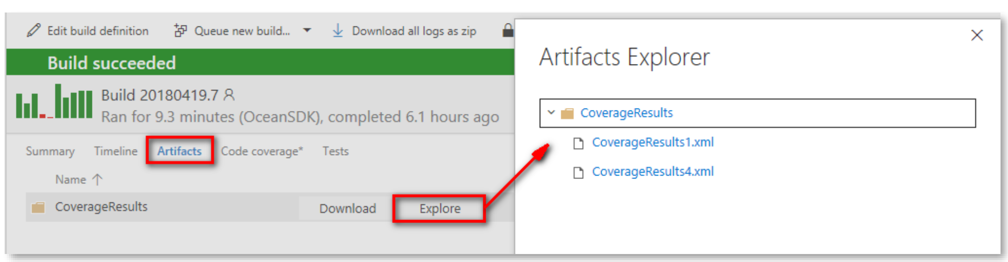


Figure 72 Coverage result file in build artifacts

Create an installer for your plug-in

The Ocean for Techlog Visual Studio templates deployed by Ocean WIX installer provide a project template that allows plug-in developers to package their plug-ins through a WIX installer. You must have WIX 3.8 or a higher version installed to use the Ocean Plug-in installer template.

To create a plug-in installer project using Visual Studio:

Add a new plug-in installer project to the solution that contains the Ocean plug-in project that you want to package by right clicking on the solution in the Solution Explorer and selecting **Add > New Project**. In the Project types area, under **Visual C++** project type, select **Ocean > Techlog 2019.1**. Then select the **Ocean Plug-in Installer** template.

Note: An installer project cannot be created in an empty Visual Studio solution. The installer project wizard uses the main plug-in project in the solution.

Provide the name "MyFirstPluginInstaller" for the project. Click the **OK** button to start the Wizard. (See Figure 73.)

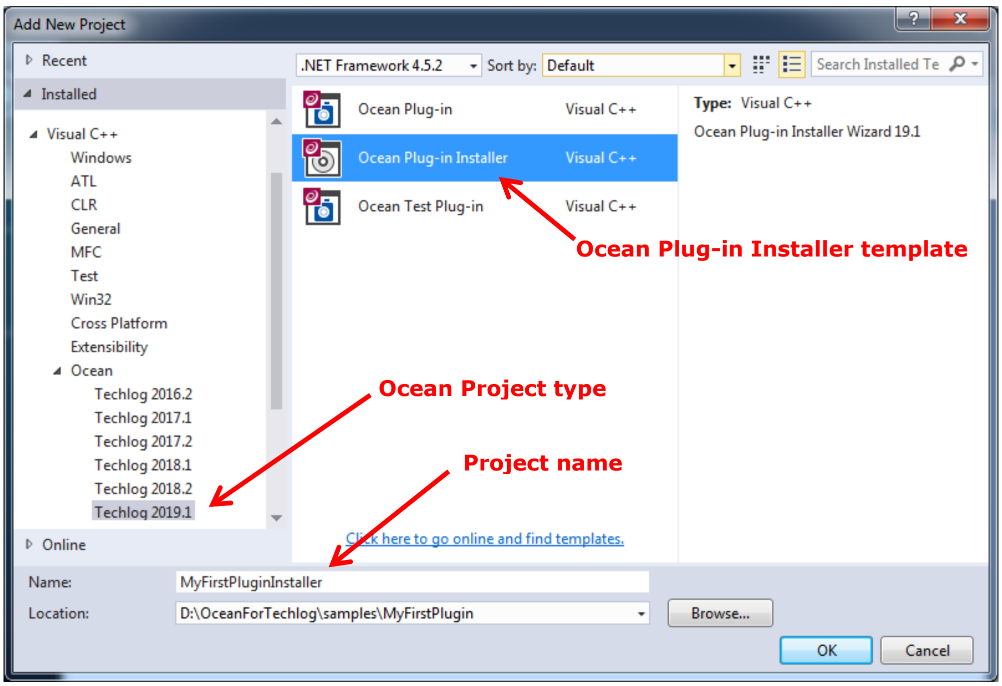


Figure 73 New project window

The plug-in installer wizard appears (See Figure 74).

