



Development Testing Platform Engines for .NET User's Guide

Version 10.3

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Third-Party Content

Introduction

Parasoft Development Testing Platform (DTP) Engines for .NET are integrated solutions for automating a broad range of best practices to improve productivity and software quality. DTP Engines are a component of the Parasoft Development Testing Platform family of software quality solutions. Please read the following guide for additional information about how DTP Engines integrate into Parasoft's Development Testing ecosystem:

The Parasoft Development Testing Solution (PDF)

This documentation provides information on how to use the following engines:

Static Analysis Engine (SAE)

SAE enforces your coding policy with proven quality practices, such as static analysis and flow analysis, to ensure that your C# and VB.NET applications function as expected. See "Static Analysis Engine", page 12.

Unit Test Connector (UTC)

UTC allows you to run unit tests from open format tools, and report results to Development Testing Platform (DTP) Server. See "Unit Test Connector", page 36.

Code Coverage Engine (CCE)

CCE collects coverage information during a run of the executable and generates reports that can be sent to DTP Server. See "Code Coverage Engine", page 40.

Getting Started

This chapter will help you verify that your system meets the requirements for using DTP Engines, as well as help you configure DTP Engines so you can quickly start analyzing code.

System Requirements

- Windows 10, Windows 8, Windows 7, Windows Server 2012, or Windows Server 2008
- 4GB memory minimum, 8GB recommended
- 2GHz or faster processor
- .NET Framework 4.5, 4.0, or 3.5 installed on the target machine. See “About .NET Framework Prerequisite”, page 6.
- Microsoft Visual C++ Redistributable Packages. If not already present, the packages are automatically installed during DTP Engines for .NET installation. Also see “Manually Installing Visual C++ Redistribution Packages”, page 6.

About .NET Framework Prerequisite

.NET Framework 3.0 and older are not sufficient for DTP Engines. Version 4.5 of .NET Framework is bundled with DTP Engines and installed automatically. To install the framework manually, run the following command:

```
[INSTALL_DIR]\bin\prerequisites\dotnetfx45_full_x86_x64.exe
```

You can download and install other supported versions from Microsoft. The following table describes .NET Framework version support.

Framework Version	Static Analysis	Unit Testing	Metrics
4.6	Supported	Supported	Supported
4.5	Supported	Supported	Supported
4.0	Supported	Supported	Unsupported
3.5	Supported	Supported	Unsupported

Manually Installing Visual C++ Redistribution Packages

If you installed DTP Engines from a ZIP distribution, the Visual C++ Redistribution Packages necessary for full functionality may not have been installed. You can install them manually by running the following installers located in the `[INSTALL_DIR]\bin\prerequisites\` directory:

- `vcredist_x64_10.exe`
- `vcredist_x64_9.exe`
- `vcredist_x86_10.exe`
- `vcredist_x86_9.exe`

Installing DTP Engines

Running the installation executable launches a graphical interface that simplifies installing or updating DTP Engines for .NET. Using this method ensures that all prerequisites are installed and that permissions are elevated to work with User Access Control. Running the installer executable also allows you to use the Windows Control Panel to uninstall DTP Engines.

1. Run `parasoft_dottest_[version].exe` setup file
2. Follow the steps as shown in the installation wizard.

Installing from a Zip Distribution

DTP Engines are also available for installation as a .zip file that you can manually deploy to your desired directory. If you are installing a customized version of DTP Engines, e.g., contains a modified set of built-in test configurations, then you may need to install from the .zip file.

We recommend extracting the contents of the .zip file with unzip software other than the built-in Windows unzip utility, which may consider the downloaded .zip file to be untrusted.

The following components must be installed manually prior to installing DTP Engines using this method:

- NET Framework 4.0 or .NET Framework 3.5
- VC++ Redistributable Package x86

These components ship with DTP Engines in the `[INSTALL_DIR]\bin\prerequisites` directory.

Connecting to Build and Continuous Integration Systems

DTP Engines ship with a set of integrators that allow you to easily integrate with the following build and continuous integration systems:

- MSBuild
- NAnt
- JetBrains TeamCity

When the "Select Build System for Integration" tab appears during installation, choose the appropriate build systems and follow the deployment wizards. For instructions on how to integrate with your build or continuous integration system, see the appropriate section in the "Integrations", page 73, chapter.

You can deploy the integrators after DTP Engines have been installed by running the following command and following the wizard instructions:

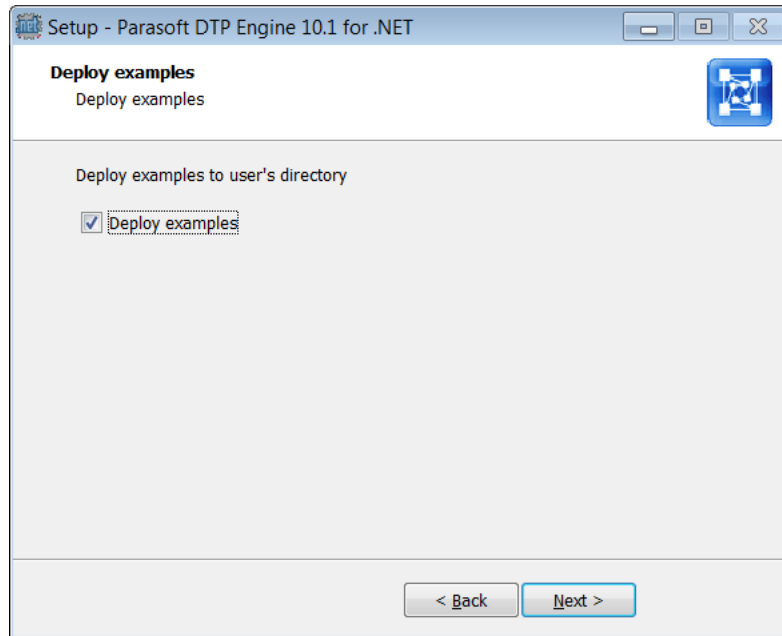
```
[INSTALL_DIR]\Integrations\[Build System]\deploy.exe
```

Deploying Examples

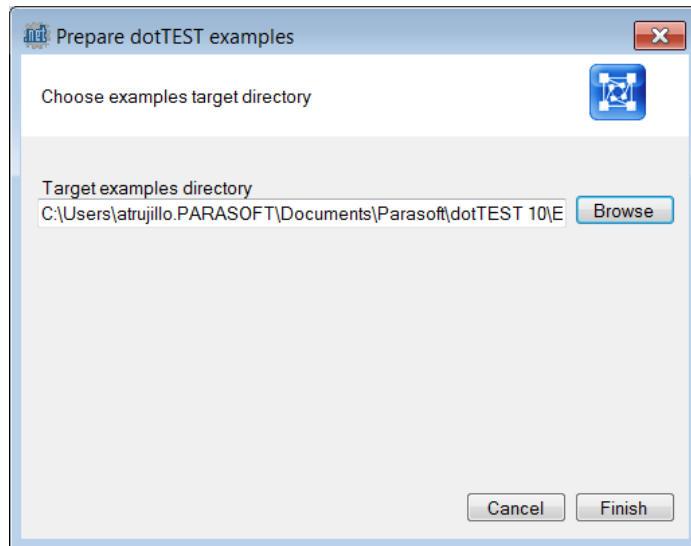
DTP Engines for .NET ships with several examples to help you become familiar with its functionalities. You can deploy the examples during installation or on demand after the installation has been completed.

Deploying Examples During Installation

1. Enable the Deploy examples option when prompted and click **Next**



2. Choose a location for the examples and click **Finish**. If the examples directory already exists, the previous files will be moved to the recycle bin and replaced with a clean image of the example files.



After the examples are deployed, the examples directory opens so that you can browse the content. Examples are organized into directories for all supported versions of Visual Studio. Each directory contains subdirectories covering various functionality. Follow the instructions in the ReadMe file in each directory for tutorials on using DTP Engines for .NET. We recommend starting with the 010_Basics examples.

The examples point to the instance of DTP Engines from which they were deployed. This allows you to run the examples with minimal configuration effort. The license, however, must be configured to start using the examples. See "Connecting to DTP Server", page 10.

Some files contain absolute paths to where they were deployed, so moving the example files will cause them to fail. Redeploy the examples to a new location instead of moving them if necessary.

Deploying Examples from the Command Line

Run the following command to deploy the examples shipped with DTP Engines:

```
[INSTALL_DIR]\deploy_examples.exe
```

Follow the same processes as described in “Deploying Examples During Installation”, page 7.

Multiple Installations on a Single Machine

Run the installer in extract mode to install DTP Engines two or more times on a single machine.

```
parasoft_dottest_10.X.Y.exe /extract
```

Running dotTEST with a Local System Account

Using dotTEST from a Local System account may impact some functionalities, such as integration with MSTest and collecting coverage information for applications or NUnit tests. To ensure that dotTEST functions as expected, you may need to manually run `Parasoft.Dottest.Profiling.Reg.exe` located in `<INSTALL_DIR>\bin\dottest\dotnet`. Add the `-ForAllUsers` switch to the executable:

```
<INSTALL_DIR>\bin\dottest\dotnet\parasoft.dottest.profiling.reg.exe -ForAllUsers
```

Ensure you have admin credentials before you run the executable.

Setting the License

DTP Engines can run on either a local or a network license. There are two types of network licenses:

- `dtp`: This license is stored in DTP. Your DTP license limits analysis to the number of files specified in your licensing agreement. This is the default type when `license.use_network` is set to `true`.
- `ls`: This is a "floating" or "machine-locked" license that limits usage to a specified number of machines. This type of license is stored in DTP in License Server.

Network licenses are also available in three editions that determine what functionality is available:

- `desktop_edition`: Functionality is optimized for desktop usage.
- `server_edition`: Functionality configured for high performance usage in server command line mode.
- `custom_edition`: functionality can be customized.

Local License

In the `.properties` configuration file:

1. Set the `dottest.license.use_network` property to `false`
2. Set the `dottest.license.local.password` property with your password

Obtaining the Machine ID

If you are using a local license, you will need your machine ID to request a license from Parasoft. Run the following command from a command line window to obtain your machine ID:

```
dottestcli -machineID
```

Network License

In the `.properties` configuration file:

1. Set the `dottest.license.use_network` property to `true`
2. Set the `dottest.license.network.type`
3. Set the `dottest.license.network.edition`

Connecting to DTP Server

Connecting to DTP Server is required for licensing, as well as extending other team-working capabilities, such as:

- Reporting analysis to a centralized database (see “Sending Results to Development Testing Platform (DTP) Server”, page 35)
- Sharing test configurations
- Sharing static analysis rules

Modify the following settings in the `[INSTALL_DIR]\dottestcli.properties` file to configure the connection to DTP Server.

```
ntp.server= [SERVER]
ntp.port= [PORT]
ntp.user= [USER]
ntp.password= [PASSWORD]
```

Creating an Encoded Password

DTP Engines can encrypt your password, which adds a layer of security to your interactions with DTP Server. Run the following command to print an encoded password:

```
-encodepass [MYPASSWORD]
```

Copy the encoded password that is returned and paste it into the `dottestcli.properties` file.

```
ntp.password= [ENCODED PASSWORD]
```

Connecting to Source Control

You can integrate DTP Engines with any source control system (see the Parasoft Custom Extension Development Guide for more information), but DTP Engines ship with out-of-the-box support for the following SCMs:

Brand	Tested Version
AccuRev	4.6, 5.4, 6.2
ClearCase	2003.06, 7.0, 8.0
CVS	1.1.2
Git	1.7
Mercurial	1.8.0 - 3.6.3
Perforce	2006, 2012, 2013, 2014, 2015
Serena Dimensions	9.1, 10.1, 10.3 (2009 R2), 12.2
Star Team	2005, 2008, 2009
Subversion (SVN)	1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9
Synergy/CM	6.4, 7.0, 7.1
Microsoft Team Foundation Server	2008, 2010, 2012, 2013, 2015
Visual SourceSafe	5.0, 6.0, 2005

Edit the `dottestcli.properties` file located in the installation directory to connect to your SCM. Parameters will vary depending on the brand of your SCM. The following example shows the parameters required to connect to SVN:

```
scontrol.rep.type=svn
scontrol.rep.svn.url=https://svn_server/
scontrol.rep.svn.login=username
scontrol.rep.svn.password=password
scontrol.svn.exec=C:\\path\\to\\svn.exe
```

See “Customizing DTP Engines for .NET”, page 48, for information about configuring your SCM connection.

If you have dotTEST 9.5 or later, you can use its interface to configure integration with source control systems. See “Integrating with Source Control Systems”, page 80 for details.

Known Limitations

Please refer to the Known Limitations section in `[INSTALL_DIR]\releasenotes.rtf` for information.

Static Analysis Engine

Static Analysis Engine (SAE) enforces your coding policy with proven quality practices, such as static analysis and flow analysis, to ensure that your applications function as expected. The following sections describe how to analyze code with SAE.

- Basic Analysis
- Specifying Test Configurations
- Defining Test Scope
- Metrics Analysis
- Code Duplicate Analysis
- Using DTP Engines in an IDE

Basic Analysis

The command-line is the primary interface for running Static Analysis Engine in non-interactive mode. The interface allows you to run Static Analysis Engine from any other script, language or build system that can launch a program, including *.bat and *.cmd scripts. For MSBuild, NAnt, or JetBrains TeamCity, use the integrators shipped with DTP Engines. See "Integrations", page 73, for details.

Analyzing Visual Studio Solutions

Provide the paths of a solution to analyze code. The following versions of Visual Studio solutions can be analyzed: 2005, 2008, 2010, 2012, 2013, 2015.

Analyzing a Single FileSolution

Use the `-solution` switch to specify path of the solution, e.g.:

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-config "builtin://Demo" -report "C:\Report"
```

Analyzing Multiple Solutions

Specify `-solution` multiple times or provide ANT-style wildcards, e.g.:

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-solution "C:\Devel\BarSolution\BarSolution.sln"
-config "builtin://Demo" -report "C:\Report"
```

or

```
dottestcli.exe -solution "C:\Devel\**\*.sln" -config
"builtin://Demo" -report "C:\Report"
```

Analyzing Visual Studio Projects Without Solutions

You can specify a path or paths to *.csproj or *.vbproj projects if *.sln files are unavailable by using the `-project` switch. The `-solution` switch is recommended, however, and should be used whenever possible.

```
dottestcli.exe -project "C:\Devel\FooSolution\**\*.csproj"
-config "builtin://Demo" -report "C:\Report"
```

ANT-style paths are supported. The switch may be specified several times.

Analyzing Websites

Visual Studio Web Site projects do not use *.proj files and may be maintained without *.sln files. Use the -website switch to specify the directory of the website when no *.sln files are present, e.g.:

```
dottestcli.exe -website "C:\Devel\FooWebSite" -config "builtin://Demo"  
-report "C:\Report"
```

Specifying Test Configurations

Test configurations define how DTP Engines test and analyze code, including which static analysis rules are enabled, which tests to run, and other analysis parameters. DTP Engines ship with built-in test configurations, but users can create and store their own test configurations in the DTP server. You can access the DTP server via the DTP plug-in. If you have administrator-level access in DTP Report Center, you can also create test configurations directly in DTP (**administration> Engines> Test Configurations**).

User-defined test configurations can be downloaded from the DTP server and stored in the [INSTALL_DIR]/configs/user directory as *.properties files.

Use the `-config` switch to specify which test configuration to run:

```
dottestcli.exe -solution "C:\Devel\MyFooSolution\MySolution.sln"
-config "builtin://Demo" -report "C:\Report"
```

The test configuration being executed can be specified in the following ways (by default, the `builtin://Recommended Rules` test configuration is used):

Built-in Configurations

```
-config "builtin://Recommended Rules"
```

User-defined Configurations

```
-config "user://Foo Configuration"
```

DTP Server-hosted Configurations

```
-config "dtp://Foo Team Configuration"
-config "dtp://FooTeamConfig.properties"
```

Test configurations can also be referenced by filename and URL:

By File Name

```
-config "C:\Devel\Configs\FooConfig.properties"
```

By URL

```
-config "http://foo.bar.com/configs/FoodConfig.properties"
```

Viewing Available Test Configurations

Use the `-listconfigs` switch to print the available test configurations.

```
-listconfigs
```

Built-in Test Configurations

The following table includes the test configurations shipped with DTP Engines in the [INSTALL] / configs/builtin directory.

