

Sitecore Install Framework 2.2.0 Configuration Guide

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Sitecore Experience Platform 9.3.0

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1. Introduction

This document describes Sitecore Install Framework (SIF) for Sitecore 9.3.0.

This document contains the following chapters:

- **Chapter 1 – Introduction** An introduction to the Sitecore Install Framework.
- **Chapter 2 – Install the Module** Contains information about the steps necessary to install the Sitecore Install Framework module.
- **Chapter 3 – Customize Sitecore Install Framework** Contains information about extension points that allow you to customize SIF for your specific installation needs
- **Chapter 4 – Further guidance and troubleshooting** Contains information about assistance and common troubleshooting strategies.

1.1. Getting started

Sitecore Install Framework is a Microsoft® PowerShell module that supports local and remote installations of Sitecore, and it is fully extensible. You can install the entire Sitecore solution (XP), or the CMS-only mode (XM) solution.

This guide describes how to configure and customize the installation process of the Sitecore Experience Platform to suit your own needs.

1.1.1. How to use this guide

This guide describes how to configure your Sitecore installation with SIF, as well as cmdlets and extensibility points. There is also a chapter on further help and guidance.

This guide is intended to be a supplement all the Sitecore installation guides and to help you customize your installation. Refer to an installation guide for information about system requirements and other prerequisites, the general installation process, and the additional configuration tasks that are necessary after installing Sitecore Experience Platform.

You can download the Sitecore installation guides from the [Sitecore Downloads page](#).

2. Install the Sitecore Install Framework module

This chapter contains information about installing, updating, validating, and importing the Sitecore Install Framework module.

This chapter contains the following sections:

- [Install the Sitecore Install Framework Module](#)
- [Multiple Versions of Sitecore Install Framework](#)

2.1. Install the Sitecore Install Framework Module

You can install the SIF module directly through Microsoft PowerShell®, or you can perform a manual installation by downloading the Sitecore Install Framework module as a ZIP package.

2.1.1. Installation with Microsoft PowerShell

Sitecore Install Framework is made available through the [Sitecore Gallery](#). The Sitecore Gallery is a public MyGet feed where you can download PowerShell modules created by Sitecore.

To install Sitecore Install Framework with PowerShell:

1. To add the repository, in Windows, open Microsoft PowerShell® as an administrator and run the following cmdlet: `Register-PSRepository -Name SitecoreGallery -SourceLocation https://sitecore.myget.org/F/sc-powershell/api/v2`
2. When prompted to install the module, press Y, and then Enter.
3. To install the PowerShell module, run the following cmdlet: `Install-Module SitecoreInstallFramework`
4. When prompted to install the module, press Y, and then Enter.

Update the Sitecore Install Framework Module

As new features and bug fixes are periodically released, it is recommended that you update the Sitecore Install Framework.

NOTE

This procedure is optional.

- To update the Sitecore Install Framework module, run the following cmdlet: `Update-Module SitecoreInstallFramework`

2.1.2. Manual installation

Sitecore Install Framework is also provided as a ZIP package. You can download SIF from the Sitecore Downloads page – <https://dev.sitecore.net>. When you download the package, the ZIP package might be marked as *blocked* by Microsoft Windows. To continue the installation of SIF, you must first unblock the ZIP package.

Unblock a ZIP package

To unblock a ZIP package:

1. In Windows Explorer, navigate to the folder where you downloaded the packages, and right-click the relevant ZIP file.
2. Click **Properties**.
3. In the **Properties** dialog box, on the **General** tab, click **Unblock**.
4. Click **OK**.

Extract the Sitecore Install Framework

The installation path that you use depends on where you want to install Sitecore Install Framework. You can install it for all users (global path), for a specific user, or to a custom location.

Usage	Path
All users	C:\Program Files\WindowsPowerShell\Modules
Specific user	C:\Users\ <user>\documents\windowspowershell\modules< td=""> </user>\documents\windowspowershell\modules<>
Custom location	Any path

For example, if you want to make SIF available to all users, extract the `Sitecore Install Framework.ZIP` package to the following folder:

```
C:\Program Files\WindowsPowerShell\Modules\SitecoreInstallFramework
```

2.1.3. Validate the installation

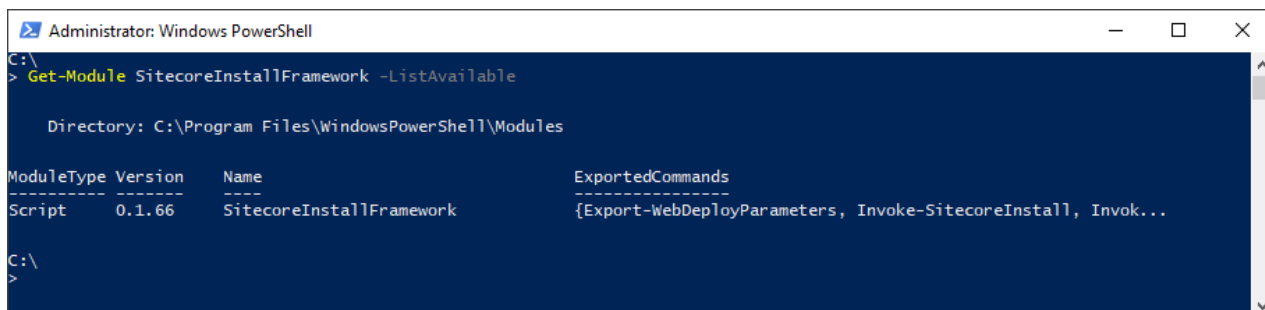
After you install SIF, you can validate the installation to confirm that it is available for use. This procedure is optional.

NOTE

This validation only works if you have installed SIF for *All users* (global).

To validate the installation, run the following cmdlet:

```
Get-Module SitecoreInstallFramework -ListAvailable
```



2.1.4. Import Sitecore Install Framework into a PowerShell session

If you added SIF to either an *All users* or *Specific user* path, you do not have to import it, as this is done automatically, and you can immediately use it in a session by running any cmdlet available in the PowerShell module.

However, if you have installed SIF to a custom location, run the following cmdlet.

```
Import-Module C:\<CustomLocation>\SitecoreInstallFramework
```

2.2. Multiple Versions of Sitecore Install Framework

If you want to install a 9.0.x version of Sitecore XP on the same computer as a Sitecore XP 9.3.0 installation, you must also have SIF 1.2.1 installed. PowerShell uses the latest available version of a module in a session by default. To install a specific version of SIF run the following command:

```
Install-Module -Name SitecoreInstallFramework -RequiredVersion x.x.x
```

Enter the appropriate value in the `RequiredVersion` parameter. The following table lists the versions of SIF that are compatible with Sitecore XP 9.0.0 and later:

Sitecore XP Version	Compatible SIF Version
9.0.x	1.2.1
9.1	2.0.0
9.1.1	2.1.0 or later
9.2	2.1.0 or later
9.3	2.2.0

2.2.1. Running a specific version of SIF

To run a specific version of SIF, launch a new Powershell session and run the following command:

```
Import-Module -Name SitecoreInstallFramework -Force -RequiredVersion x.x.x
```

You will use the specified version for the remainder of the session.

The next time you start a PowerShell session it will automatically use the latest available version.

