Polyspace® Bug Finder™ Release Notes

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Polyspace® Bug Finder™ Release Notes

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R2019b

R2019a

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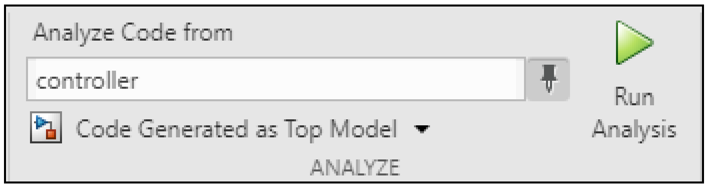
R2021a

Analysis Setup

Simulink Support: Start Polyspace analysis without an explicit code generation step

Summary: In R2021a, start the Polyspace analysis of generated code without having to explicitly generate the code first. To start the Polyspace analysis of code generated from a model, Click **Run Analysis** in the Simulink® toolstrip.



If you have Embedded Coder®, Polyspace generates code from the model by using Embedded Coder when there is no previously generated code corresponding to the model. After the code generation is complete, the Polyspace analysis starts.

See "Run Polyspace Analysis on Code Generated from Simulink Model".

Benefits: Previously, you generated code explicitly in a separate step before starting the Polyspace analysis of the generated code. You are no longer required to perform this step.

Additional Considerations: Before starting a Polyspace analysis, you still need to generate code explicitly if any of the following is true:

- You do not use Embedded Coder to generate code.
- The model is configured to generate code as a model reference.

Configuration from Build System: Specify options delimiter and suppress console output

Summary: In R2021a, `polyspace-configure` has new options to simplify the creation of a Polyspace project or options file:

- `-options-for-sources-delimiter` — Use this option to specify an ASCII character that Polyspace uses as a delimiter between a group of analysis options. You typically use this option in combination with `-options-for-sources`, which associates a group of analysis options with specific source files. You might want to specify a delimiter if, for instance, the default delimiter (`;`) is already used inside a macro.
- `-no-console-output` — Use this option to completely suppress the console output of `polyspace-configure`, including error and warning messages. By default, `polyspace-configure` emits errors and warnings only.

See also `polyspace-configure`.

Benefits: The new options allow you to customize the `polyspace-configure` runs without extensive additional scripting.

Configuration from Build System: Improved detection of incompatible software

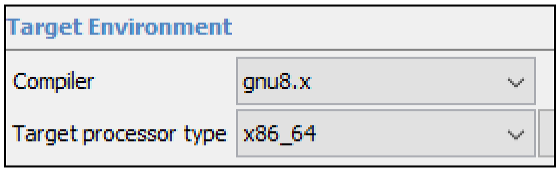
Summary: In R2021a, if you use software that is not compatible with `polyspace-configure` when you trace your build process, `polyspace-configure` emits a message that identifies the software and that provides contextual help if applicable. Software that is not compatible with `polyspace-configure` includes some antivirus software and certain build systems such as Bazel.

For more information, see `polyspace-configure`.

Benefits: Previously, when `polyspace-configure` could not trace your build process because of incompatible software, the command output did not identify the software. Now, you can easily check if your build system and environment is compatible with `polyspace-configure`.

Updated GCC Compiler Support: Set up Polyspace analysis for code compiled with GCC version 8.x

Summary: In R2021a, Polyspace supports the GCC compiler version 8.x natively. If you build your source code by using GCC version 8.x, you can specify the compiler name for your Polyspace analysis.



Target Environment

Compiler: gnu8.x

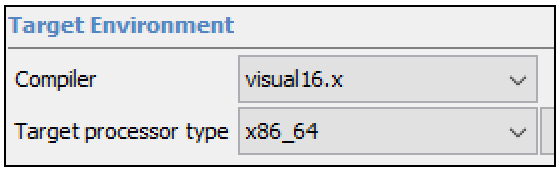
Target processor type: x86_64

For more information, see `Compiler (-compiler)`.

Benefits: Because of the native support, you can now set up a Polyspace project without knowing the internal workings of this compiler. The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.

Updated Microsoft Visual C++ Support: Set up a Polyspace analysis for code compiled with Visual Studio 2019

Summary: In R2021a, Polyspace supports the compiler Visual Studio® 2019 natively. If you build your source code by using Visual Studio 2019 (versions 16.x), you can specify the compiler name for your Polyspace analysis.



Target Environment

Compiler: visual16.x

Target processor type: x86_64

For more information, see `Compiler (-compiler)`.

Benefits: Because of the native support, you can now set up a Polyspace project without knowing the internal workings of this compiler. The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.

Modifying Checker Behavior: Modify parameters for MISRA C:2012 rules 1.1 and 5.1 to 5.5

Summary: In R2021a, you can modify the thresholds used in the checkers for MISRA C®: 2012 Rules 1.1 and 5.1 to 5.5.

Rule	Description	Supported Modification
`MISRA C:2012 Rule 1.1`	The program shall contain no violations of the standard C syntax and constraints, and shall not exceed the implementation's translation limits.	You can increase or decrease these parameters of the rule checker: • Maximum depth of nesting allowed in control flow statements • Maximum levels of inclusion allowed using include files • Maximum number of constants allowed in an enumeration • Maximum number of macros allowed in a translation unit • Maximum number of members allowed in a structure • Maximum levels of nesting allowed in a structure

`MISRA C:2012 Rule 5.1`
`MISRA C:2012 Rule 5.2`
`MISRA C:2012 Rule 5.3`
`MISRA C:2012 Rule 5.4`
`MISRA C:2012 Rule 5.5`
	These rules require uniqueness of certain types of identifiers. For instance, rule 5.1 requires that external identifiers be distinct.	If the difference between two identifiers occurs beyond the first *`num`* characters, the rule checker considers the identifiers as identical. You can modify the parameter *`num`* separately for external and internal identifiers.

For more information, see:

- “Modify Default Behavior of Bug Finder Checkers”
- `-code-behavior-specifications`

Benefits: You can adapt the checkers for MISRA C: 2012 Rules 1.1 and 5.1 to 5.5 to follow your compiler specifications.

polyspacesetup Function: Integrate Polyspace with MATLAB in fewer steps

Summary: In R2021a, you can integrate Polyspace with the current or earlier release of MATLAB® in fewer steps. When you run the function `polyspacesetup` at the MATLAB command prompt, the function looks for a Polyspace installation in the default location. If the installation exists, the function integrates Polyspace with MATLAB. Specify the installation location explicitly only when you install Polyspace in a nondefault location.

See Also:

- `polyspacesetup`
- “Integrate Polyspace with MATLAB and Simulink”

Benefits: Previously, to integrate Polyspace with Simulink, you provided the location of the Polyspace installation folder. Starting in R2021a, providing the installation location is no longer required if you install Polyspace in the default location.

pslinkrunCrossRelease Function: Analyze code generated in an earlier release of Simulink by using a later release of Polyspace

Summary: In R2021a, you can run a Polyspace analysis of generated code from an earlier release of Simulink by using the function `pslinkrunCrossRelease`. To use this cross-release workflow, your Polyspace version must be later than your Simulink version and your Simulink must be R2020b or later.

See :

- `pslinkrunCrossRelease`
- “Run Polyspace on Code Generated by Using Previous Releases of Simulink”

Benefits: Previously, you used the function `pslinkrun` in both cross-release and same release workflows. Starting in R2021a, these two workflows are differentiated by introducing the function `pslinkrunCrossRelease` explicitly for the cross-release workflow.

The compatibility of Polyspace with prior releases of Simulink is also simplified. Previously, the compatibility of Polyspace with an earlier Simulink depended on the specific version of Polyspace and Simulink. Starting in R2021a, you can integrate Polyspace with Simulink only if your Polyspace version is later than your Simulink version, and you have Simulink from R2020b or later. See “Polyspace Support of MATLAB and Simulink from Different Releases”.

Compatibility Considerations

The function `pslinkrun` no longer supports a cross-release workflow. Use the function `pslinkrunCrossRelease` instead.

Functionality being removed: Compilation assistant

The Polyspace compilation assistant will be removed in a future release.

Compatibility Considerations

If you use the compilation assistant in your Polyspace project, clear the corresponding option. To clear this option in the desktop interface, go to **Tools > Preferences** and then select the **Project and Results Folder** tab.

Instead, when you set up your Polyspace project, you can:

- Use the `Compiler (-compiler)` option to specify a compiler that Polyspace supports natively if you compile your code by using that compiler.
- Use `polyspace-configure` to trace your build command and to obtain your compiler configuration. See `polyspace-configure`.

Changes in analysis options and binaries

-code-behavior-specifications takes only one file as argument
Behavior change

Starting in R2021a, this option only takes one XML file as argument. If you were specifying code behaviors in multiple XML files, combine their content into one file and provide this file as argument to the option.

See also `-code-behavior-specifications`.

-sources-encoding with value other than auto disables automatic detection of encoding
Behavior change

Starting in R2021a, if you explicitly specify a value with the option `-sources-encoding` (or use the default value `system` which uses the default encoding of your OS), the analysis does not perform any automatic detection of source file encoding. For instance, if you use `-sources-encoding shift-jis`, the analysis internally converts your source files from Shift JIS (Shift Japanese Industrial Standards) to UTF-8 encoding before processing them. If you see regressions from previous releases, consider using `-sources-encoding auto` to reenable the automatic detection of source encoding. Automatic detection is useful when your project contains, for instance, a mix of different encodings.

See also `Source code encoding (-sources-encoding)`.

Analysis Results

AUTOSAR C++14 Support: Check for 327 AUTOSAR C++14 rules including 19 new rules in R2021a

Summary: In R2021a, you can look for violations of these AUTOSAR C++14 rules in addition to previously supported rules.