Set these inputs:

- **Title:** title of the Ocean plug-in to be installed
- **Company:** company name that owns the Ocean plug-in; displayed during plug-in installation
- **Description:** description of the Ocean plug-in; displayed during plug-in installation
- **Projects:** select the Ocean plug-ins in the solution to package in the installer

Click **Finish** in the dialog.

Note: The plug-in dll and its resources built or copied at the post build in the project output directory are packaged in the plug-in WIX installer by the Ocean plug-in installer wizard.

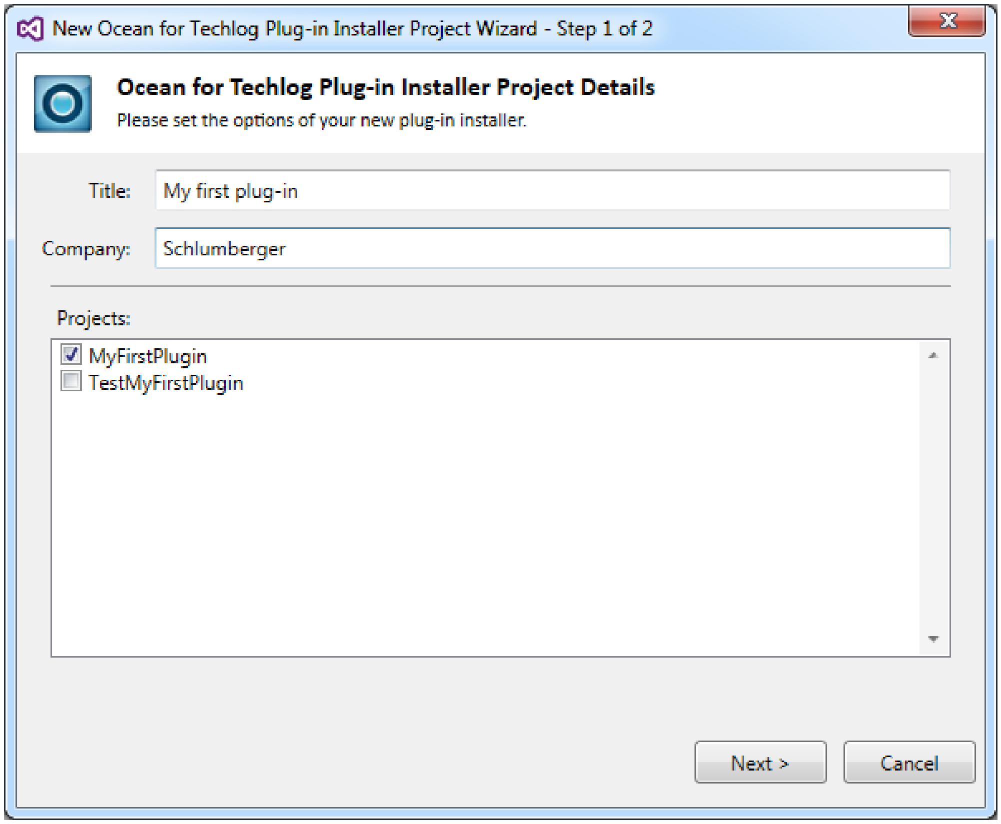


Figure 74 Plug-in installer wizard

The WIX installer project for "MyFirstPlugin" is added to the Visual Studio solution. Build the project; a MSI installer is generated in output of the build. Use it to deploy the plug-in in Techlog to the plug-in users.