Configuration Name	Description
Recommended Rules	The default configuration of recommended rules. Covers most Severity 1 and Severity 2 rules. Includes rules in the Flow Analysis Fast configuration.
Find Duplicated Code	Applies static code analysis rules that report duplicate code. Duplicate code may indicate poor application design and lead to maintainability issues.
Metrics	Computes values for several code metrics.
Critical Rules	Includes most Severity 1 rules, as well as rules in the Flow Analysis Fast configuration.
Flow Analysis	Detects complex runtime errors without requiring test cases or application execution. Defects detected include using uninitialized or invalid memory, null pointer dereferencing, array and buffer overflows, division by zero, memory and resource leaks, and dead code. This requires a special Flow Analysis license option.
Flow Analysis Aggressive	Includes rules for deep flow analysis of code. Significant amount of time may be required to run this configuration.
Flow Analysis Fast	Includes rules for shallow depth of flow analysis, which limits the number of potentially acceptable defects from being reported.
Demo	Includes rules for demonstrating various techniques of code analysis. May not be suitable for large code bases.
Find Memory Issues	Includes rules for finding memory management issues in the code.
Find Unimplemented Scenarios	Includes rules for finding unimplemented scenarios in the code.
Find Unused Code	Includes rules for identifying unused/dead code.
Check Code Compatibility against .NET [2.0, 3.0, 3.5, 4.0 Client Profile, 4.0 Full]	Includes a set of test configurations that validates the code's compatibility with the specified version of .NET framework.
CWE-SANS Top 25 Most Dangerous Programming Errors	Includes rules that find issues classified as Top 25 Most Dangerous Programming Errors of the CWE-SANS standard.

Configuration Name	Description
NIST SAMATE	Includes rules that find issues identified in the NIST SAMATE standard
OWASP Top 10 Security Vulnerabilities	Includes rules that find issues identified in OWASP's Top 10 standard
PCI Data Security Standard	Includes rules that find issues identified in PCI Data Security Standard
Security Assessment	General test configuration that finds security issues
IEC 62304 (Template)	A template test configuration for applying the IEC 62304 Medical standard.
Run NUnit Tests	Runs NUnit Tests that are found in the scope of analysis
Run NUnit Tests with coverage	Runs NUnit Tests that are found in the scope of analysis and monitors coverage
Calculate Application Coverage	Processes the application coverage data to generate a coverage.xml file. See "Application Coverage for Web Applications", page 43 for additional information.
Execute MSTests with Coverage	Executes MSTests and collects coverage. See "Running MSTest Tests", page 36, for more information.
Execute MSTests	Executes MSTests. See "Running MSTest Tests", page 36, for more information.
Collect Static Coverage	Generates the static coverage data necessary for application coverage. See "Application Coverage for Web Applications", page 43, for details.

Creating Custom Rules

Use RuleWizard to create custom rules. To use the rule in the Static Analysis Engine, it needs to be enabled in a test configuration and the custom rule file must be located in one of the following directories:

- [INSTALL_DIR]\rules\user\
- [DOCUMENTS_DIR]\Parasoft\[engine]\rules where [DOCUMENTS_DIR] refers to the "My Documents" directory in Windows

Defining Test Scope

The test scope refers to the file or set of files for testing. Use the `-resource` switch followed by a path in the solution to define the scope. Do not use file system paths to define the scope. Use the Visual Studio Solution Explorer path instead.

If you are running analysis from your IDE, a source file that is open in the active editor has higher priority than resources defined with Solution Explorer and only this file will be analyzed.

Testing a Single Project in a Solution

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-resource "FooSolution/QuxProject"
-config "builtin://Demo" -report "C:\Report"
```

Testing a Single Directory of Files in a Project

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-resource "FooSolution/BarProject/QuxDirectory"
-config "builtin://Demo"
```

Testing a Single Source File

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-resource "FooSolution/BarProject/QuxDirectory/BazFile.cs"
-config "builtin://Demo"
```

Testing a Single Project Under a Solution Folder

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-resource "FooSolution/BarSolutionFolder/QuxProject"
-config "builtin://Demo" -report "C:\Report"
```

Testing a Single Source File When No Solution is Provided

Because the name of the solution is unknown, the solution path should start from `/`.

```
dottestcli.exe -project "C:\Devel\FooSolution\FooProject.csproj"
-resource "/FooProject/BarDirectory/QuxFile.cs"
-config "builtin://Demo" -report "C:\Report"
```

Fine-tuning the Scope

Use the `-include` and `-exclude` switches to apply additional filters to the scope.

- `-include` instructs Static Analysis Engine to test only the files that match the file system path; all other files are skipped.
- `-exclude` instructs Static Analysis Engine to test all files except for those that match the file system path.

If both switches are specified, then all files that match `-include`, but not those that match `-exclude` patterns are tested.

These switches accept file system paths and ANT-style wildcards. This is in contrast to the `-resource` switch, which accepts the solution path and ANT-style wildcards.

The following example shows how to exclude all files under directories `*.Tests:`

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-exclude "C:\Devel\FooSolution\*.Tests\**\*.*"
-config "builtin://Demo" -report "C:\Report"
```

You can specify a file system path to a list file (`*.lst`) to include or exclude files in bulk. Each item in the `*.lst` file is treated as a separate entry.

Specifying Additional Assemblies

Use the `-reference` switch to specify a path to additional assemblies needed to resolve dependencies of the analyzed projects. ANT-style wildcards and relative paths to the current working directory are accepted.

Examples

```
-reference C:\MySolution\ExternalAssemblies\*.dll
-reference C:\MySolution\ExternalAssemblies\*.exe
-reference C:\MySolution\ExternalAssemblies\**\*.dll
-reference C:\MySolution\ExternalAssemblies\**\*.dll
```

Use the `-reference` switch if you receive an "Unable to find reference assembly" message.

Configuring Authorship

You can configure DTP Engines to collect authorship data during analysis to facilitate task assignment. The data can be sent to the DTP server where additional analysis components, such as the Process Intelligence Engine (PIE), can be leveraged to facilitate defect remediation and development optimization.

You can configure DTP Engines to assign authorship based on information from source control, XML files that directly map sources to authors, and/or the current local user.

About Authorship Configuration Priority

Authorship priority is determined by reading the settings in the `.properties` configuration file from top to bottom. If multiple authorship sources are used, the following order of precedence is used:

1. information from source control
2. XML map file
3. current user

if one of the selected options does not determine an author, Authorship will be determined based on the next option selected. If an author cannot be determined, the user is set as "unknown". Likewise, if none of these options is selected, the user is set as "unknown."

Configuring How Authorship is Computed

Edit the `dottestcli.properties` configuration file to specify how authorship is determined.

```
scope.local=[true or false]
scope.scontrol=[true or false]
scope.xmlmap=[true or false]
```

- Setting `scope.scontrol` to `true` calculates authorship based on check-in data in source control. This is set to `false` by default.
- Setting `scope.local` to `true` calculates authorship based on the local user and system files modification time. This is set to `true` by default.
- Setting `scope.xmlmap` to `true` calculates authorship based on information stored in an XML map file (see "Creating Authorship XML Map Files", page 21, for syntax information). This is set to `false` by default.
- If all properties are set to `true`, `scope.scontrol` takes precedence.

Additional Authorship Configurations

By default, author names are case-sensitive, but you can disable case sensitivity:

```
authors.ignore.case=true
```

You can set the user name, email, and full name for a user with the `authors.user[identifier]` setting. For example:

```
authors.user1=john,john.doe@company.com,John Doe
```

If a user is no longer on team or must transfer authorship to another user, you can use the `authors.mapping[x,y]` setting:

```
authors.mapping1=old_user,new_user
```

If you are transferring authorship between users, the author-to-author mapping information can be stored locally or in an a shared XML map file:

```
authors.mappings.location=[local or shared]
```

If the mapping file is shared, you must specify the location of the shared XML file:

```
authors.shared.path=[path to file]
```

Creating Authorship XML Map Files

The `<authorship>` element contains indicates the beginning of the mapping information.

The `<file />` element is placed inside the `<authorship>` element and takes two properties, `author` and `path` to map users to files or sets of files:

```
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE authorship (View Source for full doctype...)>
<authorship>
  <!-- assigns all files named: "foo/src/SomeClass.java" to "author1" -->
  <file author="author1" path="foo/src/SomeClass.java" />
</authorship>
```

You can use wildcards to map authors to sets of files. The following table contains examples:

Wildcard Expression	Description
<code>?oo/src/Foo.c</code>	Assigns all files that have names starting with any character (except /) and ends with "oo/src/"
<code>** .cs</code>	Assigns all *.cs files in any directory
<code>**/src/**</code>	Assigns every file whose path has a folder named "src"
<code>src/**</code>	Assigns all files located in directory "src"
<code>src/**/Test*</code>	Assigns all files in directory "src" whose name starts with "Test" (e.g., "src/some/other/dir/TestFile.c")

Mapping order matters. The mapping file is read from top to bottom, so beginning with the most specific mapping ensures that authorship will map to the correct files.

Suppressing Violations

Suppressions prevent DTP Engines from reporting additional occurrences of a specific static analysis task (multiple tasks might be reported for a single rule). Suppressions are useful when you want to follow a rule, but do not want to receive repeated messages about your intentional rule violations. If you do not want to receive error messages for any violations of a specific rule, disable the rule in the test configuration.

If you are using DTP Engines in an IDE, you can define suppressions using the GUI (see the DTP Plugin documentation for your IDE for details), otherwise suppressions are defined in the source code using the following syntax.

Line Suppression

```
<suppression keyword> [<rule category> | <rule category> . <rule id> | <rule
category > - <rule severity> | ALL ] <suppression comment>
```

Line Suppression Examples

```
// parasoft-suppress CODSTA "suppress all rules in category CODSTA"

// parasoft-suppress CODSTA.NEA "suppress rule CODSTA.NEA"

// parasoft-suppress CODSTA-1 "suppress all rules in category CODSTA with severity
level 1"

// parasoft-suppress ALL "suppress all rules"

// parasoft-suppress CODSTA FORMAT.MCH JAVADOC-3 "suppress all rules in category
CODSTA and rule FORMAT.MCH and all rules in category JAVADOC with severity level 3"
```

Block Suppression

```
<begin suppression keyword> [<rule category> | <rule category> . <rule id> | <rule
category > - <rule severity> | ALL ] <suppression comment>
```

```
..... source code block .....
```

```
<end suppression keyword> [<rule category> | <rule category> . <rule id> | <rule
category > - <rule severity> | ALL ] <suppression comment>
```

Block Suppression Examples

```
// parasoft-begin-suppress CODSTA "begin suppress all rules in category CODSTA"
.....
// parasoft-end-suppress CODSTA "end suppress all rules in category CODSTA"

// parasoft-begin-suppress CODSTA.NEA "begin suppress rule CODSTA.NEA"
.....
```

```

// parasoft-end-suppress CODSTA.NEA "end suppress rule CODSTA.NEA"

// parasoft-begin-suppress CODSTA-1 "begin suppress all rules in category CODSTA
with severity level 1"
.....
// parasoft-end-suppress CODSTA-1 "end suppress all rules in category CODSTA with
severity level 1"

//parasoft-begin-suppress ALL "begin suppress all rules"
.....
// parasoft-end-suppress ALL "end suppress all rules"

// parasoft-begin-suppress CODSTA FORMAT.MCH "begin suppress all rules in category
CODSTA and rule FORMAT.MCH"
.....
// parasoft-end-suppress CODSTA FORMAT.MCH "end suppress all rules in category COD-
STA and rule FORMAT.MCH"

// parasoft-begin-suppress CODSTA "begin suppress all rules in category CODSTA"
.....
// parasoft-end-suppress CODSTA-1 "end suppress all rules in category CODSTA with
severity level 1; however rules with severity level 2-5 in category CODSTA are still
suppressed."
.....
// parasoft-end-suppress CODSTA "end suppress all rules in category CODSTA"

// parasoft-begin-suppress ALL "begin suppress all rules"
.....
// parasoft-end-suppress CODSTA FORMAT-1 "end suppress all rules in category CODSTA
and all rules in category FORMAT with severity level 1; however, others rules in COD-
STA and FORMAT-1 are still suppressed."
.....
// parasoft-end-suppress ALL "end suppress all rules"

//parasoft-begin-suppress ALL "begin suppress all rules, since no end suppression
comment, all rules will be suppressed starting from this line"

```


Flow Analysis

Flow Analysis is a type of static analysis technology that uses several analysis techniques, including simulation of application execution paths, to identify paths that could trigger runtime defects. Defects detected include use of uninitialized memory, null pointer dereferencing, division by zero, memory and resource leaks.

Since this analysis involves identifying and tracing complex paths, it exposes bugs that typically evade static code analysis and unit testing, and would be difficult to find through manual testing or inspection.

Flow Analysis' ability to expose bugs without executing code is especially valuable for users with legacy code bases and embedded code (where runtime detection of such errors is not effective or possible).

Run one of the Flow Analysis test configurations during analysis to execute flow analysis rules:

```
builtin://Flow Analysis Fast
builtin://Flow Analysis Standard
builtin://Flow Analysis Aggressive
```

Configuring Depth of Flow Analysis

Flow Analysis engine builds paths through the analyzed code to detect different kinds of problems. Since the analysis of all possible paths that span through the whole application may be infeasible, you can set up the desired level of depth of analysis. A deeper analysis will result in more findings, but the performance will be slower and the memory consumption will increase slightly.

You can specify the depth of analysis using the following methods:

- By using the test configuration interface in DTP. Go to **Report Center> Test Configurations> Static Analysis> Flow Analysis Advanced Settings> Performance> Depth of analysis** and choose one of the following options by selecting a radio button:
 - **Shallowest (fastest):** Finds only the most obvious problems in the source code. It is limited to cases where the cause of the problem is located close to the code where the problem occurs. The execution paths of violations found by this type of analysis normally span several lines of code in a single function. Only rarely will they span more than 3 function calls.
 - **Shallow (fast):** Like the "Shallowest" analysis type, finds only the most obvious problems in the source code. However, it produces a greater overall number of findings and allows for examination of somewhat longer execution paths.
 - **Standard:** Finds many complicated problems with execution paths containing tens of elements. Standard analysis goes beyond shallow analysis and also looks for more complicated problems, which can occur because of bad flow in a single function or due to improper interaction between different functions in different parts of the analyzed project. Violations found by this type of analysis often reveal non-trivial bugs in the analyzed source code and often span tens of lines of code.
 - **Deep (slow):** Allows for detection of a greater number of problems of the same complexity and nature as those defined for "Standard" depth. This type of analysis is slower than the standard one.
 - **Thorough (slowest):** Finds more complicated problems. This type of analysis will perform a thorough scan of the code base; this requires more time, but will uncover many very complicated problems whose violation paths can span more than a hundred lines

of code in different parts of the scanned application. This option is recommended for nightly runs.

- By manually editing the test configuration file. Open the test configuration file in an editor and set the `com.parasoft.xtest.checker.flowanalysis.depthOfAnalysis` property to the value that represents the desired depth of analysis: 0 - Shallowest, 1 - Shallow, 2 - Standard, 3 - Deep, 4 - Thorough.

The depth of Flow Analysis is set to **Standard** by default.

Setting Timeout Strategy

Apart from the depth of analysis, Flow Analysis engine uses an additional timeout guard to ensure the analysis completes within a reasonable time. An appropriate strategy can be set using the following methods:

- By using the test configuration interface in DTP. Go to **Report Center> Test Configurations> Static Analysis> Flow Analysis Advanced Settings> Performance> Strategy for Timeouts** and choose one of the following options by selecting a radio button:
 - **time**: Analysis of the given hotspot is stopped after spending the defined amount of time on it. Note: in some cases, using this option can result in a slightly unstable number of violations being reported.
 - **instructions**: Analysis of the given hotspot is stopped after executing the defined number of Flow Analysis engine instructions. Note: to determine the proper number of instructions to be set up for your environment, review information about timeouts in the Setup Problems section of the generated report.
 - **off**: No timeout. Note: using this option may require significantly more time to finish the analysis.
- By manually editing the test configuration file. Open the test configuration file in an editor and set the `com.parasoft.xtest.checker.flowanalysis.hotSpotTimeoutStrategy` property to the value that represents the desired timeout strategy:
 - `time`: Analysis of the given hotspot is stopped after spending the defined amount of time on it. Set the `com.parasoft.xtest.checker.flowanalysis.hotSpotTimeoutSeconds` property to a value representing the number of seconds.
 - `ticks`: Analysis of the given hotspot is stopped after executing the defined number of Flow Analysis engine instructions. Set the `com.parasoft.xtest.checker.flowanalysis.hotSpotTimeoutTicks` property to a value representing the number of instructions. Note: to determine the proper number of instructions to be set up for your environment, review information about timeouts in the Setup Problems section of the generated report.
 - `off`: No timeout.

The default timeout option is **time** set to 60 seconds. To get information about the Flow Analysis timeouts that occurred during the analysis, review the Setup Problems section of the report generated after the analysis.

Metrics Analysis

DTP Engines can compute several code metrics, such as code complexity, coupling between objects, and lack of cohesion, which can help you understand potential weak points in the code. Run the Metrics test configuration during analysis to execute metrics analysis rules:

```
builtin://Metrics
```

Metrics analysis is added to the HTML and XML report files generated by DTP Engines. See “Metrics Summary”, page 32, for information about reports.

Setting Metrics Thresholds

You can set upper and lower boundaries so that a static analysis violation is reported if a metric is calculated outside the specified value range. For example, if you want to restrict the number of logical lines in a project, you could configure the Metrics test configuration so that a violation is reported if the Number of Logical Lines metric exceeds the limit.

The Metrics test configuration shipped with DTP Engines includes default threshold values. There are some rules, such as Number of Files (METRIC.NOF), for which thresholds cannot be set.

Metric thresholds can be set using the following methods:

- By using the test configuration interface in DTP (see "Report Center> Test Configurations> Editing Test Configurations> Metrics Tab" in the Development Testing Platform user manual for details).
- By editing the test configuration using the interface in an IDE (see "Working with Test Configurations> Creating Custom Test Configurations" in the DTP Plugin manual for your IDE).
- By manually editing the test configuration file:
 1. Duplicate the built-in Metrics test configuration ([INSTALL]/configs/builtin) to the user configurations directory ([INSTALL]/configs/user)
 2. Open the duplicate configuration in an editor and set the [METRIC.ID].ThresholdEnabled property to true.
 3. Configure the lower and upper boundaries in the [METRIC.ID].Threshold property according to the following format:
[METRIC.ID].Threshold=l [lower boundary value] g [upper boundary value]
 4. Save the test configuration and run the analysis using the custom metrics test configuration.

Code Duplicate Analysis

DTP Engines can check for duplicate code, which may indicate poor application design, as well as increase maintenance costs. During code duplication analysis, the code is parsed into smaller language elements (tokens). The tokens are analyzed according to a set of rules that specify what should be considered duplicate code. There are two types of rules for analyzing tokens:

- Simple rules for finding single token duplicates, e.g., string literals
- Complex rules for finding multiple token duplicates, e.g., duplicate methods or statements

Run the Find Duplicated Code test configuration during analysis to execute code duplicates detection rules:

```
builtin://Find Duplicated Code
```

Using DTP Engines in an IDE

You can use DTP Engines within Visual Studio. Integrating with an IDE gives you a desktop interface for executing code analysis locally, viewing results, and leveraging the data and test configurations stored in DTP server. You can also import findings from DTP Server into your development environment.

This integration is achieved with the DTP Plugin for Visual Studio and the DTP Engine Plugin. See the appropriate DTP Plugin User Guide for installation, usage, and other details stored in the [INSTALL]/integration/vstudio/ directory.

Reporting

DTP Engines print results to the output console, as well as save an HTML report to the `[WORKING_DIR]/reports` directory by default. Data for the HTML report is stored in the directory as an XML file, which can be used for importing results into a supported Parasoft DTP Plugin for the IDE and Parasoft DTP Plugin for .NET (see "Parasoft DTP Plugin for [IDE] User's Guide" for additional information). For an overview of the HTML report structure, see "Viewing Reports", page 29.

If the engines are connected to DTP, reports are also sent to the server (see "Sending Results to Development Testing Platform (DTP) Server", page 35).

Specifying Report Output Location

You can use the `-report` switch during analysis to specify an output directory for reports.

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-config "builtin://Demo" -report "C:\Report"
```

You can also use the `report.location` property to change the location of an HTML report.

```
report.location=<HTML_REPORT_LOCATION>
```

Specifying Report Format

You can also generate a PDF report or a report using a custom extension to the specified directory by setting the `report.format` property. See "Report Settings", page 57, for additional information.

```
report.format=pdf
```

Viewing Reports

Open the `report.html` or `report.pdf` file saved to the working directory or location specified with the `-report` switch. Reports may contain different sections depending on the type of analysis, but the following sections are included in all static and flow analysis configurations.

Header

The screenshot shows the header of a report generated by the dotTEST DTP Engine. The title is "dotTEST DTP Engine Report" and the version is "DTP Engine for .NET 10.2.3.137". Below the title is a "Session Summary" section with the following details:

Build ID:	dotTEST_10.2.2-2016-05-20
Test Configuration:	user://Run NUnit Tests with coverage
Started:	2016-05-20T14:02:32+02:00
Performed on:	iris by hanna
Session Tag:	\$([control_branch])-win32_x86_64
Project:	dotTEST_10.2.2

On the right side of the report, there are two summary statistics:

Static Analysis	Severity 1 Findings: 9
Test Execution	Test Failures: 5/13

The following information is included:

- Tool used for the analysis
- Build ID
- Test configuration
- Time stamp of the analysis
- Machine name and user name
- Session tag
- Project name
- Number of findings with the highest severity
- Number of failed tests

Static Analysis

The first part of the report covers the Static Analysis findings and is divided into two main sections. The first section is a summary which shows an overview of findings displayed as a pie chart. The colors indicate different severity types and their corresponding number of findings detected during static analysis.



The second section shows the details of static analysis findings. It starts with a table which includes static analysis results.

Details - Static Analysis

Static Analysis

Module	Findings			Files		Lines	
	suppressed	total	per 10,000 lines	checked	total	checked	total
com.parasoft.demo	1	804	2213	59	59	3632	3632
Total [0:00:43]	1	804	2213	59	59	3632	3632

The following information is included:

- Name of module
- Number of suppressed rules
- Total number of findings
- Average number of findings per 10,000 lines
- Number of analyzed files
- Total number of files in the module
- Number of code lines analyzed
- Total number of code lines in the module

All Findings

The All Findings section displays the details of findings organized by category or severity. Click the **Severity** or **Category** link to toggle between views.

In category view, findings are reported by rule and grouped by category. A count of how many times each rule was violated in the scope of analysis is also shown.

All Findings by Category	
Category	Severity
[4] Collections (SO.CO)	
[4] Do not modify collection while iterating over it (SO.CO.ITMOD-1)	
[12] Exceptions (SO.EXCEPT)	
[12] Avoid NullPointerException (SO.EXCEPT.NP-1)	
[3] Optimization (SO.OPT)	
[3] Avoid inefficient removal of Collection elements (SO.OPT.INFCOL-3)	
[1] Avoid inefficient iteration over Map entries (SO.OPT.INFMAP-1)	
[1] Avoid inefficient removal of Map entries (SO.OPT.INFMAPRM-1)	

In severity view, findings are reported and grouped by severity. A count of findings per severity is also included.

All Findings by Severity	
Category	Severity
[73] Severity 1 - Highest	
[4] Do not modify collection while iterating over it (SO.CO.ITMOD-1)	
[12] Avoid NullPointerException (SO.EXCEPT.NP-1)	
[2] Avoid use before explicit initialization (SO.PB.NOTEEXPLINT-1)	
[1] Avoid use of fields before initialization in constructors and static initializers (SO.PB.NOTINITCTOR-1)	
[1] Do not append null values to strings (SO.PB.STRNULL-1)	
[1] Avoid division by zero (SO.PB.ZERO-1)	
[1] Protect against Command injection (SO.SECURITY.DCMD-1)	
[1] Protect against Environment injection (SO.SECURITY.DENV-1)	
[1] Protect against File contents injection (SO.SECURITY.DFILES-1)	
[1] Protect against File names injection (SO.SECURITY.DFNAMES-1)	
[1] Protect against Library injection (SO.SECURITY.DLIB-1)	
[1] Protect against Reflection injection (SO.SECURITY.DREFL-1)	
[2] Protect against SQL injection (SO.SECURITY.DSQL-1)	
[4] Protect against XML data injection (SO.SECURITY.DXML-1)	
[1] Protect against XSS vulnerabilities (SO.SECURITY.DXSS-1)	
[1] Ensure index is valid in JDBC method invocation (SO.SECURITY.DBMSA-1)	
[1] Use "PreparedStatement" correctly (SO.SECURITY.DBSP-1)	
[6] Unrestricted lock resource (PS.CLOS-1)	
[1] Avoid conditional expressions that always evaluate to a constant value (PS.USC.CC-1)	
[2] Avoid unreachable "else if" and "else" cases (PS.USC.UF-1)	
[18] Do not pass exception messages into output in order to prevent the application from leaking sensitive information (SECURITY.SD.INFO-1)	
[4] Avoid using "SELECT" in SQL queries (SECURITY.SQ.ACSS-1)	
[4] Use "prepareCall" or "prepareStatement" instead of "createStatement" (SECURITY.SQALPS-1)	
[1] Avoid passing hardcoded usernames/passwords/URLs to database connection methods (SECURITY.WSC.HOCCB-1)	
[1] Do not define instance fields in Servlet classes (SERVLET.F-1)	
[17] Severity 2 - High	
[6] Avoid conditions that always evaluate to the same value (SO.PB.CC-2)	
[2] Do not use "==" or "!=" to compare objects (PS.OJB.UCC-2)	
[1] Avoid using "private" fields which are never given a meaningful value (PS.USC.FCBS-2)	
[4] Avoid "main()" methods because they may allow unauthorized access to classes (SECURITY.WSC.UMAIN-2)	
[4] Use a Context Object to manage HTTP request parameters (SERVLET.UCC-2)	
[705] Severity 3 - Medium	
[3] Avoid inefficient removal of Collection elements (SO.OPT.INFCOL-3)	
[1] Avoid inefficient iteration over Map entries (SO.OPT.INFMAP-1)	

These sections are merged in PDF versions of the report.

- [1] Erratic Application Behavior (SECURITY.EAB)
 - [1] Do not store user-given mutable objects directly into variables (SECURITY.EAB.SMO-1)
- [21] Serialization (SERIAL)
 - [21] Create a "serialVersionUID" for all "Serializable" classes (SERIAL.OUID-3)
- [6] Servlets (SERVLET)
 - [1] Do not define instance fields in Servlet classes (SERVLET.F-1)
 - [4] Use a Context Object to manage HTTP request parameters (SERVLET.UCC-2)
 - [1] Do not use JDBC code in Servlet classes (SERVLET.AJDBC-3)
- [25] Unused Code (UC)
 - [10] Avoid unnecessary modifiers in an "interface" (UC.AAI-3)
 - [4] Remove commented out Java code (UC.ACC-3)
 - [11] Avoid local variables that are never read (UC.ALRV-3)

Findings by Category section

- [73] Severity 1 - Highest
 - [4] Do not modify collection while iterating over it (SO.CO.ITMOD-1)
 - [12] Avoid NullPointerException (SO.EXCEPT.NP-1)
 - [2] Avoid use before explicit initialization (SO.PB.NOTEEXPLINT-1)
 - [1] Avoid use of fields before initialization in constructors and static initializers (SO.PB.NOTINITCTOR-1)
 - [1] Do not append null value to strings (SO.PB.STRNULL-1)
 - [1] Avoid division by zero (SO.PB.ZERO-1)
 - [1] Protect against Command injection (SO.SECURITY.DCMD-1)
- [17] Severity 2 - High
 - [6] Avoid conditions that always evaluate to the same value (SO.PB.CC-2)
 - [2] Do not use "==" or "!=" to compare objects (PS.OJB.UCC-2)
 - [1] Avoid using "private" fields which are never given a meaningful value (PS.USC.FCBS-2)
 - [4] Avoid "main()" methods because they may allow unauthorized access to classes (SECURITY.WSC.UMAIN-2)
 - [4] Use a Context Object to manage HTTP request parameters (SERVLET.UCC-2)

Findings by Severity section

Findings by Author

This section includes a table of authors associated with the analyzed code and a count of findings per each author. Findings are segmented into findings associated with suppressed rules and findings recommended for remediation. Click on an author link to view their finding details.

Findings by Author			
Author	Findings		
	Suppressed	Total	Recommended
hanna	0	26	26

[hanna](#) Total Findings: 26 [Back to Top](#)

BankExample\Parasoft\DotTest.Examples.Bank.Money\Currency.cs

49: Replace equality comparison of floating-point types to comparison which handles floating-point uncertainty. PB.DNCF-2

BankExample\Parasoft\DotTest.Examples.Bank.Money\CurrencyProvider.cs

23: Provide 'default' for 'switch' statement. CS.PB.DEFSWITCH-2

38: Provide 'default' for 'switch' statement. CS.PB.DEFSWITCH-2

51: Private method 'Parasoft.DotTest.Examples.Bank.Money.CurrencyProvider.Parse(System.String, Parasoft.DotTest.Examples.Bank.Money.CurrencyInfo)' is unused. Call it or remove dead code. CM.UJ.MU.AUPM-2

53: Use TryParse instead of Parse in method 'Parse'. PB.DNUP-2

The details view includes the following information:

- File containing the finding and its location
- Violation message and rule
- Flow analysis reports also mark the cause of the violation (C), violation points (P), thrown exceptions (E), and important data flows (!)

Findings by File

You can navigate the analyzed code to the reported findings in the Findings by File section. Each node begins with a value that indicates the total number of findings in the node. The value in brackets shows the number of suppressed rules in the node. You can click nodes marked with a plus sign (+) to expand them. PDF versions of the reports are already fully expanded.

Findings by File			
		Expand All	Collapse All
- 26 (0) Total (Suppressed)			
- 26 (0) Parasoft.DotTest.Examples.Bank			
- 3 (0) AccountNumber.cs			
Findings: 3			
14: Change Equals() implementation to match a standard pattern. Use: if (obj == null) { return false; }	hanna	CPU.CPNEG-1	
14: Change Equals() implementation to match a standard pattern. Use: if (obj.GetType() != obj2.GetType()) { return false; }	hanna	CPU.CPNEG-2	
17: Change bitwise operator to logical operator in method 'Equals'.	hanna	CS.PB.BITBOO-2	

Metrics Summary

If your test configuration includes metrics analysis, a metrics section will appear in the report. See “Metrics Analysis”, page 26, for additional information.

Metrics Summary						
Metric name	Number of Items	Average	Std. Deviation	Maximum	Minimum	
- McCabe Cyclomatic Complexity (METRIC.CC)	59	1,542	0,908	4	1	
Parasoft.DotTest.Examples.Bank	59	1,542	0,908	4	1	
- Nested Blocks Depth (METRIC.NBD)	113	0,248	0,588	3	0	
Parasoft.DotTest.Examples.Bank	113	0,248	0,588	3	0	
- Number of Physical Lines in Files (METRIC.NOPLIF)	19	55,526	27,886	141	13	
Parasoft.DotTest.Examples.Bank	19	55,526	27,886	141	13	
- Number of Source Lines in Methods (METRIC.NOSLIM)	87	6,885	6,439	48	1	
Parasoft.DotTest.Examples.Bank	87	6,885	6,439	48	1	

Test Execution

The second part of the report covers the Test Execution results and is divided into two sections. The first section is a summary which shows an overview of test failures and coverage displayed as pie charts.



