# Variables, Objects & Expressions



## Variables, Objects & Expressions

Variables and objects are used throughout Continua and they enable dynamic properties and values to be used during your build process. Variables and objects are similar in the way they are called, however they differ in a few key areas which are explained below.

Expressions are the string representation of objects and variables which are used to access their values in various inputs throughout Continua CI.

## Variables

Variables can be used during the build process and can be created at all levels of Continua CI. They are used to pass dynamic values into the build process. Additional information on variables can be found on the Variables page.

### Variable Definition and how they differ from Objects

Variables differ from objects as they have the following properties:

- Variables are defined by either the user or pulled from the server's environment variables.
- A Variable can only ever contain **1 value**.
- Variables can be created at the following levels: **Build, Configuration, Project and Application**. Variables can also exist at the **Environment** level however these variables are pulled directly from the server's environment variables.
- **Variables can be accessed by surrounding the variable name with the '%' character**. For example, **all variables** can be accessed with **%myBuildVariableName%** while a specific variable can be accessed by provided a namespace prefix. For example, a **project variable** can be accessed with **%Project.myProjectVariableName%**.

### Variable Namespaces

Variable namespaces control where a variable exists within the Continua CI environment. Namespaces also provide variables with a scope which limits what each build can access. For example, if you create a configuration variable then only builds from that configuration can access that variable.

#### Environment Variables

Environment variables are created from the server's environment variables automatically and cannot be changed. These variables can be accessed system wide by every build. Environment variables are always read-only and they can be accessed with the **%Environment.MyVariableName%** or **%MyVariableName%** syntax.

#### Application Variables

Application variables are system wide variables that every build, configuration and project can access. This means that any variable defined in the application namespace can be used anywhere in Continua CI. These are the highest variables that the user can define. Application variables are read-only at run time and they can be accessed with the **%Application.MyVariableName%** or **%MyVariableName%** syntax.

#### Project Variables

Project variables are created on a specific project and they can only be accessed by configurations and builds that belong to that project. Project variables are read-only at run time and they can be accessed with the **%Project.MyVariableName%** syntax.

#### Configuration Variables

Configuration variables are created on a specific configuration and they can only be accessed by builds that belong to that configuration. Configuration variables are read-only at run time and they can be accessed with the **%Configuration.MyVariableName%** syntax.

### Build Variables

Build variables belong to a specific build however they cannot be created manually. They are used to override any of the variables listed above. Build variables can be updated at runtime - see the next section for more information on how build variables work. Build variables can be accessed with the **%MyVariableName%** syntax (Note that you cannot use the Build namespace prefix).

## Variable Namespace Hierarchy

Continua CI's namespace hierarchy is designed around the idea that variables with the same name can override each other at run time. Variables will only override each other if no namespace prefix is used when accessing the variable.

For example, lets say you have 2 variables called **myVariable**. One of these values is defined on the configuration while the other is defined on the project.