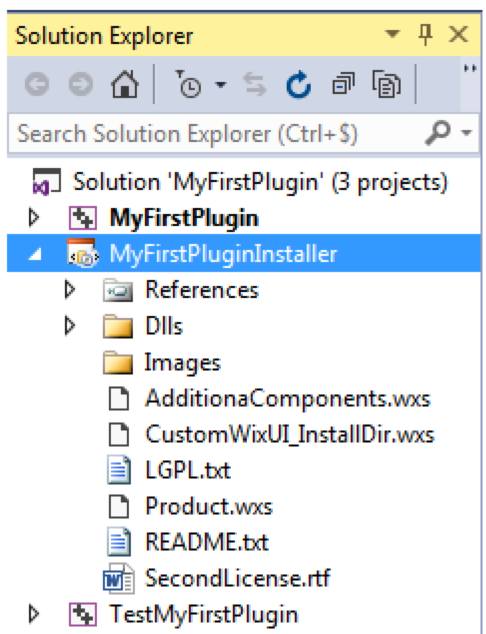


Figure 75 Plug-in installer project

Deploy folders and files with the plug-in dll

You may have to deploy additional files with your plug-in dll that follow a particular folder hierarchy. The WIX installer created through the Ocean plug-in installer template allows you to add those files by editing the **Product.wxs** file.

Consider a plug-in activity that creates a **`Logview`** from a layout template stored at the plug-in level.

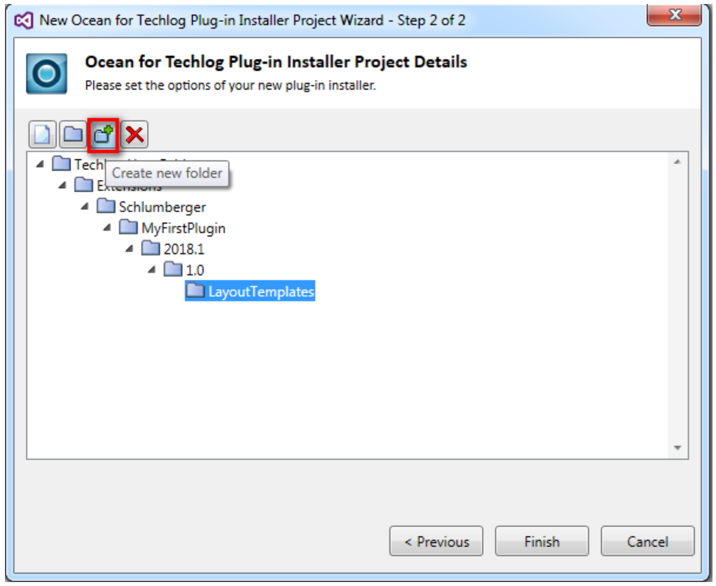
```
void SetupLogviewActivity::run()
{
  Lock lock = LOCK_CREATE_AND_ACQUIRE_ALL(lock);

  Project project = Session::current().mainProject();

  Workspace workspace = Session::current().currentWorkspace();

  // Apply the template for all the wells in the projects
  QList<Well> wells = project.wells().toList();

  LogviewTemplate logviewTemplate =
  LogviewTemplate::get(StorageLevelPlugin, "Well9_short");

  Logview logview =
  Logview::create(workspace, logviewTemplate, wells);

  lock.release();

  stop();
}
```

The layout template **Well9_short.xml** must be deployed with the plug-in dll in a folder named "LayoutTemplates".

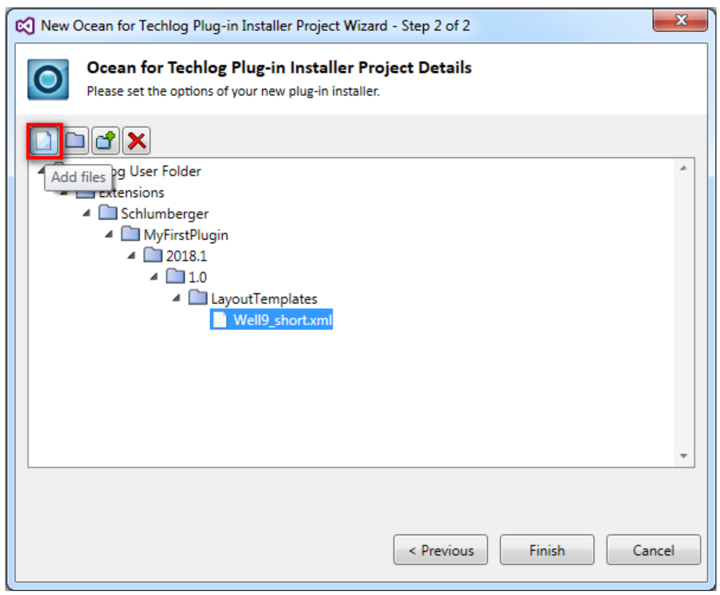
The Ocean plug-in installer wizard dialog allows you to do this.