AUTOSAR C++14 Rule	Description	Polyspace Checker
A2-7-3	All declarations of "user-defined" types, static and non-static data members, functions and methods shall be preceded by documentation.	`AUTOSAR C++14 Rule A2-7-3`
A2-8-1	A header file name should reflect the logical entity for which it provides declarations.	`AUTOSAR C++14 Rule A2-8-1`
A2-8-2	An implementation file name should reflect the logical entity for which it provides definitions.	`AUTOSAR C++14 Rule A2-8-2`
A8-4-5	"consume" parameters declared as X && shall always be moved from.	`AUTOSAR C++14 Rule A8-4-5`
A8-4-6	"forward" parameters declared as T && shall always be forwarded.	`AUTOSAR C++14 Rule A8-4-6`
A8-4-8	Output parameters shall not be used.	`AUTOSAR C++14 Rule A8-4-8`
A8-4-9	"in-out" parameters declared as T & shall be modified.	`AUTOSAR C++14 Rule A8-4-9`
A8-4-10	A parameter shall be passed by reference if it can't be NULL.	`AUTOSAR C++14 Rule A8-4-10`
A8-5-4	If a class has a user-declared constructor that takes a parameter of type std::initializer_list, then it shall be the only constructor apart from special member function constructors.	`AUTOSAR C++14 Rule A8-5-4`
A12-8-1	Move and copy constructors shall move and respectively copy base classes and data members of a class, without any side effects.	`AUTOSAR C++14 Rule A12-8-1`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A12-8-2	User-defined copy and move assignment operators should use user-defined no-throw swap function.	`AUTOSAR C++14 Rule A12-8-2`
A12-8-3	Moved-from object shall not be read-accessed.	`AUTOSAR C++14 Rule A12-8-3`
A13-5-3	User-defined conversion operators should not be used.	`AUTOSAR C++14 Rule A13-5-3`
A13-6-1	Digit sequences separators ' shall only be used as follows: (1) for decimal, every 3 digits, (2) for hexadecimal, every 2 digits, (3) for binary, every 4 digits.	`AUTOSAR C++14 Rule A13-6-1`
A15-4-1	Dynamic exception-specification shall not be used.	`AUTOSAR C++14 Rule A15-4-1`
A15-4-4	A declaration of non-throwing function shall contain noexcept specification.	`AUTOSAR C++14 Rule A15-4-4`
A20-8-1	An already-owned pointer value shall not be stored in an unrelated smart pointer.	`AUTOSAR C++14 Rule A20-8-1`
A27-0-4	C-style strings shall not be used.	`AUTOSAR C++14 Rule A27-0-4`
M5-0-16	A pointer operand and any pointer resulting from pointer arithmetic using that operand shall both address elements of the same array.	`AUTOSAR C++14 Rule M5-0-16`

See also "AUTOSAR C++14 Rules".

CERT C++ Support: Check for memory management and programming rule violations.

Summary: In R2021a, you can look for violations of these CERT C++ rules in addition to previously supported rules.

CERT C++ Rule	Description	Polyspace Checker
OOP50-CPP	Do not invoke virtual functions from constructors or destructors	`CERT C++: OOP50-CPP`
EXP63-CPP	Do not rely on the value of a moved-from object	`CERT C++: EXP63-CPP`
MEM56-CPP	Do not store an already-owned pointer value in an unrelated smart pointer	`CERT C++: MEM56-CPP`

See also “CERT C++ Rules”.

MISRA C++:2008 Support: Check for disallowed pointer arithmetic

Summary: In R2021a, you can look for violation of this MISRA C++:2008 rule in addition to previously supported rules.

Rule	Description	Polyspace Checker
MISRA C++:2008 Rule 5-0-16	A pointer operand and any pointer resulting from pointer arithmetic using that operand shall both address elements of the same array.	`MISRA C++:2008 Rule 5-0-16`

See also “MISRA C++:2008 Rules”.

MISRA C:2012 Support: Checkers updated to account for MISRA C:2012 Technical Corrigendum 1 and Amendment 2

Summary: In R2021a, Polyspace supports amendments to MISRA C:2012 rules in Technical Corrigendum 1 and Amendment 2.

MISRA C:2012 Technical Corrigendum 1

MISRA C:2012 Technical Corrigendum 1 adds clarifications to existing rules. The clarifications have led to changes in these checkers:

Rule	Description	Update in Technical Corrigendum 1
`MISRA C:2012 Rule 10.1`	Operands shall not be of an inappropriate essential type.	The rule now explicitly forbids use of pointer types with logical operands such as &&, `||` and `!`.
`MISRA C:2012 Rule 10.5`	The value of an expression should not be cast to an inappropriate essential type.	The rule now forbids casts of integer constants with value 0 or 1 to essentially enum types.
`MISRA C:2012 Rule 11.2`	Conversions shall not be performed between a pointer to an incomplete type and any other type.	The rule now takes into account only the unqualified types that the pointers point to. For instance, if a pointer is assigned to another and the only difference between the pointed types is a `const` qualifier, the rule does not consider this assignment as a conversion.

Rule	Description	Update in Technical Corrigendum 1
MISRA C:2012 Rule 11.4	A conversion should not be performed between a pointer to object and an integer type.	The rule now applies explicitly to pointers to objects only. Conversions between an integer type and other pointer types such as `void*` or pointers to functions are flagged by other rules.
MISRA C:2012 Rule 11.9	The macro NULL shall be the only permitted form of integer null pointer constant.	The rule allows the use of `{0}` to initialize aggregates or unions containing pointers.
MISRA C:2012 Rule 14.2	A for loop shall be well-formed.	The rule allows any form of initialization of the loop counter as long as the initialization does not have other side effects.

MISRA C:2012 Amendment 2

MISRA C:2012 Amendment 2 addresses the new language features in the C11 standard. All updates in Amendment 2 have been incorporated in the checkers.

Rule	Description	Update in Amendment 2
MISRA C:2012 Rule 1.4	Emergent language features shall not be used.	This rule is new in Amendment 2.
MISRA C:2012 Rule 12.1	The precedence of operators within expressions should be made explicit.	The rule now mandates a violation if the operand of the `_Alignof` operator is not enclosed in parenthesis.
MISRA C:2012 Rule 21.3	The memory allocation and deallocation functions of `<stdlib.h>` shall not be used.	The rule now flags uses of the `aligned_alloc` function.
MISRA C:2012 Rule 21.8	The Standard Library termination functions of <stdlib.h> shall not be used.	The rule no longer flags `system`. In addition to `exit` and `abort`, the rule now flags `_Exit` and `quick_exit`.
MISRA C:2012 Rule 21.21	The Standard Library function `system` of `<stdlib.h>` shall not be used.	This rule is new in Amendment 2.
MISRA C:2012 Rule 22.1	All resources obtained dynamically by means of Standard Library functions shall be explicitly released.	The rule now flags memory allocation using the `aligned_alloc` function if the memory is not released.

Guidelines: New checkers for software complexity defects

Summary: In R2021a, Polyspace has a new category of checkers called **Guidelines**. This category contains the **Software Complexity** checkers. Reduce the software complexity metrics of your code by activating these new checkers. See “Reduce Software Complexity by Using Polyspace Checkers”. The **Software Complexity** checkers include:

Defect	Description
`Number of Calling Functions Exceeds Threshold`	The number of distinct callers of a function is greater than the defined threshold.
`Number of Called Functions Exceeds Threshold`	The number of distinct function calls within the body of a function is greater than the defined threshold.
`Comment density below threshold`	The comment density of the module falls below the specified threshold.
`Call Tree Complexity Exceeds Threshold`	The call tree complexity of a file is greater than the defined threshold.
`Number of Lines Within body Exceeds Threshold`	The number of lines in the body of a function is greater than the defined threshold.
`Number of Executable Lines Exceeds Threshold`	The number of executable lines in the body of a function is greater than the defined threshold.
`Number of Call Levels Exceeds Threshold`	The nesting depth of control structures in a function is greater than the defined nesting depth threshold of a function.
`Number of GOTO Statements Exceeds Threshold`	The number of `goto` statements in a function is greater than the defined threshold.
`Number of Local Static variables Exceeds Threshold`	The number of local static variables in a function is greater than the defined threshold.
`Number of Local Nonstatic Variables Exceeds Threshold`	The number of function calls in a function is greater than the defined call occurrence threshold of a function.
`Number of Call Occurrences Exceeds Threshold`	The number of function calls in a function is greater than the defined call occurrence threshold of a function.
`Number of Function Parameters Exceeds Threshold`	The number of arguments of a function is greater than the defined threshold.
`Number of Paths Exceeds Threshold`	The number of static paths in a function is greater than the defined threshold.
`Number of Return Statements Exceeds Threshold`	The number of `return` statements in a function is greater than the defined threshold.
`Number of Instructions Exceeds Threshold`	The number of instructions in a function is greater than the defined threshold.
`Number of Lines Exceeds Threshold`	The number of total lines in a file is greater than the defined threshold.

Defect	Description
`Cyclomatic Complexity Exceeds Threshold`	The cyclomatic complexity of a function is greater than the defined cyclomatic complexity threshold of a function.
`Language Scope Exceeds Threshold`	The language scope of a function is greater than the defined threshold.

In the Polyspace user interface, activate these checkers in the **Coding Standard & Code Metric** node of the **Configuration** pane. Alternatively, in the Checkers selection window, select the **Guidelines** > **Software Complexity** checkers.

To activate these checkers in the command-line, use the analysis option `Check Guidelines (-guidelines)`. To specify a subset of these checkers with modified thresholds by using a checkers selection file, use `Set checkers by file (-checkers-selection-file)`.

Compatibility Considerations

Each of these software complexity checkers corresponds to a code metric. When you import comments from a previous run by using the command `polyspace-comments-import`, Polyspace copies any review information on a code metric in the previous result to the corresponding software complexity checker in the current result. If the current result contains the same code metric, the review information is also copied to the code metric.