**myVariable** in the **configuration namespace** is assigned the text "my configuration value!"

**myVariable** in the **project namespace** is assigned the text **"my project value!"**

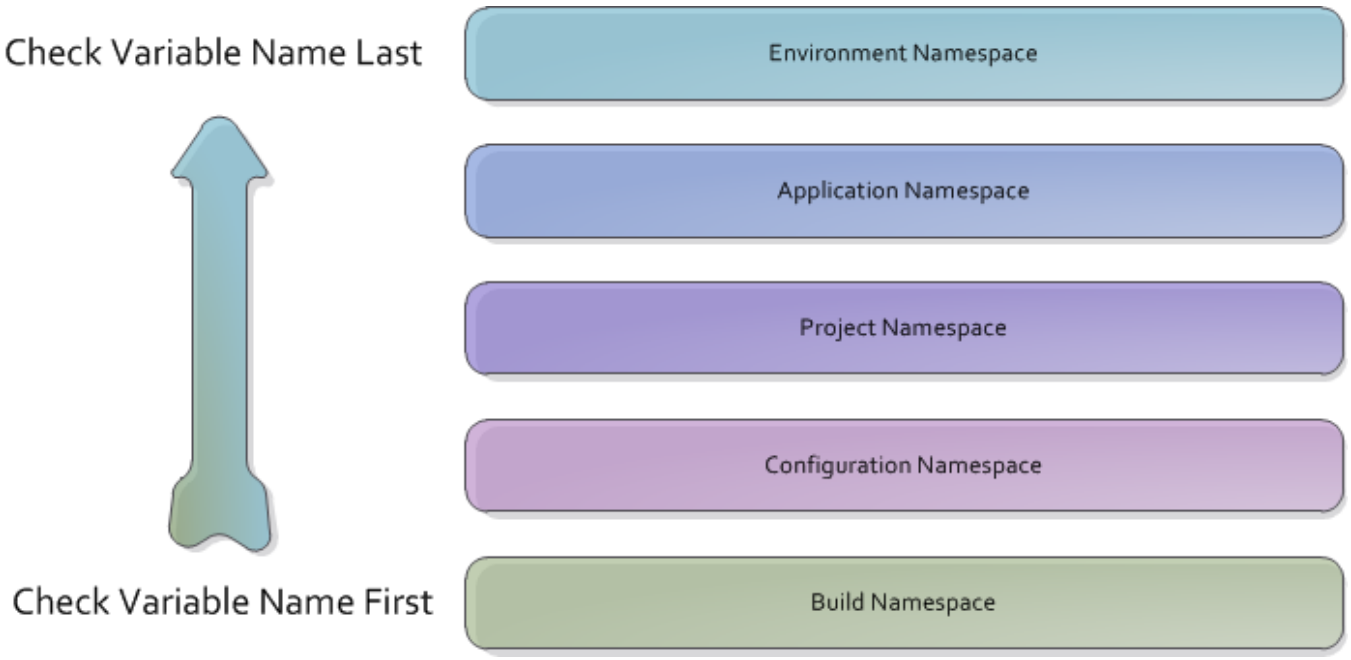
During the build process, if I access myVariable with the correct namespace I will get the following values:

- **%Configuration.myVariable%** = **"my configuration value!"**
- **%Project.myVariable%** = **"my project value!"**

However, if I access myVariable without a namespace I will get the following value:

- **%myVariable%** = **"my configuration value!"**

In this scenario, when accessing myVariable without a prefix, it will always return the Configuration value instead of the Project as it will return the variable in the lowest namespace it can find.




## Overriding Variable Values

As environment, application, project and configuration variables are all read-only at run-time, their values will never change during the course of a build. All of these variables can be considered as constants at run-time. If you set the value of one of these variables during your build process, you are not actually changing the value of that variable. Instead, you are creating a **new build variable with the same name which will contain the new value**. This means that if you ever want to access the new value, you cannot use namespace prefixes when calling a variable in an expression.

To demonstrate changing a variable's value, lets use the **myVariable** example above. So lets say we have **configuration variable called myVariable** and its value is **"my configuration value!"**.

In our build process we include a Set Variable Action that sets **myVariable** to **"my new value!"**.

After the Set Variable action has run, if we access **myVariable** we will get the following values:

- **%Configuration.myVariable%** = **"my configuration value!"**
- **%myVariable% = "my new value!"**

You can see that changing the value of myVariable did not override the value but rather created a Build Variable with the same name. Note that you cannot prefix build variables with the Build namespace.

So if you use the namespace prefix on a variable you will always get the variable's value at the start of the build, not the updated value.

### Setting Variable Values

Variable values can be set in a number of ways within Continua CI. (Note that by setting a variables value you are actually creating a build variable with the same name and setting its value, as explained above):

- **Original Values**: All Configuration, Project and Application variables can be given a value when creating the variable.
- **Set Build Variable values when manually queuing a build**: All build variables can have their values changed when you manually start a build. Note that the variable must have a prompt type before they can be overridden when manually queuing a build.
- **Set Build Variable values when automatically triggering a build**: Build variable values can be set by Triggers when they automatically queue a build.
- **Set Build Variable values during the build with the Set Variable Action**: The Set Variable Action allows you to change a build variable's value during the build process.

## Objects

Objects are created automatically by Continua and they contain properties that relate to various aspects of Continua. For example, there are Build, Configuration and Project objects which include properties regarding the current build, configuration or project respectively. Additional information and a list of available objects can be found on the Expression Objects page.

### Object Definition and how they differ from Variables

Objects differ from variables as they have the following properties:

- Objects are native to Continua and are defined by Continua. Continua includes several objects such as Server, Agent, Build, etc. These objects store properties regarding that object. For example, the server hostname can be accessed with $Server.HostName$ and the Build number can be accessed with $Build.BuildNumber$
- Objects can contain multiple properties and objects. For example, the Server object includes the HostName property and the Now and NowUtc objects.
- Objects and object properties can be accessed by surrounding the object and it's sub properties with the '$' character. For example, repositories can be accessed using the following format: $Repository.my_repository_name$.

## Expressions

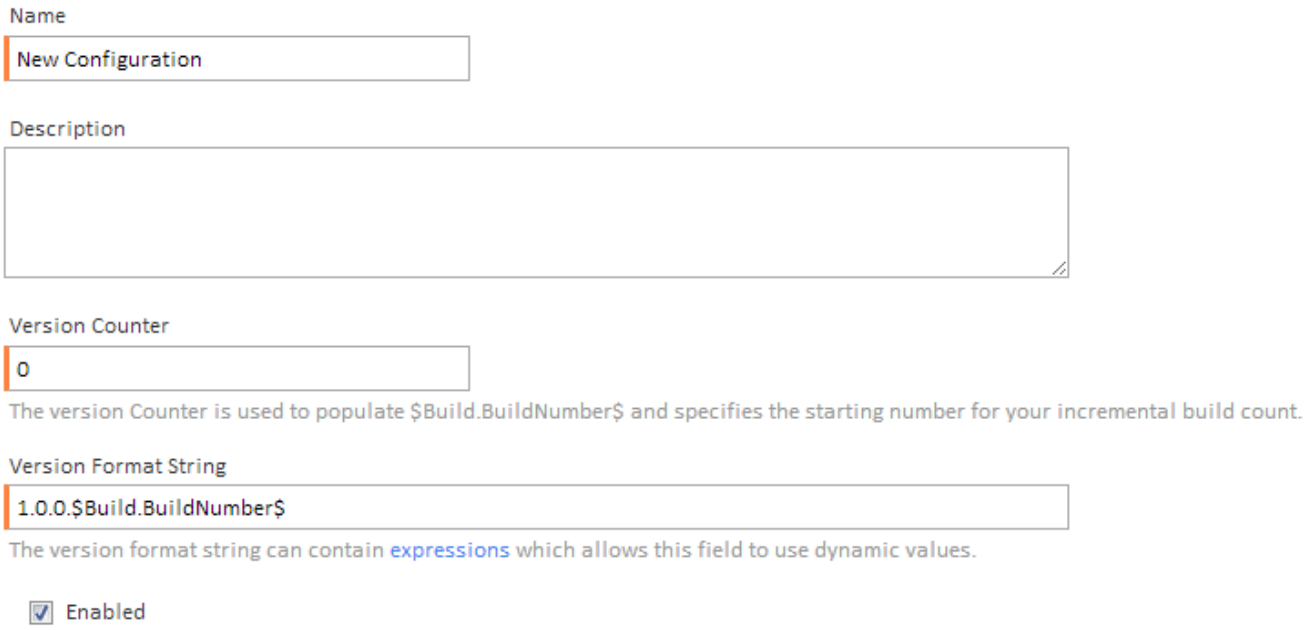
Expressions are the string representation of objects and variables which are used to access their values. Expressions can access both variables and objects and they are built up at design time then evaluated at run time. For example, each configuration contains a Version Format String property that is used to set the version number of each build. By default, this property uses the expression 1.0.0.$Build.BuildNumber$ (as shown below).

This expression contains two parts:

- 1.0.0.: This is the first part of the expression and is simply plain text. Every time a build is created, its version number will begin with 1.0.0..
- $Build.BuildNumber$: This is the second part of the expression and this is calling the BuildNumber property on the Build object. The BuildNumber property is an integer that increments for each build that is created in a configuration. Every time a build is created, its version number will end in its current build number.

When this expression is evaluated, you will get the following results for each subsequent build:

- 1.0.0.0
- 1.0.0.1
- 1.0.0.2
- ...
- 1.0.0.1235234




Many inputs in Continua accept expressions as values. Most fields that accept expressions will be denoted with the icon, however you can also determine whether they are accepted by entering the '%' or '$' character. If the expression auto-complete drop down appears then the field accepts expressions.