Browse to a folder on the disk and add it or add a virtual folder that is created at plug-in installation time.

1. Add "LayoutTemplates" folder to plug-in folder



2. Add the **Well9_short.xml** file to new "LayoutTemplates" folder



You can also delete folders and files with the **Remove**  button. When you are happy with folder structure and files that will be deployed with the plug-in, click **Finish** in the dialog. Then the Ocean plug-in installer is added to the Visual Studio solution with folders and files added to **Product.wxs** file.

After the fact, add some additional folders and files by manually modifying the **Product.wxs** file:

1. Add the file to the `<Feature></Feature>` block tags in the **Product.wxs** file.

```
    <Feature
Id="ProductFeature" ConfigurableDirectory="EXTENSIONS" Description="
$(var.description)" Title="$(var.mainpluginname)" Level="1">
      <ComponentRef Id="Component" Primary="yes" />
      <ComponentRef Id="IniFile" Primary="yes"/>
      <ComponentRef Id="MyLayoutTemplate" Primary="yes"/>
```

```
</Feature>
```

2. Then declare inside the **<Directory></Directory>** block tags of the plug-in dll a **<Directory></Directory>** block with the name attribute value equal to the name of the folder that you want to deploy with the plug-in dll ("LayoutTemplates" in this example). Add the file, here **Well9_short.xml**, inside the new **<Directory> </Directory>** block tags using the previously declared component id.

```
<Directory Id="PluginVersion" Name="$(var.mainpluginversion)">
  <Compo-
nent Id="Component" Guid="80dd22d7-5e83-4967-88f3-9fec434a6b83">
    <Condition>TECHLOGPATH</Condition>
    <File Id="fil1649aa340c434607ae9771ceeebeb051" Source="..\MyFirs
tPlugin/x64/$(var.Configuration)/MyFirstPlugin.dll" />
  </Component>
  <Directory Id="LayoutTemplates" Name="LayoutTemplates">
    <Component
  Id="MyLayoutTemplate" Guid="80dd22d7-5e83-4967-88f3-9fec434a6b84">
      <Condition>TECHLOGPATH</Condition>
      <File Id="fil1649aa340c434607ae9771ceeebeb052"

Source="..\MyFirstPlugin/x64/$(var.Configuration)/Well9_short.xml" /
>
    </Component>
  </Directory>
</Directory>
```

3. The WIX installer searches for the file in the output directory of Visual Studio plug-in project.

   Well9_short.xml file must be:

   - copied to the Visual Studio plug-in project directory
   - added to the Visual Studio project (**Add > Existing item** in context menu of the project)
   - copied from the project directory to the output directory by adding this command line in Post-Build Event of project properties:

     ```
     copy "Well9_short.xml" "$(OutDir)Well9_short.xml" /Y
     ```

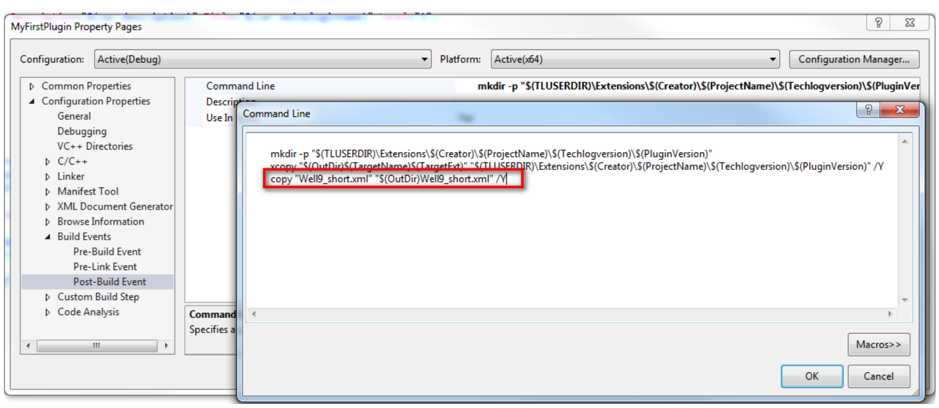


Figure 76 Post-Build Event in Ocean plug-in properties

Plug-in WIX installer designed with Techlog deployment options

A plug-in end user can deploy a plug-in at the Techlog, Company or user level.

This deployment option is clearly exposed in the destination folder window of the WIX installer wizard as shown in the screenshot below:

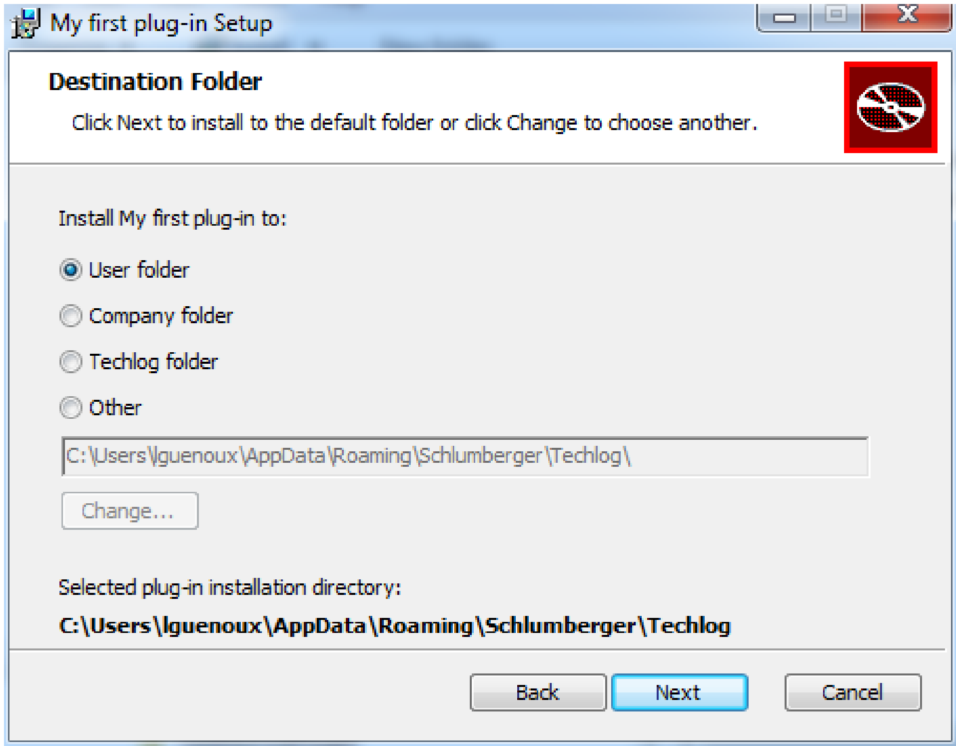


Figure 77 Techlog deployment options

Change the license agreement text of the plug-in installer

A plug-in installer is created with a default Lorem ipsum text that shows up as the plug-in license agreement text during the plug-in installation.

Figure 78 Default "Lorem ipsum" license agreement text

In order to replace the default Lorem ipsum text by your plug-in license agreement text, you have to:

1) add a **License.rtf** file that contains you license agreement text at the root folder of the WIX project
2) add the **License.rtf** file to the WIX project in the Visual Studio solution
3) build your solution

User folder versus company folder deployment

A plug-in is uniquely identified in the module manager by its key **VendorName/PluginName/TechlogVersion/PluginVersion**.

This information is set in the code of the plug-in (plug-in information of the main plug-in class) and the plug-in information has to match the plug-in folder structure: **Extensions/VendorName/PluginName/TechlogVersion/PluginVersion**.