JSF AV C++ Support: Check for cases where pass-by-reference is preferred to pass-by-pointer

Summary: In R2021a, you can check for this JSF® AV C++ rule in addition to previously supported rules.

Rule	Description
AV Rule 117	Arguments **should** be passed by reference if NULL values are not possible.

See also “JSF AV C++ Coding Rules”.

New Bug Finder Checkers: Check for inefficient string operations, noncompliance with AUTOSAR Standard specifications, and other issues

Summary: In R2021a, you can check for these new Bug Finder defects in your code.

Defect	Description
`Const rvalue reference parameter may cause unnecessary data copies`	The `const`-ness of an rvalue reference prevents move operation and causes a more expensive copy operation instead.

Defect	Description
`Expensive use of std::string methods instead of more efficient overload`	An `std::string` method uses a single character string literal, that is, a `const char*` object of length one, instead of using a single quoted character.
`Expensive use of std::string with empty string literal`	Use of `std::string` with empty string literal can be replaced by less expensive calls to `std::basic_string` member functions.
`Expensive use of non-member std::string operator+() instead of a simple append`	The non-member `std::string operator+()` function is called when the append (or `+=`) method would have been more efficient.
`Expensive local variable copy`	A local variable is created by copy from a `const` reference and not modified later.
`Expensive logical operation`	A logical operation requires the evaluation of both operands because of their order, resulting in inefficient code.
`File does not compile`	A file has a compilation error.
`Noncompliance with AUTOSAR library`	A call to an AUTOSAR RTE API function violates AUTOSAR Standard specifications.
`Use of new or make_unique instead of more efficient make_shared`	Creating a `shared_ptr` pointer with `new` or `make_unique` causes an unnecessary additional memory allocation.

For all defect checkers, see “Defects”.

Changes to coding rules checking

In R2021a, coding rules checking has improved across various standards. For instance, you can check for both MISRA C:2004 and MISRA C:2012 rules in the same run.

These changes have been made in the checking of previously supported rules.

Rule	Description	Change
`MISRA C:2012 Rule 1.1`	An implementation-defined behavior on which the output of the program depends shall be documented and understood.	You can now change the thresholds used in the rule checking using the option `-code-behavior-specifications`.
`MISRA C:2012 Rule 1.3`	There shall be no occurrence of undefined or critical unspecified behaviour.	The checker no longer flags all instances of the `offsetof` macro, but only the instances that cause undefined behavior. For instance, if the second argument of `offsetof` is not a field of the first argument or is a bitfield, the checker raises a violation.

Rule	Description	Change
MISRA C: 2012 Rule 5.x	Rules that ensure uniqueness of identifiers.	You can now change the thresholds used in the rule checking using the option `-code-behavior-specifications`.

`MISRA C:2012 Rule 10.3`	The value of an expression shall not be assigned to an object with a narrower essential type or of a different essential type category.	The checker now detects implicit conversions when a structure is initialized using aggregate initialization. For instance, in this code snippet, the initialization of structure `a` results in an implicit conversion from the essentially signed type of `x` to the essentially unsigned type of the field `a_`
		
		`typedef struct tag_A`
		`{`
		`     unsigned char a_;`
		`     unsigned char b_;`
		`}tag_A;`
		
		`int x = 1;`
		`tag_A a = {x,0}; //Noncompliant`

`MISRA C:2012 Rule 10.4`	Both operands of an operator in which the usual arithmetic conversions are performed shall have the same essential type category.	The checker treats macros such as TRUE or FALSE that resolve to 0 or 1 as essentially boolean.
`AUTOSAR C++14 Rule A5-0-3`	The declaration of objects shall contain no more than two levels of pointer indirection	The checker no longer flags the use of objects with more than two levels of pointer indirection.

Rule	Description	Change
`AUTOSAR C++14 Rule A8-5-2`	Braced-initialization {}, without equals sign, shall be used for variable initialization.	The checker now adheres more strictly to the AUTOSAR C++14 specifications. The checker flags non-uniform initializations such as: • `Type obj1 = obj2;` • `Type obj1(obj2);` Even if `obj1` and `obj2` have the same types. Previously, the checker raised a flag only if the types were different. The checker allows an exception for these cases: • Initialization of variables with type `auto` using a simple assignment • Initialization of reference types • Declarations with global scope using the format *`Type`* `a()` where *`Type`* is a class type with default constructor. The analysis interprets `a` as a function returning the type *`Type`*. • Loop variable initialization in OpenMP parallel `for` loops, that is, in `for` loop statements that immediately follow `#pragma omp parallel for`
`AUTOSAR C++14 Rule A10-1-1`	Classes shall not be derived from more than one base class which is not an interface class.	The checker now expands interface classes to include constructors and destructors set to `=default` or `=delete`.
`AUTOSAR C++14 Rule A12-6-1`	All class data members that are initialized by the constructor shall be initialized using member initializers.	The checker no longer flags constructors that use default member initialization.
`AUTOSAR C++14 Rule A12-8-7`	Assignment operators should be declared with the ref-qualifier &.	The checker no longer flags deleted assignment operators without the ref-qualifier &.

Rule	Description	Change
AUTOSAR C++14 Rule A20-8-5 and AUTOSAR C++14 Rule A20-8-6	`std::make_unique` (`std::make_shared`) shall be used to construct objects owned by `std::unique_ptr` (`std::shared_ptr`).	The checkers now also apply to `boost::unique_ptr` and `boost::shared_ptr`.
AUTOSAR C++14 Rule M5-0-15	Array indexing shall be the only form of pointer arithmetic.	The checker no longer flags arithmetic operations such as increment and decrement on iterators that point to elements in containers.
CERT C: Rule INT31-C	Ensure that integer conversions do not result in lost or misinterpreted data	The checker now detects comparisons of `time_t` variables with variables of other types. `time_t` is an implementation-defined type, therefore, these comparisons can lead to unexpected results.
CERT C: Rec. MEM04-C	Beware of zero-length allocations	The checker now performs more direct checks for possibilities of zero-length memory allocations and adheres more strictly to the CERT C standard.
CERT C++: DCL53-CPP	Do not write syntactically ambiguous declarations.	The checker no longer flags ambiguous declarations with global scope. For instance, the analysis does not flag declarations with global scope using the format *`Type`* `a()` where *`Type`* is a class type with a default constructor. The analysis interprets `a` as a function returning the type *`Type`*.
CERT C: Rule EXP37-C	Call functions with the correct number and type of arguments	This checker now flags: • Calls with complex arguments to math functions that do not take a complex input • Calls to functions whose provided or deduced prototypes do not match their definitions.
CERT C++: EXP37-C	Call functions with the correct number and type of arguments	This checker now flags the calls to an `extern "C"` function if its prototypes does not match the definition.

Rule	Description	Change
Checkers from different C++ standards: • `MISRA C++:2008 Rule 3-2-2` • `AUTOSAR C++14 Rule M3-2-2` • `CERT C++: DCL60-CPP`	Checkers for the one definitions rule in C++.	Starting in R2021a, in the declarations that violate these rules, the violations are flagged on the keywords instead of the variable names. Starting in R2021a, these checkers are no longer raised on unused code such as: • Noninstantiated templates • Uncalled `static` or `extern` functions • Uncalled and undefined local functions • Unused types and variables
Checkers from different C++ standards: • `MISRA C++:2008 Rule 3-2-1` • `AUTOSAR C++14 Rule M3-2-1`	Checkers that flag declaration of an object with incompatible types across modules.	Starting in R2021a, Polyspace considers two types to be compatible if they have the same size and signedness in the environment that you use. For instance, if you specify `-target` as i386, Polyspace considers `long` and `int` to be compatible types. Starting in R2021a, these checkers are no longer raised on unused code such as: • Noninstantiated templates • Uncalled `static` or `extern` functions • Uncalled and undefined local functions • Unused types and variables

Rule	Description	Change
Checkers from different C++ standards: • MISRA C++2008: • `MISRA C++:2008 Rule 2-10-5` • `MISRA C++:2008 Rule 3-2-4` • AUTOSAR C++14: • `AUTOSAR C++14 Rule A2-10-4` • `AUTOSAR C++14 Rule A2-10-5` • `AUTOSAR C++14 Rule M3-2-4`	Checkers that check for inconsistent declaration and definitions, and name re-use across different modules.	Starting in R2021a, these checkers are no longer raised on unused code such as: • Noninstantiated templates • Uncalled `static` or `extern` functions • Uncalled and undefined local functions • Unused types and variables
`JSF AV C++ Rule 137`		Starting in R2021a, this checker is raised on declarations of nonstatic objects that you use in only one file. The checker is raised even if you analyze a singe file. The checker is not raised on the declarations of objects that remain unused, such as: • Noninstantiated templates • Uncalled `static` or `extern` functions • Uncalled and undefined local functions • Unused types and variables

Compatibility Considerations

If you checked your code for the preceding rules, you might see a change in the number of violations.

Updated Bug Finder defect checkers

In R2021a, these defect checkers have been updated.

Defect	Description	Update
`Ambiguous declaration syntax`	Declaration syntax can be interpreted as object declaration or part of function declaration	The checker no longer flags ambiguous declarations with global scope. For instance, the analysis does not flag declarations with global scope using the format *`Type`* `a()` where *`Type`* is a class type with a default constructor. The analysis interprets `a` as a function returning the type *`Type`*.
`Format string specifiers and arguments mismatch`	Format specifiers in `printf`-like functions do not match corresponding arguments	In cases where integer promotion modifies the perceived data type of an argument, the analysis result shows both the original type and the type after promotion. The format specifier has to match the type after integer promotion.