The second section shows the details of test execution. It starts with a table which includes test execution results and coverage information.

Details - Test Execution

Test Execution [Back to Top](#)

Module	Findings			Executed Test Cases				Coverage (%)	
	fix unit test problems	review exceptions	review assertion failures	passed	failed	incompleted	total	line	
com.parasoft.demo	2	0	0	31	2	0	33	13	
Total [0:00:00]	2	0	0	31	2	0	33	13	

The following information is included:

- Module name
- Number of unit test problems which need to be fixed
- Number of exceptions which need to be reviewed
- Number of assertion failures which need to be reviewed
- Number of unit tests successfully executed
- Number of unit tests failures
- Number of incomplete unit tests
- Total number of unit tests
- Line coverage expressed as percentage

All Findings

The All Findings section displays the details of all unit test problems detected during test execution.

All Findings

(5) Unit Test Problems
(5) Assertion Failures
(5) Error

Findings by Author

This section includes a table of authors associated with the analyzed code and shows the total number of findings for each author. Click on an author link to view their finding details.

Findings by Author [Back to Top](#)

Author	Findings	
	total	recommended
hanna	5	5

hanna Total Findings : 5 [Back to Top](#)

```
BankExample.Parasoft.DotTest.Examples.Bank.BankUser.cs [ 5 ]
Test case: Parasoft.DotTest.Examples.Bank.Tests.BankUserTests.Test("bob bar")
System.ArgumentException : parsing "'[a-z-0-9]*'(?=[^@!#$%^&*()-+=~:;]{1,64})$'" - Unrecognized escape sequence '\_'. (Source:
System.Text.RegularExpressions.Regex.Parser.ScanChar(Escape)
System.Text.RegularExpressions.Regex.Parser.ScanCharClass(Boolean caseInsensitive, Boolean scanOnly)
System.Text.RegularExpressions.Regex.Parser.CountCaptures()
System.Text.RegularExpressions.Regex.Parser.Parse(String re, RegexOptions options)
System.Text.RegularExpressions.Regex.Compile(String pattern, RegexOptions options, TimeSpan matchTimeout, Boolean useCache)
System.Text.RegularExpressions.Regex.IsMatch(String input, String pattern, RegexOptions options, TimeSpan matchTimeout)
System.Text.RegularExpressions.Regex.IsMatch(String input, String pattern)
Parasoft.DotTest.Examples.Bank.BankUser.CheckEmail()
Parasoft.DotTest.Examples.Bank.Tests.BankUserTests.Test(String sourceMail)
```

The details view includes the following information:

- Finding location
- Test name
- Failure message

Executed Tests (Details)

You can view the findings in the Executed Tests (Details) section. The nodes where all the test passed are marked with "P" in square brackets. The nodes with test failures begin with a set of values in square brackets. The first value is a count of successfully passed tests and the second indicates the total number of tests executed in the node. The letter "F" indicates the final node where the test failed. You can click nodes marked with a plus sign (+) to expand them.

Executed Tests (Details) [Expand All](#) [Collapse All](#) [Back to Top](#)

```
+ [P] [0:00:00.214] Passed : Total
+ [P] [0:00:00.214] Parasoft.DotTest.Examples.Bank.Tests
- [P] [0:00:00.104] Parasoft.DotTest.Examples.Bank.Tests.AccountNumberTests.TestAccountNumberCreation
- [P] [0:00:00.010] Parasoft.DotTest.Examples.Bank.Tests.AccountNumberTests.TestAccountNumberHashing
- [P] [0:00:00.010] Parasoft.DotTest.Examples.Bank.Tests.AccountNumberTests.TestInvalidAccountNumberCreation
- [P] [0:00:00.006] Parasoft.DotTest.Examples.Bank.Tests.BankUserTests.Test
- [P] [0:00:00.034] Parasoft.DotTest.Examples.Bank.Tests.CurrencyExchangeConverterTests
```

Coverage

This section shows the details of coverage collected during the test execution. Each node starts with a set of values. The first value shows coverage expressed as percentage. The second value is a count of the number of lines in the node which were covered during the test execution. The third value indicates the total number of lines in the node. You can click nodes marked with a plus sign (+) to expand them.

Coverage [Expand All](#) [Collapse All](#) [Back to Top](#)

```
- Total [22% 109/496 executable lines]
- Parasoft.DotTest.Examples.Bank [22% 109/496 executable lines]
- Money [22% 28/125 executable lines]
- Currency.cs [19% 5/26 executable lines]
+ CurrencyInfo.cs [62% 8/13 executable lines]
  CurrencyInfo.CurrencyInfo(System.String, System.String, System.String) [70% 7/10 executable lines]
  CurrencyInfo.get_Code() [100% 1/1 executable lines]
  CurrencyInfo.get_Notation() [0% 0/1 executable lines]
  CurrencyInfo.get_Sign() [0% 0/1 executable lines]
```

Test Parameters

The arguments specified during analysis are shown in the Test Parameters section.

Test Parameters

```
dottestcli -solution C:\dotTEST\Examples_10.2.3.137\VS2013\030_NUnit\BankExample\BankExample.sln -config builtin:Run NUnit Tests with coverage -report C:\dotTEST\Examples_10.2.3.137\VS2013\030_NUnit\020_Run_NUnit_Tests_With_Coverage_Report -out C:\dotTEST\Examples_10.2.3.137\VS2013\030_NUnit\020_Run_NUnit_Tests_With_Coverage_Output.txt
```

Sending Results to Development Testing Platform (DTP) Server

See “Connecting to DTP Server”, page 10, for information about configuring your connection to DTP Server. Use the `-publish` switch to report test results to DTP server.

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-config "builtin://Demo" -publish
```

Associating Results with a DTP Project

Configure the `dtp.project` property to associate results with a project in Development Testing Platform.

```
dtp.project=[PROJECT NAME]
```

Publishing Source Code to DTP Server

By default, tested sources are sent to DTP when the report setting is enabled. This enables DTP to present source code associated with findings.

You can use the `report.dtp.publish.src` setting to disable the publishing of source code, restrict the depth of source code publishing, or enable source code publishing when sending reports to DTP Server is disabled. See “Settings Reference”, page 50, for additional information on DTP Engine settings.

The `report.dtp.publish.src` setting takes one of the following values:

- `off`: Code is not published to DTP server.
- `min`: Publishes minimal part of sources. Only source code that has no reference to source control is published.
- `full`: Publishes all sources associated with the specified scope. This is the default settings.

See the "Development Testing Platform User Guide" for additional information about viewing source code in DTP.

Publishing Sources to DTP Without Running Code Analysis

DTP Engines need to execute to send data to DTP Server, but you may want to send sources without running analysis.

1. Create an empty test configuration and save it to `[INSTALL_DIR]/configs/user` (see “Specifying Test Configurations”, page 15).
2. Run the configuration with appropriate `report.dtp.publish.src` setting.

Unit Test Connector

Unit Test Connector (UTC) allows you to run unit tests created in open source unit testing tools and report results to DTP. UTC for .NET currently ships with out-of-the-box support for the following unit testing tools:

- NUnit
- MS Test versions VS2010, VS2012, VS2013, VS2015

Visit the Parasoft Marketplace (<http://marketplace.parasoft.com>) for additional unit test tool integrations.

Running Unit Tests with Coverage

You can run NUnit tests with or without coverage analysis. Coverage information is collected by running a dedicated test configuration. The built-in test configuration for collecting coverage is `Run NUnit Tests with coverage`.

Running NUnit Tests

Run one of the built-in test configurations to run NUnit tests on the scope of analysis. See “Specifying Test Configurations”, page 15 for details on using the `-config` switch.

Examples

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-config "builtin://Run NUnit Tests" -report "C:\Report"
```

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"
-config "builtin://Run NUnit Tests with coverage" -report "C:\Report"
```

All files associated with NUnit integration are in the `[INSTALL_DIR]\integration\NUnit-2.6.3` directory.

Running MSTest Tests

1. MSTest must be integrated with UTC to run MSTest tests. If you did not integrate with MSTest during installation, you can run `Deploy.exe` in the MSTest integration directory:
`[INSTALLATION_DIR]\integration\MSTest\Deploy.exe`
2. Run one of the built-in test configurations for MSTest test and extend your `dottestcli.exe` command to include the build script that invokes `mstest.exe`:

```
dottestcli.exe -solution "FooSolution.sln" -config "builtin://Execute MSTests with
Coverage" -report "Report" -- "Run_tests.bat"
```

The `--` separator indicates the end of the dotTEST command line; arguments following `--` form a command line that is invoked by `dottestcli.exe`.

In the above example, dotTEST launches the `Run_tests.bat` script and listens to all MSTests executed in the script as it runs. Unit test results are collected and code coverage is measured for `FooSolution.sln`.

Tagging Unique Test Runs

Use the `session.tag` property to define a tag that can be assigned to results from a specific test run. The tag is a unique identifier for the analysis process on a specific module. Using the same session tag overwrites data with results from the most recent run. By default, the tag is set to the name of the executed test configuration.

```
session.tag= [name]
```

Associating Tests with Development Artifacts

You can configure DTP Engines to associate tests with a broad range of development artifacts, such as requirements, defects, tasks, and feature requests.

To successfully associate unit tests with artifacts, you need to:

1. Enable the artifact association property.
2. Specify issue tracking tags and configure their URL associations.
3. Use the tags in the `NUnit.Framework.PropertyAttribute` attribute.

See the sections below for details.

Enabling Artifact Associations

Set the `report.associations` property to `true` to enable associations with artifacts. This also enables/disables test associations in the HTML report.

```
report.associations=true
```

Specifying Issue Tracking Tags

The following tags for artifact types are associated by default when report associations is enabled:

- pr (defects)
- fr (enhancements)
- task
- asset
- req (user stories)

You can use the `issue.tracking.tags` property to define any number of additional tracking tags. Separate the tags' names with a comma:

```
issue.tracking.tags=tag1,tag2,tag3
```

Configuring Issue Tracking Tags and URL Associations

You can generate a link to the association in the HTML report:

```
report.assoc.url.tag1= [URL]
```

URLs can contain `[%ID%]` or `${id}` variables, which will be replaced by issue identifiers. For example:

```
report.assoc.url.tag1=http://bugzilla.company.com/show_bug.cgi?id= [%ID%]
```

Enabling Test Details

You can enable or disable showing test details in the HTML report:

```
report.contexts_details=[true | false]
```

The `report.contexts_details` property must be set to `true` to enable showing associations.

The product's property file is preconfigured to enable showing test details.

See "Report Settings", page 57 for additional information.

Using NUnit Attributes

Use the `NUnit.Framework.PropertyAttribute` attribute to associate NUnit tests with artifacts. See the NUnit documentation for additional information about the `PropertyAttribute` attribute: <http://www.nunit.org/index.php?p=property&r=2.6.3>.

Place the tag in the `NUnit.Framework.PropertyAttribute` attribute to associate it with your tests.

```
[Property("bug", "1234")]
[Test]
public void Test()
{
    ...
}
```

You can also associate a tag with a class. As a result, it will be associated with all the tests within this class. In the example below, bug 9876 is associated with both tests within the `Test` class, whereas bug 111 is associated only with the `Test2` test.

```
[Property("bug", "9876")]
public class Tests
{
    [Test]
    public void Test1()
    {
        ...
    }

    [Property("bug", "111")]
    [Test]
    public void Test2()
    {
        ...
    }
}
```

Multiple Associations

You can associate one tag with more than one artifact.

```
[Property("bug", "1234, 1199")]
[Test]
public void Test()
{
    ...
}
```

You can separate the tasks with a comma, a semicolon or a space character. In the example below, the test is associated with all the listed tasks:

```
[Property("bug", "1234, 1199; 2345 1928")]
[Test]
public void Test()
{
    ...
}
```


Code Coverage Engine

In this section:

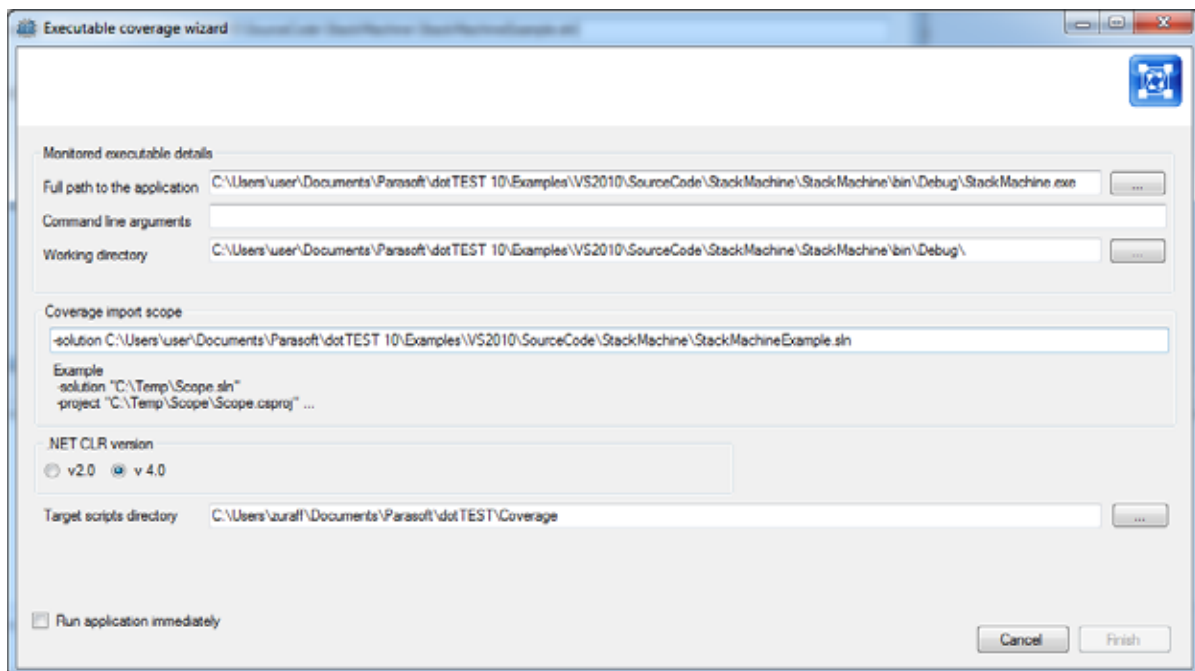
- Application Coverage for Standalone Applications
- Application Coverage for Web Applications

Application Coverage for Standalone Applications

DTP Engines for .NET ship with the `coverage.exe` tool that facilitates collecting coverage information during execution of standalone applications.

The tool launches a wizard for creating two *.bat scripts. One script runs and monitors the application and the other script imports and reports coverage data.

1. Run the [INSTALL_DIR]\coverage.exe tool and specify the following information:
 - Full path to the application
 - Command line arguments
 - Working directory



2. Define scope of coverage to import by providing `-solution` or `-project` switches that will be passed to DTP Engine executable so that it can locate sources. See “Defining Test Scope”, page 18, for more information about the switches.
3. Specify the .NET CLR version used by the application.
4. Specify a directory for the scripts generated by the wizard.
5. Enable the **Run application immediately** option to automatically launch the `monitorCoverage.bat` script (optional; you can also open the directory specified in step 4 and manually run the script).
6. Execute your test cases and close the application.
7. Run the `importCoverage.bat` script (in the directory you specified in the wizard).

8. Check the report for coverage information. The report is written to the 'report' folder by default.

Important

By default, the `monitorCoverage.bat` script cleans the contents of the directory that contains the logs of the previous execution. If you do not want the logs to be removed, you can modify the `monitorCoverage.bat` script by removing the `rmdir /s /q [path/to/directory]` command.

Alternatively, you can comment the command with the `rem` tag, for example:

```
rem rmdir /s /q "C:\Users\annstu\Documents\Parasoft\dotTEST\Coverage\CoverageLogs"
```

You can also collect coverage information during test execution of running web applications. See “Application Coverage for Web Applications”, page 43 for details.

For information about collecting coverage for unit tests, see “Unit Test Connector”, page 36.

Merging Coverage Data

In order to properly merge coverage data in DTP, you must specify one or more coverage image tags in the command line or `.properties` settings file. The coverage image(s) is automatically sent to the connected DTP server where it can be associated with a filter.

You can specify a set of up to three tags that can be used to create coverage images in DTP Server with the `report.coverage.images` property:

```
report.coverage.images=[tag1; tag2; tag3]
```

Associate coverage images in DTP in the Report Center administration page (**administration> Projects> Filters> [click on a filter]**).

You can also use the `report.coverage.limit` property to specify a lower coverage threshold:

```
report.coverage.limit=[value]
```

Coverage results lower than this value are highlighted in the report. The default value is 40.

Application Coverage for Web Applications

You can monitor and collect coverage data during manual or automated functional tests performed on a running web application server. You can also send coverage data and test results to DTP, which merges and correlates the data. The application coverage information can be displayed in the DTP Coverage Explorer (see the "Coverage Explorer" chapter in the DTP user manual), which provides insights about how well the application is tested, as well as the quality of your tests.

Prerequisites

The following components are required for collecting coverage:

- Internet Information Services (IIS) version 7.5 or higher
- Coverage Agent UI application (contact your Parasoft representative) or SOAtest

Process Overview

The DTP Engine for .NET ships with a component called the coverage agent. The coverage agent is attached to the application under test (AUT) and monitors the code being executed as the AUT runs. When the coverage agent is attached to the AUT, a REST API is exposed that enables you to mark the beginning and end of each test and test session.

Metadata about the lines of code that can be covered (static coverage data) is collected by running a dedicated test configuration as part of the application build process. During test execution, interactions with the coverage agent are written to a dynamic coverage map, which contains markers that specify which lines of code were touched.

The DTP Engine processes the dynamic coverage map and static coverage data. A coverage.xml file, which contains the coverage information, is produced and sent to DTP. When DTP receives the coverage data, it's loaded into a coverage image, which is a special tag that enables you to aggregate coverage data from runs with the same build ID. The coverage image enables you to associate coverage information with specific tests.

Test results are also sent to DTP from the tool executing the tests (i.e., SOAtest, tests executed by the DTP Engine, manual tests, etc.) in a report.xml file. If the build IDs for the coverage data file and the report match, DTP is able to correlate the data and display the coverage information.

The complete process is detailed in the following sections.

Configuring the Application Under Test for Coverage

There are a few processes for preparing the AUT:

1. The static coverage file must be generated. The static coverage file contains metadata about user classes, methods, and lines. This is described in "Generating the Static Coverage File", page 43.
2. The coverage agent must be attached to the AUT. See "Attaching the Coverage Agent to the AUT", page 44.

Generating the Static Coverage File

Run the following test configuration on the solution:

```
dottestcli.exe -config "builtin://Collect Static Coverage" -solution SOLUTION_PATH
```

The `dottestcli` console output will indicate where the static coverage data is saved:

```
Saving static coverage information into:
'C:\Users\[USER]\Documents\Parasoft\dotTEST\Coverage\Static\[FILE].data'
```

Customizing Scope of Coverage

By default, coverage is measured for the entire web application. You can customize the scope of coverage by adding the following switches when collecting static coverage to measure specific parts of the application (see “Defining Test Scope”, page 18, for usage information):

```
dottestcli.exe -config "builtin://Collect Static Coverage"
-solution "C:\Devel\FooSolution\FooSolution.sln"
-resource "FooSolution/QuxProject"
-include "C:\Devel\FooSolution\src\QuxProject\**\*.cs"
-exclude "C:\Devel\FooSolution\src\QuxProject\**\tests\**\*.cs"
```

The `-resource` switch points to a path inside the solution, while the `-include` and `-exclude` switches should be paths in the file system.

The scope information is stored in a scope configuration file, which can be provided to the IIS manager tool during web server configuration (see “Attaching the Coverage Agent to the AUT”, page 44). The output from the console will indicate the location of the scope configuration file:

```
Saving static coverage scope configuration into: 'C:\Users\[USER]\Documents\Parasoft\dot-
TEST\Coverage\Static\[FILE].txt'
```

It is not possible to use the application coverage scope file for web projects that are compiled on IIS. This is because the target assemblies of IIS compilations are named unpredictably. Scope files can be used safely when the assembly name loaded by IIS can be predetermined before coverage collection starts.

Attaching the Coverage Agent to the AUT

1. Copy the `[INSTALLATION_DIR]\integration\IIS` directory to the machine where IIS is installed and the web application is deployed.
2. Run a console as an Administrator
3. Invoke the `dotTEST` IIS Manager tool on this machine to enable runtime coverage collection inside IIS:

```
dottest_iismanager.exe
```

If you’ve specified a coverage scope, you must also include the path to the scope configuration file:

```
dottest_iismanager.exe -scope [FILE_PATH]
```

You can add the `-agentTimeout` switch to change the default timeout (1500 ms) for connection with the Coverage Agent. Adjust the timeout to your machine capabilities and provide the value in milliseconds:

```
dottest_iismanager.exe -agentTimeout [TIMEOUT_IN_MILLISECONDS]
```

If you provide 0 or a negative value, the connection attempt will not timeout, which may lead to a considerable slowdown or hang the tool.

You can also add the `-port` switch to change the port number when you start `dottest_iismanager` if the default port is unavailable:

```
dottest_iismanager.exe -port [PORT]
```

`dottest_iismanager` initializes the environment for the web server (IIS) and behaves like a service, enabling you to execute tests and collect coverage. The service is ready and waiting for commands as long as the following message is printed to the output:

```
Write 'exit' and hit Enter to close dottest_iismanager
```

Be aware that a session and test can be started even if the tested website or application has not been loaded yet.

4. Ensure that port 8050 (default port for the coverage agent) allows HTTP traffic in firewall settings on this machine. You can change the coverage agent port number if the default port is unavailable.
5. Open the web site or application
6. Go to the following address to check the status of the coverage agent:

```
http://host:8050/status
```

You should receive the following response:

```
{"session":null,"test":null}
```

Changing IIS Idle Time-outs

By default, IIS application pool processes are recycled after 20 minutes of idle time, which can have negative consequences on a test session. You can prevent this behavior by changing the default value so that people working with the application do not experience unexpected stops and restarts during a test session.

1. Start the Internet Information Services (IIS) Manager
2. Open the Application Pools node
3. Choose the pool for your web application
4. Click **Advanced Settings** in the Actions panel
5. In Process Model section, change the Idle Time-out (minutes) setting to a value better-suited to your testing practices.

Test Configuration and Execution

You can use SOAtest to run functional tests (refer the Application Coverage chapter of the SOAtest documentation to set up the test configuration), as well as execute manual tests. At the end of the test session, coverage will be saved in `runtime_coverage_[timestamp].data` files in the directory speci-

fied in SOAtest. This information will eventually be merged with the static coverage data to create a coverage.xml file and uploaded to DTP.

Uploading Test Results to DTP

For tests executed by SOAtest, the SOAtest XML report will need to be uploaded to DTP. See the "Uploading Rest Results to DTP" section in the Application Coverage topic in the SOAtest documentation for details.

Generating a Dynamic Coverage Data File and Uploading it to DTP

The following settings should be configured in the dottestcli.properties file in order to properly merge coverage data.

- `report.coverage.images` - this setting specifies a set of tags that are used to create coverage images in DTP Server. A coverage image is a unique identifier for aggregating coverage data from runs with the same build ID. DTP supports up to three coverage images per report.
- `session.tag` - this specifies a unique identifier for the test run and is used to distinguish different runs on the same build.
- `build.id` - this setting specifies a build identifier used to label results. It may be unique for each build, but it may also label several test sessions executed during a specified build.

These settings are in addition to the other properties that must be configured, such as scope, authorship, and DTP settings. See the following sections:

- "Connecting to DTP Server", page 10
- "Sending Results to Development Testing Platform (DTP) Server", page 35
- "Settings Reference", page 50

In order to fill the coverage.xml file with runtime coverage data, the DTP Engine must have access to the runtime coverage data generated during test execution, as well as the static coverage data. Copy the runtime coverage and static coverage files to a directory on the same machine and run dottestcli using the `-runtimeCoverage` and `-staticCoverage` switches to specify the location of the files:

```
dottestcli.exe -runtimeCoverage PATH [ -report PATH ] [ -publish ] [ -settings PATH ] [ -out PATH ] [ -staticCoverage PATH ]
```

Stopping Dynamic Coverage Data Collection

In the open console, type `exit` while the following message is printed to the output to stop `dottest_iismanager`:

```
Write 'exit' and hit Enter to close dottest_iismanager
```

You can also send a request to the service by entering the following URL in the browser:

```
http://host:8050/shutdown
```

Stop `dottest_iismanager` only when all test sessions are finished. Application coverage will no longer be collected when the service stops, so it is important that `dottest_iismanager` runs continuously while performing tests to collect coverage.

If any errors occur when `dottest_iismanager` exits that prevent the clean-up of the Web Server environment, then execute `dottest_iismanager` and include the `-stop` parameter to bring back the original Web Server environment and settings:

```
dottest_iismanager.exe -stop
```

Reviewing Coverage in DTP

You can use the Coverage Explorer in DTP to review the application coverage achieved during test execution. See the DTP documentation for details on viewing coverage information.

Customizing DTP Engines for .NET

Basic settings can be specified in the `dottestcli.properties` file in the installation directory. By default, most settings are disabled. Uncomment the settings you want to enable and specify the parameters. Modifying the properties file may require administrator access.

You can create custom properties files and point to them with the `-settings` switch.

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"  
-settings "C:\Devel\Settings\ntp_server.properties"
```

The `-settings` switch may be specified multiple times. Entries with the same key will be overwritten.

```
dottestcli.exe -solution "C:\Devel\FooSolution\FooSolution.sln"  
-settings "C:\Devel\Settings\ntp_server.properties"  
-settings "C:\Devel\Settings\email_server.properties"
```

General settings are applied in the following order:

1. `[INSTALL_DIR]/etc/dottestcli.properties`; the base configuration file for Static Analysis Engine and **should not be modified**.
2. `[INSTALL_DIR]/dottestcli.properties`; contains templates for commonly used settings (license, reporting etc.)
3. `[USER_HOME]/dottestcli.properties`; optional
4. `[WORKING_DIR]/dottestcli.properties`; optional
5. Custom settings passed with the command line switch `-settings path/to/settings.properties` (e.g., `-settings ../settings.properties`)
- 6.

All of the above settings can be overridden by custom settings that are passed with command line switches (e.g. `-report`, `-config`, `-ntp.share.enabled`).

If you have dotTest 9.5 or later, settings can be prepared in Visual Studio and exported to a `*.properties` file.

Use the `-showsettings` option to print the current settings and customizations, including the origin file for each configuration.

Auto-configuring Settings from DTP Server

You can specify settings in Development Testing Platform and configure the Static Analysis Engine to use the settings when it connects to DTP Server. This enables you to use the same settings across multiple machines and configurations to ensure consistency. Edit the following setting in the `dottestcli.properties` file to enable auto-configuration:

```
ntp.autoconfig=true
```

Settings can be auto-configured for the entire organization or per project.

Specifying Organization-wide Settings

1. Log into Development Testing Platform with administrator credentials

2. Switch to Report Center and click the **administration** link.



3. Choose **Settings> Parasoft Test** and enter the settings from `dottestcli.properties`
4. Click **Save**.

Specifying Settings Per Project

1. Log into Development Testing Platform with administrator credentials
2. Switch to Report Center and click the **administration** link.
3. Choose **Projects> Search** and click **Search**
4. Click on your project name in the results and click the **Parasoft Test Settings** tab
5. Enter the settings from `dottestcli.properties` and click **Save**.

Using Variables

You can use the following variables in settings values.

Variable	Description	Example
<code>analysis_type</code>	Outputs a comma separated list of enabled analysis types (e.g., Static, Generation and Execution)	<code>\${analysis_type}</code>
<code>env_var</code>	Outputs the value of the environmental variable specified after the colon.	<code>\${env_var:HOME}</code>
<code>config_name</code>	Outputs the name of executed Test Configuration.	<code>\${config_name}</code>
<code>dtp_project</code>	Outputs the name of DTP project specified in the settings file using <code>dtp.project</code> option.	<code>\${dtp_project}</code>
<code>project_module</code>	Outputs the name of the tested project's module. If more than one module is provided as an input, the first tested module name is output followed by an ellipsis (...). The variable can be configured in the settings file with the <code>project.module</code> option.	<code>\${module_name}</code>
<code>host_name</code>	Outputs the name of the host.	<code>\${host_name}</code>
<code>user_name</code>	Outputs the name of the current user.	<code>\${user_name}</code>
<code>os</code>	Outputs the name of the operating system.	<code>\${os}</code>
<code>arch</code>	Outputs the name of the operating system architecture	<code>\${arch}</code>

Variable	Description	Example
<code>exec_env</code>	Outputs the execution environment. This variable is a concatenation of <code>\${os}</code> and <code>\${arch}</code> variables. It can be configured in the settings file with the <code>exec.env</code> option.	<code>\${exec_env}</code>
<code>scontrol_branch</code>	Outputs the source control branch name for the tested project. If more than one branch name is detected, the first branch name is output followed by an ellipsis (...). The variable can be configured in the settings file with the <code>scontrol.branch</code> option.	<code>\${scontrol_branch}</code>
<code>tool_name</code>	Outputs the name of the tool (i.e., <code>Jtest</code> , <code>C++test</code> , <code>dotTEST</code>).	<code>\${tool_name}</code>
<code>jvm_prop</code>	Outputs the value of the Java vm property specified after the colon.	<code>\${jvm_prop:os.name}</code>

Settings Reference

The following tables contain settings that are currently supported in DTP Engines.

Base Configuration Settings

Setting	Value	Description/Notes
<code>console.verbosity.level</code>	<code>low</code> <code>normal</code> <code>high</code>	Specifies the verbosity level for the Console <code>low</code> : configures the Console view to show errors and basic information about the current steps and status (done, failed, up-to-date). <code>normal</code> : (default) also shows command lines and issues reported during test and analysis. <code>high</code> : also shows warnings.
<code>parallel.mode</code>	<code>disabled</code> <code>auto</code> <code>manual</code>	Determines which of the following modes is active: <code>disabled</code> : configures Parasoft Test to use only one of the available CPUs. <code>auto</code> : (default) allows Parasoft Test to control parallel processing settings. <code>manual</code> : allows you to manually configure parallel processing settings to suit your specific needs.

Setting	Value	Description/Notes
<code>parallel.no_memory_limit</code>	true false	Enables/disables restrictions (beyond existing system limitations) on the memory consumed by parallel processing. Default is <code>false</code>
<code>parallel.free_memory_limit</code>	[percentage]	Specifies the amount of memory that should be kept free in low memory conditions (expressed as a percentage of the total memory available for the application). This is used to ensure that free memory is available for other processes. Default is 25
<code>parallel.max_threads</code>	[number]	Specifies the maximum number of parallel threads that can be executed simultaneously. The actual number of parallel threads is determined by the number of CPUs, available memory, and license settings. The default value is equal to the number of CPUs
<code>file.encoding.mode</code>	default auto user	Specifies how file encoding is determined. default: enables use of system properties auto: enables automatic detection of encoding for the Far-East languages specified with <code>file.encoding.lang</code> user: enables use of specified encoding by <code>file.encoding.name</code> .
<code>file.encoding.lang</code>	[code]	Allows specify language's numeric code when <code>file.encoding.mode</code> is set to <code>auto</code> : Japanese = 1 Chinese = 2 Simplified Chinese = 3 Traditional Chinese = 4 Korean = 5

Setting	Value	Description/Notes
<code>file.encoding.name</code>	[encoding]	Allows you to specify the encoding name when <code>file.encoding.mode</code> is set to user: ASCII-US UTF-8 UTF-16 UTF-16LE UTF-16BE ...
<code>settings.validation</code>	true false	Enables/disables settings validation.
<code>settings.rules.file.dottest</code>	path	Indicates the path to a file that contains additional rules for settings validation. The file should follow the <code>.properties</code> format and include rules according to the following examples: <pre>engine.path=\$ANY engine.enabled=\$BOOLEAN engine.analysis.deep=\$INTEGER engine.severity.limit=\$REGEXP{ [1-5] } engine.verbosity.level=\$REGEXP_IC{ (low) (normal) (high) }</pre>

Test Configuration Settings

Setting	Value	Description/Notes
<code>configuration.dir.builtin</code>	[path]	Path to directory with built-in test configurations.
<code>configuration.dir.user</code>	[path]	Path to directory with user-defined test configurations.
<code>configuration.share.path</code>	[path]	Path on DTP server share with shared test configuration.
<code>dottest.custom.rule.dir</code>	[path to directory]	Specifies the location of user-defined coding standard rules. Default is <code>[INSTALL_DIR] / rules/user</code>

Development Testing Platform Settings

Setting	Value	Description/Notes
<code>dtp.server</code>	[host]	Specifies the host name of the DTP server.

Setting	Value	Description/Notes
<code>dtp.port</code>	[port]	Specifies the port number on DTP server port. The default settings is 443.
<code>dtp.user</code> <code>dtp.password</code>	[username] [password]	Specifies authentication to connect to DTP server.
<code>dtp.project</code>	[project_name]	Specifies the name of the DTP project that you want linked to. This settings is optional.
<code>dtp.autoconfig</code>	true false	Enables auto configuration with settings stored on the DTP server. The default is false.
<code>report.dtp.publish</code>	true false	Determines whether the current installation is reporting test results to DTP server. The default is false.
<code>report.dtp.publish.src</code>	off min full	Determines whether tested source code is published to DTP server. off: code is not published to DTP server. min: publishes minimal part of sources. In most cases, source code without references to source control, e.g., auto-generated code, is published. full: publishes all sources associated with the specified scope. The default is full if <code>report.dtp.publish</code> is enabled, otherwise the default is off
<code>dtp.share.enabled</code>	true false	Enables/disables connection to Team Server. The default is false.
<code>dottest.license.use_network</code>	true false	Enables/disables license retrieval from License Service. The default setting is true.
<code>dottest.license.network.type</code>	dtp ls	Sets the network license type. dtp: file count license that limits usage to a certain number of files as determined by your licensing agreement ls: floating license (machine locked) that limits usage to a certain number of machines

Setting	Value	Description/Notes
<code>dottest.license.local.password</code>	[password]	Specifies the local license password.
<code>dottest.license.local.expiration</code>	[expiration]	Specifies the local license expiration date.
<code>dottest.license.network.edition</code>	<code>desktop_edition</code> <code>server_edition</code> <code>custom_edition</code>	Specifies the type of license that will be retrieve from License Service for this installation. Default is <code>custom_edition</code>
<code>dottest.license.custom_edition_features</code>	[feature_name, ...]	Specifies active features for custom license edition.
<code>dottest.license.wait.for.tokens.time</code>	[minutes]	Specifies the time that tool will wait for a license if a license is not currently available.

Scope and Authorship Settings

Setting	Value	Description/Notes
<code>scope.local</code>	<code>true</code> <code>false</code>	Enables/disables code authorship computation based on the local user and system files modification time. Default is <code>true</code>
<code>scope.scontrol</code>	<code>true</code> <code>false</code>	Enables/disables code authorship computation based on data from a supported source control system. Default is <code>false</code>
<code>scope.xmlmap</code>	<code>true</code> <code>false</code>	Enables/disables task assignment based on an XML mapping file that defines how tasks should be assigned for particular files or sets of files. Default is <code>false</code>
<code>scope.xmlmap.file</code>	[path]	Specifies the path to XML mapping file that defines how tasks should be assigned for particular files or sets of files.
<code>authors.ignore.case</code>	<code>true</code> <code>false</code>	Enables/disables author name case sensitivity. Example: <code>true</code> : David and david are considered the same user. Default is <code>false</code>

Setting	Value	Description/Notes
<code>authors.mappings.location</code>	local shared	Specifies where the authorship mapping file is stored. Default is local. See <code>authors.user</code> and <code>authors.mapping</code> options for details. When set to <code>shared</code> , mappings could be specified in file located on DTP share. See <code>authors.shared.path</code> option for details.
<code>authors.shared.path</code>	[path]	Specifies the location of authors mapping file in DTP share. Example: <code>authors.shared.path=test/authors_map.txt</code>
<code>authors.user{n}</code>	[user_name, email, full_name]	Specifies a specific author by user name, email, and full name. Example: <code>authors.user1=dan,dan@parasoft.com,Dan Stowe</code> <code>authors.user2=jim,jim@parasoft.com,Jim White</code>
<code>authors.mapping{n}</code>	[from_user, to_user]	Specifies a specific author mapping. Example: <code>authors.mapping1=old_user,new_user</code> <code>authors.mapping2=broken_user,correct_user</code>

Suppression Settings

Setting	Value	Description/Notes
<code>suppression{n}.file.ext</code>	[ext]	Specifies the extension of types of files that should be scanned for comment suppressions. Example: <code>suppression1.file.ext=xml</code> <code>suppression2.file.ext=java</code> Set the comment prefix with the <code>suppression{n}.comment</code> setting.

Setting	Value	Description/Notes
<code>suppression{n}.comment</code>	[comment]	Specifies comment prefix for types of files identified in <code>suppression.file.ext</code> setting. Example: <code>suppression1.comment=//</code> <code>suppression2.comment=<!--</code>
<code>suppression{n}.comment.suffix</code>	[comment suffix]	Defines the suppression comment suffix when file extensions has been specified with the <code>suppression.file.ext</code> setting. If not specified then suppression comments will not be suffixed. Example: <code>suppression1.comment.suffix=-></code>
<code>suppression{n}.block.only</code>	true fales	Enables/disables block-only comment suppressions support when file extensions have been specified with the <code>suppression.file.ext</code> setting. Default is false.

Technical Support Settings

Setting	Value	Description/Notes
<code>techsupport.enabled</code>	true false	Enables/disables global automatic technical support data collection is globally enabled with verbose logging. Default is false
<code>logging.verbose</code>	true false	Enables/disables verbose logs. Verbose logs are stored in the <code>xtest.log</code> file in the location specified with the <code>local.storage.dir</code> setting. Verbose logging state persists across sessions (restored on application startup). The log is a rolling file with a fixed maximum size. A backup is created whenever the max size is reached . Default is false

Setting	Value	Description/Notes
<code>logging.scontrol.verbose</code>	<code>true</code> <code>false</code>	Enables/disables output from source control commands in verbose logs. Note that output from source control may include fragments of analyzed source code. Default is <code>false</code>
<code>techsupport.create.on.exit</code>	<code>true</code> <code>false</code>	Enables/disables automatic archive creation when the application is shut down. The <code>techsupport.enabled</code> setting must also be enabled for packages to be created automatically. Default is <code>false</code>
<code>techsupport.archive.location</code>	[path]	Specifies the custom directory where support packages should be created.
<code>techsupport.include.reports</code>	<code>true</code> <code>false</code>	Enables/disables the inclusion of reports in the technical support package.

Report Settings

Setting	Value	Description/Notes
<code>session.tag</code>	[name]	Specifies a tag for signing results from the test session. The tag is a unique identifier for the specified analysis process made on a specified module. Reports for different test sessions should be marked with different session tags.
<code>build.id</code>	[id]	Specifies a build identifier used to label results. It may be unique for each build but may also label more than one test sessions that were executed during a specified build. The default settings is <code>build-yyyy-MM-dd HH:mm:ss</code>

Setting	Value	Description/Notes
<code>project.module</code>	[name]	Specifies a custom name for the project's module. The setting may be used to describe unique runs. If unspecified, the tested module is detected automatically based on code provided to analysis.
<code>exec.env</code>	[env1;env2...]	Specifies a list of tags that describe the environment where the run was executed. Tags may describe operating system (e.g., Windows, Linux), architecture (e.g., x86, x86_64), compiler, browser, etc. The <code>exec.env</code> tags enable the entire session to be described. A detailed description of the environment may also be included in the test suite, test, or test case levels via services API.
<code>report.location</code>	[path]	Specifies the directory where report should be created.
<code>report.format</code>	xml html pdf csv custom	Specifies the report format. Use a comma separated list of formats to generate multiple formats. Default is <code>xml</code>
<code>report.custom.extension</code>	[ext]	Specifies the report file extension of the XSL file for a custom format. Use with <code>report.format=custom</code> and <code>report.custom.xsl.file</code> .
<code>report.custom.xsl.file</code>	[path]	Specifies the location of the XSL file for a custom format. Use with <code>report.format=custom</code> and <code>report.custom.extension</code>
<code>report.developer_errors</code>	true false	Determines whether manager reports include details about developer errors. The default is <code>true</code> .
<code>report.developer_reports</code>	true false	Determines whether the system generates detailed reports for all developers (in addition to a summary report for managers). The default is <code>false</code> .

Setting	Value	Description/Notes
<code>report.authors_details</code>	<code>true</code> <code>false</code>	Determines whether the report includes an overview of the number and type of tasks assigned to each developer. The default is <code>true</code> .
<code>report.contexts_details</code>	<code>true</code> <code>false</code>	Determines whether the report includes an overview of the files that were checked or executed during testing. The default is <code>false</code> .
<code>report.suppressed_msgs</code>	<code>true</code> <code>false</code>	Determines whether report includes suppressed messages. The default setting is <code>false</code> .
<code>report.metadata</code>	<code>true</code> <code>false</code>	Determines whether additional metadata about findings should be downloaded from DTP. Only findings that are already present on DTP are affected. The DTP server must also support the metadata service for this setting to have an effect. Default is <code>true</code> .
<code>report.scontrol</code>	<code>off</code> <code>min</code> <code>full</code>	Specifies if and how much additional information from source control is included in the report: <code>min</code> : repositories, file paths and revisions <code>full</code> : includes the same information as <code>min</code> , as well as task revisions and comments. Default is <code>off</code>
<code>report.associations</code>	<code>true</code> <code>false</code>	Enables/disables showing requirements, defects, tasks, and feature requests associated with a test in the report. The default is <code>false</code> .
<code>issue.tracking.tags</code>	<code>[tag1,tag2,...]</code>	Specifies a list of issue tracking tags. The following tags are supported by default: <code>pr</code> , <code>fr</code> , <code>task</code> , <code>asset</code> , <code>req</code> .
<code>report.assoc.url.[tag]</code>	<code>[url]</code>	Generates link to association inside the HTML report. The URL is a query string containing an <code>[%ID%]</code> placeholder for the <code>PropertyAttribute</code> value.

Setting	Value	Description/Notes
<code>report.active_rules</code>	true false	Determines if report contains a list of the rules that were enabled for the test. The default setting is false.
<code>report.rules</code>	[url]	Specifies a directory for storing static analysis rules HTML files (retrieved by clicking the Printable Docs button in the Test Configuration's Static Analysis tab). Examples: <code>report.rules=file:///C:/parasoft/gendoc/</code> <code>report.rules=./gendoc/</code>
<code>report.test_params</code>	true false	Determines whether report includes test parameter details. The default setting is false.
<code>report.coverage.images</code>	[tag1, . . .]	Specifies a set of tags that will be used to create coverage images in DTP Server. DTP supports up to 3 coverage images per report.
<code>report.coverage.limit</code>	[limit]	Value that specifies the lower coverage threshold. Coverage results lower than this value are highlighted in the report. Default is 40
<code>report.metrics.attributes</code>	[attr1;attr2;...]	Specifies a list of additional attributes for metric results. The following attributes are supported by default: <code>module</code> , <code>namespace</code> , <code>type</code> , <code>method</code> .
<code>report.archive</code>	true false	Enables/disables archiving reports into a ZIP file.
<code>report.graph.start_date</code>	[MM/dd/yy]	Specifies start date for trend graphs that track static analysis task, test execution, and coverage. Use with <code>report.graph.period=[?d ?m ?y]</code>

Setting	Value	Description/Notes
<code>report.graph.period</code>	[?d ?m ?y]	Determines the duration from the start date for trend graphs that track static analysis task, test execution, and coverage. Use with <code>report.graph.start_date=[MM/dd/yy]</code>
<code>report.mail.enabled</code>	true false	Enables/disables report emails to developers and additional recipients specified with the <code>report.mail.cc</code> setting. If enabled, all developers that worked on project code will automatically be sent a report that contains the errors/results related to his or her work. The default setting is <i>false</i> .
<code>report.mail.server</code>	[host]	Specifies the mail server used to send reports.
<code>report.mail.port</code>	[port]	Specifies the port for SMTP server. The default port is 25.
<code>report.mail.security</code>	[security]	Specifies SMTP server connection security. STARTTLS and SSL are supported. The default is STARTTLS.
<code>report.mail.subject</code>	[subject line]	Specifies the subject line of the emails sent.
<code>report.mail.username</code> <code>report.mail.password</code> <code>report.mail.realm</code>	[user_name] [password] [realm]	Specifies the settings for SMTP server authentication. The realm value is required only for those servers that authenticate using SASL realm.
<code>report.mail.domain</code>	[domain]	Specifies the mail domain used to send reports.
<code>report.mail.time_delay</code>	[time]	Specifies a time delay between emailing reports (to avoid bulk email restrictions).
<code>report.mail.from</code>	[email user_name]	Specifies the "from" line of the emails sent.
<code>report.mail.attachments</code>	true false	Enables/disables sending reports as attachments. All components are included as attachments; before you can view a report with images, all attachments must be saved to the disk. The default setting is <i>false</i> .

Setting	Value	Description/Notes
<code>report.mail.compact</code>	trends links	Specifies how report information is delivered in the email. trends: email contains a trend graph, summary tables, and other compact data; detailed data is not included. links: email only contains a link to a report available on DTP server. This setting is not configured by default
<code>report.mail.format</code>	html ascii	Specifies content type for the email. The default setting is html.
<code>report.mail.cc</code>	[email; ...]	Specifies email address for sending comprehensive manager reports. Multiple addresses must be separated with a semicolon. This setting is commonly used to send reports to managers or architects, as well as select developers.
<code>report.mail.include</code>	[email; ...]	Specifies email addresses of developers that you want to receive developer reports. Multiple addresses must be separated with a semicolon. This setting is commonly used to send developer reports to developers if developer reports are not sent automatically (e.g., because the team is not using a supported source control system). This setting overrides addresses specified in the 'exclude' list.
<code>report.mail.exclude</code>	[email; ...]	Specifies email addresses that should be excluded from automatically receiving reports.
<code>report.mail.exclude.developers</code>	true false	Enables/disables report emails to developers not explicitly listed in the <code>report.mail.cc</code> setting. This setting is used to prevent reports from being mailed to individual developers. The default setting is <code>false</code> .

Setting	Value	Description/Notes
<code>report.mail.unknown</code>	[email user_name]	Specifies where to email reports for errors assigned to "unknown".
<code>report.mail.on.error.only</code>	true false	Enables/disables email reports to the manager when an error is found or a fatal exception occurs. Developer emails are not affected by this setting; developer emails are sent only to developers who are responsible for reported errors. The default setting is <code>false</code> .
<code>report.setup.problems</code>	top bottom hidden	Determines placement of setup problems section in report. The default setting is <code>bottom</code> .
<code>report.setup.problems.category_limit</code>	[numerical value]	Specifies a limit to the number of messages reported in a single setup problem category. Default is 10
<code>report.setup.problems.display_limit</code>	[numerical value]	Specifies a limit to the total number of messages displayed in the HTML report in the setup problem section. Default is 100
<code>report.setup.problems.console</code>	true false	Determines whether setup problems will be printed on the console. The default setting is <code>true</code> .
<code>report.ue_coverage_details_htmls</code>	LC DC	Specifies type of coverage included in an additional report, which includes source code annotated with line-by-line coverage details, when a test's HTML report links to it. LC: line coverage DC: decision coverage
<code>report.separate_vm.xmx</code>	[size]	Specifies how much memory should be used for reports generation. The default is 1024M.
<code>report.separate_vm</code>	true false	Enables/disables generating reports as a separate virtual machine. Default is <code>false</code> .
<code>report.separate_vm.launch.file</code>	[path]	Specifies path to launch file which should be used during reports generation.

Setting	Value	Description/Notes
<code>dupcode.sorting.mode</code>	<code>oldest newest paths</code>	Determines how elements in the code duplication findings are sorted. <code>oldest</code> : the oldest result appears at the top. <code>newest</code> : the newest result appears at the top. <code>paths</code> : sorts by full path names in ascending alphabetical order (A to Z). The default is <code>paths</code> .
<code>report.coverage.version</code>	1 2	Specifies the version of the XML coverage report: 1: the standard version will be used. 2: the size of the XML report will be optimized. The default value is 1.

General Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.timeout</code>	[seconds]	Specifies timeout value for operations with source control. The default value is 60.
<code>scontrol.branch</code>	[name]	Enables you to specify a custom name for the tested branch. This setting may be used to describe unique runs. If it is not specified, the tested branch is detected automatically based on code provided to analysis.

AccuRev Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	<code>accurev</code>	AccuRev repository type identifier.
<code>scontrol.accurev.exec</code>	[path]	Path to external client executable (accurev).
<code>scontrol.rep{n}.accurev.host</code>	[host]	AccuRev server host.
<code>scontrol.rep{n}.accurev.port</code>	[port]	AccuRev server port. Default port is 1666.
<code>scontrol.rep{n}.accurev.login</code>	[login]	AccuRev user name.

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.accurev.password</code>	[password]	AccuRev password.

ClearCase Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	<code>ccase</code>	ClearCase repository type name.
<code>scontrol.ccase.exec</code>	[path]	Path to external client executable (cleartool).
<code>scontrol.rep{n}.ccase.vob</code>	[path]	Specifies the VOB's mount point - the path at which the VOB will be accessed by user. Examples: <code>scontrol.rep.ccase.vob=X:\myvob</code> <code>scontrol.rep.ccase.vob=/vobs/myvob</code>
<code>scontrol.rep{n}.ccase.vob_tag</code>	[tag]	The VOB's unique tag in the ClearCase network region.

CVS Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	<code>cvs</code>	CVS repository type identifier.
<code>scontrol.rep{n}.cvs.root</code>	[root]	Full CVSROOT value.

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.cvs.pass</code>	[password]	<p>Plain or encoded password. The encoded password should match password in the <code>.cvspass</code> file.</p> <p>For CVS, use the value in <code>.cvspass</code> from within the user's home directory.</p> <p>For CVSNT, use the value store in the registry under <code>HKEY_CURRENT_USER\Software\Cvsnt\cvspass</code></p> <p>The password is saved in the registry when you first log into the CVS repository from the command line using <code>cvs login</code>. To retrieve the password, go to the registry (using <code>regedit</code>) and look for the value under <code>HKEY_CURRENT_USER->CVSNT> cvspass</code>. This displays your entire login name (e.g., <code>:pserver:exampleA@exampleB:/exampleC</code>) and encrypted password value.</p>
<code>scontrol.rep{n}.cvs.useCustomSSHCredentials</code>	true false	Enables/disables using the <code>cvs</code> login and password for EXT/SSH connections. Default is <code>false</code> .
<code>scontrol.rep{n}.cvs.ext.server</code>	[cvs]	Specifies which CVS application to start on the server side if connecting to a CVS server in EXT mode. Has the same meaning as the <code>CVS_SERVER</code> variable. Default is <code>cvs</code> .
<code>scontrol.rep{n}.cvs.ssh.loginname</code>	[login]	Specifies the login for SSH connections (if an external program can be used to provide the login).
<code>scontrol.rep{n}.cvs.ssh.password</code>	[password]	Specifies the password for SSH connection.
<code>scontrol.rep{n}.cvs.ssh.keyfile</code>	[file]	Specifies the private key file to establish an SSH connection with key authentication.
<code>scontrol.rep{n}.cvs.ssh.passphrase</code>	[passphrase]	Specifies the passphrase for SSH connections with the key authentication mechanism.
<code>scontrol.rep{n}.cvs.useShell</code>	true false	Enables/disables an external program (<code>CVS_RSH</code>) to establish a connection to the CVS repository. Default is <code>false</code> .

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.cvs.ext.shell</code>	[path]	Specifies the path to the executable to be used as the CVS_RSH program. Command line parameters should be specified in the <code>cvs.ext.params</code> property.
<code>scontrol.rep{n}.cvs.ext.params</code>	[parameters]	Specifies the parameters to be passed to an external program. The following case-sensitive macro definitions can be used to expand values into command line parameters: {host} repository host {port} port {user} cvs user {password} cvs password {extuser} parameter <code>cvs.ssh.loginname</code> {extpassword} parameter <code>cvs.ssh.password</code> {keyfile} parameter <code>cvs.ssh.keyfile</code> {passphrase} parameter <code>cvs.ssh.passphrase</code>

Git Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	git	Git repository type identifier.
<code>scontrol.git.exec</code>	[path]	Path to git executable. If not set, assumes git command is on the path.
<code>scontrol.rep{n}.git.url</code>	[url]	The remote repository URL (e.g., <code>git://hostname/repo.git</code>).
<code>scontrol.rep{n}.git.workspace</code>	[path]	The directory containing the local git repository.

Mercurial Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	hg	Mercurial repository type identifier.

Setting Name	Value	Description/Notes
scontrol.hg.exec	[path]	Path to external client executable. Default is hg
scontrol.rep{n}.hg.url	[url]	The remote repository URL (e.g., http://hostname/path).
scontrol.rep{n}.hg.workspace	[path]	The directory containing the local Mercurial repository.

Perforce Source Control Settings

Setting Name	Value	Description/Notes
scontrol.rep{n}.type	perforce	Perforce repository type identifier.
scontrol.perforce.exec	[path]	Path to external client executable (p4).
scontrol.rep{n}.perforce.host	[host]	Perforce server host.
scontrol.rep{n}.perforce.port	[port]	Perforce server port. Default port is 1666.
scontrol.rep{n}.perforce.login	[login]	Perforce user name.
scontrol.rep{n}.perforce.password	[password]	Perforce password, optional if ticket is used for authentication.
scontrol.rep{n}.perforce.client	[client]	The client workspace name as specified in the P4CLIENT environment variable or its equivalents. Root directory for specified workspace should be configured correctly for local machine.

Serena Dimensions Source Control Settings

Setting Name	Value	Description/Notes
scontrol.rep{n}.type	serena	Serena Dimensions repository type identifier.
scontrol.serena.droot	[path]	Path to the Serena Dimensions executable. Example: C:\\Program Files (x86)\\Serena\\Dimensions 2009 R2\\CM\\
scontrol.rep{n}.serena.login	[login]	Serena user name.
scontrol.rep{n}.serena.password	[password]	Password.
scontrol.rep{n}.serena.host	[host]	Serena Dimensions server host name.

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.serena.dbname</code>	[name]	Name of the database for the product you are working with.
<code>scontrol.rep{n}.serena.dbconn</code>	[connection]	Connection string for that database.
<code>scontrol.rep{n}.serena.locale</code>	[locale]	The language used, (e.g., en_US)
<code>scontrol.rep{n}.serena.mapping</code>	[mapping]	If the project has been downloaded/moved to a location other than default work area, use this option to specify a mapping between the project or stream with the Serena repository and the local project. If you are working in the default work area, you do not need to define mappings.

StarTeam Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	starteam	StarTeam repository type identifier.
<code>scontrol.rep{n}.starteam.host</code>	[host]	StarTeam server host.
<code>sscontrol.rep{n}.starteam.port</code>	[port]	StarTeam server port. Default port is 49201.
<code>scontrol.rep{n}.starteam.login</code>	[login]	Login name.
<code>scontrol.rep{n}.starteam.password</code>	[password]	Password (not encoded).
<code>scontrol.rep{n}.starteam.path</code>	[path]	<p>Specifies the project, view, or folder that you are currently working with.</p> <p>You can specify a project name (all views will be scanned when searching for the repository path), project/view (only the given view will be scanned) or project/view/folder (only the specified Star Team folder will be scanned). This setting is useful for working with large multi-project repositories.</p> <p>Examples:</p> <pre>scontrol.rep.starteam.path=proj1</pre> <pre>scontrol.rep.starteam.path=proj1/view1</pre> <pre>scontrol.rep.starteam.path=proj1/view1/folderA</pre> <pre>scontrol.rep.starteam.path=proj1/view1/folderA/folderB</pre>

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.starteam.workdir</code>	[path]	Specifies a new working directory for the selected view's root folder (if the path represents a view) or a new working directory for the selected folder (if the path represents a folder) when the <code>scontrol.rep.starteam.path</code> setting points to a StarTeam view or folder. Examples: <code>scontrol.rep.starteam.workdir=C:\\storage\\dv</code> <code>scontrol.rep.starteam.workdir=/home/storage/dv</code>

Subversion Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	svn	Subversion repository type identifier.
<code>scontrol.svn.exec</code>	[path]	Path to external client executable (svn).
<code>scontrol.rep{n}.svn.url</code>	[url]	Subversion URL specifies protocol, server name, port and starting repository path. Example: <code>svn://buildmachine.foobar.com/home/svn</code>
<code>scontrol.rep{n}.svn.login</code>	[login]	Login name.
<code>scontrol.rep{n}.svn.password</code>	[password]	Password (not encoded).

Synergy/CM Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	synergy	Synergy/CM repository type identifier.
<code>scontrol.synergy.exec</code>	[path]	Path to external client executable (ccm).
<code>scontrol.rep{n}.synergy.host</code>	[host]	Computer on which synergy/cm engine runs. Local host is used when missing. For Web mode, the host must be a valid Synergy Web URL with protocol and port (e.g., <code>http://synergy.server:8400</code>).
<code>scontrol.rep{n}.synergy.dbpath</code>	[path]	Absolute synergy database path (e.g., <code>\\host\db\name</code>).

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.synergy.projspec</code>	[specification]	Synergy project specification which contains project name and its version (e.g., name-version).
<code>scontrol.rep{n}.synergy.login</code>	[login]	Synergy user name.
<code>scontrol.rep{n}.synergy.password</code>	[password]	Synergy password (not encoded).
<code>scontrol.rep{n}.synergy.port</code>	[port]	Synergy port.
<code>scontrol.rep{n}.synergy.remote_client</code>	[client]	(UNIX only) Specifies that you want to start ccm as a remote client. Default value is false. Optional. This is not used for Web mode.
<code>scontrol.rep{n}.synergy.local_dbpath</code>	[path]	Specifies the path name to which your database information is copied when you are running a remote client session. If null, then the default location will be used. This is not used for Web mode.

Microsoft Team Foundation Server Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	tfs	TFS repository type identifier.
<code>scontrol.rep{n}.tfs.url</code>	[url]	URL to TFS repository, e.g., <code>http://localhost:8080/tfs</code>
<code>scontrol.rep{n}.tfs.login</code>	[login]	TFS user name.
<code>scontrol.rep{n}.tfs.password</code>	[password]	TFS password.

Microsoft Visual SourceSafe Source Control Settings

Setting Name	Value	Description/Notes
<code>scontrol.rep{n}.type</code>	vss	Visual SourceSafe repository type identifier.
<code>scontrol.vss.exec</code>	[path]	Path to external client executable (ss).
<code>scontrol.rep{n}.vss.ssdire</code>	[path]	Path of repository database.
<code>scontrol.rep{n}.vss.projpath</code>	[path]	VSS project path.
<code>scontrol.rep{n}.vss.login</code>	[login]	VSS login.
<code>scontrol.rep{n}.vss.password</code>	[password]	VSS password.

Visual Studio Settings

Setting Name	Value	Description
<code>dottest.configuration</code>		Configuration to be used during analysis when not specified with the <code>-config</code> switch is not used. See “Specifying Test Configurations”, page 15
<code>dottest.build.builder_id</code>	<code>msbuild</code> <code>visualstudio</code>	Specifies which builder to use.
<code>dottest.devenv.2015.path</code>	Path to Visual Studio 2015 <code>devenv.exe</code> file	Allows users to customize the default path of Visual Studio 2015.
<code>dottest.devenv.2013.path</code>	Path to Visual Studio 2013 <code>devenv.exe</code> file	Allows users to customize the default path of Visual Studio 2013.
<code>dottest.devenv.2012.path</code>	Path to Visual Studio 2012 <code>devenv.exe</code> file	Allows users to customize the default path of Visual Studio 2012.
<code>dottest.devenv.2010.path</code>	Path to Visual Studio 2010 <code>devenv.exe</code> file	Allows users to customize the default path of Visual Studio 2010.
<code>dottest.devenv.2008.path</code>	Path to Visual Studio 2008 <code>devenv.exe</code> file	Allows users to customize the default path of Visual Studio 2008.
<code>dottest.devenv.2005.path</code>	Path to Visual Studio 2005 <code>devenv.exe</code> file.	Allows users to customize the default path of Visual Studio 2005.
<code>dottest.visualstudio.version</code>	2005 2008 2010 2012 2015	Allows users to override the default Visual Studio version automatically detected from the <code>*.sln</code> file. Uses the appropriate version of Visual Studio for building the solution regardless of <code>*.sln</code> files version.
<code>dottest.visualstudio.target</code>	Build Rebuild Deploy	Allows users to customize the target name used by Visual Studio during solution build. See http://msdn.microsoft.com/en-us/library/vstudio/xee0c8y7.aspx for details.
<code>dottest.visualstudio.custom_switches</code>		Allows users to pass additional switches to the <code>devenv.exe</code> command line during builds. See http://msdn.microsoft.com/en-us/library/vstudio/xee0c8y7.aspx for details.
<code>dottest.visualstudio.timeout</code>	Number of seconds for the timeout	Allows users to apply timeout during solution build (default is 3 hours).

Integrations

- Integrating with MSBuild
- Integrating with NAnt
- Integrating with Source Control Systems
- Using DTP Engines in an IDE
- Integrating with CI Tools

Integrating with MSBuild

Static Analysis Engine for .NET ships with built-in support for integration with MSBuild to simplify running it in MSBuild build scripts environments. Integration with MSBuild scripts is achieved with the following custom MSBuild task:

```
Parasoft.DotTest.MSBuild.Tasks.dll
```

Use the following code in your MSBuild script after a task is deployed:

```
<Import Project="$(MSBuildExtensionsPath)\Parasoft\Parasoft.DotTest.targets"/>

  <Target Name="Demo">
    <DotTest
      Configuration="builtin://Demo"
      Solutions="C:\Devel\FooSolution\FooSolution.sln"
      Report="C:\Devel\Report"
      Out="C:\Devel\Out.txt" />
  </Target>
```

Target File

The target file must be imported in the MSBuild script. If you use `deploy.exe`, then you can the following import statement:

```
<Import Project="$(MSBuildExtensionsPath)\Parasoft\Parasoft.DotTest.targets"/>
```

Alternatively, you can import the target directly from the installation directory:

```
<Import
  Project="[INSTALL_DIR]\integration\MSBuild\Parasoft.DotTest.targets\Parasoft.DotTest.targets"
"/>
```

Targets can be directly imported from the installation directory when running multiple Static Analysis Engine for .NET installations on a single machine.

MSBuild Task

Use `<DotTest>` task in your build file to run Static Analysis Engine for .NET. The following arguments are supported:

- **Configuration:** Defines configuration used during analysis. See “Specifying Test Configurations”, page 15.
- **Solutions:** Defines solutions that are analyzed. See “Analyzing Visual Studio Solutions”, page 13.
- **Projects:** Defines projects that are analyzed. See “Analyzing Visual Studio Projects Without Solutions”, page 13.

- `Websites` : Defines web sites that are analyzed. See “Analyzing Websites”, page 13.
- `Resources`: Defines resources that are analyzed. See “Defining Test Scope”, page 18.
- `Report`: Defines path to report. See “Reporting”, page 29.
- `Settings`: Path to settings file. “Customizing DTP Engines for .NET”, page 48.
- `NoBuild`: Disables build of the tested solutions or projects.
- `SolutionConfig`: Solution build architecture. See “Specifying Solution Configuration and Target Platform”, page 83.
- `TargetPlatform`: Solution build architecture. See “Specifying Solution Configuration and Target Platform”, page 83.
- `Out`: Path where console output is saved.
- `DottestPath`: Path to `dottestcli.exe` file. Allows users to override the auto-detected `dottestcli.exe` path. This can be used to support multiple Static Analysis Engine for .NET installations on a single machine.

Integrating with NAnt

Static Analysis Engine for .NET ships with built-in support for integration with NAnt to simplify running it in NAnt build scripts environments. Use the following code in your NAnt script after the task is deployed to NAnt:

```
<target name="analyze">
  <dottest
    config="builtin://Demo"
    report="C:\Devel\Report"
    out="C:\Devel\Out.txt">
    <solutions>
      <include name="C:\Devel\FooSolution\FooSolution.sln">
    </solutions>
  </dottest>
</target>
```

Loading NAnt Task Library

Integration with NAnt scripts is achieved with the following custom NAnt task:

```
Parasoft.Dottest.NAnt.Tasks.dll.
```

This library must be in the same directory as `NAnt.exe` for the NAnt scripts to detect the Static Analysis Engine task. Alternatively, `<loadtasks>` can be used, which is useful for running multiple Static Analysis Engine for .NET installations on one machine:

```
<project name="sampleProject" default="test">
  <target name="test">
    <loadtasks>
      <fileset>
        <include
name=" [INSTALL_DIR] \integration\NAnt\Parasoft.Dottest.NAnt.Tasks.dll" />
      </fileset>
    </loadtasks>
  </target>
</project>
```

Supported NAnt Task Arguments

- `config`: Defines configuration used during analysis. See "Specifying Test Configurations", page 15.

- **solutions:** Defines solutions that are analyzed. List wildcards in ANT-style format separated by semi-colons to analyze two or more solutions:

```
<dottest config="builtin://Demo"
solutions="C:\Devel\FooSolution\FooSolution.sln;C:\Devel\Bar\**\*.sln" />
```

You can also nest `<include>` elements that point to ANT-style wildcards inside `<solutions>` elements:

```
<dottest config="builtin://Demo" >
  <solutions>
    <include name="C:\Devel\FooSolution\FooSolution.sln">
    <include name="C:\Devel\Bar\**\*.sln">
  </solutions>
</dottest>
```

See “Analyzing Visual Studio Solutions”, page 13.

- **projects:** Defines which projects are analyzed. List wildcards in ANT-style format separated by semi-colons to analyze two or more projects:

```
<dottest config="builtin://Demo"
projects="C:\Devel\FooProjects\Qux\Qux.csproj;C:\Devel\BarProjects\**\*.csproj" />
```

You can also nest `<include>` elements that point to ANT-style wildcards inside `<projects>` elements:

```
<dottest config="builtin://Demo" >
  <projects>
    <include name="C:\Devel\Foo\Qux\Qux.csproj">
    <include name="C:\Devel\Bar\**\*.csproj">
  </projects>
</dottest>
```

See “Analyzing Visual Studio Projects Without Solutions”, page 13.

- **websites:** Defines which web sites are analyzed. List wildcards in ANT-style format separated by semi-colons to analyze two or more web sites:

```
<dottest config="builtin://Demo"
websites="C:\Devel\Foo\WebSite;C:\Devel\Bar\*.WebSite" />
```

You can also nest `<include>` elements that point to ANT-style wildcards inside `<websites>` elements:

```
<dottest config="builtin://Demo" >
  <websites>
    <include name="C:\Foo\WebSite">
    <include name="C:\Bar\*.WebSite">
  </websites>
</dottest>
```

See “Analyzing Websites”, page 13.

- `resources`: Defines which resources are analyzed. Separate two or more paths to resources with a semi-colon:

```
<dottest config="builtin://Demo" resources="Foo/Bar/Baz;Foo/Qux/Garply" >
```

You can also nest `<res>` elements that point to paths inside `<resources>` elements:

```
<dottest config="builtin://Demo">
  ...
  <resources>
    <res name="Foo/Bar/Baz" />
    <res name="Foo/Qux/Garply" />
  </resources>
</dottest>
```

See “Defining Test Scope”, page 18.

- `report`: Defines path to the report.

```
<dottest
  config="builtin://Demo"
  report="C:\Foo\Report" >
  ...
</dottest>
```

See “Reporting”, page 29.

- `settings`: Defines path to settings file:

```
<dottest
  config="builtin://Demo"
  settings="C:\Foo\settings.properties" >
</dottest>
```

See “Customizing DTP Engines for .NET”, page 48.

- `nobuild`: Disables build of the tested solutions or projects.

```
<dottest
  config="builtin://Demo"
  nobuild="true" >
  . . .
</dottest>
```

- `solutionConfig`: **Solution build architecture.** See “Specifying Solution Configuration and Target Platform”, page 83.
- `targetPlatform`: **Solution build architecture.** See “Specifying Solution Configuration and Target Platform”, page 83.
- `Out`: **Path where console output is saved.**
- `DottestPath`: **Path to `dottestcli.exe` file.** Allows users to override the auto-detected `dot-testcli.exe` path. This can be used to support multiple Static Analysis Engine for .NET installations on one machine.

Integrating with Source Control Systems

DTP Engines can collect information from source control systems and use the data to assign ownership of violations, filter analyzed files based on time or modification history, and report information about controlled files to DTP Server. Use the dotTEST 9.5 or later interface to configure integration with source control systems:

1. In your IDE , choose **Parasoft > Preferences** and click **Source Controls**
2. Configure your repository and source control client and click **Apply**.
3. In the Preferences panel menu, click **Scope and Authorship**
4. Enable the **Use source control (modification author) to compute scope** option and click **Apply**.
5. In the Preferences panel menu, click Parasoft
6. Click the **share** to open the Export to localsettings file panel.
7. Select the **Source Controls, Scope and Authorship**, and any other options you want to save.
8. Choose a location and click **OK**.
9. Add the following line to the settings file, which ensures that information on source control details are saved to the report:

```
report.scontrol=min
```

10. Either pass the file to the command line or copy the settings in the administration panel of a project in DTP server (Parasoft Test settings tab) if applicable.
11. Run the analysis.

Integrating with CI Tools

Integrating with TeamCity

Team City is a continuous integration build system where Web Service may be installed on different machine than its builds agents.

Integrating DTP Engines with TeamCity

1. Install DTP Engines for .NET on a machine or machines where the Team City build agent is installed.
2. Perform one of the following actions:
 - Choose "Team City" on the "Select Build System for Integration" tab during installation and follow the wizard instructions.
 - Run the following command manually and follow the wizard instructions:


```
[INSTALL_DIR]\Integrators\TeamCity\deploy.exe
```
3. If TeamCity does not automatically recognize and deploy its plug-in to the build agent, restart TeamCity server and build agent services in **Control Panel> Administrative Tools> Services**.

Configuring a TeamCity Project for DTP Engines

1. Launch TeamCity web services.
2. Choose **Projects> [Project Name]**.
3. Click **Edit Project Settings**.
4. Create a build configuration or edit an existing configuration.
5. At configuration step 3 under "Build Steps", add a build step.
6. Choose Parasoft dotTEST runner.
7. Complete fields on the form.
8. Save the configuration.
9. Ensure that at least one agent is capable of running the configuration (see Step 8 "Agent Requirements").
10. Run the Configuration.

Viewing Results

1. Choose **Projects> [Project Name]**.
2. Go to the Configuration that was used for the run.
3. Click **Build Log** to view the logs.
4. Click **Artifacts** to view the report.

Integrating with Jenkins

DTP Engines for .NET can be integrated with Jenkins continuous integration software. The Parasoft Findings Plugin for Jenkins allows you to visualize static analysis and test results as trend graphs and warnings.

Parasoft Findings Plugin is available directly in Jenkins. See [Parasoft Findings Plugin](#) for details.

You can download the plugin source files from GitHub, see [Parasoft Findings Plugin Project](#). If you need additional information on how to rebuild the plugin, contact Parasoft Support.

Building Solutions and Projects

Many Static Analysis Engine for .NET features require source code to be compiled into binaries. By default, Static Analysis Engine attempts to build solutions and projects prior to analyzing them.

Delegating the Build to MSBuild or Visual Studio

Static Analysis Engine for .NET delegates the build to `msbuild.exe` by default when Visual Studio is not installed on the machine. If an appropriate version of Visual Studio is present, the build is performed by the `devenv.exe /Build` mechanism.

Define the `dottest.build.builder_id` setting to either `visualstudio` or `msbuild` to explicitly set Visual Studio or MSBuild as the builder. See “Settings Reference”, page 50, for additional information.

Depending on Pre-built Code

Pass the `-nobuild` switch to skip the building phase during analysis if the code is compiled prior to analysis.

Specifying Solution Configuration and Target Platform

If code is built during or prior to analysis, Static Analysis Engine for .NET needs to know the correct Solution Configuration (e.g. Debug, Release, or other) and Target Platform (e.g. Any CPU, x86, or other). Static Analysis Engine attempts to choose the most suitable one, but it is recommended to specify them explicitly.

You can use the `-solutionConfig` and `-targetPlatform` command line switches to specify these Solution Configuration and Target Platform. See “Switches Reference”, page 85, for additional information.

These can also be set with the `dottest.build.solution_config` and `dottest.build.target_platform` settings in the `dottestcli.properties` configuration file.

Verifying the Required Build Artifacts

Prior to analysis, DTP Engines for .NET need to verify that all required build artifacts, such as `.exe`, `.dll` or `.pdb` files, are available. Artifacts may not be available due to build issues or incorrect setup, which may prevent DTP Engines from performing analysis or collecting complete analysis results.

If DTP Engines are unable to find all required `.exe`, `.dll` or `.pdb` files, the missing artifacts will be listed in the Setup Problems section of your report.

Getting Help

Use the the -help switch to access usage information on the command line.

```
dottestcli.exe -help
```

Technical Support

You can configure DTP Engines to create package for technical support. Add the following settings to your .properties configuration file:

```
techsupport.enabled=true  
techsupport.create.on.exit=true  
techsupport.archive.location=[OUTPUT DIRECTORY]
```

A technical support package will be created in the output directory at the end of an analysis run.

You need to escape the colon and the backslashes to specify the package location. The following example shows what the path may look like:

```
C:\\Project\\MailSystem\\Report
```

You can also collect logs manually from the following location (the domain name may need to be replaced with the machine name):

```
%ProgramData%\Parasoft\dotTEST\<<Domain>_<User>\logs
```

If you run dotTEST DTP Engine with Visual Studio, additional logs can be collected from:

```
%localappdata%\Parasoft\DtpPlugin\logs\
```

Switches Reference

The following table describes the switches available in DTP Engines

Switch	Description
-solution PATH	Path to solution(s) to be analyzed. Specify multiple times to analyze many solutions. Supports ANT-style wildcards.
-project PATH	Path to project(s) to be analyzed when solution is not provided. Specify multiple times to analyze many projects. Supports ANT-style wildcards
-website DIR	Full path to web site directory to be analyzed when solution is not provided.
-config CONFIG_URL	Path to test configuration. Can point to built-in, user-defined, or team configurations stored in DTP. Can reference by filename or by HTTP URL. See “Specifying Test Configurations”, page 15.
-resource RESOURCE	Solution path of a resource(s).The path corresponds to path of an element in Solutions Explorer of Visual Studio. See “Defining Test Scope”, page 18.
-include INCLUDE	File-system paths of files to include in the analysis. Supports ANT-style wildcards. If not specified, all files are analyzed. See “Fine-tuning the Scope”, page 18
-exclude EXCLUDE	File-system paths of files to exclude from the analysis. Supports ANT-style wildcards. See “Fine-tuning the Scope”, page 18.
-report PATH	Path to report directory or main report file. See “Reporting”, page 29.
-publish	Publishes report to Development Testing Platform (DTP) server. “Sending Results to Development Testing Platform (DTP) Server”, page 35.
-settings PATH	Path to report directory or main report file. See “Customizing DTP Engines for .NET”, page 48.
-nobuild	Disables build of the tested solution or projects.
-solutionConfig CONFIG	Solution configuration, e.g. Debug.
-projectConfig CONFIG	Project configuration, e.g. Debug.
-targetPlatform PLATFORM	Solution configuration target platform, e.g. Any CPU; or project configuration target platform, e.g. AnyCPU. Note the syntax difference.
-out PATH	Path where console output is saved.
-help	Displays command line help.
-version	Prints version
-listconfigs	Prints all available test configurations.
-encodepass PASSWORD	Prints an encoded password that can be used in the .properties configuration file.

Switch	Description
-reference PATH	Path to additional assemblies needed to resolve dependencies of the analyzed projects. Use this switch if you receive an "Unable to find reference assembly" message.
-runtimeCoverage PATH	Path to the file that contains runtime coverage data
-staticCoverage PATH	Path to the file that contains static coverage data
-machineID	Prints your machine ID.
-showsettings	Prints the current settings and customizations.

Third-Party Content

DTP Engines for .NET incorporate items that have been sourced from third parties. The names of the items and their license agreements have been listed in the table. Click the license name to see the details.

Item	License
commons-collections.jar	Apache License 2.0
commons-vfs.jar	Apache License 2.0
avalon-framework.jar	Apache License 2.0
batik-all.jar	Apache License 2.0
fop.jar	Apache License 2.0
chardet.jar	Mozilla Public License
bcprov.jar	MIT License
saxon.jar	Mozilla Public License
jfreechart.jar	GNU LGPL License
jcommon.jar	GNU LGPL License
cvslib.jar	CDDL License
javax.xml.stream_1.0.1.jar	Eclipse Public License
javax.activation_1.1.1.jar	Apache License 2.0
jakarta-log4j.jar	Apache License 2.0
xmlgraphics-commons.jar	Apache License 2.0
fst.jar	Apache License 2.0
truezip.jar	Apache License 2.0
jjawin.jar	DevelopMentor OpenSource Software License
trilead-ssh2.jar	Trilead AG License
javanet.staxutils_1.0.0.jar	BSD License
commons-codec.jar	Apache License 2.0
commons-httpclient.jar	Apache License 2.0
org.apache.commons.io_1.4.0.v20081110-1000.jar	Apache License 2.0
org.apache.commons.logging_1.1.3.jar	Apache License 2.0
fluent-hc.jar	Apache License 2.0
httpclient.jar	Apache License 2.0

Item	License
httpcore.jar	Apache License 2.0
httpclient-cache.jar	Apache License 2.0
httpmime.jar	Apache License 2.0
org.apache.jcs_1.3.4.jar	Apache License 2.0
org.codehaus.stax2_3.2.4.jar	Apache License 2.0
org.json_1.0.0.v201507290100.jar	JSON License
javax.mail_1.5.0.jar	CDDL License
org.suigeneris.jrcs.diff_0.4.2.jar	GNU LGPL License
org.apache.felix.scr-1.6.2.jar	Apache License 2.0
osgi.core-5.0.0.jar	Apache License 2.0
Java JRE	Oracle Binary Code License
Microsoft Visual C++ Redistributable Libraries	Microsoft Visual C++ Redistributable Libraries (Visual Studio License)
IKVM	Permissive Free Software Licence
Metaspec C# Parser	Metaspec Commercial License
log4cpp	GNU LGPL License
.NET Compiler Platform ("Roslyn")	Apache License 2.0
DotNetZip	Microsoft Public License
Osgi.Framework	Apache License 2.0
Apache Felix Declarative Services	Apache License 2.0
Java Native Access (JNA)	GNU LGPL License
NUnit	The zlib/libpng License (Zlib)
Microsoft.Composition	Microsoft Software License Terms
Microsoft.Tpl.Dataflow	Microsoft Software Supplemental Licence Terms
Nito AsyncEx	Microsoft Public License
System.Collections.Immutable	Microsoft Software License Terms
System.Reflection.Metadata	Microsoft Software License Terms

Item	License
Common Compiler Infrastructure	Microsoft Public License