See "Writing the plug-in" section on page 22 for details on how to declare plug-in information.

If two plug-ins with the same key are deployed in user and company folders, they show up both in the Techlog module manager.

You can see in the information pane of the Techlog module manager at which level the plug-in is deployed.

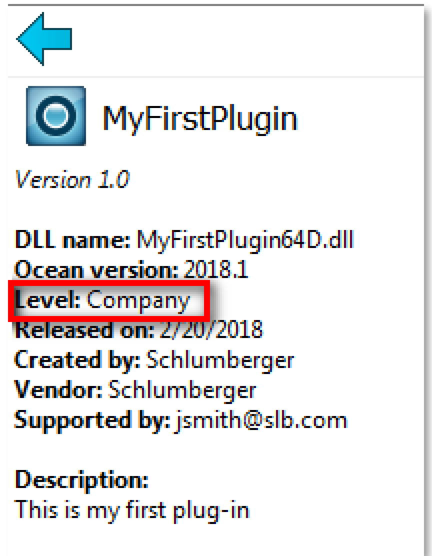


Figure 79 Level where the plug-in is deployed

Upgrade an existing Ocean plug-in to the current Ocean release

It isn't a prerequisite to uninstall previous Ocean framework versions before installing the 2019.1 release. You may have several Ocean framework versions installed on your machine.

If you open an Ocean plug-in project created with a previous Ocean template and wizard version, you can upgrade this project to the current Ocean framework version by right clicking on the project in the Visual Studio **Solution Explorer**. Then right click **Upgrade Ocean for Techlog Project** in the context menu.

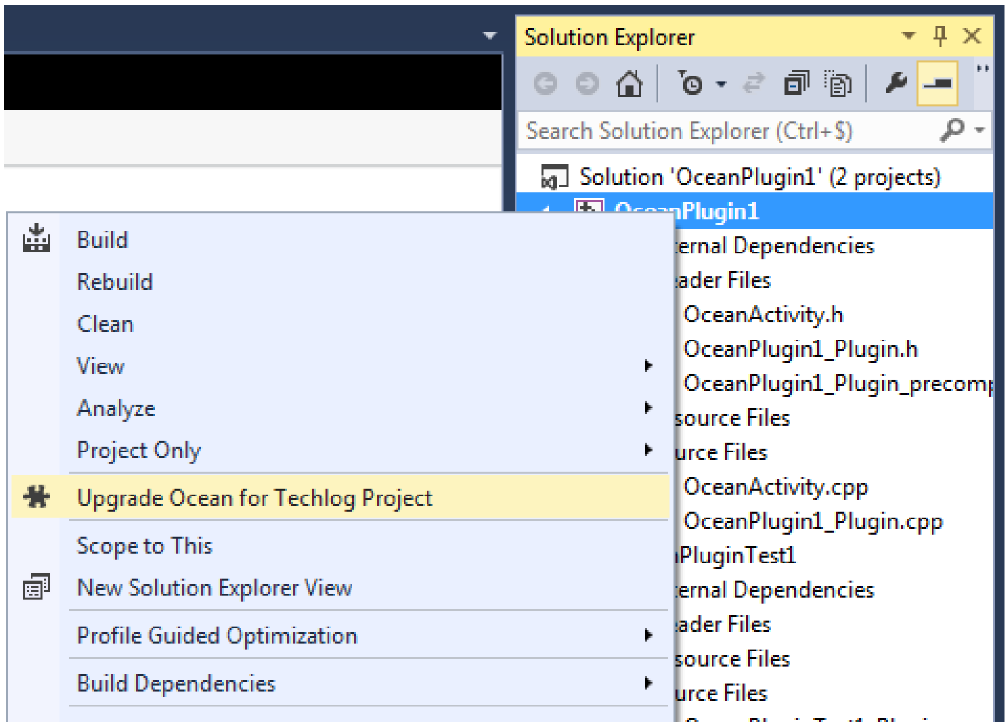


Figure 80 Upgrade Ocean for Techlog project

The upgrade window opens, asking you to confirm the project upgrade.