Reviewing Results

Simulink Block Annotation: Add multiple Polyspace annotations corresponding to multiple types of Polyspace results

Summary: In R2021a, you can annotate a Simulink block with multiple annotations for multiple types of Polyspace results through the **Polyspace Annotation** window. For instance, consider a block that is annotated for a MISRA C violation. If this block is then flagged for a defect violation, you can add an annotation corresponding to the defect violation without overwriting the previous annotation for the MISRA C violation. To add these two annotations, open the **Polyspace Annotation** window twice and each time, annotate for a specific type of result. These annotations are appended to each other and can be seen in the **Result Details** pane of Polyspace User Interface. See “Annotate Blocks to Justify Issues”

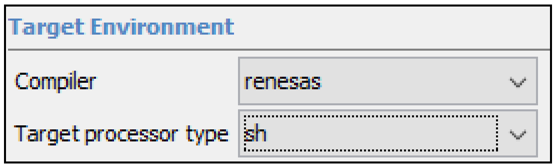
Benefits: Previously, if you added a new annotation to an already annotated Simulink block, Polyspace overwrote the existing annotation. Starting in R2021a, adding an annotation to a previously annotated Simulink block appends the new annotation to the existing annotation.

R2020b

Analysis Setup

Compiler Support: Set up Polyspace analysis for code compiled by Renesas SH C compilers

Summary: If you build your source code by using Renesas® SH C compilers, in R2020b, you can specify the target name `sh`, which corresponds to SuperH targets, for your Polyspace analysis.



Compiler	renesas
Target processor type	sh

See also `Renesas Compiler (-compiler renesas)`.

Benefits: You can now set up a Polyspace project without knowing the internal workings of Renesas SH C compilers. If your code compiles with your compiler, it will compile with Polyspace in most cases without requiring additional setup. Previously, you had to explicitly define macros that were implicitly defined by the compiler and remove unknown language extensions from your preprocessed code.

Cygwin Support: Create Polyspace projects automatically by using Cygwin 3.x build commands

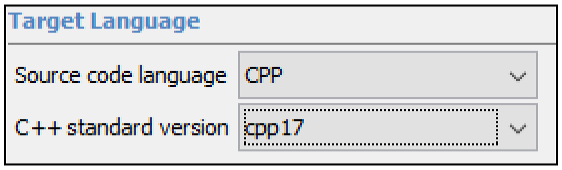
Summary: In R2020b, the `polyspace-configure` command supports version 3.x of Cygwin™ (versions 3.0, 3.1, and so on).

See also Check if Polyspace Supports Build Scripts.

Benefits: Using the `polyspace-configure` command, you can trace build scripts that are executed at a Cygwin 3.x command line and create a Polyspace project with the source files and compilation options automatically specified.

C++17 Support: Run Polyspace analysis on code that has C++17 features

Summary: In R2020b, Polyspace can interpret the majority of C++17-specific features.



Source code language	CPP
C++ standard version	cpp17

See also:

- `C++ standard version (-cpp-version)`
- C/C++ Language Standard Used in Polyspace Analysis

- C++17 Language Elements Supported in Polyspace

Benefits: You can now set up a Polyspace analysis for code containing C++17-specific language elements. Previously, some C++17 specific elements were not recognized and caused compilation errors. See .

Modifying Checker Behavior: Check for non-initialized buffers when passed by pointer to certain functions

Summary: In R2020b, you can indicate that pointer arguments to some functions must point to initialized buffers. By default, the checker `Non-initialized variable` checks a pointer for an initialized buffer only when you dereference the pointer. A function call such as:

```
int var; func(&var);
```

is not flagged for non-initialization because you might initialize the variable `var` in `func`. Starting in R2020b, you can specify a list of functions whose pointer arguments must be checked for initialized buffers.

For more information, see:

- `-code-behavior-specifications`
- Extend Checkers for Initialization to Check Function Arguments Passed by Pointers (Polyspace Bug Finder Server)

Benefits: Suppose that you consider some function calls as part of the system boundary and you want to make sure that you pass initialized buffers across the boundary. For instance, the Run-Time environment or `Rte_` functions in AUTOSAR allow a software component to communicate with other software components. You might want to ensure that pointer arguments to these functions point to initialized buffers. You can now use Bug Finder to find uninitialized buffers passed through pointers to these functions.

polyspacePackNGo Function: Generate and package Polyspace option files from a Simulink model

Summary: In R2020b, you can package Polyspace option files along with code generated from a Simulink model, and then analyze the code on a different machine in a distributed workflow. After packaging the generated code, create and archive options files required for a Polyspace analysis by using the `polyspacePackNGo` function.

See also:

- `polyspacePackNGo`
- Run Polyspace Analysis on Generated Code by Using Packaged Options Files (Polyspace Code Prover) (Simulink) (Polyspace Code Prover Server) (Polyspace Bug Finder Server)

Benefits: In a distributed workflow, a Simulink user generates code from a model and sends the code to another development environment. In this environment, a Polyspace user analyzes the generated code by using design ranges and other model-specific information. Previously, in this distributed workflow, you configured the Polyspace analysis options manually. Starting in R2020b, you do not have to manually create the option files when analyzing generated code by using Polyspace in a distributed workflow.

Polyspace and MATLAB Integration: Integrate Polyspace with MATLAB programmatically without user interaction

Summary: In R2020b, use simpler steps to integrate Polyspace and MATLAB. Instead of browsing to a specific subfolder of the Polyspace installation folder, and then running the `polyspacesetup` function, run `polyspacesetup` from any folder:

```
polyspacesetup('install', 'polyspaceFolder', folder);
```

`folder` is the location of the Polyspace installation in your machine. To integrate Polyspace with MATLAB without user interaction, use:

```
polyspacesetup('install', 'polyspaceFolder', folder, 'silent', true);
```

See:

- `polyspacesetup`
- Integrate Polyspace with MATLAB and Simulink (Polyspace Code Prover)

Benefits: Previously, integrating Polyspace with MATLAB required user interaction. Starting in R2020b, you can perform the integration programmatically and silently.

polyspace.ModelLinkOptions Object: Configure object to analyze code generated as a model reference

Summary: In R2020b, you can configure a `polyspace.ModelLinkOptions` object to analyze code generated as a model reference by using the new optional argument `asModelRef`. To run a Polyspace analysis on the code generated as a model reference, create a `polyspace.ModelLinkOptions` object and set the `asModelRef` flag to `true`. See also:

- `polyspace.ModelLinkOptions`
- Analyze Code Generated as Model Reference (Polyspace Code Prover)

Benefits: Previously, the class `polyspace.ModelLinkOptions` did not support analyzing code generated as model reference. Starting in R2020b, you can run a Polyspace analysis on code generated as a model reference by using the class `polyspace.ModelLinkOptions`. You can also set the options for the Polyspace analysis by using a `pslinkoptions` object.

Configuration from Build System: Generate a project file or analysis options file by using a JSON compilation database

Summary: In R2020b, if your build system supports the generation of a JSON compilation database, you can create a Polyspace project file or an analysis options file from your build system without tracing your build process. After you generate the JSON compilation database file, pass this file to `polyspace-configure` by using the option `-compilation-database` to extract your build information.

For more information on compilation databases, see JSON Compilation Database.

Benefits: Previously, you had to invoke your build command and trace your build process to extract the build information. For some build systems such as Bazel, `polyspace-configure` could not always trace the build process, resulting in errors when running an analysis by using the generated options file.

Configuration from Build System: Specify how Polyspace imports compiler macro definitions

Summary: In R2020b, when you use `polyspace-configure` to create a Polyspace project file or to generate an analysis options file from your build system, you can specify how Polyspace imports the compiler macro definitions.

Use option `-import-macro-definitions` and specify:

- `none` — Skip the import of macro definition. You can provide macro definitions manually instead.
- `from-whitelist` — Use a Polyspace white list to query your compiler for macro definitions.
- `from-source-token` — Use all non-keyword tokens in your source files to query your compiler for macro definitions.

See also `polyspace-configure`.

Benefits: Previously, Polyspace used all non-keyword tokens in your source files to query your compiler for macro definitions each time that you traced your build command. You now have greater control on the import of macro definitions.

Configuration from Build System: Compiler configuration cached from prior runs for improved performance

Summary: In R2020b, when you use `polyspace-configure` to create a Polyspace project file or to generate an analysis options file from your build system, Polyspace caches your compiler configuration. If your compiler configuration does not change, Polyspace reuses the cached configuration during subsequent runs of `polyspace-configure`.

See also `polyspace-configure`.

Benefits: Previously, Polyspace did not cache your compiler configuration. Instead, during every run of `polyspace-configure`, Polyspace queried your compiler for the size of fundamental types, compiler macro definitions, and other compiler configuration information. Starting R2020b, the caching improves the later `polyspace-configure` runs.

Changes in analysis options and binaries

XML syntax with option -code-behavior-specifications changed
Warns

The option `-code-behavior-specifications` takes an XML file as argument. You can use this XML file to specify whether a certain function must be subjected to special checks. For instance, you can specify that a function must not be used altogether.

In R2020b, the XML syntax changed slightly. To associate the behavior `FORBIDDEN_FUNC` with a function *`funcName`*, instead of the syntax:

```
<function name="funcName" behavior="FORBIDDEN_FUNC">
```

Use the syntax:

```
<function name="funcName">
    <behavior name="FORBIDDEN_FUNC">
</function>
```

See also `-code-behavior-specifications`.

Analysis Results

AUTOSAR C++14 Support: Check for 308 AUTOSAR C++14 rules including 61 new rules in R2020b

Summary: In R2020b, you can look for violations of these AUTOSAR C++14 rules in addition to previously supported rules.