## The Expression Drop Down

Every input that accepts expressions includes the expression auto-complete drop down to help you determine which variables and objects can be used. This drop down will show the following object types:

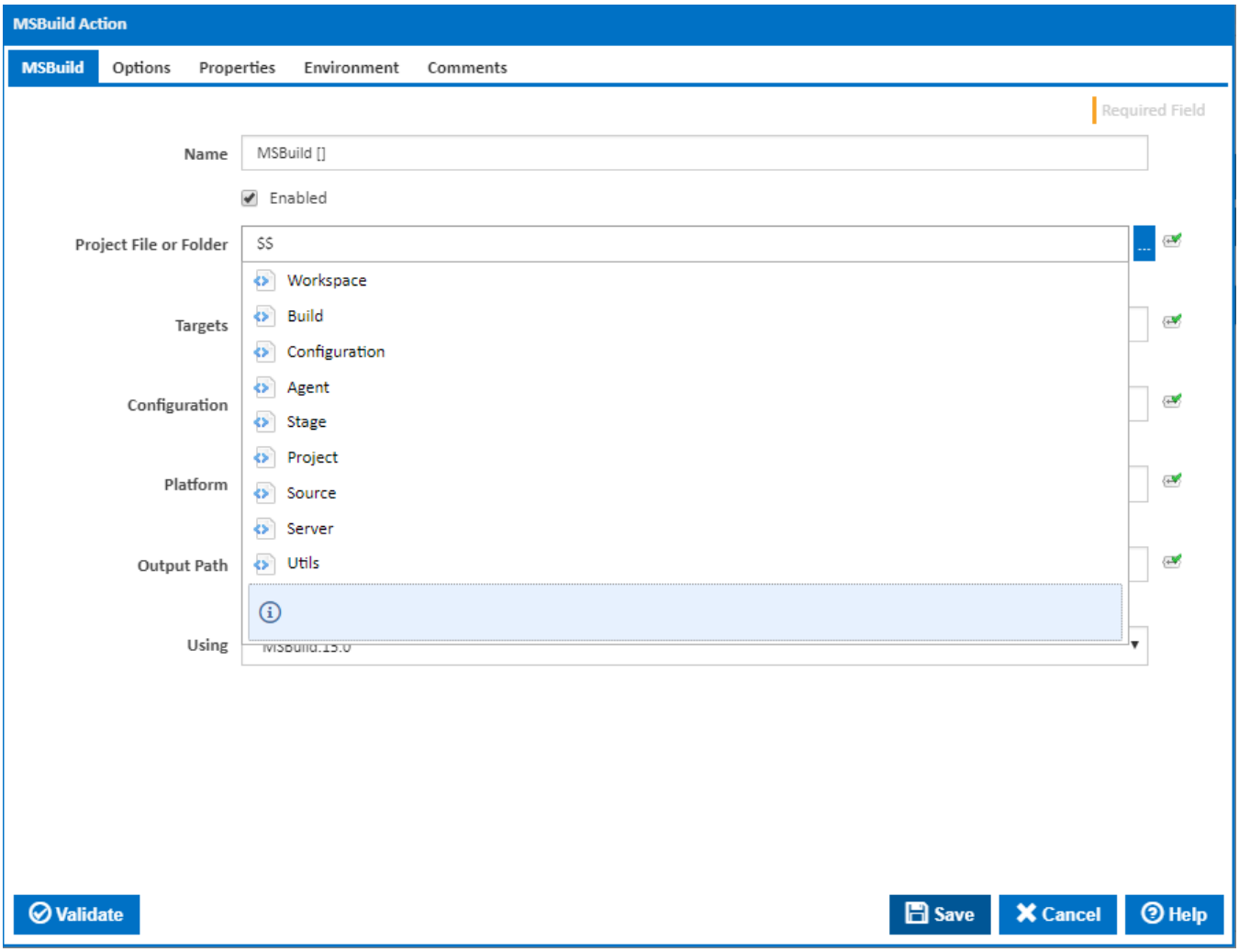
- **Variables and Object properties**: These items contain a single value and do not have any children. They are denoted with the icon and are the last selectable item in the drop down.
- **Objects**: Objects contain a list of properties and child objects which can be accessed by adding the '.' (full stop) character to the end of the Object name. Objects are denoted with the icon. If an object is referenced in an expression without specifying a child property then the object's default property will be used.
- **Variable Namespaces**: Namespaces can only be accessed when accessing variables and they are used to access variable values specific to a certain namespace (ie. Configuration, Project, etc.). For example, typing %Project.% will bring up a list of all Project variables. Namespaces are denoted with the icon.