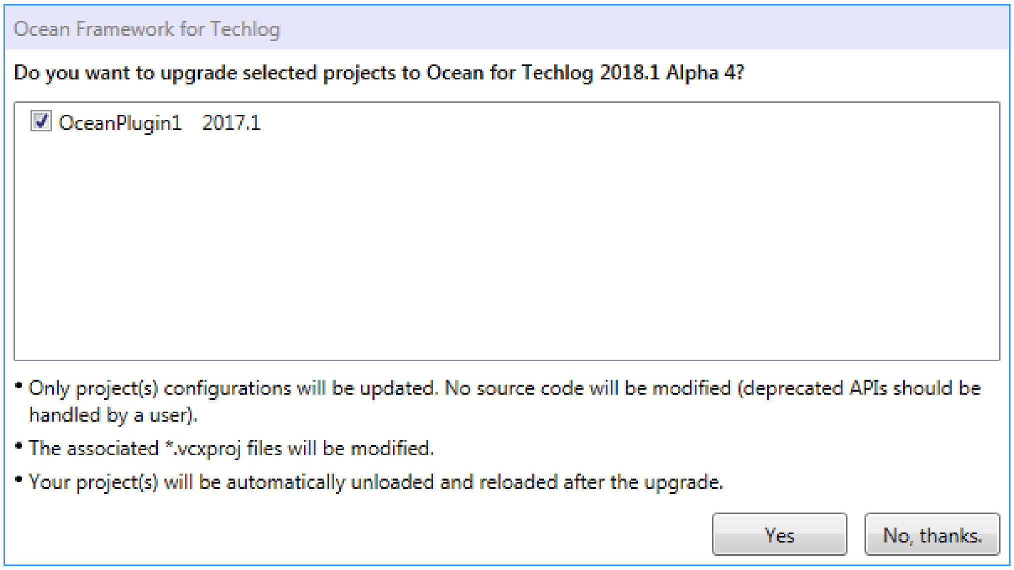


Figure 81 Upgrade window

Then an information message warns you about changes that have been applied to the Ocean for Techlog plug-in project.

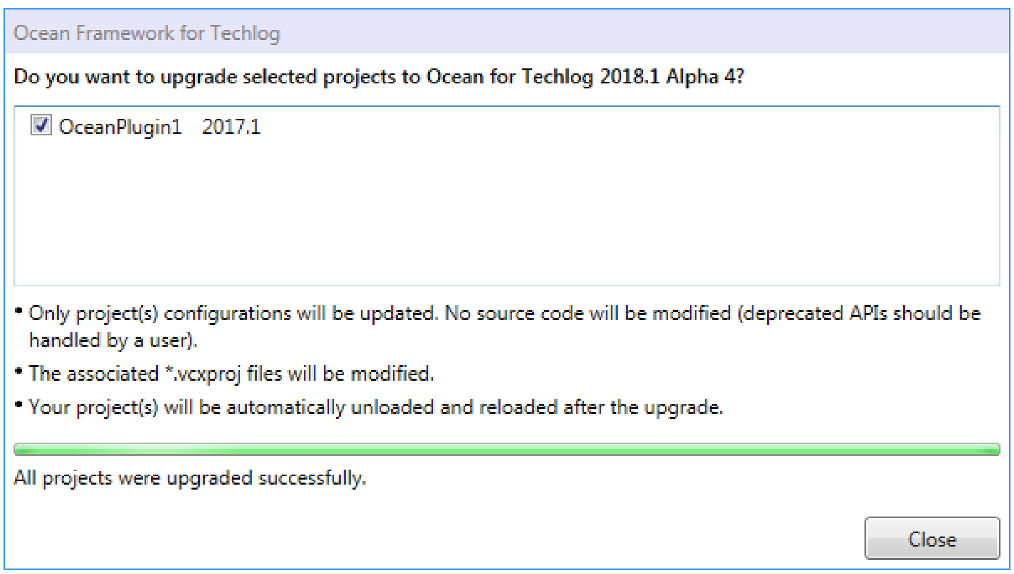


Figure 82 Upgrade information message

The Ocean for Techlog properties are automatically upgraded to the new release during the upgrade process. Those properties are displayed in the **Ocean plug-in properties** dialog window opened from the Visual Studio project contextual menu.