AUTOSAR C++14 Rule	Description	Polyspace Checker
A0-1-1	A project shall not contain instances of non-volatile variables being given values that are not subsequently used.	`AUTOSAR C++14 Rule A0-1-1`
A0-1-3	Every function defined in an anonymous namespace, or static function with internal linkage, or private member function shall be used.	`AUTOSAR C++14 Rule A0-1-3`
A2-7-2	Sections of code shall not be "commented out".	`AUTOSAR C++14 Rule A2-7-2`
A2-10-4	The identifier name of a non-member object with static storage duration or static function shall not be reused within a namespace.	`AUTOSAR C++14 Rule A2-10-4`
A2-10-5	An identifier name of a function with static storage duration or a non-member object with external or internal linkage should not be reused.	`AUTOSAR C++14 Rule A2-10-5`
A3-1-5	A function definition shall only be placed in a class definition if (1) the function is intended to be inlined (2) it is a member function template (3) it is a member function of a class template.	`AUTOSAR C++14 Rule A3-1-5`
A3-1-6	Trivial accessor and mutator functions should be inlined.	`AUTOSAR C++14 Rule A3-1-6`
A3-8-1	An object shall not be accessed outside of its lifetime.	`AUTOSAR C++14 Rule A3-8-1`
A5-1-6	Return type of a non-void return type lambda expression should be explicitly specified.	`AUTOSAR C++14 Rule A5-1-6`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A5-1-8	Lambda expressions should not be defined inside another lambda expression.	`AUTOSAR C++14 Rule A5-1-8`
A5-1-9	Identical unnamed lambda expressions shall be replaced with a named function or a named lambda expression.	`AUTOSAR C++14 Rule A5-1-9`
A5-2-1	dynamic_cast should not be used.	`AUTOSAR C++14 Rule A5-2-1`
A5-3-1	Evaluation of the operand to the typeid operator shall not contain side effects.	`AUTOSAR C++14 Rule A5-3-1`
A5-3-2	Null pointers shall not be dereferenced.	`AUTOSAR C++14 Rule A5-3-2`
A5-10-1	A pointer to member virtual function shall only be tested for equality with null-pointer-constant.	`AUTOSAR C++14 Rule A5-10-1`
A6-2-1	Move and copy assignment operators shall either move or respectively copy base classes and data members of a class, without any side effects.	`AUTOSAR C++14 Rule A6-2-1`
A6-2-2	Expression statements shall not be explicit calls to constructors of temporary objects only.	`AUTOSAR C++14 Rule A6-2-2`
A6-5-3	Do statements should not be used.	`AUTOSAR C++14 Rule A6-5-3`
A7-1-1	Constexpr or const specifiers shall be used for immutable data declaration.	`AUTOSAR C++14 Rule A7-1-1`
A7-1-2	The constexpr specifier shall be used for values that can be determined at compile time.	`AUTOSAR C++14 Rule A7-1-2`
A7-1-5	The auto specifier shall not be used apart from following cases: (1) to declare that a variable has the same type as return type of a function call, (2) to declare that a variable has the same type as initializer of non-fundamental type, (3) to declare parameters of a generic lambda expression, (4) to declare a function template using trailing return type syntax.	`AUTOSAR C++14 Rule A7-1-5`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A7-6-1	Functions declared with the [[noreturn]] attribute shall not return.	`AUTOSAR C++14 Rule A7-6-1`
A8-4-4	Multiple output values from a function should be returned as a struct or tuple.	`AUTOSAR C++14 Rule A8-4-4`
A8-4-14	Interfaces shall be precisely and strongly typed.	`AUTOSAR C++14 Rule A8-4-14`
A11-0-1	A non-POD type should be defined as class.	`AUTOSAR C++14 Rule A11-0-1`
A12-0-2	Bitwise operations and operations that assume data representation in memory shall not be performed on objects.	`AUTOSAR C++14 Rule A12-0-2`
A12-1-2	Both NSDMI and a non-static member initializer in a constructor shall not be used in the same type.	`AUTOSAR C++14 Rule A12-1-2`
A12-1-6	Derived classes that do not need further explicit initialization and require all the constructors from the base class shall use inheriting constructors.	`AUTOSAR C++14 Rule A12-1-6`
A12-4-2	If a public destructor of a class is non-virtual, then the class should be declared final.	`AUTOSAR C++14 Rule A12-4-2`
A12-8-4	Move constructor shall not initialize its class members and base classes using copy semantics.	`AUTOSAR C++14 Rule A12-8-4`
A12-8-7	Assignment operators should be declared with the ref-qualifier &.	`AUTOSAR C++14 Rule A12-8-7`
A13-5-5	Comparison operators shall be non-member functions with identical parameter types and noexcept.	`AUTOSAR C++14 Rule A13-5-5`
A14-5-2	Class members that are not dependent on template class parameters should be defined in a separate base class.	`AUTOSAR C++14 Rule A14-5-2`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A14-5-3	A non-member generic operator shall only be declared in a namespace that does not contain class (struct) type, enum type or union type declarations.	`AUTOSAR C++14 Rule A14-5-3`
A15-1-1	Only instances of types derived from std::exception should be thrown.	`AUTOSAR C++14 Rule A15-1-1`
A15-1-3	All thrown exceptions should be unique.	`AUTOSAR C++14 Rule A15-1-3`
A15-2-1	Constructors that are not noexcept shall not be invoked before program startup.	`AUTOSAR C++14 Rule A15-2-1`
A15-3-3	Main function and a task main function shall catch at least: base class exceptions from all third-party libraries used, std::exception and all otherwise unhandled exceptions.	`AUTOSAR C++14 Rule A15-3-3`
A15-3-4	Catch-all (ellipsis and std::exception) handlers shall be used only in (a) main, (b) task main functions, (c) in functions that are supposed to isolate independent components and (d) when calling third-party code that uses exceptions not according to AUTOSAR C++14 guidelines.	`AUTOSAR C++14 Rule A15-3-4`
A15-4-2	If a function is declared to be noexcept, noexcept(true) or noexcept(<true condition>), then it shall not exit with an exception.	`AUTOSAR C++14 Rule A15-4-2`
A15-4-3	Function's noexcept specification shall be either identical or more restrictive across all translation units and all overriders.	`AUTOSAR C++14 Rule A15-4-3`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A15-5-1	All user-provided class destructors, deallocation functions, move constructors, move assignment operators and swap functions shall not exit with an exception. A noexcept exception specification shall be added to these functions as appropriate.	`AUTOSAR C++14 Rule A15-5-1`
A18-5-9	Custom implementations of dynamic memory allocation and deallocation functions shall meet the semantic requirements specified in the corresponding "Required behaviour" clause from the C++ Standard.	`AUTOSAR C++14 Rule A18-5-9`
A18-5-10	Placement new shall be used only with properly aligned pointers to sufficient storage capacity.	`AUTOSAR C++14 Rule A18-5-10`
A18-5-11	"operator new" and "operator delete" shall be defined together.	`AUTOSAR C++14 Rule A18-5-11`
A18-9-2	Forwarding values to other functions shall be done via: (1) std::move if the value is an rvalue reference, (2) std::forward if the value is forwarding reference.	`AUTOSAR C++14 Rule A18-9-2`
A18-9-4	An argument to std::forward shall not be subsequently used.	`AUTOSAR C++14 Rule A18-9-4`
A20-8-2	A std::unique_ptr shall be used to represent exclusive ownership.	`AUTOSAR C++14 Rule A20-8-2`
A20-8-3	A std::shared_ptr shall be used to represent shared ownership.	`AUTOSAR C++14 Rule A20-8-3`
A20-8-5	std::make_unique shall be used to construct objects owned by std::unique_ptr.	`AUTOSAR C++14 Rule A20-8-5`
A20-8-6	std::make_shared shall be used to construct objects owned by std::shared_ptr.	`AUTOSAR C++14 Rule A20-8-6`
A26-5-2	Random number engines shall not be default-initialized.	`AUTOSAR C++14 Rule A26-5-2`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A27-0-2	A C-style string shall guarantee sufficient space for data and the null terminator.	`AUTOSAR C++14 Rule A27-0-2`
A27-0-3	Alternate input and output operations on a file stream shall not be used without an intervening flush or positioning call.	`AUTOSAR C++14 Rule A27-0-3`
M0-1-4	A project shall not contain non-volatile POD variables having only one use.	`AUTOSAR C++14 Rule M0-1-4`
M0-3-2	If a function generates error information, then that error information shall be tested.	`AUTOSAR C++14 Rule M0-3-2`
M7-5-2	The address of an object with automatic storage shall not be assigned to another object that may persist after the first object has ceased to exist.	`AUTOSAR C++14 Rule M7-5-2`
M9-6-4	Named bit-fields with signed integer type shall have a length of more than one bit.	`AUTOSAR C++14 Rule M9-6-4`
M15-1-1	The assignment-expression of a throw statement shall not itself cause an exception to be thrown.	`AUTOSAR C++14 Rule M15-1-1`
M15-3-1	Exceptions shall be raised only after start-up and before termination.	`AUTOSAR C++14 Rule M15-3-1`
M15-3-4	Each exception explicitly thrown in the code shall have a handler of a compatible type in all call paths that could lead to that point.	`AUTOSAR C++14 Rule M15-3-4`

See also AUTOSAR C++14 Rules.

CERT C Support: Check for missing const-qualification and use of hardcoded numbers

Summary: In R2020b, you can look for violations of these CERT C recommendations in addition to previously supported rules.

CERT C Rule	Description	Polyspace Checker
DCL00-C	Const-qualify immutable objects	`CERT C: Rec. DCL00-C`

See also CERT C Rules and Recommendations.

CERT C++ Support: Check for exception handling issues, memory management problems, and other rule violations

Summary: In R2020b, you can look for violations of these CERT C++ rules in addition to previously supported rules.