3. Customize Sitecore Install Framework

Sitecore Install Framework enables you to customize the installation process by using a standard configuration design that you can extend by using custom PowerShell functions. The framework defines a configuration format that supports tasks, parameters, config functions, and variables. For example, you can configure a computer with one or more Sitecore instance, add services, or add custom applications.

All Sitecore Install Framework configurations are written as JSON (JavaScript Object Notation) files.

This chapter contains the following sections:

- [Create and customize configurations](#)
- [Create tasks](#)
- [Create config functions](#)
- [Invoking an installation](#)

3.1. Create and customize configurations

You can use tasks, parameters, config functions, and variables to customize your installation process. Custom tasks and config functions can also be packaged as a module, and be included in configurations.

You can base your customization on one of the configurations provided by Sitecore, or you can create your own configuration. This section describes the different components that you can use in a Sitecore Install Framework configuration.

3.1.1. Tasks

Tasks are actions that are conducted in sequence when the `Install-SitecoreConfiguration` cmdlet is called. A task is implemented as a PowerShell cmdlet.

Each task is identified by a unique name and must contain a `Type` property. A task can have parameters or a collection of parameters passed to it. Tasks map directly to PowerShell functions that are registered with `Register-SitecoreInstallExtension -Type Task`.

The following example shows a task of type `Copy` that you can use in a configuration to copy files from one location to another:

```
{
  "Tasks": {
    "CopyFiles" : {
      "Description": "Copies files to the specified location",
      "Type": "Copy",
      "Params": {
        "Source": "c:\files",
        "Destination": "c:\newfiles"
      }
    }
  }
}
```

```
}
}
```

Skipping tasks

A task can include a `Skip` property that refers to a parameter, variable, or config function. If the return value is true, the task is not executed.

```
{
  "Parameters" : {
    "Param1" : {
      "Type" : "String"
      "DefaultValue" : ""
    }
  },
  "Tasks" : {
    "Task1" : {
      "Type" : "Copy"
      "Params" : {
        "Source" : "C:\\Source",
        "Destination" : "C:\\Destination"
      }
      "Skip" : "[not(Parameter('Param1'))]"
    }
  }
}
```

NOTE

To ensure that your configuration is valid, each task must have a unique name. This means that the task can be directly executed, and the task can be identified in a log. It also enables the same type of task to be used multiple times in a configuration.

In this configuration, if `Param1` is set to any value, `Task1` is skipped.

Requires (prerequisites)

A task may include a `Requires` block that allows prerequisite checks to be performed prior to execution of the task. The prerequisite checks are performed after the `Skip` section. Prerequisites should take the form of Config Functions which return a Boolean. If the prerequisite check returns false then the Sitecore Install Framework will attempt to enter a nested shell within the current host. You will then have an opportunity to correct the problem, either from the prompt provided or externally.

Once you have corrected the problem enter `exit` to return to the Sitecore Install Framework. The prerequisite checks will be performed again. Alternatively the prerequisite can be skipped by entering the command `SkipRequire`. If the current host doesn't support a nested shell then the requirements will be skipped.

```
{
  "Variables": {
    "Requires.Success" : [TestPath(Path:'C:\\Windows')]
  },
  "Tasks": {
    "Task1": {
      "Type": "WriteOutput",
      "Params" : {
        "InputObject": "Simple Task, depends on a variable."
      },
      "Requires": "[variable('Requires.Success')]"
    }
  }
}
```



```

    },
    "Settings" : {
      "AutoRegisterExtensions" : True
    }
  }
}

```

In this configuration, `Task1` requires the output of the `Requires.Success` variable to check the presence of `C:\Windows` to be true.

3.1.2. Parameters

Parameters let users change values inside a configuration at runtime. Parameters must declare a type. They can also declare a default value and a description.

When you add a parameter to a configuration, it can be passed into a task using the `parameter` config function. The task then points to the value provided in the configuration or the value passed when `Install-SitecoreConfiguration` is called.

For example, to pass the `Source` and `Destination` parameters to the `CopyFiles` task:

```

{
  "Parameters": {
    "Source": { "Type": "string", "Description": "The source of files" },
    "Destination": { "Type": "string", "DefaultValue": "c:\newfiles" }
  },
  "Tasks": {
    "CopyFiles" : {
      "Type": "Copy",
      "Params": {
        "Source": "[parameter('Source')]",
        "Destination": "[parameter('Destination')]"
      }
    }
  }
}

```

On the one hand, the `Source` parameter does not contain a `DefaultValue` property, so it is required when `Install-SitecoreConfiguration` is called.

However, on the other hand, the `Destination` parameter does have a default value. If the user does not provide a value, the `DefaultValue` from the configuration is used.

The values at runtime are then passed to the `CopyFiles` task using the `parameter` config function.

To pass the values at the command line you must use the name of the parameter with the standard PowerShell parameter syntax. For example:

```
Install-SitecoreConfiguration -Path .\configuration.json -Source c:\sourcefiles
```

Parameters validation

Parameter values can be validated before any tasks are started. Validation logic can be specified for each parameters using config functions:

```

{
  "Parameters": {
    "Source": {
      "Type": "string",
      "DefaultValue": "c:\myfiles",
      "Validate": "[validateLength(4, 260, $_)]"
    }
  },
}

```

```
}
}
```

In this example the parameter source is validated using the `validateLength` config function, which ensures the value is between 4 and 260 characters long.

The `Validate` property accepts any config function that returns `bool`.

This is a list of the predefined functions that you can use for validation:

- `ValidateCount` - Validates that the parameter array length is within the specified range.
- `ValidateLength` - Validates that the parameter length falls within the range.
- `ValidateNotNull` - Verifies that the argument is not null.
- `ValidateNotNullOrEmpty` - Validates that the argument is not null and is not an empty string.
- `ValidatePattern` - Validates that the parameter matches the `RegexPattern`.
- `ValidateRange` - Validates that number parameter falls within the range specified by `Min` and `Max`.
- `ValidateSet` - Validates that the parameter is present in a specified set.

When `Install-SitecoreConfiguration` is called, all the parameters with validation logic are checked. If any validation fails, the installation command is aborted. You can bypass validation by calling `Install-SitecoreConfiguration` with the `-SkipValidation` option.

3.1.3. Config functions

Config functions allow elements of the configuration to be dynamic, and allow you to calculate values, invoke functions, and pass these values to tasks so that a configuration can be flexible.

A config function is written as a string enclosed in square brackets `[]`. It is identified by a name and can receive function parameters. For example: `[functionName (param1, param2, param3)]`.

Each function maps directly to a PowerShell function that is registered with the following cmdlet:

```
Register-SitecoreInstallExtension -Type ConfigFunction
```

Named parameters

You can reference the parameters of a config function directly to ensure that the correct values are passed to the expected parameter.

Named parameters are a comma separated list denoted by following the parameter name with a colon:

```
{
  "Variables": {
    "Variable1": "GetFunction (Number:1234, String:'Text', Switch:True)]"
  }
}
```

In this example `Variable1` calls the `GetFunction` function and passes it the named parameter `Number` with the value `1234`, the named parameter `string` with the value `'Text'` and the switch parameter `Switch` with the value `true`. This is the equivalent of typing `Get-Function -Number:1234 -String:"Text" -Switch:$True` in the command line.

Switch Parameters, if declared, must be set within the configuration to True or False.