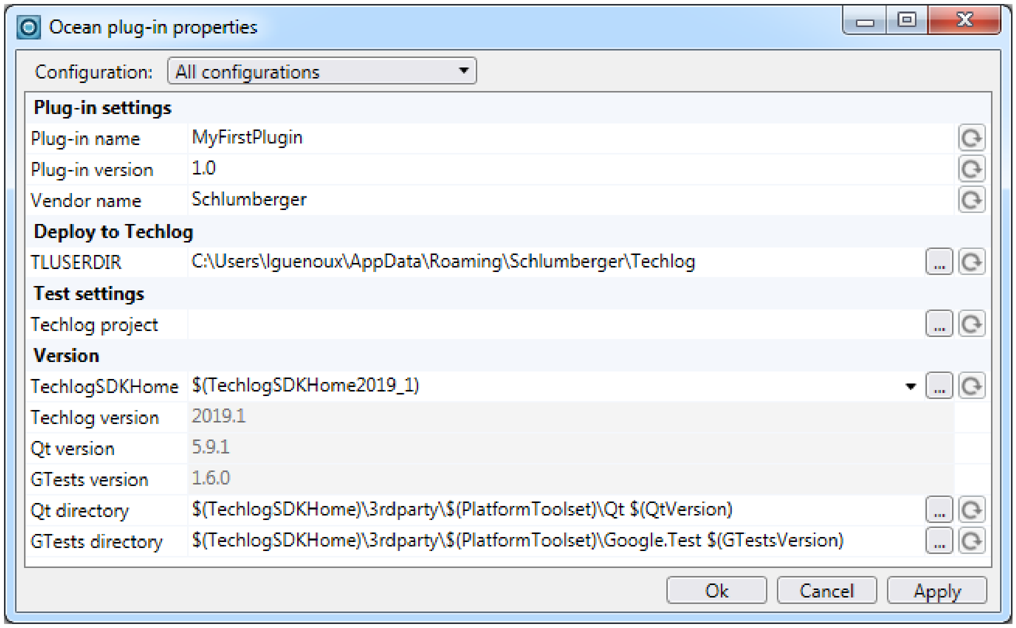


Figure 83 Ocean for Techlog project properties

In this dialog window you have access to four groups of properties:

1) **Plug-in settings:** allow you to give mandatory plug-in information values like plug-in name, version and vendor name. Changing those values will deploy the plug-in output dll with the corresponding plug-in structure folder at post-build time.

2) **Deploy to Techlog:** allow you to change the path to the Techlog user folder where the plug-in is deployed at the post build time

3) **Test settings:** allow you to specify the path to a Techlog project that will be used to run Ocean unit tests in Techlog through the Techlog test adapter.

4) **Version:** this group of properties allows you to handle the Ocean for Techlog binary versions (TechlogSDKHome), Qt binary versions (QtDir) and Google tests binary versions (GTests) with which you want to build your plug-in. If you create an Ocean project plug-in from a 2019.1 template or upgrade an Ocean plug-in project to the 2019.1 release, the default values for those properties are the TechlogSDKHome2019_1 environment variable value, QTDIR and GTests values stored in property sheets installed with the Ocean framework 2019.1.

   If you change those values through the Ocean plug-in properties dialog, the new values are only set at the user level and the TechlogSDKHome environment variable value or other properties defined in property sheets at the project level remain unchanged.

   Techlog version, Qt version and Gtests version are linked respectively to the Ocean framework version, Qt libraries version and Google tests libraries version both deployed with the Ocean package. This means that you can't change manually those properties through the Ocean plug-in properties window.

   See the "Ocean for Techlog property sheets" section on page 16 for more information on Ocean properties deployed with the Ocean framework package.