Below are some examples of the expression drop down being used in the MSBuild action.

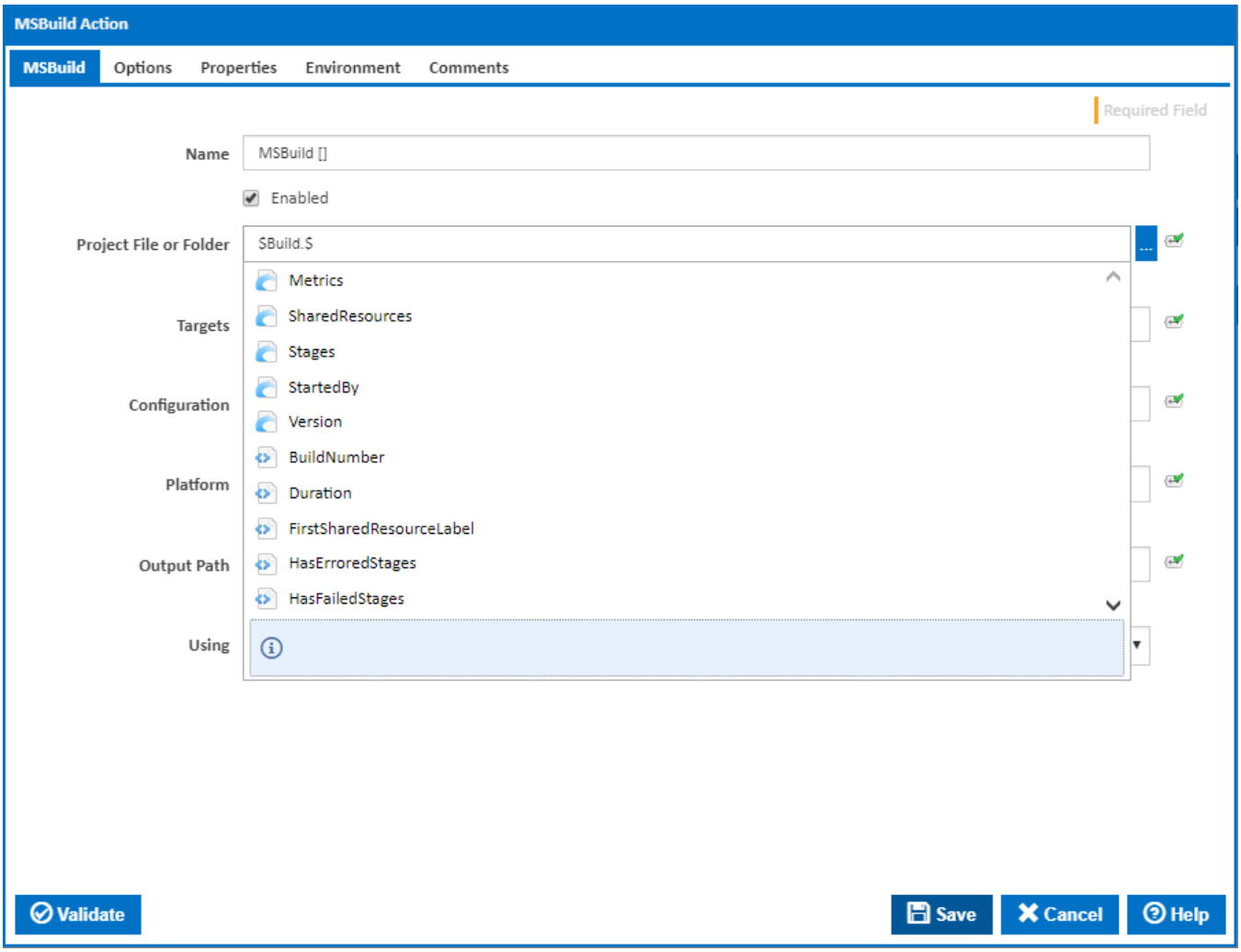
### Accessing Objects through Expressions

This screenshot demonstrates the objects and properties that are shown when you begin declaring an object by entering the '$' key. When the '$' key is first entered, the drop down will display all root objects that are available for the expression.

Note that child objects are denoted with the icon while properties use the icon.



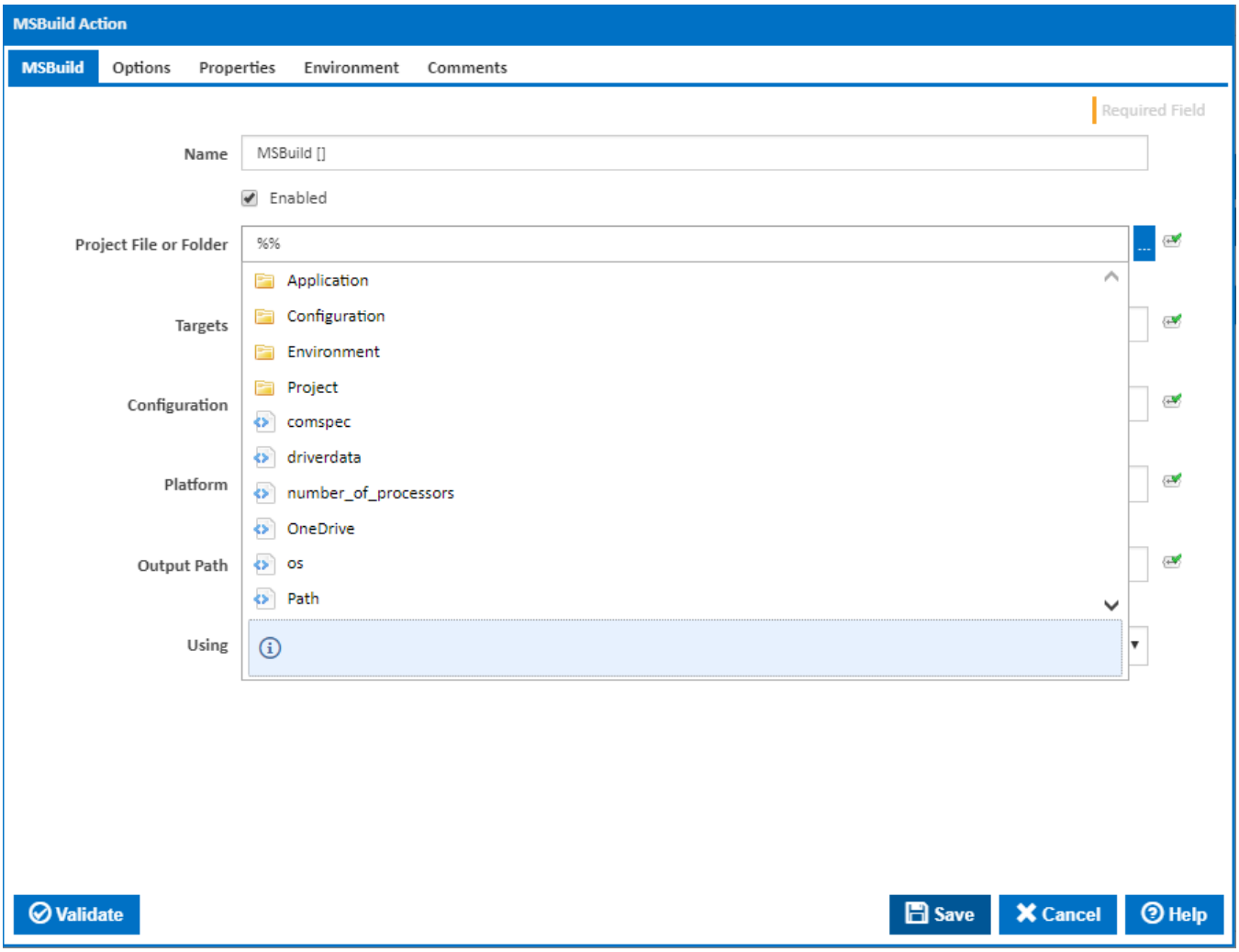

As stated above, if you select an object (ie. $Build.$), all the object's properties and sub-objects will be shown in the drop down.



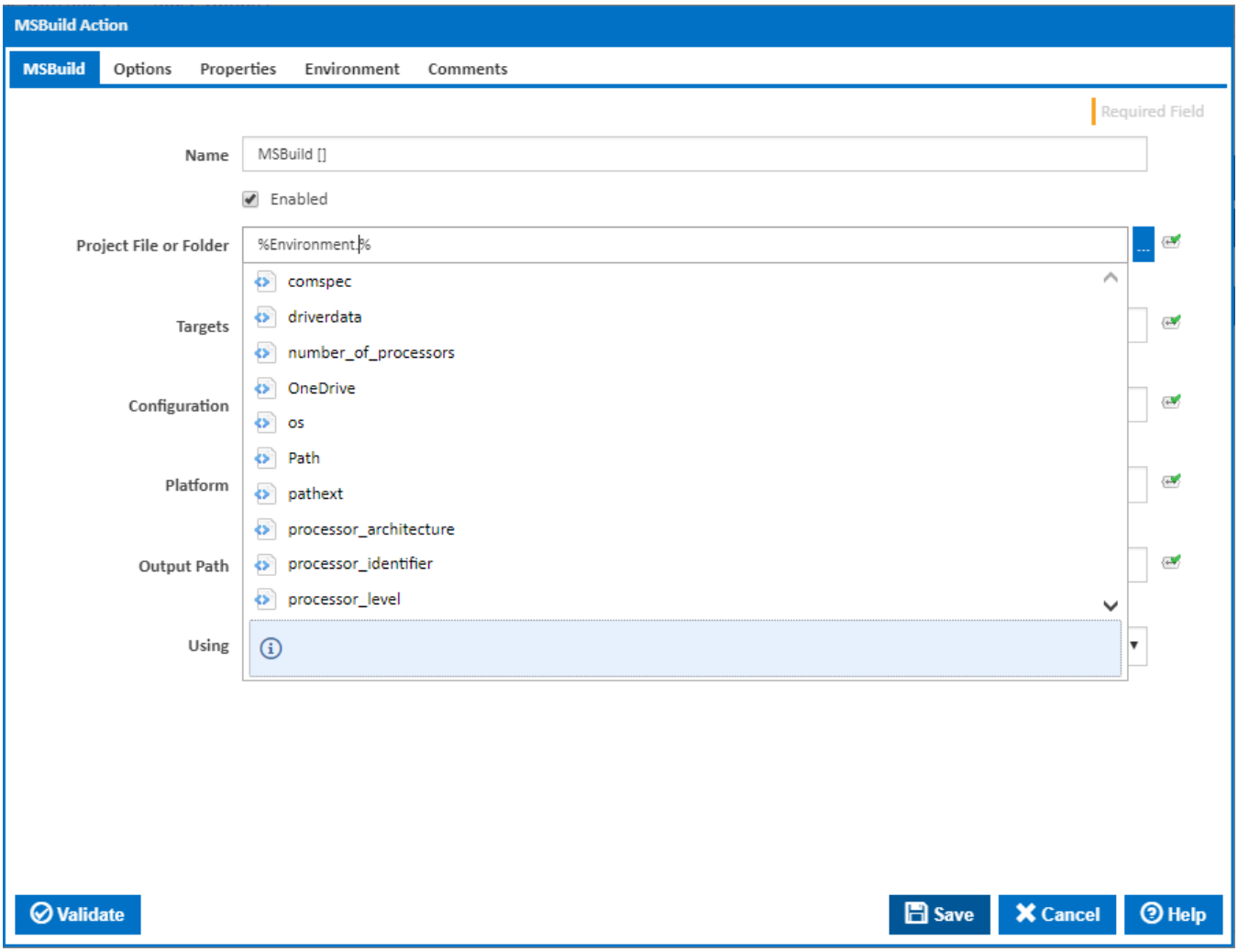

## Accessing Variables through Expressions

When you initially access variables, the root drop down will show all namespaces and every single variable that is available in all namespaces.

Note that namespaces are denoted with the icon while variables use the icon.




If you select a namespace then you will only see variables in that namespace.




## Drop Down Usage and Auto Complete Shortcut keys

The auto-complete drop down will only ever display a maximum of 10 items at a time. You can navigate through your list of elements by using the mouse wheel, the up and down arrows and the home and end keys.

Once the correct item is selected, pressing enter or tab will enter that value into the input field. Putting a '.' (full stop) at the end of the object name will display any children of that object.

Note that if the auto-complete drop down disappears, you can display it again by pressing ctrl + space.