Nested functions are also permitted and may refer to parameters, variables, or other config functions. For example:

```
[FunctionName1(functionName2(Switch1:'value1',Switch2:'value2'),Switch3:'value3')]
```

3.1.4. Variables

Variables are values that are calculated within the configuration itself. Unlike parameters, variables can use config functions to determine their value. Variables cannot be overridden at runtime; however, when they are being calculated, they can use the values from parameters and other variables.

In the following example, the `Destination` variable determines the destination path using the `environment` and `concat` config functions:

```
{
  "Parameters": {
    "Source": { "Type": "string", "Description": "The source of files" }
  },
  "Variables": {
    "Destination": "[concat(environment('SystemDrive'),'\\newfiles')]"
  },
  "Tasks": {
    "CopyFiles" : {
      "Type": "Copy",
      "Params": {
        "Source": "[parameter('Source')]",
        "Destination": "[variable('Destination')]"
      }
    }
  }
}
```

3.1.5. Modules

The Sitecore Install Framework (SIF) provides many tasks and config functions. You can load additional tasks and config functions by including them in a configuration.

If the module is available on [PSModulePath](#), you can load modules by name. Alternatively, you must load modules using an explicit path. Modules are loaded at the beginning of an installation.

If the additional features are packaged in a module on your computer, you can add them in the Modules section of a configuration to import them into the install session. For example:

- To load a module by name – "MyCustomModule"
- To load a module by explicit path – "C:\\extensions\\extensions.psm1"

```
{
  "Modules": [
    "MyCustomModule",
    "C:\\extensions\\extensions.psm1"
  ]
}
```

3.1.6. Uninstall tasks

Configurations can optionally contain an `UninstallTasks` section. This section takes the same form as the `Tasks` section. It should contain a list of tasks that will undo all the actions completed in the `Tasks` section.

Uninstall tasks are invoked either by passing the `-Uninstall` switch to `Install-SitecoreConfiguration` or by calling the `Uninstall-SitecoreConfiguration` alias. It is not necessary to include the `-Uninstall` switch if you call `Uninstall-SitecoreConfiguration`.

Uninstall tasks can be treated in the same way as normal tasks and support all the same functionality as tasks.

```
{
  "Parameters" :{
    "SolrService": {
      "Type": "string",
      "DefaultValue": "Solr-7.2.1",
      "Description": "The name of the Solr service."
    },
  },
  "UninstallTasks": {
    "RemoveSolrService": {
      "Type": "RemoveService",
      "Params": {
        "Name": "[parameter('SolrService')]"
      }
    },
  },
}
}
```

In this example, the `RemoveSolrService` uninstall task executes the `RemoveService` task and stops and removes the service specified in the `SolrService` parameter.

If you have referenced other configurations in the `Includes` section, the `Uninstall Tasks` for each of the included configurations are run, in reverse order, after the tasks in the first configuration.

3.1.7. Register

Each entry in the `Register` section allows you to expose PowerShell functions as Sitecore Install Framework Tasks or `ConfigFunctions` within the config file for use in the `Variables` or `Tasks` sections. They are registered automatically with the `Register-SitecoreInstallExtension` command.

The section takes the format:

```
{
  "Register": {
    "Tasks" : {
      "NewSMBShare" : "New-SMBShare",
      "Sleep": "Start-Sleep"
    },
    "ConfigFunction": {
      "GetRandom" : "Get-Random"
    }
  }
}
```

This configuration registers the `New-SMBShare` cmdlet as a task with the name `NewSMBShare` and registers `Start-Sleep` as a task with the name `Sleep`. The `Get-Random` cmdlet is registered as a `Config Function` with the name `GetRandom`.

As with extending the Sitecore Install Framework, the `Tasks` section of `Register` is for functions that don't return anything and the `ConfigFunctions` section is for functions that return a value.

3.1.8. Automatic registration of extensions

Configuration files can optionally declare the `AutoRegisterExtensions` setting that allows dynamic registration of `Tasks` and `ConfigFunctions`. The default value is `false`.

Any PowerShell cmdlet can be referenced in a config file using a de-hyphenated version of its name.

```
{
  "Tasks": {
    "RandomSleep": {
      "Type": "StartSleep",
      "Params": {
        "Seconds": "[GetRandom(10)]"
      }
    }
  },
  "Settings" : {
    "AutoRegisterExtensions" : true
  }
}
```

In this configuration, the `RandomSleep` task automatically registers and executes `Start-Sleep` as a task and automatically registers and executes `Get-Random` as a `ConfigFunction`. It is the equivalent of running `Start-Sleep -Seconds (Get-Random 10)` on the command line.

If two or more cmdlets match, the cmdlets are listed and an error is thrown.

3.1.9. Includes

Configurations may refer to other configuration files to allow reuse of elements and reduce repetition in different configurations.

For example, the following config is a pseudo config which will configure a site. This is saved as `CreateSite.json`:

```
{
  "Parameters": {
    "Destination": {
      "Type": "string"
    },
    "SourcePackage": {
      "Type": "string"
    },
    "SiteName": {
      "Type": "string"
    }
  },
  "Tasks": {
    "CreateSite": {
      "Type": "CreateSite",
      "Params": {
        "SiteName": "[parameter('SiteName')]",
        "Path": "[parameter('Destination')]"
      }
    },
    "InstallPackage": {
      "Type": "CreateSite",
      "Params": {
        "Source": "[parameter('SourcePackage')]",
        "Path": "[parameter('Destination')]"
      }
    }
  }
}
```

```

    }
  }
}

```

Another config can be created which includes the previous example:

```

{
  "Includes": {
    "CreateSite": {
      "Source": ".\\CreateSite.json"
    }
  }
}

```

You can override elements of the included config by using the namespace it was imported as (in this case 'CreateSite'):

```

{
  "Parameters": {
    "CreateSite:Destination": {
      "Type": "string",
      "DefaultValue": "C:\\inetpub"
    }
  },
  "Includes": {
    "CreateSite": {
      "Source": ".\\CreateSite.json"
    }
  }
}

```

This example overrides the default value for the destination parameter imported by the `CreateSite` config. A similar syntax is used to override `Variables` and `Tasks`.

We can also include the same config multiple times, as the name will be used to namespace each feature:

```

{
  "Parameters": {
    "CreateSite:Destination": {
      "Type": "string",
      "DefaultValue": "C:\\inetpub"
    },
    "CreateBackupSite:Destination": {
      "Type": "string",
      "DefaultValue": "C:\\inetpubbackup"
    }
  },
  "Includes": {
    "CreateSite": {
      "Source": ".\\CreateSite.json"
    },
    "CreateBackupSite": {
      "Source": ".\\CreateSite.json"
    }
  }
}

```

3.1.10. Settings

Settings let you configure the default requirements of the installation process. Some settings can also be overridden at runtime for the user by passing them as parameters to the `Install-SitecoreConfiguration` cmdlet.

For example:

```
Install-SitecoreConfiguration -WarningAction Stop -InformationAction SilentlyContinue
```

The values in the settings are applied from lowest to highest in the following order:

- Default value – Contained in code.
- Configuration – Set in the configuration file.
- Command line – Passed at the command line.

Name	Default Value	Allowed Values	Command Line	Description
WarningAction	Continue	Continue Ignore Inquire SilentlyContinue Stop Suspend	Yes	The action to take when a warning occurs.
ErrorAction	Stop	Continue Ignore Inquire SilentlyContinue Stop Suspend	Yes	The action to take when an error occurs.
InformationAction	Continue	Continue Ignore Inquire SilentlyContinue Stop Suspend	Yes	The action to take when information is logged.
AutoRegisterExtensios	False	True False	No	Enables Dynamic registration of Tasks and Config Functions.

Settings within configuration files can be declared as:

```
{
  "Settings": {
    "AutoRegisterExtensions": true,
    "InformationAction": "SilentlyContinue"
  }
}
```

This configuration enables the `AutoRegisterExtensions` feature and sets the `InformationAction` preference to `SilentlyContinue`.

3.2. Create tasks

Tasks are PowerShell functions that you can invoke from within a Sitecore Install Framework configuration. When you invoke a configuration, each task performs an action. Because a task is implemented as a PowerShell function, it benefits from all the features that PowerShell offers.

3.2.1. The `CmdletBinding` Attribute

When you create a task, you must use the `CmdletBinding` attribute. This provides support for common PowerShell parameters, for example, those that control error handling.

It is best practice to use the `SupportsShouldProcess` parameter so that users can test the actions that the task takes, without applying them. The following example shows the use of the `CmdletBinding` attribute in the `Invoke-UnpackTask` cmdlet:

```
Function Invoke-UnpackTask {
    [CmdletBinding(SupportsShouldProcess=$true)]
    param(
        # Parameters
    )
    # function code
}
```

For more information about the `CmdletBinding` attribute, see [About Functions CmdletBindingAttribute](#) in the Microsoft PowerShell documentation.

3.2.2. Task parameters

Task parameters are declared as normal PowerShell parameters. You can use validation and types to restrict the values that can be passed to the cmdlet. This includes marking parameters as mandatory, and support for multiple parameter sets.

When a task is called from a configuration, the `Params` property is mapped to the parameters declared in the PowerShell function. For example, the `Invoke-CopyTask` cmdlet declares the following parameters:

```
Function Invoke-CopyTask {
    [CmdletBinding(SupportsShouldProcess=$true)]
    param(
        [Parameter(Mandatory=$true)]
        [ValidateScript({ Test-Path $_ })]
        [string]$Source,
        [Parameter(Mandatory=$true)]
        [ValidateScript({ Test-Path $_ -IsValid })]
        [string]$Destination
    )
    # function code
}
```

- The `Source` parameter is mandatory and checks that the given value is a string that points to a path that exists.

- The Destination parameter is also mandatory and checks that the given value is a string that is a valid file path.

The following is an example of how to declare the Copy task in a configuration where only the mandatory parameters are used:

```
{
  "Tasks": {
    "CopySomeFiles": {
      "Type": "Copy",
      "Params": {
        "Source": "c:\somefile\example.txt",
        "Destination": "c:\copied\"
      }
    }
  }
}
```

3.2.3. Return values from task

Tasks do not need return values. When invoked through a configuration, values returned from a task are not captured or processed directly. However, any value that you return from a task is shown in the install logs.

3.2.4. Write to the logs

Previous versions of SIF used the `Write-TaskInfo` function to log information. This function has been deprecated and will be removed in a future version. Use the `Write-Information` function instead.

```
Write-Information -MessageData task "[Info] Updated"
```

Silent output

Silent output can be achieved by re-directing all the streams to `$null`.

```
Install-SitecoreConfiguration -Path MyConfig.json *> $null
```

Creating a log file

In version 1.x, every time you used the built-in PowerShell transcript features to invoke `Install-SitecoreConfiguration`, a log file was automatically created.

This feature has been removed due to issues with different hosts and with the information that was logged to a log file. To create a log file for an install we suggest the following syntax:

```
c:\> Install-SitecoreConfiguration <parameters> *>&1 | Tee-Object <logfile>
```

`*>&1` merges every stream - information, warning, and so on into the output stream.

`| Tee-Object <logfile>` outputs the stream to the console and a log file.

3.2.5. Include tasks in a configuration

Once a task has been written, it must be registered with SIF. Tasks can be included in a configuration by packaging them as a PowerShell module and adding them to the Modules section of a configuration, by directly registering them within a configuration, or enabling the `autoregisterextensions` function.

By using the `Register-SitecoreInstallExtension` cmdlet, the task is made available for use in configurations. For example, to register the `Copy-CustomItems` cmdlet as the `CustomCopy` task, use the following cmdlet:

```
Register-SitecoreInstallExtension -Command Copy-CustomItems -As CustomCopy -Type Task
```

NOTE

You can replace an existing registered task by using the `-Force` parameter. The following custom cmdlet replaces the default copy task: `Register-SitecoreInstallExtension -Command Copy-CustomItems -As Copy -Type Task -Force`.

3.3. Create config functions

Config functions are PowerShell functions that you can invoke from within a Sitecore Install Framework configuration to access and calculate values that can be passed to a task.

Because a config function is implemented as a PowerShell function, it benefits from all the features that PowerShell offers. This includes parameter validation, strict mode, requires, and others.

Config functions must always return a value, and this value can be used by other config functions or by tasks within a configuration.

3.3.1. Config function parameters

Config function parameters are declared as normal PowerShell parameters. You can use validation and types to restrict the values that can be passed. This includes marking parameters as mandatory and support for multiple parameter sets.

When a config function is called from a configuration, the parameters are applied in the order that they are declared. If you want them to be applied in a different order, use the [Position argument](#) to specify this.

The `Invoke-JoinConfigFunction` function declares the following parameters:

```
Function Invoke-JoinConfigFunction {
    param(
        [Parameter(Mandatory=$true)]
        [psobject[]]$Values = @(),
        [Parameter(Mandatory=$false)]
        [string]$Delimiter = ","
    )

    # function code
}
```

In a configuration, this can be used as follows:

```
{
    "Parameters": {
        "Values": { "Type": "string[]", "DefaultValue": [ 1,2,3,4,5 ]
    },
}
```

```
"Variables": {
  "Joined": "[join(parameter('Values'), '-')]"
}
```

When the joined variable is evaluated, it results in a value of: 1-2-3-4-5.

3.3.2. Include config functions in a configuration

Once a config function has been written, it must be registered with SIF. Config functions can be included in a configuration by packaging them as a PowerShell module and adding them to the Modules section of a configuration.

By using the `Register-SitecoreInstallExtension` cmdlet, the config function is made available for use in configurations. For example the `Get-CustomJoin` cmdlet can be registered as the `CustomJoin` config function using the following cmdlet:

```
Register-SitecoreInstallExtension
-Command Get-CustomJoin -As CustomJoin -Type ConfigFunction
```

NOTE

You can also replace an existing registered config function by using the `-Force` parameter. The following replaces the default join config function with a custom cmdlet:

```
Register-SitecoreInstallExtension -Command Get-CustomJoin -As Join -Type
ConfigFunction -Force
```

3.4. Invoking an installation

To start a Sitecore installation the following syntax is used.

```
Install-SitecoreConfiguration [-Path] <String> [[-Tasks] <String[]>] [[-From] <String>] [[-To]
<String>]
[[-Skip] <String[]>] [[-WorkingDirectory] <String>] [-WhatIf] [-Confirm] [<CommonParameters>]
```

This will begin a Sitecore installation using the given configuration loaded from a path.