CERT C++ Rule	Description	Polyspace Checker
ERR58-CPP	Handle all exceptions thrown before main() begins executing	`CERT C++: ERR58-CPP`
MEM54-CPP	Provide placement new with properly aligned pointers to sufficient storage capacity	`CERT C++: MEM54-CPP`
MEM55-CPP	Honor replacement dynamic storage management requirements	`CERT C++: MEM55-CPP`
MSC53-CPP	Do not return from a function declared [[noreturn]]	`CERT C++: MSC53-CPP`
ERR55-CPP	Honor exception specifications	`CERT C++: ERR55-CPP`

See also CERT C++ Rules.

MISRA C++:2008 Support: Check for commented out code, variables used once, exception handling issues, and other rule violations

Summary: In R2020b, you can look for violations of these MISRA C++:2008 rules in addition to previously supported rules.

MISRA C++:2008 Rule	Description	Polyspace Checker
0-1-4	A project shall not contain non-volatile POD variables having only one use.	`MISRA C++:2008 Rule 0-1-4`
0-3-2	If a function generates error information, then that error information shall be tested.	`MISRA C++:2008 Rule 0-3-2`
2-7-2	Sections of code should not be "commented out" using C-style comments.	`MISRA C++:2008 Rule 2-7-2`
2-7-3	Sections of code should not be "commented out" using C++-style comments.	`MISRA C++:2008 Rule 2-7-3`
14-5-1	A non-member generic function shall only be declared in a namespace that is not an associated namespace.	`MISRA C++:2008 Rule 14-5-1`

MISRA C++:2008 Rule	Description	Polyspace Checker
15-1-1	The assignment-expression of a throw statement shall not itself cause an exception to be thrown.	`MISRA C++:2008 Rule 15-1-1`
15-3-1	Exceptions shall be raised only after start-up and before termination of the program.	`MISRA C++:2008 Rule 15-3-1`
15-3-4	Each exception explicitly thrown in the code shall have a handler of a compatible type in all call paths that could lead to that point.	`MISRA C++:2008 Rule 15-3-4`

See also MISRA C++:2008 Rules.

JSF AV C++ Support: Check for commented out code and methods that can be inlined

Summary: In R2020b, you can check for these JSF AV C++ rules in addition to previously supported rules.

Rule	Description
122	Trivial accessor and mutator functions should be inlined.
127	Code that is not used (commented out) shall be deleted.

See also JSF AV C++ Coding Rules.

MISRA C Support: Check for commented out code

Summary: In R2020b, you can look for violations of these MISRA C rules and directives in addition to previously supported rules and directives.

MISRA C Rule	Description	Polyspace Checker
MISRA C:2004 Rule 2.4	Sections of code should not be "commented out".	MISRA C:2004 Rule 2.4 See also MISRA C :2004 and MISRA AC AGC Coding Rules.
MISRA C:2012 Dir 4.4	Sections of code should not be "commented out".	`MISRA C:2012 Dir 4.4`

See also MISRA C :2012 Directives and Rules.

New Bug Finder Defect Checkers: Check for post-C++11 defects such as problematic move operations, missing constexpr, and noexcept violations

Summary: In R2020b, you can check for these new types of defects.

Defect	Description
`A move operation may throw`	Throwing move operations might result in STL containers using the corresponding copy operations
`Const std::move input may cause a more expensive object copy`	Const `std::move` input cannot be moved and results in more expensive copy operation
`Data race on adjacent bit fields`	Multiple threads perform unprotected operations on adjacent bit fields of a shared data structure
`Expensive std::string::c_str() use in a std::string operation`	An `std::string` operation uses the output of an `std::string::c_str` method, resulting in inefficient code
`Expensive constant std::string construction`	A `const` string object is constructed from constant data resulting in inefficient code
`Expensive copy in a range-based for loop iteration`	The loop variable of a range-based `for` loop is copied from the range elements instead of being referenced resulting in inefficient code
`Expensive pass by value`	Functions pass large parameters by value instead of by reference
`Expensive return by value`	Functions return large output by value instead of by reference
`Incorrect value forwarding`	Forwarded object might be modified unexpectedly
`Missing constexpr specifier`	`constexpr` specifier can be used on expression for compile-time evaluation
`Noexcept function exits with exception`	Functions specified as `noexcept`, `noexcept(true)` or `noexcept(<true condition>)` exit with an exception, which causes abnormal termination of program execution, leading to resource leak and security vulnerability
`std::move called on an unmovable type`	Result of `std::move` is not movable
`Throw argument raises unexpected exception`	The argument expression in a `throw` statement raises unexpected exceptions, leading to resource leaks and security vulnerabilities

See the full list of defect checkers in Defects.

Changes to coding rules checking

Summary: In R2020b, coding rules checking has improved across various coding standards:

- The Polyspace checkers for AUTOSAR C++14 now follow AUTOSAR C++14 release 18-10 (October 2018).
- You can check for MISRA® C++ and JSF AV C++ rules in the same run. If the issues that you want to detect span MISRA C++ and JSF AV C++, you can enable rules from both standards and detect issues in a single run.

In addition, these changes have been made in the checking of previously supported rules.

Rule	**Description**	**Change**
`MISRA C:2012 Dir 4.14`	The validity of values received from external sources shall be checked.	The checker now use a broader definition of valid data. The following are no longer considered as invalid data: • Inputs to functions that do not have a visible caller • Return values of undefined (stubbed) functions • Global variables external to the unit See Sources of Tainting in a Polyspace Analysis. To revert to the previous definition, use the option `-consider-analysis-perimeter-as-trust-boundary`.
`MISRA C:2012 Rule 1.1`	The program shall contain no violations of the standard C syntax and constraints, and shall not exceed the implementation’s translation limits.	The checker takes into account header files irrespective of whether you suppress headers using the option `Do not generate results for (-do-not-generate-results-for)`. For instance, the checker raises a violation if the number of macros in C99 code exceeds 4095. The checker now counts macros in header files irrespective of whether you choose to suppress results in headers. The reason is that the header files are included in a translation unit and the translation unit as a whole is subject to MISRA C: 2012 Rule 1.1. Previously, the headers were taken into account only if unsuppressed.

Rule	Description	Change
`AUTOSAR C++14 Rule A2-13-6`	Universal character names shall be used only inside character or string literals.	The checker no longer flags universal character names in code deactivated with a preprocessor directive such as `#if`. You can enter universal character names for non-string uses in deactivated code.
`AUTOSAR C++14 Rule A5-1-1`	Literal values shall not be used apart from type initialization, otherwise symbolic names shall be used instead.	The checker now flags use of literal values as template parameters.
`MISRA C++:2008 Rule 2-10-2`	Identifiers declared in an inner scope shall not hide an identifier declared in an outer scope.	The checker no longer flags class member operators in nested scopes. Class member operators in nested scopes do not hide each other.
`MISRA C++:2008 Rule 3-4-1`	An identifier declared to be an object or type shall be defined in a block that minimizes its visibility.	The checker no longer flags identifiers used only in a range-based `for` loop but defined outside the loop.
`AUTOSAR C++14 Rule A21-8-1`	Arguments to character-handling functions shall be representable as an unsigned char.	The checker now only detects the use of a signed or plain `char` variable with a negative value as argument to a character-handling function declared in `ctype.h`, for instance, `isalpha()` or `isdigit()`.
`MISRA C++:2008 Rule 14-6-2`	The function chosen by overload resolution shall resolve to a function declared previously in the translation unit.	The checker no longer flags calls that use an underlying function call operator.
`MISRA C++:2008 Rule 17-0-1`	Reserved identifiers, macros and functions in the Standard Library shall not be defined, redefined or undefined.	The checker raises a violation if you define or redefine a macro beginning with an underscore followed by an uppercase letter. These macros are typically reserved for the Standard Library.
`CERT C: Rec. PRE01-C`	Use parentheses within macros around parameter names.	The checker no longer flags uses of the `va_arg` macro if the macro parameters are not enclosed in parentheses (in accordance with the exception in the CERT C specifications).

Rule	Description	Change
`CERT C++: DCL51-CPP`	Do not declare or define a reserved identifier.	The checker now flags: • Macros or identifiers beginning with underscore followed by an uppercase letter. • User-defined literal operators if the operator names do not begin with an underscore (C++11 and later). By convention, these macros, identifiers and operators are reserved for the Standard Library.
`CERT C++: EXP52-CPP`	Do not rely on side effects in unevaluated operands.	The checker now flags `decltype` operations where the operands have side effects.
`CERT C: Rule EXP36-C` and `CERT C++: EXP36-C`	Do not cast pointers into more strictly aligned pointer types.	The checker now flags: • Conversion of `void*` pointer into pointer to object. • Source buffer misaligned with destination buffer.
`CERT C: Rule MSC39-C` and `CERT C++: MSC39-C`	Do not call va_arg() on a va_list that has an indeterminate value.	The checker flags situations where you might be using a `va_list` that has an indeterminate value.
`CERT C: Rule MEM30-C` and `CERT C++: MEM30-C`	Do not access freed memory.	The checker now flags attempts to deallocate a previously freed memory block.
`CERT C: Rule MEM35-C` and `CERT C++: MEM35-C`	Allocate sufficient memory for an object.	The checker now flags the use of a pointer type as the argument of the `sizeof` operator in a `malloc` statement. Use the type of the object to which the pointer points as the argument of the `sizeof` operator.
`CERT C: Rule EXP43-C`	Avoid undefined behavior when using restrict-qualified pointers.	The checker now detects situations where you assign a `restrict` qualified pointer to another `restrict` qualified pointer such that they both attempt to point to the same object.

Rule	Description	Change
`CERT C: Rule EXP46-C` and `CERT C++: EXP46-C`	Do not use a bitwise operator with a Boolean-like operand.	The checker now flags the use of bitwise operators, such as: • Bitwise AND (&, &=) • Bitwise OR (`|`, `|=`) • Bitwise XOR (^, ^=) • Bitwise NOT(~) with: • Boolean type variables • Outputs of relational or equality expressions
`CERT C: Rule STR37-C` and `CERT C++: STR37-C`	Arguments to character-handling functions must be representable as an unsigned char.	The checker now only detects the use of a signed or plain `char` variable with a negative value as argument to a character-handling function declared in `ctype.h`, for instance, `isalpha()` or `isdigit()`.

Rule	Description	Change
Coding rules that involve detection of tainted data, including: • `CERT C: Rec. INT04-C` • `CERT C: Rec. INT10-C` • `CERT C: Rule INT31-C` and `CERT C++: INT31-C` • `CERT C: Rule INT32-C` and `CERT C++: INT32-C` • `CERT C: Rule INT33-C` and `CERT C++: INT33-C` • `CERT C: Rule ARR30-C` and `CERT C++: ARR30-C` • `CERT C: Rule ARR32-C` • `CERT C: Rule ARR38-C` and `CERT C++: ARR38-C` • `CERT C: Rec. STR02-C` • `CERT C: Rule STR32-C` and `CERT C++: STR32-C` • `CERT C: Rec. MEM04-C` • `CERT C: Rec. MEM05-C` • `CERT C: Rule MEM35-C` and `CERT C++: MEM35-C` • `CERT C: Rule FIO30-C` and `CERT C++: FIO30-C` • `CERT C: Rec. ENV01-C` • `CERT C: Rec. MSC21-C` • `CERT C: Rec. WIN00-C` • `AUTOSAR C++14 Rule A5-6-1` • `ISO/IEC TS 17961 [usrfmt]` • `ISO/IEC TS 17961 [taintstrcpy]` • `ISO/IEC TS 17961 [taintformatio]` • `ISO/IEC TS 17961 [taintsink]`		The checkers now use a narrower definition of tainted data. The following are no longer considered as tainted data: • Inputs to functions that do not have a visible caller • Return values of undefined (stubbed) functions • Global variables external to the unit See Sources of Tainting in a Polyspace Analysis. To revert to the previous definition, use the option `-consider-analysis-perimeter-as-trust-boundary`.

Rule	Description	Change
`MISRA C++:2008 Rule 0-1-4` and `AUTOSAR C++14 Rule M0-1-4`	A project shall not contain non-volatile POD variables having only one use.	• The checker now considers dynamic assignments of a variable, such as `int var = foo()` as a single use of the variable. • Some objects are designed to be used only once by their semantics. Polyspace does not flag a single use of these objects: • `lock_guard` • `scoped_lock` • `shared_lock` • `unique_lock` • `thread` • `future` • `shared_future` If you use nonstandard objects that provide similar functionality as the objects in the preceding list, Polyspace might flag single uses of the nonstandard objects. Justify their single uses by using comments.

Compatibility Considerations

If you checked your code for the preceding rules, you might see a change in the number of violations.

Updated Bug Finder defect checkers

Summary: In R2020b, these defect checkers have been updated.

Defect	Description	Update
Tainted Data Defects	Use of tainted and unvalidated data in critical operations	The checkers now use a narrower definition of tainted data. The following are no longer considered as tainted data: • Inputs to functions that do not have a visible caller • Return values of undefined (stubbed) functions • Global variables external to the unit See Sources of Tainting in a Polyspace Analysis. To revert to the previous definition, use the option `-consider-analysis-perimeter-as-trust-boundary`.
`Deterministic random output from constant seed` and `Predictable random output from predictable seed`	Issues with seeding of random number generator functions	The checkers now support random number generator functions from the C++ Standard Library, for instance, `std::linear_congruential_engine<>::seed()` and `std::mersenne_twister_engine<>::seed()`.
Large pass-by-value argument	Functions pass large parameters by value instead of by reference	Checker is removed. Use `Expensive pass by value` and `Expensive return by value` instead.
• `Empty destructors may cause unnecessary data copies` • `std::endl may cause an unnecessary flush`	Issues that impact performance of C++ code	The **Impact** attribute of these checkers has been changed from `High` to `Low`. These checkers do not have a universally high criticality. The checkers are critical only for code that must be optimized for performance.

Defect	Description	Update
`Inefficient string length computation`	Issue that impacts performance of C++ code	The **Impact** attribute of this checker has been changed from `High` to `Medium`. This checker does not have a universally high criticality. The checker is critical only for code that must be optimized for performance and also promotes a good coding style.
`Missing return statement`	Issues with data flow	This checker flags nonvoid functions that do not return the flow of execution except if the function is specified as `[[noreturn]]`.

Compatibility Considerations

If you check your code for the preceding defects, you might see a difference in the number of issues found.

Updated code metrics specifications

Summary: In R2020b, these code metrics specifications have been updated.

Code Metric	Update

`Number of Called Functions`	These metrics now accounts for function calls in a C++ constructor initializer list.
	
	For instance, in this code snippet, the number of called functions of `Derived::Derived()` is one. Previously, the number was computed as zero.
	
	`class  Base`
	`{`
	`  int b;`
	`  public:`
	`      Base() {`
	`          b = 0;`
	`      };`
	`};`
	`class Derived : public Base`
	`{`
	`  int d;`
	`  public:`
	`      Derived() : Base() {`
	`          d = 0;`
	`      };`
	`};`

Compatibility Considerations

If you compute these code metrics, you can see a difference in results compared to previous releases.

Reviewing Results

Results Export: Export Polyspace results to external formats such as SARIF JSON

Summary: In R2020b, you can use the new `polyspace-results-export` command to export Polyspace results to formats such as JSON and CSV.

- The JSON object follows the Static Analysis Results Interchange Format or SARIF notation.
- The CSV file has the same fields as produced by using the earlier `polyspace-report-generator` command with the `-generate-results-list-file` option.

  Use the `polyspace-report-generator` command to generate PDF or Word reports in a predefined format. To package results using your own format, export them using the `polyspace-results-export` command and read the resulting JSON object or CSV file.

You can use this command with results generated locally or with results uploaded to Polyspace Access.

See also `polyspace-results-export`.

Benefits: Using the JSON object or CSV file, you can display results in a convenient format. For instance, you can group defects found by Bug Finder based on their impact. Because the JSON object follows a standard notation, you can also use this format to display Polyspace results with results from other tools.

Simulink Block Annotation: Annotate Simulink blocks from Polyspace user interface to justify Polyspace results

Summary: In R2020b, you can annotate a Simulink block directly from the Polyspace user interface. See Annotate Blocks to Justify Issues (Polyspace Code Prover).

Benefits: Previously, when annotating a check on generated code from the Polyspace user interface, you had to locate the corresponding block in the Simulink Editor and annotate the block again. Starting in R2020b, you can annotate a check in the Polyspace user interface and have the annotations carry over to the Simulink blocks by using the traceable elements of the code. You do not have to go back to the model to re-enter the annotation.

User Authentication: Use a credentials file to pass your Polyspace Access credentials at the command line

Summary: In R2020b, if you use a command that requires your Polyspace Access credentials, you can save these credentials in a file that you pass to the command. If you use that command inside a script, you no longer need to store your credentials in the script.

To create a credentials file, enter a set of credentials, either as `-login` and `-encrypted-password` entries on separate lines, for example:

```
-login jsmith
-encrypted-password LAMMMEACDMKEFELKMNDCONEAPECEEKPL
```

Or as a `-api-key` entry:

```
-api-key keyValue123
```

For more information on generating API keys, see Configure **User Manager** (Polyspace Bug Finder Access) (Polyspace Code Prover Access).

Save the file and pass it to the command by using the `-credentials-file` flag. You can use the credentials file with these Polyspace commands:

- `polyspace-access`
- `polyspace-results-export`
- `polyspace-report-generator`

For increased security, restrict the read/write permissions for the credentials file.

Benefits: Previously, you could provide your Polyspace Access credentials in a script only by passing them directly to the command. Starting R2020b, when the command that requires the credentials runs, someone who is inspecting currently running processes, for instance, by using the command `ps aux` on Linux, can no longer see your credentials.

Importing Review Information: Accept information in source or destination results folder in case of merge conflicts

Summary: In R2020b, when importing review information such as severity, status, and comments at the command line, if the same result has different review information in the source and destination folder, you can choose one of the following:

- That the review information in the destination folder is retained.

  This behavior is the default behavior of the `polyspace-comments-import` command.
- That the review information in the source folder overwrites the information in the destination folder.

  You can switch to this behavior using the new option `-overwrite-destination-comments`.

See also `polyspace-comments-import`.

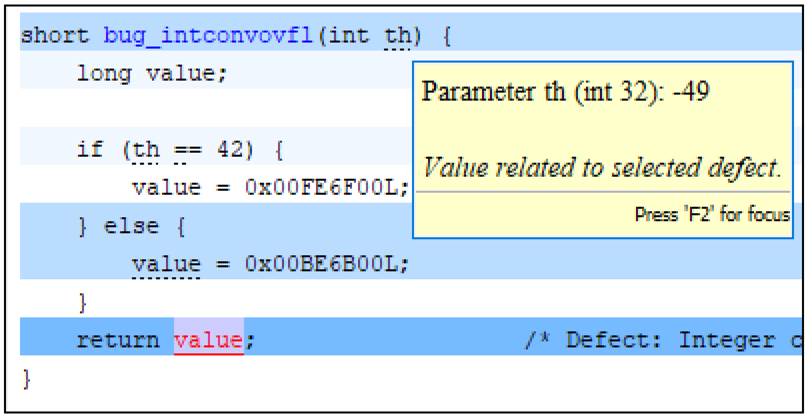
Benefits: Previously, newer review information in the destination folder was retained and could not be overwritten. Now, when merging review information, you can choose whether the source or destination folder takes precedence in case of merge conflicts.

Source Code Tooltips: Display information related to only the currently selected defect

Summary: In R2020b, Bug Finder tooltips show only information that is necessary to understand the currently selected defect, such as:

- Data types of variables that lead to the current defect.
- One specific value of an input variable that leads to the current defect, if you enable the option `Run stricter checks considering all values of system inputs (-checks-using-system-input-values)`

In this tooltip, you see that the input parameter is a 32-bit int and the value -49 leads to the currently selected defect.:



```
short bug_intconvovfl(int th) {
    long value;

    if (th == 42) {
        value = 0x00FE6F00L;
    } else {
        value = 0x00BE6B00L;
    }
    return value;                    /* Defect: Integer c
}
```

Parameter th (int 32): -49

Value related to selected defect.

Previously, tooltips showed range information such as all possible values of a specific variable in the given context. You can still see this range information in Code Prover.

Benefits: In Bug Finder, tooltips do not appear on any line other than ones related to the current defect. When they appear, they contain only information required to understand the currently selected defect.

Functionality being removed: Polyspace Metrics

Summary: The Polyspace Metrics web dashboard will be removed in a future release.

Compatibility Considerations

To continue monitoring the quality of your code in a web browser, use Polyspace Access instead. In addition to a more intuitive dashboard, with Polyspace Access you can:

- Review and justify results directly from your web browser.
- Integrate a bug tracking tool such as Jira with the web interface and create tickets to track Polyspace findings.
- Monitor the quality of your code against coding standards such as AUTOSAR C++14, CERT® C/C ++, and MISRA C.
- Define custom Quality Objectives definitions and apply them to specific projects.

For more information, see Polyspace Bug Finder Access .

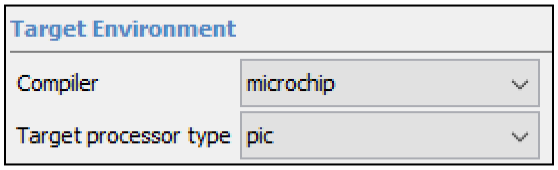
See also Migrate Results from Polyspace Metrics to Polyspace Access (Polyspace Bug Finder Access) (Polyspace Code Prover Access).

R2020a

Analysis Setup

Compiler Support: Set up Polyspace analysis easily for code compiled with MPLAB XC8 C compilers

Summary: If you build your source code by using MPLAB XC8 C compilers, in R2020a, you can specify the compiler name for your Polyspace analysis.



Compiler: microchip
Target processor type: pic

See also `MPLAB XC8 C Compiler (-compiler microchip)`.

Benefits: You can now set up a Polyspace project without knowing the internal workings of MPLAB XC8 C compilers. If your code compiles with your compiler, it will compile with Polyspace in most cases without requiring additional setup. Previously, you had to explicitly define macros that were implicitly defined by the compiler and remove unknown language extensions from your preprocessed code.

Compiler Support: Set up Polyspace analysis to emulate MPLAB XC16 and XC32 compilers

Summary: If you use MPLAB XC16 or XC32 compilers to build your source code, in R2020a, you can easily emulate these compilers by using the Polyspace GCC compiler options. See Emulate Microchip MPLAB XC16 and XC32 Compilers.

For each compiler, you can emulate these target processor types:

- **MPLAB XC16**: Targets PIC24 and dsPIC.
- **MPLAB XC32**: Target PIC32.

Benefits: You can copy the analysis options required for emulating MPLAB XC16 or XC32 compilers and paste into your Polyspace options file (or specify in a Polyspace project in the user interface), and avoid compilation errors from issues specific to these compilers.

Source Code Encoding: Non-ASCII characters in source code analyzed and displayed without errors

Summary: In R2020a, if your source code contains non-ASCII characters, for instance, Japanese or Korean characters, the Polyspace analysis can interpret the characters and later display the source code correctly.

If you still have compilation errors or display issues from non-ASCII characters, you can explicitly specify your source code encoding using the option `Source code encoding (-sources-encoding)`.

Modifying Checkers: Create list of functions to prohibit and check for use of functions from the list

Summary: In R2020a, you can define a blacklist of functions to forbid from your source code. The Bug Finder checker `Use of a forbidden function` checks if a function from this list appears in your sources.

Benefits: A function might be blacklisted for one of these reasons:

- The function can lead to many situations where the behavior is undefined leading to security vulnerabilities, and a more secure function exists.

  You can blacklist functions that are not explicitly checked by existing checkers such as `Use of dangerous standard function` or `Use of obsolete standard function`.
- The function is being deprecated as part of a migration, for instance, from C++98 to C++11.

  As part of a migration, you can make a list of functions that need to be replaced and use this checker to identify their use.

See also Flag Deprecated or Unsafe Functions Using Bug Finder Checkers.

Simulink Support: Analyze custom C code in C Function blocks

Summary: In R2020a, Polyspace can check custom C code in C Function blocks for bugs and run-time errors.

The analysis checks the C code in context of the model. In other words, the analysis uses design ranges and other context information specified in the model.

To analyze custom C code in C Function block, select **Custom Code Used in Model** instead of **Code Generated as Top Model** (meant for generated code) on the **Polyspace** tab in Simulink and then start the analysis. In addition to functions called from C Caller blocks and Stateflow charts, the custom code in C Function blocks are also checked for run-time errors. See Run Polyspace Analysis on Custom Code in C Function Block.

Benefits: The Polyspace analysis of custom code now includes individual scripts in C Function blocks (block introduced in Simulink in R2020a). In a single run, you can analyze all handwritten C code invoked from your model and check for bugs, run-time errors or coding rule violations.

Changes in analysis options and binaries

Option -function-behavior-specifications renamed to -code-behavior-specifications and capabilities extended
Warns

The option `-function-behavior-specifications` has been renamed to `-code-behavior-specifications`.

Using this option, you could previously map your functions to standard library functions to work around analysis imprecisions or specify thread creation routines. Now, you can use the option to define a blacklist of functions to forbid from your source code.

See also `-code-behavior-specifications`.

Changes in MATLAB functions, options object and properties

polyspaceBugFinderNodesktop removed
Errors

Use `polyspaceBugFinder(projectFile, '-nodesktop')` instead of `polyspaceBugFinderNodesktop(projectFile)`.

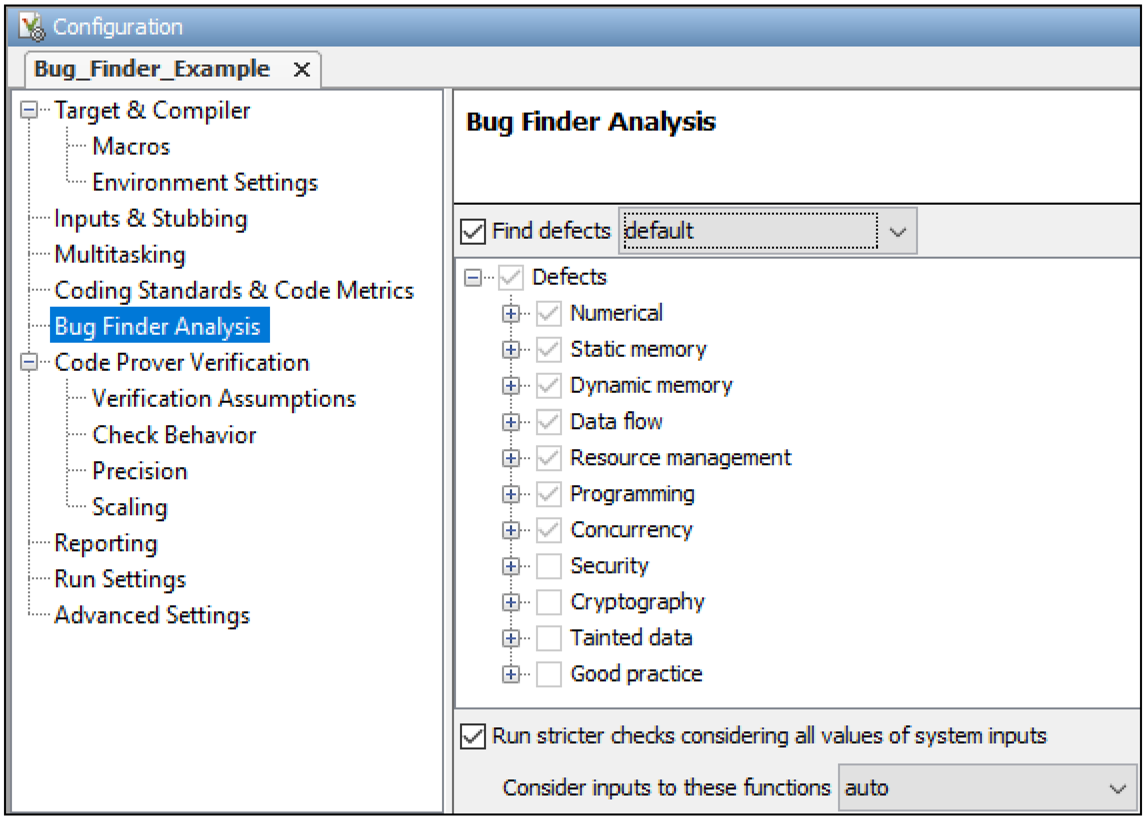
pslinksetup removed
Errors

Use `polyspacesetup` instead of `pslinksetup` to integrate between Polyspace and Simulink (in the same release or across releases). See Integrate Polyspace with MATLAB and Simulink.

Analysis Results

Extending Checkers: Run stricter analysis that considers all possible values of system inputs

Summary: In R2020a, you can run a stricter Polyspace Bug Finder analysis that checks the robustness of your code against specific values of system inputs. For defects that are detected with the stricter checks, the analysis can also show an example of values that lead to the defect. Use the option `Run stricter checks considering all values of system inputs (-checks-using-system-input-values)` to enable the stricter checks.



☑ Find defects: default

- Defects
  - ✓ Numerical
  - ✓ Static memory
  - ✓ Dynamic memory
  - ✓ Data flow
  - ✓ Resource management
  - ