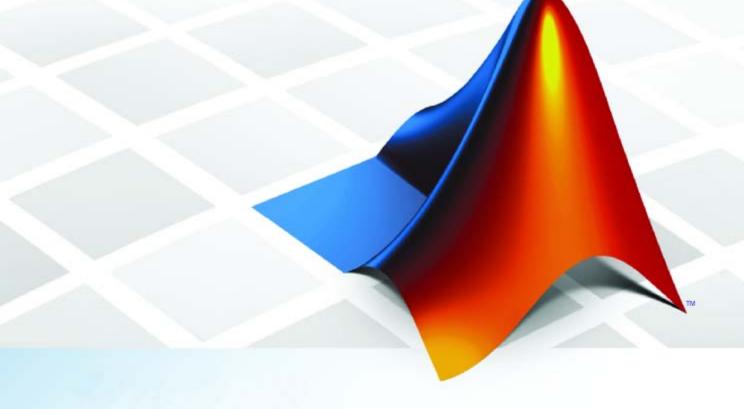
PolySpace® Products for C++ 7 Getting Started Guide





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(a)

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PolySpace[®] Products for C++ Getting Started Guide

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Introduction to PolySpace Products for Verifying C++ Code

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- "Product Components" on page 1-5
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Product Overview

In this section...

"Ensures Software Reliability" on page 1-2

"Decreases Development Time" on page 1-2

"Improves the Development Process" on page 1-3

Ensures Software Reliability

You can ensure the reliability of your C++ applications by using PolySpace[®] verification software to prove code correctness and identify run-time errors. Using advanced verification techniques, PolySpace software performs an exhaustive verification of your source code.

Because PolySpace software verifies all possible executions of your code, it can identify code that:

- Never has an error
- Always has an error
- Is unreachable
- Might have an error

With this information, you can be confident that you know how much of your code is run-time error free, and you can improve the reliability of your code by fixing the errors.

Decreases Development Time

Using PolySpace verification software reduces development time by automating the verification process and helping you to efficiently review verification results. You can use it at any point in the development process, but using it during early coding phases allows you to find errors when it is less costly to fix them.

You use PolySpace software to verify C++ source code prior to compilation. To verify the source code, you set up verification parameters in a project, run the verification, and review the results. This process takes significantly less time than using manual methods or using tools that require you to modify code or run test cases.

A graphical user interface helps you to efficiently review verification results. Results are color-coded:

- Green indicates code that never has an error.
- Red indicates code that always has an error.
- Gray indicates unreachable code (dead code).
- Orange indicates unproven code (code that might have an error).

This color-coding system helps you to identify errors quickly. You will spend less time debugging because you can see the exact location of an error in the source code. After you fix errors, you can easily run the verification again.

Using PolySpace verification software helps you to use your time effectively. Because you know which parts of your code are error-free, you can focus on the code that has definite errors or might have errors.

Reviewing the code that might have errors (orange code) can be time-consuming, but PolySpace software helps you with the review process. You can use filters to focus on certain types of errors or you can allow the software to identify the code that you should review.

Improves the Development Process

PolySpace software makes it easy to share verification parameters and results, allowing the development team to work together to improve product reliability. Once verification parameters have been set up, developers can reuse them for other files in the same application.

PolySpace verification software supports code verification throughout the development process:

- An individual developer can find and fix run-time errors during the initial coding phase.
- Quality assurance can check overall reliability of an application.

• Managers can monitor application reliability by generating reports from the verification results.

Product Components

The PolySpace products for verifying C++ code are combined with the PolySpace products for verifying C code. These products are:

PolySpace[®] Client[™] for C/C++ PolySpace[®] Server[™] for C/C++

The user interface includes:

- The *Launcher* for setting up verification parameters and starting verifications.
- The *Viewer* for reviewing verification results.
- The *Spooler* for managing verifications that run on a server and downloading results from a server to a client.

Installing PolySpace Products

In this section...

"Finding the Installation Instructions" on page 1-6

"Obtaining Licenses for PolySpace" Client for C/C++ and PolySpace" Server for C/C++ Products" on page 1-6

Finding the Installation Instructions

The tutorials in this guide require both PolySpace Client for C/C++ and PolySpace Server for C/C++ products. Instructions for installing PolySpace products are in the *PolySpace Installation Guide*. Before running PolySpace products, you must also obtain and install the necessary licenses.

Obtaining Licenses for PolySpace Client for C/C++ and PolySpace Server for C/C++ Products

See "PolySpace License Installation" in the *PolySpace Installation Guide* for information about obtaining and installing licenses for PolySpace products.

Working with PolySpace Software

In this section ...

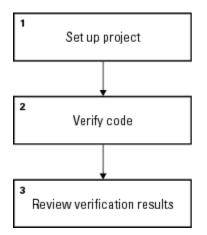
"Basic Workflow" on page 1-7

"The Workflow in This Guide" on page 1-8

"Working with PolySpace Project Model Files" on page 1-9

Basic Workflow

The basic workflow for using PolySpace software to verify C++ source code is:



In this workflow, you:

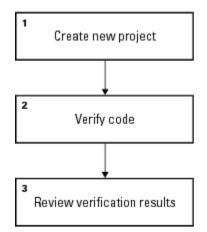
- **1** Use the Launcher to set up a project file.
- 2 Verify code on a server or client.

You can use the Launcher to start the verification or you can select files from a Microsoft[®] Windows[®] folder and send them to the PolySpace software for verification. For verifications that run on a server, you can use the Spooler to manage the verifications and download the results to a client.

3 Use the Viewer to review verification results.

The Workflow in This Guide

The tutorials in this guide take you through the basic workflow, including the different options for running verifications. The workflow that you will follow in this guide is:



In this workflow, you will:

1 Create a new project that you can use for the other steps in the workflow.

This step is in the tutorial Chapter 2, "Setting Up a Project File".

2 Verify a single class using demo C++ source code.

This step is in the tutorial Chapter 3, "Running a Verification". In this tutorial, you will verify the same class using three different methods for running a verification. You will:

- Use the Launcher to start a verification that runs on a server.
- Use PolySpace In One Click to start a verification that runs on a server.
- Use the Launcher to start a verification that runs on a client.

3 Review the verification results.

This step is in the tutorial Chapter 4, "Reviewing Verification Results".

Working with PolySpace Project Model Files

A PolySpace project model file is a project file that includes generic target processor information. You can use this file to share project information, but you cannot use it to run a verification. The tutorial Chapter 6, "Using a PolySpace Project Model File" shows you how to work with PolySpace project model files.

Learning More

In this section...

"Product Help" on page 1-10

"The MathWorks Online" on page 1-10

Product Help

To access the help that came with your installation, select **Help > Help** or click the Help icon in the PolySpace window.

To access the online documentation for PolySpace products, go to:

/www.mathworks.com/access/helpdesk/help/toolbox/polyspace/polyspace.html

The MathWorks Online

For additional information and support, see:

www.mathworks.com/products/polyspace

Related Products

In this section...

"PolySpace Products for Verifying C Code" on page 1-11

"PolySpace Products for Verifying Ada Code" on page 1-11

"PolySpace Products for Linking to Models" on page 1-11

PolySpace Products for Verifying C Code

For information about PolySpace products that verify C code, see the following:

http://www.mathworks.com/products/polyspaceclientc/

http://www.mathworks.com/products/polyspaceserverc/

PolySpace Products for Verifying Ada Code

For information about PolySpace products that verify Ada code, see the following:

http://www.mathworks.com/products/polyspaceclientada/

http://www.mathworks.com/products/polyspaceserverada/

PolySpace Products for Linking to Models

For information about PolySpace products that link to models, see the following:

http://www.mathworks.com/products/polyspacemodelsl/

http://www.mathworks.com/products/polyspaceumlrh/

2

Setting Up a Project File

- "About This Tutorial" on page 2-2
- "Creating a New Project" on page 2-3

About This Tutorial

In this section...

"Overview" on page 2-2

"Example Files" on page 2-2

Overview

You must have a project file before you can run a PolySpace verification of your source code. In this tutorial, you will create a project that you can use to run verifications in later tutorials.

Example Files

In this tutorial, you will verify the class MathUtils in the source file training.cpp that comes with the PolySpace installation CD. You can learn more about the files and folders required for this tutorial in "Preparing the Project Folders" on page 2-4.

Creating a New Project

In this section ...

"What Is a Project?" on page 2-3

"Preparing the Project Folders" on page 2-4

"Opening the PolySpace Launcher" on page 2-5

"Changing the Default Folder" on page 2-7

"Creating a New Project to Verify a Class in the Training C++ File" on page 2-9

What Is a Project?

In PolySpace, a project is a named set of parameters for a verification of your software's source files. A project includes:

- The location of source files and include folders
- The location of a folder for verification results
- Analysis options

You can create your own project or use an existing one. You can create and modify a project using the Launcher graphical user interface.

Project Type File Extension Description Configuration cfg Required for running a verification. Does not include generic target processors. PolySpace Project ppm Used to populate a Model project with analysis options, including generic target processors.

A project file has one of the following file types:

Project Type	File Extension	Description
Desktop	dsk	Obsolete. Used in earlier versions of PolySpace software for running a verification on a client computer.

In this tutorial, you create a new project and save it as a configuration file (.cfg).

Preparing the Project Folders

Before you start verifying C++ code with PolySpace software, you must know the locations of the C++ source file and the include files. You must also know where you want to store the verification results.

For each project, you decide where to store source files and results. For example, you can create a project folder and then create separate folders for the source files, include files, and results within the project folder.

For this tutorial, prepare a project folder as follows:

- 1 Create a project folder named polyspace_project.
- 2 Open polyspace_project, and create the following folders:
 - sources
 - includes
 - results
- 3 Copy the file training.cpp from

Install_folder\Examples\Demo_Cpp_Long\sources

 to

polyspace_project\sources

where *Install_folder* is the installation folder.

4 Copy the files training.h and zz_utils.h from

Install_folder\Examples\Demo_Cpp_Long\sources

to

polyspace_project\includes.

Opening the PolySpace Launcher

Use the PolySpace Launcher, a graphical user interface, to create a project and start a verification.

To open the PolySpace Launcher:

• Double-click the PolySpace Launcher icon on your desktop.

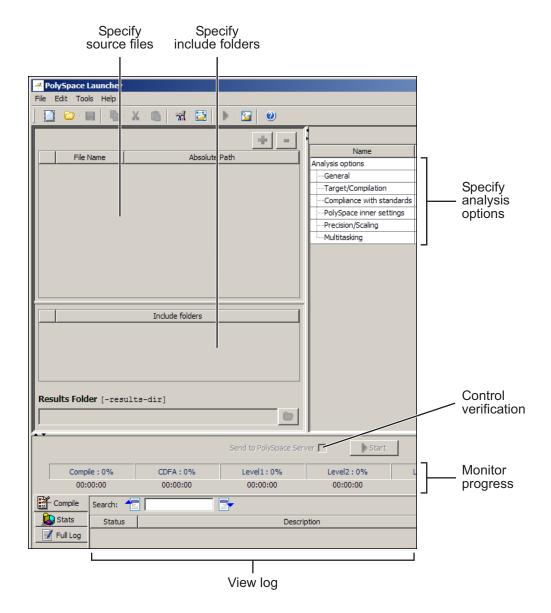


• If you have only the PolySpace Client for C/C++ product installed on your computer, skip this step. If you have both PolySpace Client for C/C++ and PolySpace Client for Ada products on your system, the **PolySpace** Language Selection dialog box will appear.

PolySpace Language Select	tion 🗵
Select a language	
PolySpace for C/C++	
O PolySpace for Ada	
ОК	Cancel

Select PolySpace for C/C++ and click OK.

The PolySpace Launcher window opens.



The Launcher window has three main sections.

Use this section	For
Upper-left	Specifying: • Source files
	• Include folders
	Results folder
Upper-right	Specifying analysis options
Lower	Controlling and monitoring a verification

You can resize or hide any of these sections. You learn more about the Launcher window later in this tutorial.

Changing the Default Folder

PolySpace software allows you to specify the default folder that appears in the directory browsers in dialog boxes. If you do not change the default folder, the default folder is the installation folder. In this tutorial, you change the default folder to the project folder that you created in "Preparing the Project Folders" on page 2-4. Changing the default folder to the project folder makes it easier for you to locate and specify source files and include folders in dialog boxes.

To change the default folder to the project folder:

1 Select Edit > Preferences.

The **Preferences** dialog box appears.

Preferences							×
Tools Menu Ren	note Launcher	Miscellaneous	Results folder	Default folder	Editors	Generic targets	
		Menu title		Exe	ecution co	mmand	
							$-\parallel$
	,		ОК	1	pply	Cancel	
			UK	A	рыу		

- 2 Select the **Default folder** tab.
- **3** Select **Always use this specific folder** if it is not already selected.
- **4** Enter or navigate to the project folder that you created earlier. In this example, the project folder is C:\PolySpace\polyspace_project.

The Preferences dialog box should now look like the following.

Preferences X
Tools Menu Remote Launcher Miscellaneous Results folder Default folder Editors Generic targets
Default folder for all browsers.
Always use this specific folder C:\PolySpace\polyspace_project
O Use the current path as a default folder
OK Apply Cancel

5 Click OK to apply the changes and close the dialog box.

Creating a New Project to Verify a Class in the Training C++ File

You must have a project, saved with file type .cfg, to run a verification. In this part of the tutorial, you create a new project to verify training.cpp.

You create a new project by:

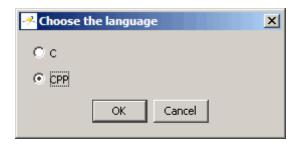
- "Opening a New project" on page 2-10
- "Specifying the Source Files, Include Folders, and Results Folder" on page 2-11
- "Specifying the Analysis Options" on page 2-14
- "Saving the Project" on page 2-17

Opening a New project

To open a new project for verifying training.cpp:

1 Select File > New Project.

The **Choose the language** dialog box appears:



2 Select C++, then click OK.

The default project name, New_Project, appears in the title bar.

In the **Analysis options** section, the **General** options node expands with default project identification information and options.

Search internal name from the selected line:				
Name	Value		Internal name	
Analysis options				
General				
Session identifier	New_Project		-prog	
Date	06/01/2010		-date	
Muthor	username		-author	
Project version	1.0		-verif-version	
····Keep all preliminary results files	files 🗌		-keep-all-files	
-Report Generation				
Report template name	C:\PolySpace\P		-report-template	
Output format	RTF 💌		-report-output-format	
Compliance with standards				
Multitasking				

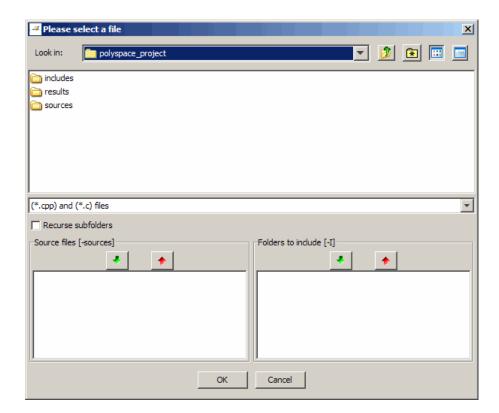
Specifying the Source Files, Include Folders, and Results Folder

To specify the source files, include folders, and results folder for the verification of training.cpp:

1 Click the green plus sign button in the upper right of the files section of the Launcher window.



The **Please select a file** dialog box appears.



- 2 The project folder polyspace_project should appear in the Look in drop-down box. If it does not, navigate to that folder.
- **3** Double-click the sources folder.
- **4** Select the file training.cpp and then click the green down arrow button in the **Source files** section.



The path for training.cpp appears in the source files list.

Tip You can also drag files from an open folder directly to the source files list or the folders to include list.

5 Navigate back to the polyspace_project folder.

Select the folder includes, then click the green down arrow button in the **Folders to include** section.



The path for the folder appears in the list of folders to include.

- 6 Navigate to the folder Install_folder\Verifier\include.
- 7 Select the folder include-linux, then click the green down arrow button in the Folders to include section.

Note This tutorial uses a Linux OS target, therefore you must include the Linux library files. When verifying your code, you should include the standard headers for your compiler.

- 8 Click OK to apply the changes and close the dialog box.
- **9** In **Results Folder**, specify the folder for the verification results. Enter the path for the results folder that you created earlier. In this example, the results folder is C:\PolySpace\polyspace_project\results.

The files section in the upper left of the Launcher window now looks like this.

training.cfg	· -
File Name	Absolute Path
training.cpp	C:\PolySpace\polyspace_project\sources
	Include folders [-I]
	pace_project\includes
C:\PolySpace\PolyS	paceForCandCPP_R2010a\Verifier\include\include-linux
Results Folder [-res	ults-dir]
C:\PolySpace\polyspace_	project/results

Specifying the Analysis Options

The analysis options in the upper-right section of the Launcher window include identification information and parameters that PolySpace software uses during the verification process. For more information about analysis options, see "Options Description" in the *PolySpace Products for C++ Reference*.

To specify the analysis options for this tutorial:

 In the General section, change the Session identifier to Training_Project.

Note The session identifier cannot contain spaces.

- 2 Expand the **PolySpace inner settings** section and select the **Generate a main using a given class** check box. This enables the -class-analyzer option and allows you to specify the class you want to verify. Expand the **Generate a main using a given class** section and type in MathUtils as the class name.
- **3** Expand the **Target/Compilation** section. Because you included Linux header files for this project, you must select a Linux[®] OS target. This will provide PolySpace with a set of predefined compilation flags that are known to be default or implicit compile options for the target OS. Select Linux from the drop-down menu next to **Operating system target for PolySpace stubs**.
- **4** Keep the default values for all other options.

The analysis options will now look like this.

Search internal name from t	2: [🔎 I 😽		
Name	Value		Internal name	
Analysis options				
General				
Session identifier	Training_Proje	ect	-prog	
Date	06/01/2010		-date	
Author	username		-author	
Project version	1.0		-verif-version	
Keep all preliminary results files			-keep-all-files	
⊡Report Generation				
Report template name	C:\PolySpace	Po	 -report-template	
Output format	RTF	-	-report-output-format	
Target/Compilation				
Target processor type	sparc	-	 -target	
Operating system target for PolySpace stubs	Linux	-	-OS-target	
Defined Preprocessor Macros			 -D	
		Ĩ	 -U	
Include			 -include	
Command/script to apply to preprocessed files			 -post-preprocessing-command	
Command/script to apply after the end of the code ve			 -post-analysis-command	
⊡Compliance with standards				
⊡PolySpace inner settings				
⊡Run a verification unit by unit	Γ		-unit-by-unit	
	Г			
⊡Generate a main for a given class	~			
Class name	MathUtils		-class-analyzer	
Analyze the class contents only			-class-only	
Select methods called by the generated main	default	•	-class-analyzer-calls	
Don't check member initialization in the generated			-no-constructors-init-check	
Generate a main for the given functions				
⊡Stubbing				
Assumptions				
Run verification in 32 or 64-bit mode	auto	-	-machine-architecture	
Number of processes for multiple CPU core systems	4		-max-processes	
Other options				

Note You can also select the -class-only option when you want to verify a single class. When this option is applied, even if you add other classes and function member definitions, PolySpace will stub them. This accelerates your verification process and allows you to check robustness issues for a single class. For the purposes of this tutorial, it is not necessary to select this option because the class MathUtils does not depend on any other classes.

Saving the Project

To save the project:

1 Select File > Save project. The Save the project as dialog box appears.

🥕 Save the proj	ect as			×
Look in:	🛅 polyspace_proje	ct	- 🦻	5 📂 🖽 🛛
My Recent D Desktop My Documents My Computer	includes im results im sources			
My Network	Session identifier			ок
	Files of type:	*.cfg	T	Cancel

- 2 In Look in, leave the default folder, polyspace_project.
- 3 In Session identifier, enter training.
- **4** In **Files of type**, leave the default *.cfg. You must have a project file with type cfg to run a verification.

Note You can also run a verification with a project file of type dsk. Older versions of PolySpace software created files with type dsk for use with verifications running on a desktop PC. For more information about the dsk file type, see "What Is a Project?" on page 2-3.

5 Click OK to save the project and close the dialog box.

Running a Verification

- "About This Tutorial" on page 3-2
- "Opening the Project" on page 3-4
- "Using the Launcher to Start a Verification That Runs on a Server" on page 3-5
- "Using PolySpace In One Click to Start a Verification That Runs on a Server" on page 3-15
- "Using the Launcher to Start a Verification That Runs on a Client" on page 3-25

About This Tutorial

In this section...

"Overview" on page 3-2

"Before You Start" on page 3-3

Overview

Once you have created the project training.cfg as described in "Creating a New Project" on page 2-3, you can run the verification.

You can run a verification on a server or a client.

Use	For
Server	• Best performance
	• Large files (more than 800 lines of code including comments)
	• Multitasking
Client	• An alternative to the server when the server is busy
	• Small files with no multitasking
	Note Verification on a client takes more time. You might not be able to use your client computer when a verification is running on it.

You can start a verification using the Launcher or using PolySpace In One Click. With either method, the verification can run on a server or a client.

Use	For
Launcher	A basic way to start a verification.
	You specify the source files in the project file. With the project file open, you click a button to start the verification.
PolySpace In One Click	A convenient way to start the verification of several files which use the same verification options.
	Once you specify the project file containing the verification options, you specify the source files by selecting them from a Microsoft Windows folder. You start the verification by sending the selected files to PolySpace software.

In this tutorial, you learn how to run a verification on a server and on a client, and you learn how to start a verification using the Launcher and using PolySpace In One Click. You verify the class MathUtils in the file training.cpp three times using a different method each time. You use:

- **1** The Launcher to start a verification that runs on a server.
- 2 PolySpace In One Click to start a verification that runs on a server.
- **3** The Launcher to start a verification that runs on a client.

Each verification stores the same results in polyspace_project\results. You review these results in the tutorial Chapter 4, "Reviewing Verification Results".

Before You Start

Before you start this tutorial, you must complete Chapter 2, "Setting Up a Project File". You use the folders and project file, training.cfg, from that tutorial to run the verifications.

Opening the Project

To run a verification, you must have an open project file. For this tutorial, you use the project file training.cfg that you created in Chapter 2, "Setting Up a Project File". Open training.cfg if it is not already open.

To open training.cfg:

- **1** If the PolySpace Launcher is not already open, open it by double-clicking the PolySpace Launcher icon.
- 2 Select File > Open project.

The **Please select a file** dialog box opens.

- 3 In Look in, navigate to polyspace_project.
- 4 Select training.cfg.
- 5 Click Open to open the file and close the dialog box.

Using the Launcher to Start a Verification That Runs on a Server

In this section...

"Starting the Verification" on page 3-5

"Monitoring the Progress of the Verification" on page 3-7

"Downloading Results from the Server to the Client" on page 3-10

```
"Troubleshooting a Failed Verification" on page 3-12
```

Starting the Verification

In this part of the tutorial, you run the verification on a server.

To start a verification that runs on a server:

1 Select the **Send to PolySpace Server** check box next to the **Start** button in the middle of the Launcher window.



Note If you select **Set this option to use the server mode by default in every new project** in the Remote Launcher pane of the preferences, the **Send to PolySpace Server** check box is selected by default when you create a new project.

2 Click Start.

Note If you see the message Verification process failed, click **OK** and go to "Troubleshooting a Failed Verification" on page 3-12.

The verification has three main phases:

- **a** Checking syntax and semantics (the compile phase). Because PolySpace software is independent of any particular C++ compiler, it ensures that your code is portable, maintainable, and complies with ANSI[®] standards.
- **b** Generating a main if it does not find a main and the **Generate a Main** option is selected. For more information about generating a main, see "Generate a Main Using a Given Class" in the *PolySpace Products for* C++ Reference.
- Analyzing the code for run-time errors and generating color-coded diagnostics.

The compile phase of the verification runs on the client. When the compile phase finishes:

- A message dialog box tells you that the verification is completed. This message means that the part of the verification that takes place on the client is complete. The rest of the verification runs on the server.
- A message in the log area tells you that the verification was transferred to the server and gives you the identification number (Analysis ID) for the verification. For this verification, the identification number is 2.

			Send	to PolySpace S	Server 🔽		👂 Sta	art
Compile : 100	% N	ormalization : 0%	C++Link:0%	Intermediat	e:0%	Level	0:0%	
00:00:05		00:00:00	00:00:00	00:00:0	00	00:0	0:00	
Compile		Search: 📢						••
🔬 Stats	Status		Description			File	Line	Col
📝 Full Log	1	PolySpace Launcher for CPP verification start at Jul 7, 2009						
	1	The analysis has been queued with ID=1						

- **3** When you see the message Verification process completed, click **OK** to close the message dialog box.
- **4** Stop the Launcher by clicking **File > Quit**.

Monitoring the Progress of the Verification

You monitor the progress of the verification using the PolySpace Queue Manager (also called the Spooler).

To monitor the verification of Example_Project:

1 Double-click the **PolySpace Spooler** icon:



The PolySpace Queue Manager Interface opens.

🛃 PolySp	ace Queue	Manager Interfac	e					_ 🗆 ×
Operations	Help							
ID	Author	Application	Results fo	older	CPU	Status	Date	Language
4	PolySpace	Demo_C	C:\PolySpace\PolySpac	eForCandCPP	runstr	completed	14-Dec-2009,	с
5	polyspace	Demo_C_Single_File	C:\PolySpace\PolySpac	eForCandCPP	runstr	completed	14-Dec-2009,	С
. 8	PolySpace	Demo_C	C: \PolySpace \polyspac	e_project\results		completed	17-Dec-2009,	С
15	username	Training_Project	C:\PolySpace\polyspac	e_project\results	runstr	running	06-Jan-2010,	CPP
onnected	to Queue I	Manager localhost					Us	ser mode

Tip You can also open the Polyspace Queue Manager Interface by clicking the PolySpace Queue Manager icon in the PolySpace Launcher toolbar.

- **2** Point anywhere in the row for ID 1.
- **3** Right-click to open the context menu for this verification.

Follow Progress View Log File Download Results Download Results And Remove From Queue
Move Down In Queue
Stop Stop And Download Results Stop And Remove From Queue
Remove From Queue

4 Select View log file.

A window opens displaying the last one-hundred lines of the verification.

```
🔤 C:\PolySpace\PolySpace_Common\RemoteLauncher\wbin\psqueue-progress.exe
GUI files generation complete.
Generating remote file
Done
Certain (red) errors have been detected in the analysed code dur
se.
Analysis continuing because the option -continue-with-red-error
***
*** Level 4 Software Safety Analysis done
***
Ending at: Apr 11, 2008 12:29:8
User time for pass4: 35.8real, 35.8u + 0s
User time for polyspace-c: 176.5real, 176.5u + 0s
***
*** End of PolySpace Verifier analysis
----
Press enter to close the window ...
```

5 Press **Enter** to close the window.

6 Select **Follow Progress** from the context menu.

A Launcher window labeled **PolySpace follow remote analysis progress for CPP** appears.

ile Edit He	follow remote code ve p						
	Se	nd to PolySpace Serv	er 🔽 📄 S	itart	Stop Execution		
Compile : 100°	% Normalization : 100%	6 C++ Link : 100%	Intermediate : 100%	Level0 : 100%	% Level1 : 100%	Level2 : 100%	Level3 : 1
00:00:04	00:00:55	00:00:28	00:00:15	00:01:53	00:03:14	00:00:56	00:01:C
Compile					Sea	arch: 📢	
📲 JSF	Number of NTL : 0						
<u>∩</u> ∼	Number of NTC : 0						
	Number of UNR : 4						
	Certain (Red) erro - certain OBAI, a	-	hin bounds: [0.	.3], File mai	in.cpp, line 61,	column 9	
		array index wit	hin bounds: [0.	.3], File maj	in.cpp, line 61,	column 9	
	- certain OBAI, a	array index with		-			Space-Dot
	- certain OBAI, « GUI files generat:	array index wit ion complete. s in a spreadsh		-			Space-Doc
	- certain OBAI, a GUI files generat: Generating result:	array index with ion complete. s in a spreadsh te	eet format in C	 :\PolySpace\J			Space-Do(
	- certain OBAI, a GUI files generat: Generating results Generation complet ****	array index with ion complete. s in a spreadsh te	eet format in C	:\PolySpace\}			Space-Dot
	- certain OBAI, a GUI files generat: Generating result: Generation complet	array index with ion complete. s in a spreadsh te	eet format in C	:\PolySpace\}			Space-Doc

You can monitor the progress of the verification by watching the progress bar and viewing the logs at the bottom of the window. The word processing appears under the current phase. The progress bar highlights each completed phase and displays the amount of time for that phase.

The logs report additional information about the progress of the verification. The information appears in the log display area at the bottom of the window. The full log displays by default. It display messages, errors, and statistics for all phases of the verification. You can search the full log

by entering a search term in the **Search in the log** box and clicking the left arrows to search backward or the right arrows to search forward.

- 7 Click the Compile Log button to display compile phase messages and errors. You can search the log by entering search terms in the Search in the log box and clicking the left arrows to search backward or the right arrows to search forward.
- 8 Click the **Stats** button to display statistics, such as analysis options, stubbed functions, and the verification checks performed.
- **9** Click the refresh button



to update the stats log display as the verification progresses.

10 Select **File > Quit** to close the progress window.

11 Wait for the verification to complete.

When the verification completes, the status in the **PolySpace Queue Manager Interface** changes from running to completed.

🚟 PolySp	ace Queue	Manager Interfac	e i i i i i i i i i i i i i i i i i i i				_ 🗆 🗵
Operations	Help						
ID	Author	Application	Results folder	CPU	Status	Date	Language
4	PolySpace	Demo_C	C:\PolySpace\PolySpaceForCandCPP	runstr	completed	14-Dec-2009,	С
····5	polyspace	Demo_C_Single_File	C:\PolySpace\PolySpaceForCandCPP	runstr	completed	14-Dec-2009,	С
± 8	PolySpace	Demo_C	C:\PolySpace\polyspace_project\results		completed	17-Dec-2009,	С
	username	Training_Project	C:\PolySpace\polyspace_project\results	runstr	completed	06-Jan-2010,	CPP
Connected	to Queue	Manager localhost				Us	ser mode

Downloading Results from the Server to the Client

At the end of the verification, the results are on the server. To download the results to your client:

1 In the **PolySpace Queue Manager Interface**, select **Download Results** from the context menu for the verification.

The **Browse For Folder** dialog box appears with the polyspace_project\results folder selected.

Browse For Folder	? ×
Directory where to store the results :	
Folder: results Make New Folder OK Cance	

2 Click OK to close the dialog box.

A dialog box appears telling you that the download is complete and asking if you want to open the PolySpace Viewer.

Question		X
Download completed. Do you v	want to open Pol	ySpace Viewer ?
Yes	No	[

- 3 Click No.
- 4 Select Remove From Queue from the context menu.

A dialog box appears asking you to confirm that you want to remove the verification from the queue.

Question			X
Do you really w	ant to remove	the analysis 1 I	from the queue ?
_			-
	Yes	No	
			_

5 Click Yes.

Note

- To download the results and remove the verification from the queue, select **Download Results And Remove From Queue** from the context menu.
- If you download results before the verification completes, you get partial results and the verification continues.

6 Select Operations > Exit to close the PolySpace Queue Manager Interface.

Once the results are on your client, you can review them using the PolySpace Viewer. You review the results from the verification in Chapter 4, "Reviewing Verification Results".

Troubleshooting a Failed Verification

When you see a message that the verification failed, it indicates that PolySpace software could not perform the verification. The following sections present some possible reasons for a failed verification.

Hardware Does Not Meet Requirements

The verification fails if your computer does not have the minimal hardware requirements. For information about the hardware requirements, see

www.mathworks.com/products/polyspaceclientc/requirements.html.

To determine if this is the cause of the failed verification, search the log for the message:

Errors found when verifying host configuration.

You can:

- Upgrade your computer to meet the minimal requirements.
- Select the **Continue with current configuration option** in the General section of the Analysis options and run the verification again.

You Did Not Specify the Location of Included Files

If you see a message in the log, such as the following, either the files are missing or you did not specify the location of included files.

include.h: No such file or folder

For information on how to specify the location of include files, see "Creating a New Project to Verify a Class in the Training C++ File" on page 2-9.

PolySpace Software Cannot Find the Server

If you see the following message in the log, PolySpace software cannot find the server.

Error: Unknown host :

PolySpace software uses information in the preferences to locate the server. To find the server information in the preferences:

- 1 Select Edit > Preferences.
- 2 Select the Remote Launcher tab.

* Preferences	x						
Tools Menu Remote Launcher Miscellaneous Results folder Default folder Editors Generic targets							
Remote configuration							
Set this option to use the server mode by default in every new project Note: this option is mandatory when the project contains multitasking options.							
The multitasking options will be ignored otherwise.							
C Automatically detect the remote server							
Use the following server and port : localhost							
The server name "localhost" can be used if the server is the local machine.							
OK Apply Cancel							

By default, PolySpace software automatically finds the server. You can specify the server by selecting **Use the following server and port** and providing the server name and port. For information about setting up a server, see the *PolySpace Installation Guide*.

Using PolySpace In One Click to Start a Verification That Runs on a Server

In this section...

"Overview of PolySpace In One Click" on page 3-15

"Setting the Active Project" on page 3-15

"Sending the Files to PolySpace Software" on page 3-17

Overview of PolySpace In One Click

In a Microsoft Windows environment, PolySpace software provides a convenient way to streamline your work when you want to verify several files using the same set of options. Once you have set up a project file that has the options you want, you designate that project as the *active project*, and then send the source files to PolySpace software for verification. You do not have to update the project with source file information. This process is called *PolySpace In One Click*.

In this part of the tutorial, using PolySpace In One Click, you learn how to:

- 1 Set the active project.
- 2 Send files to PolySpace software for verification.

Setting the Active Project

The active project is the project that PolySpace In One Click uses to verify the files that you select. Once you have set an active project, it remains active until you change the active project. PolySpace software uses the analysis options from the project; it does not use the source files or results folder from the project.

To set the active project:

1 Right-click the PolySpace In One Click icon in the taskbar area of your Windows desktop:



The context menu appears.

	Set active project	+
	Open active project - Training_Project	
3	Viewer	
<u></u>	Launcher	
3	Spooler	
	Help	•
	Exit	

2 Select Set active project > Browse from the menu.

The **Please set an active project** dialog box appears:

Please set an ac	tive project.						<u>? ×</u>
Look in:	Dolyspace_p	roject		•	+ 🗈 🖻	* 🎫 🕶	
Desktop Desktop My Documents mathworks	includes results sources craining.cfg						
My Network Places	File name: Files of type:	 PolySpace	configuration	files	•] [Open Cancel

- 3 In Look in, navigate to polyspace_project.
- 4 Select training.cfg.
- 5 Click **Open** to apply the changes and close the dialog box.

Sending the Files to PolySpace Software

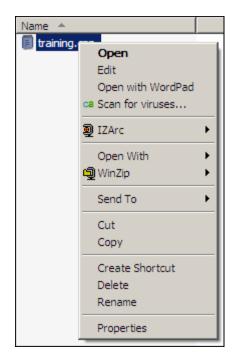
You can send several files to PolySpace software for verification. For this tutorial, you send one file, training.cpp.

To send training.cpp to PolySpace software for verification:

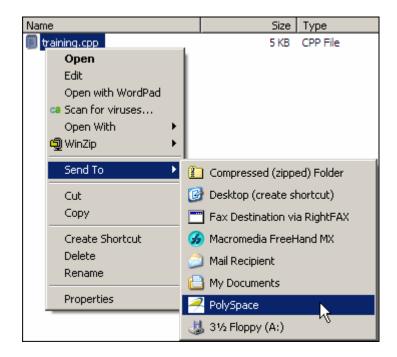
1 Navigate to the folder polyspace_project\sources.

2 Right-click the file training.cpp.

The context menu appears.



3 Select **Send To > PolySpace**.



The **PolySpace basic settings** dialog box appears.

PolySpace basic settings [C++]	
Settings	
Precision Passes Results folder	O2 Pass2 (Software Safety Analysis level 2) C:\PolySpace\polyspace_project\results
Verification Mode Settings	
C Class analysis	O Main analysis
Main generator calls	Al
Function called before main Main generator write variables	Uninit 💌
Scope C:\PolySpace\polyspace_project\sources\t	raining.cpp
Send to PolySpa	ace Server 💽 Start

- 4 Make sure that **Results folder** is polyspace_project\results.
- 5 You will see that there are three different tabs in the **Parameters** section to assist you in setting up the type of verification you want to run. In this

tutorial, you are verifying a single class, so you want to use the **Class analysis** tab to set up the analysis parameters. Under the **Class analysis** tab, type MathUtils in the box labeled **Class**. You will see that the **Class only** checkbox is selected by default. This activates the -class-only option in PolySpace. For the purposes of this tutorial, it does not matter whether or not this option is applied because the class MathUtils does not depend on any other classes.

- 6 Select the Send to PolySpace Server option if it is not already selected.
- 7 Leave the default values for the other parameters.

The PolySpace basic settings window should now look like this.

noive the setting of the set of the	
Settings	
Precision	02
Passes	Pass2 (Software Safety Analysis level 2)
Results folder	C:\PolySpace\polyspace_project\results
Verification Mode Settings	
 Class analysis C File analysis 	C Main analysis
Class	Math Utils
Class analyzer calls	Unused
Class only	
Function called before main	
Main generator write variables	Uninit
Scope	
C:\PolySpace\polyspace_project\sources\t	raining.cpp
Send to PolySpa	ice Server 💽 Start 🐼 Cancel

Click Start.

The verification log appears.

C:\PolySpace\polyspace_project\results
📴 🚰 🐸 🐵 -
Number of lines with libraries : 7833
Packing compilation datas
done.
Generating remote file
Done

*** C++ source compliance checking done ***

Ending at: Jan 6, 2010 14:3:13 User time for compilation: 00:00:04.54 (4.5real, 4.5u + 0s (0.1gc)) User time for polyspace-cpp: 00:00:04.76 (4.8real, 4.8u + 0s (0.1gc)) ***
*** End of PolySpace Verifier analysis ***
Adding the verification to the queue Queue Manager server: localhost
Transfer completed. Analysis ID : 16
The verification has been queued. You may follow its progress using the Queue Manager 👻
The code verification completed successfully

The compile phase of the verification runs on the client. When the compile phase completes:

• You see the message:

End of PolySpace Verifier analysis

- A message in the log area tells you that the verification was transferred to the server and gives you the identification number (Analysis ID) for the verification. For this verification, the identification number is 1.
- Monitor the verification using the Spooler. For information on using the Spooler to monitor a verification on a server, see "Monitoring the Progress of the Verification" on page 3-7.

• When the verification completes, download the results to polyspace_project\results. For information on downloading results from a server to a client, see "Downloading Results from the Server to the Client" on page 3-10

You review the results in Chapter 4, "Reviewing Verification Results".

Using the Launcher to Start a Verification That Runs on a Client

In this section...

"Starting the Verification" on page 3-25

"Monitoring the Progress of the Verification" on page 3-26

"Completing the Verification and Stopping the Launcher" on page 3-27

"Stopping the Verification Before It Completes" on page 3-28

Starting the Verification

For the best performance, run verifications on a server. If the server is busy or you want to verify a small file, you can run a verification on a client.

Note Because a verification on a client can process only a limited number of variable assignments and function calls, the source code should have no more than 800 lines of code.

To start a verification that runs on a client:

- **1** Open the Launcher if it is not already open.
- 2 Open the project file training.cfg if it is not already open.

For information about opening a project file, see "Opening the Project" on page 3-4.

- 3 Make sure that the Send to PolySpace Server check box is clear.
- **4** If you see a warning that multitasking is not available when you run a verification on the client, click **OK** to continue and close the message box. This warning only appears when you clear the **Send to PolySpace Server** check box.
- 5 Click the **Start** button.

👂 Start

6 If you see a caution that PolySpace software will remove existing results from the results folder, click **Yes** to continue and close the message dialog box.

The progress bar and logs area of the Launcher window become active.

Note If you see the message Verification process failed, click **OK** and go to "Troubleshooting a Failed Verification" on page 3-12.

Monitoring the Progress of the Verification

You can monitor the progress of the verification by watching the progress bar and viewing the logs at the bottom of the Launcher window.

Compile : 100	1% N	Normalization : 15% C++ Link : 0%		Intermediat	Intermediate : 0%		Level0 : 0%	
00:00:02		00:00:06 00:00:00		00:00:1	00:00:00		00:00:00	
Compile				Search:	•• [••	
Stats	Status	Description		File	File		Col	
🗾 Full Log	PolySpace Launcher 1		er for CPP ver	·				

The progress bar highlights the current phase in blue and displays the amount of time and completion percentage for that phase.

The logs report additional information about the progress of the verification. To view a log, click the button for that log. The information appears in the log display area at the bottom of the Launcher window. Follow the next steps to view the logs:

1 The compile log displays by default.

This log displays compile phase messages and errors. You can search the log by entering search terms in the **Search in the log** box and clicking the left arrows to search backward or the right arrows to search forward.

- **2** Click the **Stats** button to display statistics, such as analysis options, stubbed functions, and the verification checks performed.
- **3** Click the refresh button



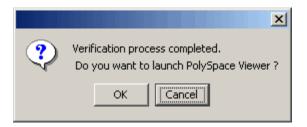
to update the display as the verification progresses.

4 Click the **Full Log** button to display messages, errors, and statistics for all phases of the verification.

You can search the full log by entering a search term in the **Search in the log** box and clicking the left arrows to search backward or the right arrows to search forward.

Completing the Verification and Stopping the Launcher

When the verification completes, a message dialog box appears telling you that the verification is complete and asking if you want to open the Viewer. For this tutorial, do not open the Viewer at this point.



To indicate that you do not want to open the Viewer:

• Click Cancel.

You can also open the Viewer from the Launcher toolbar, but for this tutorial, you do not do this. For this tutorial, close the Launcher.

To close the Launcher:

• Select File > Quit.

In the tutorial Chapter 4, "Reviewing Verification Results", you open the Viewer and review the verification results.

Stopping the Verification Before It Completes

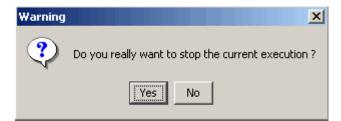
You can stop the verification before it completes. If you stop the verification, results will be incomplete, and if you start another verification, the verification starts over from the beginning.

To stop a verification:

1 Click the **Stop Execution** button.

🗴 Stop Execution

A warning dialog box appears.



2 Click Yes.

The verification stops and the message Verification process stopped appears.

3 Click OK to close the Message dialog box.

Note Closing the Launcher window does *not* stop the verification. To resume display of the verification progress, open the Launcher window and open the project that you were verifying when you closed the Launcher window.

Reviewing Verification Results

- "About This Tutorial" on page 4-2
- "Opening the Viewer and the Verification Results" on page 4-3
- "Exploring the Viewer Window" on page 4-5
- "Reviewing Results in Expert Mode" on page 4-10
- "Reviewing Results in Assistant Mode" on page 4-27
- "Generating Reports of Verification Results" on page 4-34

About This Tutorial

In this section...

"Overview" on page 4-2

"Before You Start" on page 4-2

Overview

In the previous tutorial, Chapter 3, "Running a Verification", you completed a verification of the class MathUtils in the file training.cpp. In this tutorial, you explore the verification results.

PolySpace Client for C/C++ provides a graphical user interface, called the Viewer, that you use to review results. In this tutorial, you learn:

- **1** How to use the Viewer, including how to:
 - Open the Viewer and open verification results.
 - Select the Viewer mode.
 - Explore results in expert mode.
 - Explore results in assistant mode.
 - Generate reports.
- **2** How to interpret the color-coding that PolySpace software uses to identify the severity of an error.
- **3** How to find the location of an error in the source code.

Before You Start

Before starting this tutorial, complete the tutorial Chapter 3, "Running a Verification". In this tutorial, you use the verification results stored in this file:

polyspace_project\results\RTE_px_02_Training_Project_LAST_RESULTS.rte.

Opening the Viewer and the Verification Results

In this section...

"Opening the Viewer" on page 4-3

"Selecting the Viewer Mode" on page 4-3 $\,$

"Opening the Results" on page 4-4

Opening the Viewer

You use the Viewer to review verification results. Open the Viewer if it is not already open.

To open the Viewer:

• Double-click the PolySpace Viewer icon:



Note You can also open the Viewer from the Launcher by clicking the Viewer icon in the Launcher toolbar with or without an open project.

Selecting the Viewer Mode

You can review verification results in *expert* mode or *assistant* mode:

- In expert mode, you decide how you review the results.
- In assistant mode, PolySpace software guides you through the results.

You switch from one mode to the other by clicking a button in the Viewer toolbar. For this part of the tutorial, the Viewer should be in expert mode. If the Viewer is in expert mode, the switch mode button in the toolbar displays **Assistant**.



If the Viewer is not in expert mode, click the mode button to switch to expert mode.



You learn more about expert and assistant modes later in this tutorial.

Opening the Results

To open the verification results:

- 1 Select File > Open.
- 2 In the Please select a file dialog box, navigate to polyspace_project\results and select the file RTE_px_02_Training_Project_LAST_RESULTS.rte.
- **3** Click the **Open** button.

The results appear in the Viewer window.

Note The file RTE_px_02_Training_Project_LAST_RESULTS.rte represents the verification with the highest level of precision. The lower level results files that you see in the polyspace_project\results folder represent lower precision verifications.

Exploring the Viewer Window

In this section...

"Overview" on page 4-5

"Reviewing the Procedural Entities View" on page 4-7

Overview

The PolySpace Viewer window looks like this.

PolySpace Viewer - C:\PolySpace\po rspace_project\results\RTE_px_Training_Project_LAST_RESULTS.rte File Edit Reports Windows Help Image: Second State of State o
File Edit Reports Windows Help Image: Second Seco
File Edit Reports Windows Help Image: Second Seco
Image: Second Progress Count Process <
Reviewed filter off X Y PROC OBBIL ZOU INT IDP CPP COR FAU NIT NOP EX PLORT ASKT NTC NTL UNR INF UOR Coding review progress Count Progress training.cpp / MathUtis: Pointer_Arithmetic() / line 72 / column 4 Imp
Coding review progress Count Progress training.cpp / MathUtlis:Pointer_Arithmetic() / line 72 / column 4 num IDP reviewed / num IDP to review (Red) 1/1 100 num reviewed / num to review (Red) 1/1 100 Software reliability indicator 78/87 89
num IDP reviewed / num IDP to review (Red) 1/1 100 num reviewed / num to review (Red) 1/1 100 Software reliability indicator 1/1 100
num reviewed / num to review (Red) 1/1 100 Software reliability indicator 78/87 89
Software reliability indicator 78/87 89
Error : pointer is outside its bounds dereference of variable 'p' (pointer to int 32, size: 32 bits): pointer is not null points to 4 bytes at offset 400 in allocated buffer of 400 bytes may point to variable or field of variable in: (MathUtils::Pointer_Arithmetic():tab)
Procedural entities 🕴 🗶 🖓 🗸 Line Col 🛊 Details Reviewed Acror
Image Project I 0 5 33 89 Image Project Ima
B exception.stdh 1 0 exception Variables ∇ # Read # Write W.T. R.T. Line Col Values Calls ∇ Line
Training_Project (Training_MathUtils::Pointer_Anthmetic) 61
Tal. Math Hills "Close To Zerro 3 8 12 16 73 training con Tal. Tal. Tal. Tal. Tal. Tal. Tal. T
GL Marbil blis: Mon Infinite I d 5 39 15 100 training con
Handbolks: Pointer_Aritime 1 8 61 16 100 training opp Pointer_Aritime 1 8 61 16 100 training opp Pointer_Aritime 1 75
1 72 4 Error: point V 61 void MathUtils::Pointer Arithmetic ()
NNT.11 1 74 18 this-pointe 62 ₹
64
H_MathUtls::Recursion(m ⁺) 2 4 104 16 6/ training.opp 66 int i, *p = tab; H_MathUtls::Recursion_2(int) 2 88 16 100 training.opp 67
B MathUts::Recursion_sale 9 117 18 100 training.opp □ 66 for(1 = 0; 1 ≤ 100; 1++, p++)
RTE::test() 183 11 0 training.opp 69 **p = 0;
Square::Square:Root() 148 14 0 training.cpp 70
Square:Square:Square_Root.con 140 14 0 training.cpp 71 if (u.random_int() == 0)
Square::Unreachable_Cod 164 14 0 training.cop 72 72 72 72 72 72 72 72 72 72
Butraining h 2 1 100 training h 73
B→_polyspace_main.cpp 1 1 1 100 polyspac /6 77 if (0≤1 66 i≤=100)
IDP.9 Details: Error : pointer is outside its bounds
Procedural Variables Source code Call tree
entities view view view view

The appearance of the Viewer toolbar depends on the Viewer mode. Because the Viewer is in expert mode, the expert mode toolbar is displayed.

1		*	CRLLS .	Alpha		- 🗳	Assis	tant			
OBRI	ZDV	NIV local	SCAL OVFL	SHF	NNT	IDP -	CPP	COR	FRV	NIV other	NIP

In both expert mode and assistant mode, the Viewer window has six sections below the toolbar. Each section provides a different view of the results. The following table describes these views.

This view	Displays
Procedural entities view (lower left)	List of the diagnostics (checks) for each file and function in the project
Source code view (lower right)	Source code for a selected check in the procedural entities view
Coding review progress view (upper left)	Statistics about the review progress for checks with the same type and category as the selected check
Selected check view (upper right)	Details about the selected check
Variables view	Information about the global variables declared in the source code
	Note The file that you use in this tutorial does not have global variables.
Call tree view	Tree structure of function calls

You can resize or hide any of these sections. You learn more about the Viewer window later in this tutorial.

Reviewing the Procedural Entities View

The procedural entities view, in the lower-left part of the Viewer window, displays a table with information about the diagnostics for each file in the project. The procedural entities view is also called the RTE (Run-Time Error) view. When you first open the results file from the verification of training.cpp, the procedural entities view looks like this.

Procedural entities	1	×	?	~	Line	Col	8	Details
🚵 Training_Project	1	0	5	39			89	
• exception.stdh					1		0	exception.stdh
new.stdh					1		0	new.stdh
training.cpp	1		5	36	1		88	training.cpp
training.h				2	1		100	training.h
polyspacestdstubs.c					1		0	polyspacestdstub
polyspacestdstubscpp.cpp					1		0	polyspacestdstub
polyspace_main.cpp				1	1		100	_polyspace_main.cpp
					1			1

The file training.cpp is red because its contains a run-time error. PolySpace software assigns a file the color of the most severe error found in that file. The first column of the table is the procedural entity (the file or function). The following table describes some of the other columns in the procedural entities view.

Column Heading	Indicates
Ŷ	Number of red checks (operations where an error always occurs)
×	Number of gray checks (unreachable code)
\$	Number of orange checks (warnings for operations where an error might occur)
~	Number of green checks (operations where an error never occurs)
8	Selectivity of the verification (percentage of checks that are not orange) This is an indication of the level of proof.

Tip If you see three dots in place of a heading,, resize the column until you see the heading. Resize the procedural entities view to see additional columns.

Note You can select which columns appear in the procedural entities view by editing the preferences.

What you select in the procedural entities view determines what displays in the other views. In the following examples, you learn how to use the views and how they interact.

Reviewing Results in Expert Mode

In this section ...

"What Is Expert Mode?" on page 4-10 "Switching to Expert Mode" on page 4-10 "Reviewing Checks in Expert Mode" on page 4-10 "Reviewing Additional Examples of Checks" on page 4-16

"Filtering the Types of Checks That You See" on page 4-20

What Is Expert Mode?

In expert mode, you can see all checks from the verification in the PolySpace Viewer. You decide which checks to review and in what order to review them.

Switching to Expert Mode

If the Viewer is in expert mode, the switch mode button displays **Assistant**. If the Viewer is in assistant mode, the switch mode button displays **Expert**. To switch from assistant to expert mode:

• Click the Viewer mode button:



The Viewer window toolbar displays buttons and menus specific to expert mode.

Reviewing Checks in Expert Mode

In this part of the tutorial, you learn how to use the Viewer window views to examine checks from a verification. This part of the tutorial covers:

- "Selecting a Check to Review" on page 4-11
- "Displaying the Calling Sequence" on page 4-12
- "Tracking Review Progress" on page 4-13

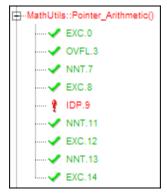
• "Tracking Reviewed Checks in Procedural Entities View" on page 4-15

Selecting a Check to Review

In the procedural entities view, training.cpp is red, indicating that this file has at least one red check. To review a red check in training.cpp:

- 1 In the procedural entities section of the window, expand training.cpp.
- 2 Expand the red procedure MathUtils::Pointer_Arithmetic().

A color-coded list of the checks performed on MathUtils::Pointer_Arithmetic() appears:



Each item in the list of checks has an acronym that identifies the type of check and a number. For example, in IDP.9, IDP stands for Illegal Dereferenced Pointer. For more information about different types of checks, see "Check Descriptions" in the *PolySpace Products for C++ Reference*.

3 Click on the red IDP.9.

The source code view displays the section of source code where this error occurs.

training.cpp

```
65
        int tab[100];
        int i, *p = tab;
66
67
68
        for(i = 0; i < 100; i++, p++)</pre>
69
           *p = 0;
70
71
        if(u.random_int() == 0)
72
           *p = 5;
                         // Out of bounds
73
74
        i = u.random_int();
75
        if (u.random int())
                                (p-i) = 10;
76
77
        if (0<i && i<=100)
78
           {
•
```

4 At line 72 of the code, click on the red code.

An error message box appears indicating that when the pointer p is dereferenced, it is outside of its bounds. At line 66, p points to the start of tab which has 100 elements. The for loop starting at line 68 initializes the elements of tab to 0. This for loop leaves p pointing to the location after the last element of tab.

Displaying the Calling Sequence

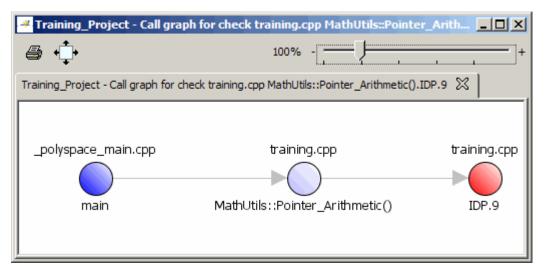
You can display the calling sequence that leads to the code associated with a check. To see the calling sequence for the red IDP.9 check in MathUtils::Pointer Arithmetic():

- 1 Expand MathUtils::Pointer Arithmetic().
- 2 Click the red IDP.9.



_ 8

3 Click the call graph button in the toolbar.



A window displays the call graph.

The code associated with IDP.9 is in MathUtils::Pointer_Arithmetic. The generated main function calls MathUtils::Pointer_Arithmetic.

Tracking Review Progress

You can keep track of the checks that you have reviewed by marking them. To mark that you have reviewed the red IDP.9 check in MathUtils::Pointer_Arithmetic():

I Expand MathUtils::Pointer_Arithmetic().

2 Click the red IDP.9.

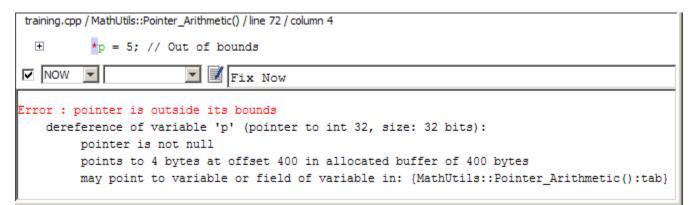
A table with statistics about the review progress for that category and severity of error appear in the upper-left part of the window.

Count	Progress
)/1	0
)/1	0
78/87	89
)	/1 /1

The **Count** column displays a ratio and the **Progress** column displays the equivalent percentage. The first row displays the ratio of reviewed checks to the total number of checks that have the same color and category as the current check. In this example, it displays the ratio of reviewed red IDP checks to total red IDP errors in the project.

The second row displays the ratio of reviewed checks to total checks that have the same color as the current check. In this example, this is the ratio of red errors reviewed to total red errors in the project. The third row displays the ratio of the number of green checks to the total number of checks, providing an indicator of the reliability of the software.

Information about the current check (the red IDP.9) appears in the upper-right part of the Viewer window.



- **3** After you review the check, select an acronym to describe the check in the Predefined acronyms menu:
 - **NOW** Bug to fix now.
 - NXT Bug to fix in Next Release

- ROB Robustness Issue
- **DEF** Defensive Code
- MIN Minor quality issue
- OTH Other

Note You can also define your own acronyms. See "Defining Custom Acronyms ".

- **4** In the comment box, enter additional information about the check.
- **5** Select the check box to indicate that you have reviewed this check.

The **Coding review progress** part of the window updates the ratios of errors reviewed to total errors.

Coding review progress	Count	Progress
num IDP reviewed / num IDP to review (Red)	1/1	100
num reviewed / num to review (Red)	1/1	100
Software reliability indicator	78/87	89

Tracking Reviewed Checks in Procedural Entities View

The **Procedural entities** view in the Viewer displays which checks you have reviewed and the predefined acronym you used to describe each check.

Procedural entities	1	×	?	~	Line	Col	8	Details	Reviewed	Acronym
Training_Project	1	0	5	39			89			
-exception.stdh					1		0	exception.stdh		
new.stdh					1		0	new.stdh		
training.cpp	1		5	36	1		88	training.cpp		
HathUtils::Close_To_Zero()			3	8	12	16	73	training.cpp		
⊕MathUtils::Non_Infinite_Loop()				5	39	15	100	training.cpp		
	1			8	61	16	100	training.cpp		
EXC.0				1	61			function does not throw		
OVFL.3				1	68	23		operation [+] on scala		
NNT.7				1	71	17		this-pointer of random		
EXC.8				1	71	17		call to random_int doe		
👔 IDP.9	1				72	4		Error : pointer is outsi	v	NOW
NNT.11				1	74	18		this-pointer of random		
EXC.12				1	74	18		call to random_int doe		
NNT.13				1	75	18		this-pointer of random		
EXC.14				1	75	18		call to random_int doe		

Tip If you do not see the Reviewed column, resize the **Procedural entities** view to display the column. If it does not appear, right click the **Procedural entities** column heading and select **Reviewed**.

You can select the **Reviewed** check box to mark a check as reviewed. Selecting this check box also automatically:

- Selects the check box for that check in the current check view (upper-right part of the window).
- Updates the counts in the coding review progress view (upper-left part of the window).

Reviewing Additional Examples of Checks

In this part of the tutorial, you learn about other types and categories of errors by reviewing the following examples in training.cpp:

- "Example: Unreachable Code" on page 4-17
- "Example: A Function with No Errors" on page 4-18
- "Example: Division by Zero" on page 4-19

Example: Unreachable Code

Unreachable code is code that never executes. PolySpace software displays unreachable code in gray. In the following steps, you will look at an example of unreachable code.

1 In **Procedural Entities**, click on Square::Unreachable_Code().

The source code for this function displays in the source code view.

```
🗶 training.cpp
                                                                 160
      /* Here we demonstrate PolySpace Verifier's ability to
161
         identify unreachable sections of code due to the
162
         value constraints placed on the variables.
163
      */
      void Square::Unreachable_Code()
164
165
      {
166
        Utils u:
167
        int x = u.random int();
168
        int y = u.random_int();
169
170
        if (x > y)
171
          ł
172
            x = x - y;
            if (x < 0)
173
174
              x = x + 1;
175
          }
176
177
        x = y;
178
      }
•
```

2 Examine the source code.

At line 174, the code x = x + 1 is never reached because the condition x < 0 is always false.

Note that in the **Procedural Entities** view all public and protected member functions for the classes RTE and Square are marked as unreachable code. This is because the analysis results are from the single class verification of MathUtils which does not depend on any other classes.

Example: A Function with No Errors

In the following example, PolySpace software determines, in code with a large number of iterations, that a loop terminates and a variable does not overflow:

I In Procedural entities, click on the green MathUtils::Non_Infinite_Loop() function.

The source code for this function is displayed in the source code view.

```
🗸 training.cpp
34
          Correct operation is demomonstrated because:
35
          1) x = x + 2 is shown to never generate an overflow
          2) the loop is not infinite
36
37
       */
38
39
       int MathUtils::Non Infinite Loop ()
40
       {
         const int big = 1073741821 ; // 2**30-3
41
42
         int x=0, y=0;
43
44
         while (1 == 1)
45
           {
46
              if (y > big) break;
47
             x = x + 2;
             y = x / 2;
48
49
           }
50
51
         \underline{\mathbf{Y}} = \underline{\mathbf{x}} / 100;
52
         return y;
53
       }
•
```

2 Examine the source code. The variable x never overflows because the while loop at line 44 terminates before x can overflow.

Example: Division by Zero

In the following example, PolySpace software detects a potential division by zero:

1 In **Procedural entities**, expand MathUtils::Recursion().

The source code for this function is displayed in the source code view.

```
_ 8 ×
training.cpp
93
         If the initial value passed to Recursion() is negative, then
94
         the recursive loop will at some point attempt a division
95
         by zero.
96
      */
97
98
      void MathUtils::Recursion 2(int* depth)
99
      £
100
        Recursion (depth);
101
      }
102
103
      /* if depth<0, recursion will lead to division by zero */
104
      void MathUtils::Recursion (int* depth)
105
      {
106
        float advance;
107
108
        *depth = *depth + 1;
109
        advance = 1.0/(float)(*depth); // potential division by zero
110
111
        if (*depth < 50)
112
          {
113
            Recursion_2(depth);
114
          }
115
      }
•
```

2 Examine the MathUtils::Recursion() function.

When Recursion() is called with depth less than zero, the code at line 109 will result in division by zero. The orange color indicates that this is a potential error (depending on the value of depth).

Filtering the Types of Checks That You See

You can filter the checks that you see in the Viewer so that you can focus on certain types of checks. PolySpace software provides three predefined composite filters, a custom composite filter, and several individual filters. You learn about filters in the following sections:

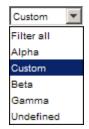
- "Using Composite Filters" on page 4-21
- "Using the Custom Filter" on page 4-22
- "Using Individual Filters" on page 4-25

Using Composite Filters

Composite filters combine individual filters, allowing you to display or hide groups of checks.

Use this filter	То
Alpha	Display all checks
Beta	Hide NIV, NIV local, NIP, Scalar OVFL, and Float OVFL checks
Gamma	Display red and gray checks
User def	Hide checks as defined in a custom filter that you can modify

The default filter is Custom. You learn more about the Custom filter in "Using the Custom Filter" on page 4-22. You can select a composite filter from the filter menu.

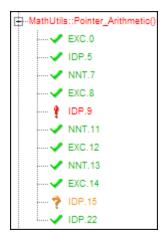


To learn how the composite filters affect the display of checks:

1 Expand the function MathUtils::Pointer_Arithmetic() in Procedural Entities. Select Alpha from the filter menu to display all the checks for MathUtils::Pointer_Arithmetic().

MathUtils::Pointer_Arithmetic() has twenty-four checks: twenty-two green, one red, and one orange.

2 Select Beta from the filter menu to hide the NIV local, SCAL OVFL, NIV other, NIP, and FLOAT OVFL checks.



Now, only eleven checks are visible: four EXC, four IDP, and three NNT.

- 3 Select Alpha to display all checks again.
- 4 Select Gamma to display only the red and gray checks.

÷	lathl	Utils	s::Pointer	_Arithmetic()
	İ	ł	IDP.9	_Arithmetic()

Now, only one check is visible: the red IDP.

Using the Custom Filter

The custom filter is a composite filter that you define. It appears on the composite filter menu as User def and is the default composite filter. By

default, the custom filter hides the OBAI, NIV local, IDP, COR, IRV, NIV other, NIP, and NTL checks as shown in the following figure.



To modify the custom filter:

- 1 Select Custom from the composite filters menu.
- **2** Select **Edit** > Custom filters.

The **Custom filter setup** dialog box appears.

Custom filter setup - PolySpace Viewer							
Select the checks or colors to hide when the custom filter is	set.						
Check Filters	Color Filters						
☑ Dut of Bound Array Index Checks	Gray Checks						
Tero Division Checks	Crange Checks						
Non-Initialized Local Variable Checks	Green Checks						
Scalar Overflow Checks	Errors in non executable procedures						
Shift Amount out of Bounds or Left Operand of Left Shift Checks	orange checks possibly impacted by inputs						
this-pointer of function is not null Checks							
✓ Illegal Dereferenced Pointer Checks							
errors that are C++ related and are not covered by the EXC and OOP filters. This includes checks such as array size is strictly positive, typeid argument is correct, and dynamic casts are valid.							
Correctness Condition Checks							
Function Returns a Value Checks							
Von-Initialized Variable Checks	Float / Scalar Filters						
Von-Initialized Pointer Checks	Float Checks						
This includes checks related to virtual function calls, this-pointer validity.	Calar Checks						
Exception handling deals with the try block and exception block.							
Float Overflow Checks							
User Assertion Checks							
Unknown Non-Termination of Call Checks							
Von-Termination of Loop Checks							
Unreachable Code Checks							
informative checks including information related to implicit and potential function calls.							
Value On Assigned (only displayed, not counted)							
Ok Apply	Cancel						

3 Clear the filters for the checks that you want to display. For example, if you clear the **Out of Bound Array Index Checks** box, these checks display.

Note You do not have to change any of the selections for this tutorial.

- 4 Select the filters for the checks that you do not want to display.
- 5 Click OK to apply the changes and close the dialog box.

PolySpace software saves the custom filter definition in the Viewer preferences.

Using Individual Filters

You can use an individual filter to display or hide a given check category. When a filter is enabled, that check category is not displayed. For example, when the VOA filter is enabled, VOA checks are not displayed. When the VOA filter is disabled, VOA checks are displayed. You can also filter by check color. To enable or disable an individual filter, click the toggle button for that filter on the toolbar.

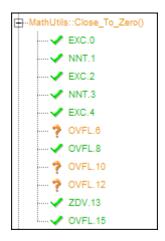
Tip When you mouse over a filter button, a tooltip tells you which filter the button is for and whether the filter is currently enabled or disabled.

To learn how an individual filter affects the display of checks:

- I Expand MathUtils::Close_To_Zero().
- 2 Select Alpha from the composite filters menu to display all checks.
- 3 Click the NIV local filter button

NIV local

to hide the NIVL checks for MathUtils::Close_To_Zero().



- 4 Click the NIV local filter button again to display the NIVL checks.
- 5 Now click the green checks filter button



to hide the green checks.

-MathUtil	ls::Close_To_Zero()
?	OVFL.6
?	OVFL.10
?	OVFL.12

Note When you filter a check category, some red checks within that category are still displayed. For example, if you filter IDP checks, IDP.9 is still displayed under MathUtils::Pointer_Arithmetic().

Reviewing Results in Assistant Mode

In this section ...

"What Is Assistant Mode?" on page 4-27 "Switching to Assistant Mode" on page 4-27 "Selecting the Methodology and Criterion Level" on page 4-28 "Exploring Methodology for C++" on page 4-28 "Reviewing Checks" on page 4-30 "Defining a Custom Methodology" on page 4-32

What Is Assistant Mode?

In assistant mode, PolySpace software chooses the checks for you to review and the order in which you review them. PolySpace software presents checks to you in this order:

- 1 All red checks
- 2 All blocks of gray checks (the first check in each unreachable function)
- **3** Orange checks according to the selected methodology and criterion level

You will learn about methodologies and criterion levels in "Selecting the Methodology and Criterion Level" on page 4-28.

Switching to Assistant Mode

If the Viewer is in assistant mode, the switch mode button displays **Expert**. If the Viewer is in expert mode, the switch mode button displays **Assistant**. To switch from expert mode to assistant mode:

Click the Viewer's switch mode button
 Assistant

The Viewer window toolbar displays controls specific to assistant mode.



The controls for assistant mode include:

- A menu for selecting the review methodology for orange checks
- A slider for selecting the criterion level within that methodology
- A check box for skipping gray checks
- Arrows for navigating through the reviews

Selecting the Methodology and Criterion Level

A methodology is a named configuration that defines the number of orange checks, by category, that you review in assistant mode. Each methodology has three criterion levels. Each level specifies the number of orange checks for a given category. The levels correspond to different development phases that have different review requirements. To select the methodology and level for this tutorial:

1 Select **Methodology for C++** from the methodology menu.

Methodology for Model Based Designed 💌
Methodology for Ada
Methodology for C
Methodology for C++
Methodology for Model Based Designed

2 If the level slider is not already at 1, move the slider to level 1.



Exploring Methodology for C++

In this part of the tutorial, you examine the configuration for **Methodology for C++**. To begin:

1 Select Edit > Preferences.

The Preferences PolySpace Viewer dialog box appears.

2 Select the Assistant configuration tab.

The configuration for Methodology for C++ appears.

On the right side of the dialog box, a table shows the number of orange checks that you review for a given criterion and check category.

A	Assistant configuration Character encoding					
[Number of checks to review					
	_	Criterion 1 Criterion 2 Criterion 3				
	-Common-					
	ZDV	5	20	ALL		
	NIVL	10	50	ALL		
	S-OVFL	10	50	ALL		
	COR		10	10		
	NIV		5	10		
	F-OVFL	5	10	20		
	ASRT		5	20		
C & C++ only						
	OBAI	10	20	ALL		
ts	SHF	5	10	ALL		
	IDP		10	20		
	NIP		10	20		

For example, the table specifies that you review five orange ZDV checks when you select criterion 1. The number of checks increases as you move from criterion 1 to criterion 3, reflecting the changing review requirements as you move through the development process.

In the lower-left part of the dialog box, the section **Review threshold criterion** contains text that appears in the tooltip for the criterion slider on the Viewer toolbar (only in assistant mode).

Configuration set				
Methodology for C++				
□ Set number of checks to review as percentage of green and justified orange checks				
Review threshold criterion				
Criterion 1 Fresh code				
Criterion 2	Unit tested			
Criterion 3	Final version			

For the configuration Methodology for C++, the criterion names are:

Criterion	Name in the Tooltip	
1	Fresh code	
2	Unit tested	
3	Final version	

These names correspond to phases of the development process.

3 Click OK to close the dialog box.

Reviewing Checks

In assistant mode, you review checks in the order in which PolySpace software presents them:

- 1 All reds
- 2 All blocks of gray checks (the first check in each unreachable function)

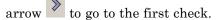
Note You can skip gray checks by selecting the **Skip gray checks** check box in the toolbar.

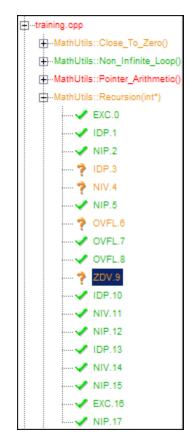
3 Orange checks according to the selected methodology and criterion level

Earlier in this tutorial, you selected Methodology for C++, criterion l. In this part of the tutorial, you continue to review the checks for training.cpp using this methodology and criterion level. To navigate through these checks:

1 In the procedural entities view (lower left), MathUtils::Recursion(int*) is expanded and ZDV.9 is displayed as the current check.

If the Viewer is displaying the message "No check currently selected" in the upper-right portion of the window, then you will need to click the forward





The source code view (lower right) displays the source for this check and the current check view (upper right) displays information about this check.

Note You can display the calling sequence and track review progress as you did in "Reviewing Results in Expert Mode" on page 4-10.

2 Continue to click the forward arrow until you have gone through all of the checks.

After the last check, a dialog box appears asking if you want to start again from the first check.

Wrappin	g search 🔀		
End of the set of checks under review. Do you want to start again from the first check?			
	Yes		

3 Click No.

Defining a Custom Methodology

You cannot change the predefined methodologies, such as Methodology for C++, but you can define your own methodology. In this part of the tutorial, you learn how to create and use your own methodology.

To define your custom methodology:

1 Select Edit > Preferences.

The Preferences PolySpace Viewer dialog box appears.

- 2 Select the Assistant configuration tab.
- **3** Select Add a set from the menu in Configuration set.
- **4** In the **Create a new set** dialog box, enter My methodology for the name and click **Enter** to close the dialog box.

- 5 Under the **Criterion 1** column, enter the number 1 next to **IDP**. This tells PolySpace software to select up to one orange IDP for review. Poly Space[™] will not select any other orange checks for review because you are leaving all of the other fields blank. This does not affect the red and gray checks: the software will still present all red checks and the first check in each unreachable function for review.
- 6 Click OK to save the methodology and close the dialog box.

To use My methodology:

- 1 Select My methodology from the methodology menu.
- **2** If the level slider is not already at 1, move the slider to level 1.
- **3** Click the forward arrow **b** to review the checks.

With this methodology at criterion 1, you review the orange IDP.3 check. You did not review IDP.3 earlier in the tutorial because the number of orange IDP checks in Methodology for C++ criterion level 1 is zero.

4 End PolySpace Viewer by selecting File > Quit.

Generating Reports of Verification Results

In this section...

"PolySpace Report Generator Overview" on page 4-34

"Generating Verification Reports" on page 4-35

PolySpace Report Generator Overview

The PolySpace Report Generator allows you to generate reports about your verification results, using pre-defined report templates.

The PolySpace Report Generator provides the following report templates:

- **Coding Rules Report** Provides information about compliance with JSF Coding Rules, as well as PolySpace configuration settings used for the verification.
- **Developer Report** Provides information useful to developers, including summary results, detailed lists of red, orange, and gray checks, and PolySpace configuration settings used for the verification.
- **Developer with Green Checks Report** Provides the same content as the Developer Report, but also includes a detailed list of green checks.
- **Quality Report** Provides information useful to quality engineers, including summary results, statistics about the code, graphs showing distributions of checks per file, and PolySpace configuration settings used for the verification.

The PolySpace Report Generator allows you to generate verification reports in the following formats:

- HTML
- PDF
- RTF
- WORD
- XML

Note WORD format is not available on UNIX platforms, RTF format is used instead.

Generating Verification Reports

You can generate reports for any verification results using the PolySpace Report Generator.

To generate a verification report:

- **1** Open your verification results in the Viewer.
- 2 Select Reports > Run Report.

The Run Report dialog box opens.

Run Report			2	
-Select Report Te	mplate			
C:\PolySpace\PolySpace_Common\ReportGenerator\templates\CodingRules.rpt				
	olySpace_Common/ReportGenerator/templates/Develope	•		
	olySpace_Common\ReportGenerator\templates\Develope			
C: \PolySpace\PolySpace_Common\ReportGenerator\templates\Developer_WithGreenChecks.rpt C: \PolySpace \PolySpace Common\ReportGenerator\templates\Quality.rpt				
C: (Polyspace (oryspace_common (kepor (serier ator (templates (quality))	pt		
			_	
			Browse	
Select Report Fo	rmat			
Output folder	C: \PolySpace\polyspace_project\results\PolySpace-Doc			
ouputioner	[e. #oryspace poryspace_project #esuits #oryspace-boe			
Output format	PDF 💌			
		Run Report	Cancel	
		Runkeport	Cancer	

- **3** Select the type of report you want to run in the Select Report Template section.
- 4 Select the Output folder in which to save the report.
- **5** Select the Output format for the report.
- 6 Click Run Report.

The software creates the specified report.

Checking Compliance with Coding Rules

- "About This Tutorial" on page 5-2
- "Setting Up Coding Rules Checking" on page 5-3
- "Running a Verification with Coding Rules Checking" on page 5-10

About This Tutorial

In this section...

"Overview" on page 5-2

"Before You Start" on page 5-2

Overview

PolySpace software allows you to analyze code to demonstrate compliance with established C++ coding standards (MISRA C++:2008 or JSF++:2005).

Applying coding rules can both reduce the number of orange checks in your verification results, and improve the quality of your code. Coding rules are the most efficient way to reduce orange checks.

To check compliance with coding rules, you set an option in your project and then run a verification. PolySpace software finds the violations during the compile phase of a verification. When you have addressed all coding rule violations, you run the verification again.

For more information on the coding rules checker, see "Checking Coding Rules" in the *PolySpace Products for C++ User's Guide*.

In this tutorial, you learn how to:

- **1** Set an option for checking JSF++ compliance.
- **2** Select JSF++ rules to check.
- **3** Run a verification with JSF++ checking.

Before You Start

For this tutorial, you check the JSF++ compliance of the file training.cpp, using the project that you created in Chapter 2, "Setting Up a Project File".

Setting Up Coding Rules Checking

In this section ...

"Opening the Example Project" on page 5-3 "Setting the JSF++ Checking Option" on page 5-3 "Creating a JSF++ Rules File" on page 5-4 "Excluding Files from JSF++ Checking" on page 5-7 "Configuring Text and XML Editors" on page 5-8 "Saving the Project with a New Name" on page 5-9

Opening the Example Project

For this tutorial, you modify the project in training.cfg to include JSF++ checking and save the project with a new name. You use the Launcher to modify the project.

To open the Launcher:

• Double-click the Launcher icon.

To open training.cfg:

1 Select File > Open project.

The **Please select a file** dialog box opens.

- 2 In Look in, navigate to polyspace_project.
- **3** Select training.cfg.
- 4 Click **Open** to open the file and close the dialog box.

Setting the JSF++ Checking Option

You set up JSF++ checking by selecting an option and then selecting the rules to check. To set the JSF++ checking option:

 In the Analysis options, select Compliance with standards > Coding rules checker.

The software displays the JSF C++ rules checker options, -jsf-coding-rules and -includes-to-ignore.

Coding rules checker		
⊡Check JSF C++ rules		
JSF C++ rules configuration		-jsf-coding-rules
⊡Check MISRA C++ rules		
MISRA C++ rules configuration		-misra-cpp
Files and folders to ignore		-includes-to-ignore

These options allow you to specify which rules to check and any files to exclude from the checker.

2 Select the Check JSF C++: rules check box.

Creating a JSF++ Rules File

You must have a rules file to run a verification with JSF++ checking. You can use an existing file or create a new one. You create a new rules file for this tutorial by:

- "Opening a New Rules File" on page 5-4
- "Setting All the Rules to Off" on page 5-6
- "Selecting the Rules to Check " on page 5-6

Opening a New Rules File

To open a new rules file:

To create a new rules file:

1 Click the browse button is to the right of the JSF C++ rules configuration option.

The New File window opens, allowing you to create a new JSF++ rules file, or open an existing file.

✓ New File File					×						
🗋 e 😂 e 📕 e											
Set the following state to all Jsf rules : Error 💌 GC											
Rules	Error	Warning	Off	Comments							
JSF AV rules					٠						
Number of rules by mode :	1	156	77								
⊖ Code Size and Complexity - Rules 1 to 3											
-1 Any one function (or method) will contain no n		\odot	0								
2 There shall not be any self-modifying code.	•	•	۲	Not implemented							
	0	\odot	0								
⊡ Rules - Rules 4 to 7											
Terminology											
Environment - Rules 8 to 15											
		•	•								
9 Only those characters specified in the C++ ba		\odot	0								
10 Values of character types will be restricted to		•	۲	Not implemented							
11 Trigraphs will not be used.	0	\odot	0								
	0	\odot	0								
13 Multi-byte characters and wide string literals		\odot	0								
14 Literal suffixes shall use uppercase rather th	0	O	0								
	0	O	0								
⊕ Libraries - Rules 16 to 25											
⊕ Pre-Processing Directives - Rules 26 to 32					-						
				Ok Cancel							

For each JSF++ rule, you specify one of these states:

State	Causes the verification to						
Error	End after the compile phase when this rule is violated.						
Warning	Display warning message and continue verification when this rule is violated.						
Off	Skip checking of this rule.						

Note The default state for most rules is Warning. The state for rules that have not yet been implemented is Off. Some rules always have state Error (you cannot change the state of these).

Setting All the Rules to Off

Because this tutorial checks only a few rules, first set the state of all rules to Off. Later, you select the rules to check.

To set the state of all rules to Off:

- 1 From the Set the following state to all Jsf menu, select Off.
- 2 Click Go.

Selecting the Rules to Check

To select the rules to check for this tutorial:

- 1 Expand the set of rules named Type Conversions Rules 177 to 185.
- 2 Select the Warning column for rule 180.
- **3** Expand the set of rules names Flow Control Structures Rules 186 to 201.
- 4 Select the Error column for rule 191.
- 5 Click OK to save the rules and close the window.

The Save as dialog box opens.

- 6 In File, enter jsf.txt
- 7 Click OK to save the file and close the dialog box.

Excluding Files from JSF++ Checking

You can exclude files from JSF++ checking. You might want to exclude some included files. To exclude math.h from the JSF++ checking of the project training.cfg:

1 Click the button to the right of the **Files and folders to ignore** option.

The Files and folders to ignore (includes-to-ignore) dialog box opens.

<mark>*</mark>		X
Files and directories to ignore [-includes-to-ignore]		
	+ -	\bigcirc
C:\PolySpace\sources\math.h		*
C:\PolySpace\sources\matrix.h		
C:\PolySpace\sources\includes		
		+
Ok	Cancel	

2 Click the folder icon.

The Select a file or folder to include dialog box appears.

- **3** Navigate to the polyspace_project folder.
- **4** Select the includes folder.
- 5 Click OK.

The includes folder appears in the list of files to ignore.

6 Click OK to close the dialog box.

Configuring Text and XML Editors

Before you check JSF++ rules, you should configure your text and XML editors in the Launcher. Configuring text and XML editors allows you to view source files and JSF reports directly from the JSF log in the Launcher.

To configure your text and .XML editors:

1 Select Edit > Preferences.

The Preferences dialog box opens.

2 Select the **Editors** tab.

The Editors tab opens.

Preferences	x									
Tools Menu	Remote Launcher									
Miscellaneous Result directory	Result directory Default directory Editors Generic targets									
-XML editor configuration										
Specify the full path to a XML editor or use	Specify the full path to a XML editor or use the browse button.									
XML Editor: C:\Program Files\MSOffic	ce\Office12\EXCEL.EXE									
Text editor configuration										
Specify the full path to a text editor or use	the browse button.									
Text Editor: C:\Program Files\Windo	ws NT\Accessories\wordpad.exe									
Specify the command line arguments for the	e text editor.									
Arguments: \$FILE	Arguments: \$FILE									
The following macros can be used \$FILE, \$LINE, \$COLUMN										
L										
	OK Apply Cancel									

3 Specify an XML editor to use to view JSF++ reports. For example:

C:\Program Files\MSOffice\Office12\EXCEL.EXE

4 Specify a Text editor to use to view source files from the Launcher logs. For example:

C:\Program Files\Windows NT\Accessories\wordpad.exe

5 Specify command line arguments for the text editor. For example:

\$FILE

6 Click OK.

Saving the Project with a New Name

You save the project with a new name so that you do not modify training.cfg. To save the project with the name jsf_training.cfg:

- 1 Select File > Save as new project.
- 2 In the Save the project as dialog box, navigate to polyspace_project.
- **3** Enter jsf_training for the Session identifier and *cfg for the type.
- 4 Click **OK** to close the dialog box.

Running a Verification with Coding Rules Checking

In this section ...

"Starting the Verification" on page 5-10

"Examining the JSF Log" on page 5-11

"Opening JSF Report" on page 5-12

Starting the Verification

When you run a verification with the **Check JSF C++ rules** option selected, the verification checks most of the JSF++ rules during the compile phase. If there is a violation of a rule with state Error, the verification stops.

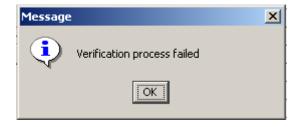
Note Some rules address run-time errors.

The verification stops if there is a violation of a rule with state Error.

To start the verification:

- 1 Click the **Start** button
- 👂 Start
- **2** If you see a caution that PolySpace software will remove existing results from the results folder, click **Yes** to continue and close the message dialog box.

The verification fails because of JSF++ violations. A message dialog box appears.



3 Click OK.

Examining the JSF Log

To examine the JSF++ violations:

1 Click the **JSF** C++ button in the log area of the Launcher window.

A list of JSF++ violations appear in the log part of the window.

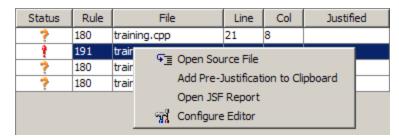
Compile	Filter		Hide justifed violated rules									
JSF C++	Status	Rule	File	Line	Col	Justified	Acronym	User Acronym	Justification	Δ		
💫 Stats	?	180	training.cpp	21	8							
📝 Full Log	1	191	training.cpp	46	19							
	?	180	training.cpp	109	15							
	?	180	training.cpp	142	38							

2 Click on any of the violations to see a description of the violated rule, the full path of the file in which the violation was found, and the source code containing the violation.

Filter	Filter Image: Hide justified violated rules Image: Hide justified violated rules									
Status	Rule	File	Line	Col	Justified	Acronym	User Acronym	Justification 🔺		
?	180	training.cpp	21	8						
1	191	training.cpp	46	19						
?	180	training.cpp	109	15						
?	180	training.cpp	142	38						
? 180 training.cpp 142 38 Detail										

The log reports a violation of rule 191. A break statement is used in training.cpp.

3 Right click the row containing the violation of rule 191 , then select Open Source File.



The training.cpp file opens in your text editor.

Note You must configure a text editor before you can open source files. See "Configuring Text and XML Editors" on page 5-8.

4 Correct the JSF++ violation and run the verification again.

The verification will complete, and the results will be the same as those from the tutorial in Chapter 3, "Running a Verification".

Opening JSF Report

After you check JSF++ rules, you can generate an XML report containing all the errors and warnings reported by the JSF C++ checker.

Note You must configure an XML editor before you can open a JSF report. See "Configuring Text and XML Editors" on page 5-8..

To view the JSF report:

1 Click the **JSF** button in the log area of the Launcher window.

A list of JSF++ violations appears in the log part of the window.

- Col Justified Status Rule File Line 180 21 8 training.cpp 191 trair ⊊ Open Source File 180 trair ? Add Pre-Justification to Clipboard 180 7 trair Open JSF Report 📆 Configure Editor
- 2 Right click any row in the log, and select **Open JSF Report**.

The report opens in your XML editor.

0	Book1 - Microsoft Excel															
C	Home Insert Page Layout Formulas Data Review View Add-Ins Acrobat 🞯 – 🕫 🗴															
Pa	$\begin{array}{c c c c c c c c c c c c c c c c c c c $															
Clip	board 😼		Font	G		Alignment	t G	1	lumb	er 🕼	St	tyles		Cells	Editing	
	А	В	С			D		E		F					G	
1	Name 💌	Mode 💌	Report 💌	File				Line		Column 💌	Message					
2	180	shall	warning	C:\PolySpac	ce\polyspace_	project\s	ources\training.c	рр	21	8	Implicit conv	version	s that ma	ay result in a l	oss of information	sł
3	191	shall	error	C:\PolySpac	ce\polyspace_	project\s	ources\training.c	рр	46	19	The break st	atemer	nt shall n	ot be used (e	xcept to terminate	tł
4	180	shall	warning	C:\PolySpac	ce\polyspace_	project\s	ources\training.c	pp :	109	15	Implicit conv	version	s that ma	ay result in a l	oss of information	sł
5	180	shall	warning	C:\PolySpac	ce\polyspace_	project\s	ources\training.c	pp :	L42	38	Implicit conv	version	s that ma	ay result in a l	oss of information	sł
6																

6

Using a PolySpace Project Model File

- "About This Tutorial" on page 6-2
- "Creating a New PolySpace Project Model File" on page 6-3
- "Creating a Configuration File from a PolySpace Project Model File" on page 6-9
- "Deleting a Generic Target from the Preferences" on page 6-12

About This Tutorial

In this section...

"Overview" on page 6-2

"Before You Start" on page 6-2

Overview

A PolySpace project model file provides a way to save generic targets with project information. Although you can populate a project with information, such as source files and project options, from a project model file, you cannot run a verification with a project model file. You must have a configuration file to run a verification. In this tutorial, you learn how to:

- 1 Create a new project model file.
- 2 Define a generic target and save it in the project model file.
- **3** Create a configuration file from a project model file.
- 4 Delete a generic target from the Launcher preferences.

Before You Start

Before you start this tutorial, you must complete Chapter 2, "Setting Up a Project File" to learn about configuration files and basic Launcher operations.

Creating a New PolySpace Project Model File

In this section...

"What Is a PolySpace Project Model File?" on page 6-3

"Creating the PolySpace Project Model File" on page 6-3

What Is a PolySpace Project Model File?

A PolySpace project model file is a project file that includes generic target processors. A development team uses this file to share project information. The workflow is:

- 1 A team leader creates a project model file (.ppm). This file has the analysis options for the project, including generic targets.
- 2 The team leader distributes the .ppm file to the team.
- **3** A developer opens the .ppm file. From this file, PolySpace software populates the project parameters and the generic targets in the preferences.
- **4** The developer adds source files, include folders, and a results folder to the project and saves it as a configuration file (.cfg).
- **5** The developer launches a verification with the.cfg file.

Creating the PolySpace Project Model File

You use the PolySpace Launcher to create a PolySpace project model file. Creating a project model file involves:

- "Opening a New Project" on page 6-4
- "Examining the Preferences Before Adding the Generic Target" on page 6-4
- "Defining the Generic Target" on page 6-5
- "Examining the Preferences After Adding the Generic Target" on page 6-7
- "Saving the PolySpace Project Model File" on page 6-8

Opening a New Project

To open a new project:

- **1** Open the PolySpace Launcher by double-clicking the Launcher icon on your desktop.
- **2** If the **PolySpace Language Selection** dialog box appears, select **PolySpace for C/C++** and click **OK**.
- **3** Select **File > New Project**.
- **4** In the **Choose the language** dialog box, select **CPP** and click **OK** to close the dialog box.

Examining the Preferences Before Adding the Generic Target

In this step, you look at the generic targets in the preferences before you add a generic target. Unless you previously added a generic target, the generic targets list is empty. Later, after you add a generic target, when you look at the generic targets in the preferences again, you will see that the generic target you added is in the list.

To look at the generic targets in the preferences:

1 Select Edit > Preferences.

The **Preferences** dialog box appears.

Preferences							×
Tools Menu Ren	note Launcher	Miscellaneous	Results folder	Default folder	Editors	Generic targets	
		Menu title		Exe	ecution co	mmand	
							_
							-1
•=							
				1		1	_
			OK	A	pply	Cancel	

2 Select the Generic targets tab.

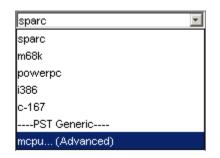
Unless you previously added generic targets to your preferences, the generic targets list is empty.

3 Click **Cancel** to close the dialog box.

Defining the Generic Target

To define a generic target:

- 1 In Analysis options, expand Target/Compilation.
- 2 Click the down arrow to open the **Target processor type** menu.



3 Select mcpu...(Advanced).

The Generic target options dialog box appears.

🧭 Generic target options										
Enter the target name Endianness		Lit	tle endia	n	_					
	8bits	16bits	32bits	64bits						
Char	۲	0	0	0	🔽 Signed					
Short	0	۲	0	0						
Int	0	•	0	0						
Long	0	0	۲	0						
Long long	0	0	۲	0						
Float	0	0	۲	0						
Double/Long double	0	0	۲	0						
Pointer	0	۲	0	0						
Alignment	0	0	۲	0						
			Save	Cancel						

4 In Enter the target name, type target1.

5 Click Save to save the generic target options and close the dialog box.

Examining the Preferences After Adding the Generic Target

Now when you look at the generic targets in the preferences, you should see the generic target that you added. To look at the generic targets list in the preferences:

1 Select Edit > Preferences.

The **Preferences** dialog box appears.

2 Select the Generic targets tab.

Notice that target1 appears in the generic targets list:

A Preferences	×
Tools Menu Remote Launcher Miscellaneous Results folder Default folder Editors Generic targe	ets
target1	
target i	
Edit	
Remove	
OK Apply Cancel	

3 Click **Cancel** to close the dialog box.

Saving the PolySpace Project Model File

To save the PolySpace project model file:

1 Select File > Save project.

The Save the project as dialog box appears.

- 2 Select *.ppm from the Files of type menu.
- 3 In Session identifier, enter target_training.
- 4 Click OK to save the file and close the dialog box.

Warning The generic target that you defined in this tutorial remains in your preferences until you delete it. Be sure to complete the section "Deleting a Generic Target from the Preferences" on page 6-12 at the end of this tutorial.

Creating a Configuration File from a PolySpace Project Model File

In this section ...

"Why You Must Have a Configuration File" on page 6-9

"Opening the Project Model File" on page 6-9

"Entering Additional Required Information" on page 6-10

"Saving the Configuration File" on page 6-10

Why You Must Have a Configuration File

In the first part of this tutorial, you created a project model file. To run a verification, you must have a configuration file. In this part of the tutorial, you create a configuration file from the project model file that you created earlier. The workflow is:

- **1** Open the project model file. Opening the project model file populates the:
 - Generic targets in the preferences
 - Analysis options and other project information
- **2** Enter additional information, such as the results folder and source files.

Note If you enter the results folder and source files in the project before you save it as a PolySpace project model file, then that information is saved in the file and appears in the project when you open the file.

3 Save the configuration file.

Opening the Project Model File

To open the project model file:

1 Select File > Open project.

The **Please select a file** dialog box appears.

- 2 Navigate to the polyspace_project folder.
- 3 In File of type:, select Project Model (*.ppm) files from the menu.
- 4 Select target_training.ppm and click Open.

A message appears telling you that this project has no source files.

5 Click **OK** to close the message dialog box.

Entering Additional Required Information

A configuration file must specify the source files and results folder.

To complete the required project information:

- In **Results Folder**, enter the results folder that you created. For the example in this guide, it is C:\polyspace_project\results.
- Add C:\polyspace_project\sources\training.cpp to the source files.
- Add C:\polyspace_project\includes to the include folders.

Note For more information about adding source files and include folders to a project, see "Creating a New Project to Verify a Class in the Training C++ File" on page 2-9.

Saving the Configuration File

To save the configuration file:

1 Select File > Save project.

The **Save the project as** dialog box appears.

- **2** Navigate to the polyspace_project folder.
- **3** In Session identifier, enter training2.
- **4** Leave the default type as ***.cfg**.

5 Click OK to save the project and close the dialog box.

Note Your preferences still include the generic target target1. Complete "Deleting a Generic Target from the Preferences" on page 6-12 to delete this generic target from your preferences.

Deleting a Generic Target from the Preferences

In this section ...

"Understanding the Generic Targets Preference" on page 6-12

"Deleting the Generic Target Added in This Tutorial" on page 6-12

Understanding the Generic Targets Preference

The list of generic targets is stored as a PolySpace software preference. You can add generic targets to the list in one of these ways:

- Edit the preferences using the PolySpace Launcher.
- Open a PolySpace project model file that includes generic targets.

The generic targets remain in your preferences until you delete them. You should delete the generic target that you defined and added to you preferences earlier in this tutorial.

Deleting the Generic Target Added in This Tutorial

To delete the generic target target1 from your preferences:

- 1 In Analysis options, expand Target/Compilation.
- **2** If **Target processor type** is **target1**, change it to **sparc** (You cannot delete a generic target if it is the target processor type for the current project.)
- **3** Select **Edit** > **Preferences**.

The **Preferences** dialog box appears.

- 4 Select the Generic targets tab.
- 5 Select target1 from the list.
- 6 Click Remove.
- **7** Click **OK** to apply the change and close the dialog box.

Note You removed the generic target target1 from your preferences, but it is still in target_example.ppm. If you save the current project in target_example.ppm, then target_example.ppm will no longer include target1.



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