The working directory is set as follows:

- If provided, the working directory is set to the given path.
- The current directory is used.

One or more tasks can also be passed to enable the execution of only a selection of tasks from the full configuration. If no tasks are passed (or an empty list is provided) all the tasks are executed. Execution of tasks can be further isolated by providing the 'From' and 'To' parameters. This executes an inclusive subset of tasks.

Parameters contained in the configuration file can also be overridden at the command line.

3.4.1. Examples

Examples based on JSON configuration files.

Example 1

```
PS C:\> Install-SitecoreConfiguration -Path .\MyConfig.json
```

Starts an installation based on a JSON configuration file.

Example 2

```
PS C:\> Install-SitecoreConfiguration -Path .\MyConfig.json -Tasks Alpha,Beta,Epsilon
```

Starts an installation based on a JSON configuration file and executes only the named tasks.

Example 3

```
PS C:\> Install-SitecoreConfiguration -Path .\MyConfig.json -Skip Alpha,Beta
```

Starts an installation based on a JSON configuration file and executes all the tasks except the named tasks.

Example 4

```
PS C:\> Install-SitecoreConfiguration -Path .\MyConfig.json -From Beta
```

Starts an installation based on a JSON configuration file and executes from the specified task.

Example 5

```
PS C:\> Install-SitecoreConfiguration -Path .\MyConfig.json -From Alpha -To Beta
```

Starts an installation based on a JSON configuration file and executes from the task named Alpha to the task named Beta.

Example 6

```
PS C:\> Install-SitecoreConfiguration -Path .\MyConfig.json -SiteName 'MySite'
```

Starts an installation based on a JSON configuration file, overriding the value for the SiteName parameter contained in that file.

Example 7

```
PS C:\> Install-SitecoreConfiguration -Path .\MyConfig.json -SkipValidation
```

Starts an installation based on a JSON configuration file and skips parameter validation.

4. Further guidance and troubleshooting

Sitecore Install Framework contains embedded documentation about tasks and configuration functions that you can access directly from the PowerShell command line.

This chapter contains the following section:

- [Further usage and help](#)
- [Troubleshooting](#)

4.1. Further usage and help

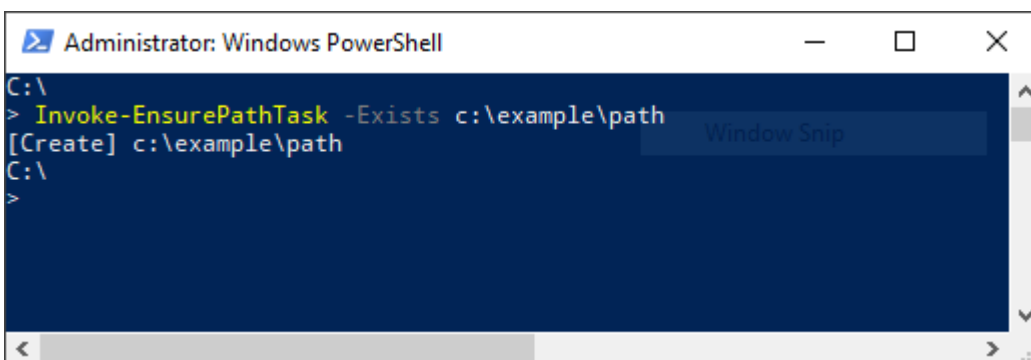
This section contains the following additional information that might be useful when you are using Sitecore Install Framework:

- [Run tasks and config functions directly](#)
- [Execution policies](#)
- [Get help about Sitecore Install Framework](#)

4.1.1. Run tasks and config functions directly

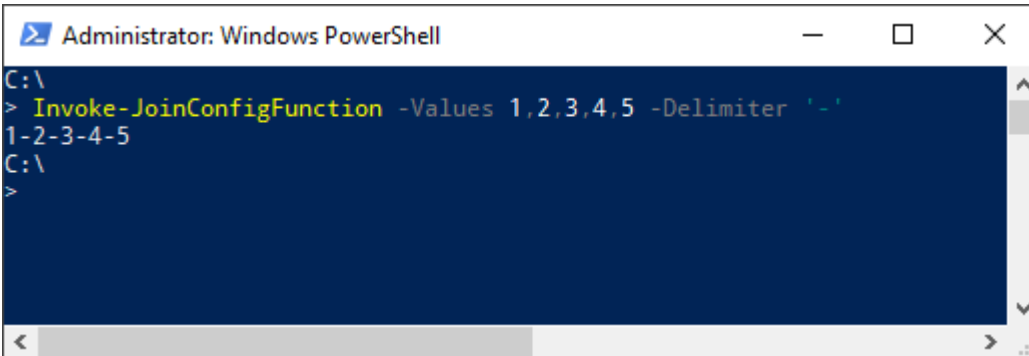
Both tasks and config functions are implemented as PowerShell cmdlets. When SIF has been installed, you can directly invoke the cmdlets using standard PowerShell syntax.

Running tasks or config functions directly allows you to test the results at the command line. You can also integrate the commands into your own PowerShell scripts. For example, you can directly invoke the `EnsurePath` task by using its full PowerShell syntax:



```
Administrator: Windows PowerShell
C:\
> Invoke-EnsurePathTask -Exists c:\example\path
[Create] c:\example\path
C:\
>
```

Similarly, you can directly invoke the `Join` config function by using its full PowerShell syntax:



```
Administrator: Windows PowerShell
C:\> Invoke-JoinConfigFunction -Values 1,2,3,4,5 -Delimiter '-'
1-2-3-4-5
C:\>
```

4.1.2. Execution policies

The execution policies in PowerShell let you restrict the conditions in which scripts and modules are loaded.

You can set policies for the computer, the user, or for the current session. You can also apply them by using a Group Policy. Sitecore Install Framework is digitally signed. This means that the module can be imported and executed in a PowerShell session running under any execution policy, except **Restricted**.

For more information about PowerShell Execution Policies, see the following [link](#).

4.1.3. Get help about Sitecore Install Framework

Sitecore Install Framework contains information about each task and config function, and there is also documentation about the general use of the framework:

`about_SitecoreInstallFramework`: contains general information about the framework.

`about_SitecoreInstallFramework_Extending`: contains information about extension points that let you customize the framework for your specific installation needs.

`about_SitecoreInstallFramework_Configurations`: contains examples of how to use tasks, scripts, and modules if you extend the framework.

There are three ways to view the help documentation:

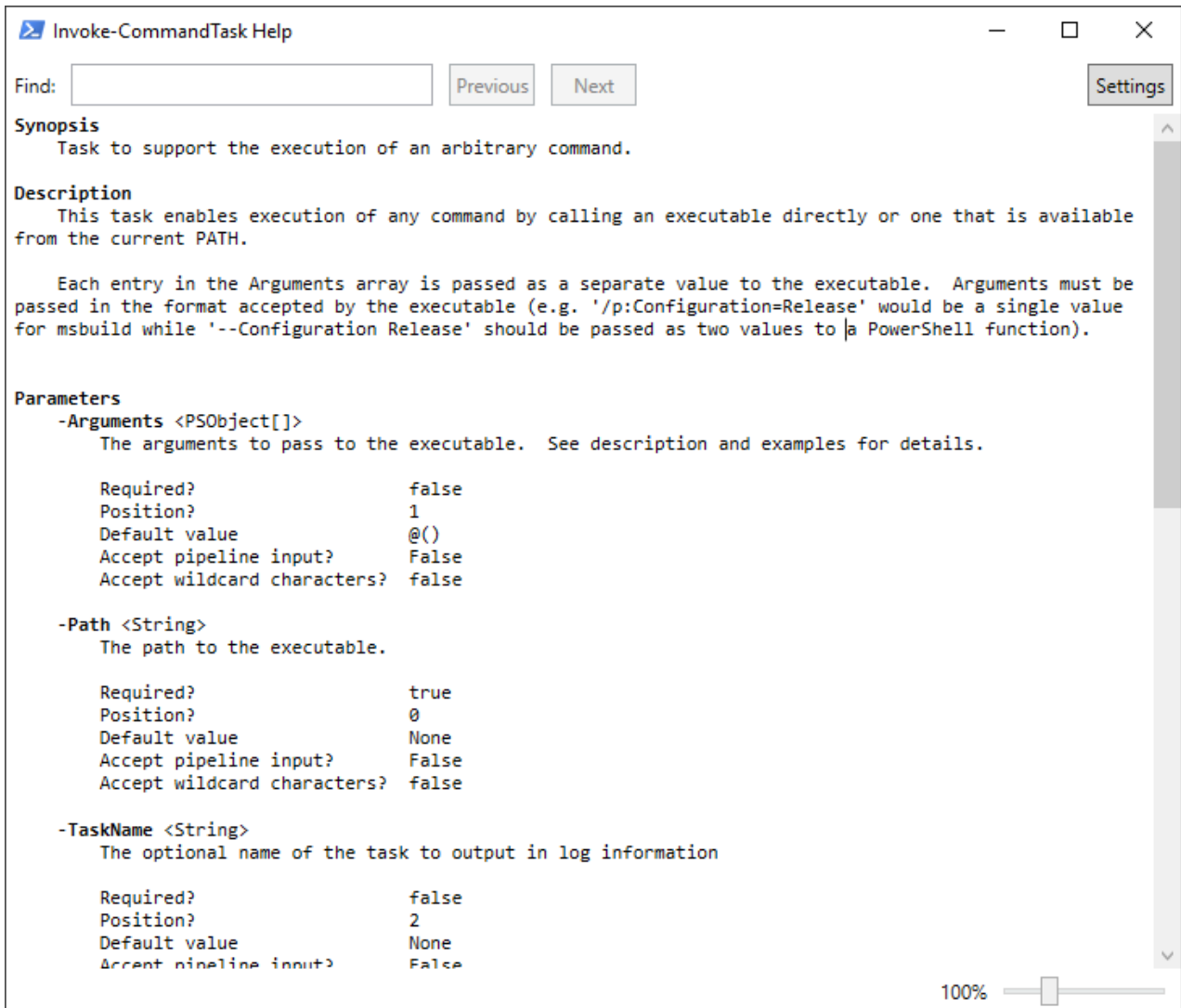
- In the PowerShell window.
- With a markdown reader.
- As HTML pages.

In addition to the help for individual tasks and functions, it is also possible to get a list of all available tasks or config functions using the `Get-Command` cmdlet.

View help in the PowerShell window

The PowerShell module has embedded help documentation. To access the help for a specific PowerShell command or function, enter the `Get-Help` cmdlet. The returned help is displayed in the command line.

If you want to open the help in a separate window, add the `ShowWindow` parameter to the `Get-Help` command. For example: `Get-Help Invoke-CommandTask -ShowWindow`



View help with a markdown reader

When you unpack Sitecore Install Framework, it contains a folder of markdown documentation that you can read with any text editor or markdown reader.

To read the documentation, in the Windows Explorer, navigate to the `SitecoreInstallFramework\docs` folder and use a text editor or markdown reader to open the relevant topic.

The following image shows a subset of the topics that are available:

about_SitecoreInstallFramework.md	20/06/2017 13:33	Markdown Source...
about_SitecoreInstallFramework_Configu...	20/06/2017 13:33	Markdown Source...
about_SitecoreInstallFramework_Extendi...	20/06/2017 13:33	Markdown Source...
Export-WebDeployParameters.md	20/06/2017 13:33	Markdown Source...
Invoke-AddXmlTask.md	20/06/2017 13:33	Markdown Source...
Invoke-AppPoolTask.md	20/06/2017 13:33	Markdown Source...
Invoke-CommandTask.md	20/06/2017 13:33	Markdown Source...
Invoke-ConcatConfigFunction.md	20/06/2017 13:33	Markdown Source...
Invoke-CopyTask.md	20/06/2017 13:33	Markdown Source...
Invoke-CreateServiceTask.md	20/06/2017 13:33	Markdown Source...
Invoke-DownloadFileTask.md	20/06/2017 13:33	Markdown Source...
Invoke-EnsurePathTask.md	20/06/2017 13:33	Markdown Source...
Invoke-EnvironmentConfigFunction.md	20/06/2017 13:33	Markdown Source...
Invoke-FilePermissionsTask.md	20/06/2017 13:33	Markdown Source...

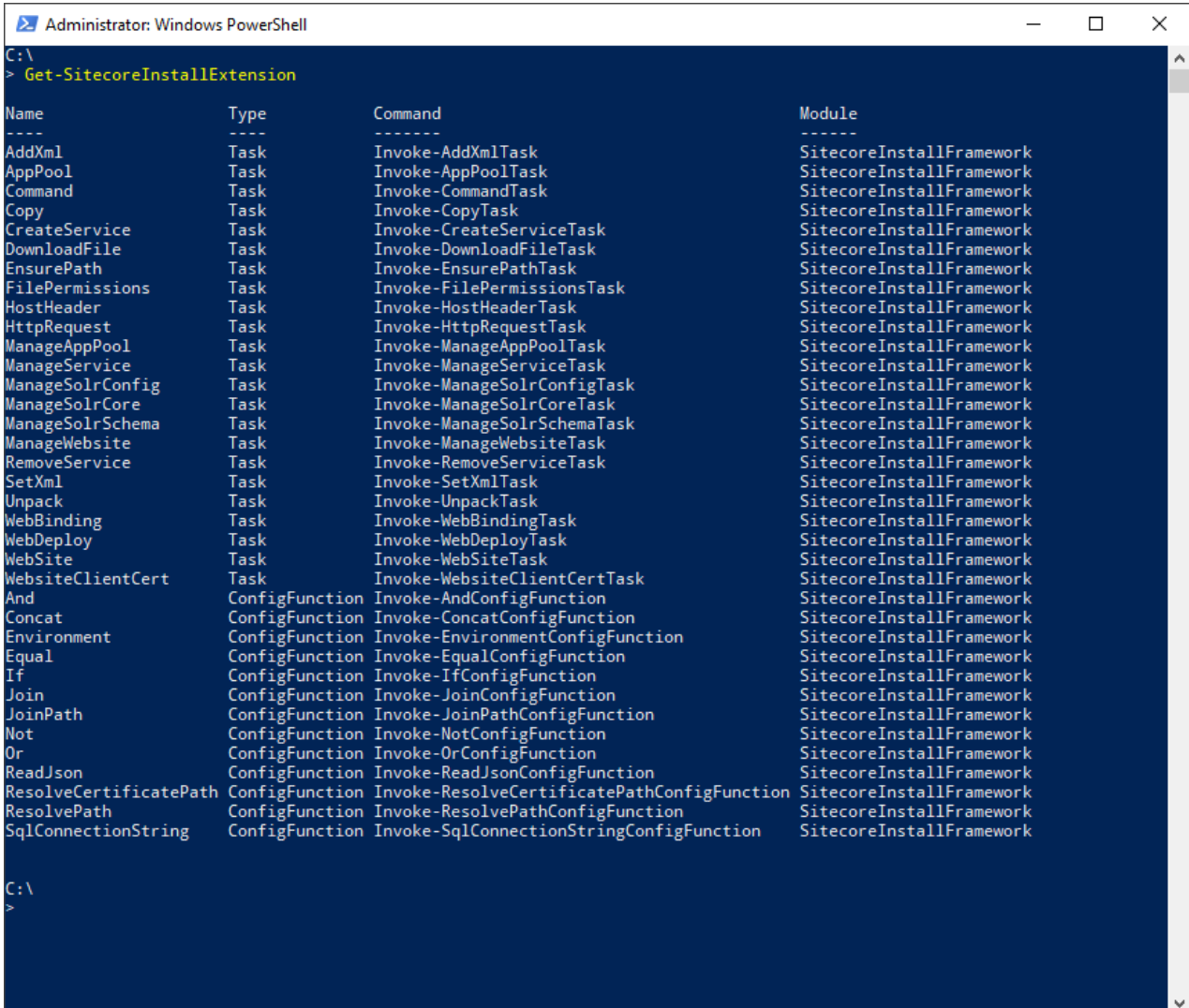
View help as HTML pages

Sitecore Install Framework contains a folder of HTML pages that you can read with any browser. To read the documentation:

1. In Windows Explorer, navigate to the `SitecoreInstallFramework\docs\html` folder.
2. To open it in the default browser window, double-click the relevant topic.

Get a list of the available tasks and config functions

To see the tasks and config functions that are available, run the `Get-SitecoreInstallExtension` cmdlet.



```

Administrator: Windows PowerShell
C:\
> Get-SitecoreInstallExtension

Name                Type                Command                Module
----                -
AddXml              Task                Invoke-AddXmlTask      SitecoreInstallFramework
AppPool             Task                Invoke-AppPoolTask     SitecoreInstallFramework
Command            Task                Invoke-CommandTask     SitecoreInstallFramework
Copy               Task                Invoke-CopyTask        SitecoreInstallFramework
CreateService      Task                Invoke-CreateServiceTask SitecoreInstallFramework
DownloadFile       Task                Invoke-DownloadFileTask SitecoreInstallFramework
EnsurePath         Task                Invoke-EnsurePathTask  SitecoreInstallFramework
FilePermissions    Task                Invoke-FilePermissionsTask SitecoreInstallFramework
HostHeader         Task                Invoke-HostHeaderTask  SitecoreInstallFramework
HttpRequest        Task                Invoke-HttpRequestTask SitecoreInstallFramework
ManageAppPool      Task                Invoke-ManageAppPoolTask SitecoreInstallFramework
ManageService      Task                Invoke-ManageServiceTask SitecoreInstallFramework
ManageSolrConfig   Task                Invoke-ManageSolrConfigTask SitecoreInstallFramework
ManageSolrCore     Task                Invoke-ManageSolrCoreTask SitecoreInstallFramework
ManageSolrSchema   Task                Invoke-ManageSolrSchemaTask SitecoreInstallFramework
ManageWebsite      Task                Invoke-ManageWebsiteTask SitecoreInstallFramework
RemoveService      Task                Invoke-RemoveServiceTask SitecoreInstallFramework
SetXml             Task                Invoke-SetXmlTask      SitecoreInstallFramework
Unpack             Task                Invoke-UnpackTask      SitecoreInstallFramework
WebBinding         Task                Invoke-WebBindingTask  SitecoreInstallFramework
WebDeploy          Task                Invoke-WebDeployTask   SitecoreInstallFramework
Website            Task                Invoke-WebsiteTask     SitecoreInstallFramework
WebsiteClientCert Task                Invoke-WebsiteClientCertTask SitecoreInstallFramework
And                ConfigFunction      Invoke-AndConfigFunction SitecoreInstallFramework
Concat             ConfigFunction      Invoke-ConcatConfigFunction SitecoreInstallFramework
Environment        ConfigFunction      Invoke-EnvironmentConfigFunction SitecoreInstallFramework
Equal             ConfigFunction      Invoke-EqualConfigFunction SitecoreInstallFramework
If                ConfigFunction      Invoke-IfConfigFunction SitecoreInstallFramework
Join              ConfigFunction      Invoke-JoinConfigFunction SitecoreInstallFramework
JoinPath          ConfigFunction      Invoke-JoinPathConfigFunction SitecoreInstallFramework
Not               ConfigFunction      Invoke-NotConfigFunction SitecoreInstallFramework
Or                ConfigFunction      Invoke-OrConfigFunction SitecoreInstallFramework
ReadJson          ConfigFunction      Invoke-ReadJsonConfigFunction SitecoreInstallFramework
ResolveCertificatePath ConfigFunction      Invoke-ResolveCertificatePathConfigFunction SitecoreInstallFramework
ResolvePath       ConfigFunction      Invoke-ResolvePathConfigFunction SitecoreInstallFramework
SqlConnectionString ConfigFunction      Invoke-SqlConnectionStringConfigFunction SitecoreInstallFramework

C:\
>

```

You can filter the list by passing a value to the `Type` parameters. The following command only returns the tasks:

```
Get-SitecoreInstallExtension -Type Task
```

To return the tasks and config functions that are available when a particular configuration is run, you must pass the path to the configuration file to the `Path` parameter.

For example,

```
Get-SitecoreInstallExtension -Path c:\configuration.json
```

displays the default tasks and config functions, as well as the extra registrations brought in by the configuration.

```

Administrator: Windows PowerShell
C:\
> Get-SitecoreInstallExtension -Path C:\configuration.json
Importing Module => c:\extensions.psm1

Name                Type                Command              Module
----                -
AddXml              Task                Invoke-AddXmlTask    SitecoreInstallFramework
AppPool             Task                Invoke-AppPoolTask   SitecoreInstallFramework
Command            Task                Invoke-CommandTask   SitecoreInstallFramework
Copy               Task                Invoke-CopyTask       SitecoreInstallFramework
CreateService      Task                Invoke-CreateServiceTask SitecoreInstallFramework
DownloadFile       Task                Invoke-DownloadFileTask SitecoreInstallFramework
EnsurePath         Task                Invoke-EnsurePathTask SitecoreInstallFramework
FilePermissions    Task                Invoke-FilePermissionsTask SitecoreInstallFramework
HostHeader         Task                Invoke-HostHeaderTask SitecoreInstallFramework
HttpRequest        Task                Invoke-HttpRequestTask SitecoreInstallFramework
ManageAppPool     Task                Invoke-ManageAppPoolTask SitecoreInstallFramework
ManageService     Task                Invoke-ManageServiceTask SitecoreInstallFramework
ManageSolrConfig  Task                Invoke-ManageSolrConfigTask SitecoreInstallFramework
ManageSolrCore    Task                Invoke-ManageSolrCoreTask SitecoreInstallFramework
ManageSolrSchema  Task                Invoke-ManageSolrSchemaTask SitecoreInstallFramework
ManageWebsite     Task                Invoke-ManageWebsiteTask SitecoreInstallFramework
RemoveService     Task                Invoke-RemoveServiceTask SitecoreInstallFramework
SetXml            Task                Invoke-SetXmlTask     SitecoreInstallFramework
Unpack            Task                Invoke-UnpackTask     SitecoreInstallFramework
WebBinding        Task                Invoke-WebBindingTask SitecoreInstallFramework
WebDeploy         Task                Invoke-WebDeployTask  SitecoreInstallFramework
WebSite           Task                Invoke-WebSiteTask    SitecoreInstallFramework
WebsiteClientCert Task                Invoke-WebsiteClientCertTask SitecoreInstallFramework
And               ConfigFunction      Invoke-AndConfigFunction SitecoreInstallFramework
Concat            ConfigFunction      Invoke-ConcatConfigFunction SitecoreInstallFramework
Environment        ConfigFunction      Invoke-EnvironmentConfigFunction SitecoreInstallFramework
Equal             ConfigFunction      Invoke-EqualConfigFunction SitecoreInstallFramework
If                ConfigFunction      Invoke-IfConfigFunction SitecoreInstallFramework
Join              ConfigFunction      Invoke-JoinConfigFunction SitecoreInstallFramework
JoinPath          ConfigFunction      Invoke-JoinPathConfigFunction SitecoreInstallFramework
Not               ConfigFunction      Invoke-NotConfigFunction SitecoreInstallFramework
Or                ConfigFunction      Invoke-OrConfigFunction SitecoreInstallFramework
ReadJson          ConfigFunction      Invoke-ReadJsonConfigFunction SitecoreInstallFramework
ResolveCertificatePath ConfigFunction      Invoke-ResolveCertificatePathConfigFunction SitecoreInstallFramework
ResolvePath       ConfigFunction      Invoke-ResolvePathConfigFunction SitecoreInstallFramework
SqlConnectionString ConfigFunction      Invoke-SqlConnectionStringConfigFunction SitecoreInstallFramework
Write             ConfigFunction      Write-Host            Microsoft.PowerShell.Utility
  
```

4.2. Troubleshooting

This section describes some of the issues you might encounter when using the Sitecore Install Framework, and how to resolve them.

4.2.1. Internal server error

After a successful installation, the CM instance cannot be started and the following error is displayed:

```

HTTP Error 500.19 - Internal Server Error
The requested page cannot be accessed because the related configuration data for the page is
invalid.
Error Code 0x8007000d
  
```

To resolve this error, you must install the URL Rewrite module for IIS:

- Install URL Rewrite 2.1 using the [Web Platform Installer](#).

4.2.2. Error when invoking the Web Deploy task

When you execute the Web Deploy task (`Invoke-WebDeployTask`), you can see the following error:

```
ERROR_SCRIPTDOM_NEEDED_FOR_SQL_PROVIDER
```

This error appears when the web deploy package installs databases using the SQL DACFx framework, and the provider has not been registered.

To resolve this error, ensure that you have the following components installed:

- [SQL Server System CLR Types](#) (2016 version)
- [SQL Server Transact-SQL ScriptDom](#) (2016 version)
- [SQL Server Data-Tier Application](#) (2016 version)

NOTE

If you are running the Sitecore installation from a 64-bit computer (x64), you must install both the 32-bit (x86) and 64-bit versions of the SQL Server components.

If you still receive the error after installing the SQL Server components, you must directly register the ScriptDom components.

To register the ScriptDom component:

1. Find the path to the ScriptDom library. In Windows Explorer, navigate to the `C:\Program Files (x86)\Microsoft SQL Server` folder.
2. The *Microsoft SQL Server* folder contains one or more subfolders. Click the subfolders (`\90`, `\100`, `\110`, `\120`, `\130`) and find the `\DAC\bin\Microsoft.SqlServer.TransactSql.ScriptDom.dll` file.
3. Copy or write down the path where the DLL file is located.
4. Launch PowerShell and navigate to the *NETFX 4.5.1 Tools* folder – `C:\Program Files (x86)\Microsoft SDKs\Windows\v8.1A\bin\NETFX 4.5.1 Tools`.
5. Invoke the `gacutil` application and enter the path that you copied in step 3. For example:

```
gacutil.exe /i C:\Program Files (x86)\Microsoft SDKs\Windows\v8.1A\bin\NETFX 4.5.1 Tools\120\DAC\bin\Microsoft.SqlServer.TransactSql.ScriptDom.dll
```

4.2.3. Missing modules

Some features within the SIF require that other modules be loaded as well. You might see warnings that certain tasks cannot be loaded when importing the module.

You can continue to use other features in the module, however, the features that displayed warnings cannot be executed. For example, if the `WebAdministration` module is not available, you see the following warnings:

```
> Import-Module .\SitecoreInstallFramework
WARNING: The script 'Invoke-AppPoolTask.ps1' cannot be run because the following modules that are specified by the
"#requires" statements of the script are missing: WebAdministration.
WARNING: The script 'Invoke-WebBindingTask.ps1' cannot be run because the following modules that are specified by the
"#requires" statements of the script are missing: WebAdministration
WARNING: The script 'Invoke-WebsiteTask.ps1' cannot be run because the following modules that are specified by the
"#requires" statements of the script are missing: WebAdministration
```

When this happens, the module is loaded but the following tasks are not available:

- Invoke-AppPoolTask
- Invoke-WebBindingTask
- Invoke-WebsiteTask

NOTE

To install the WebAdministration module, you must first configure IIS on your computer. For more details and steps to configure IIS, see the Configuring IIS section in the Sitecore Experience Platform 9.1 Installation Guide that you can download from the [Sitecore Downloads page](#).

4.2.4. Administrator permissions

To run SIF, you must run PowerShell as an Administrator.

IMPORTANT

If you try to use SIF in a non-administration window, you might see one of the following error messages and you will not be able to install Sitecore.

```
Import-Module : The required module 'SitecoreFundamentals' is not loaded. Load the module or remove the module from 'RequiredModules' in the file
```

```
import-module : The script 'SitecoreFundamentals.psm1' cannot be run because it contains a "#requires" statement for running as Administrator. The current Windows PowerShell session is not running as Administrator. Start Windows PowerShell by using the Run as Administrator option, and then try running the script again.
```

4.2.5. Sitecore installation failed while using Skype

When using Skype (or other communication tools) while installing Sitecore, it is possible that your xConnect installation might fail. This is due to Skype and Sitecore xConnect both using port 443, which interferes with the installation. If this happens, you must change your Skype configuration as outlined in the following [article](#).

Another approach to solving this installation issue is to update the default HTTP port, and if needed the HTTPS port.

Updating the default HTTP port

Updating the default HTTP port can be applied to the following Sitecore configurations:

- All Sitecore configurations
- All xConnect configurations

To update the default HTTP port:

1. In a text editor, open the relevant configuration file, for example: `sitecore-xpl.json`.
2. In the `CreateWebsite` task, add a `Port` property to the `Params` collection with the new value. For example: `"CreateWebsite": {`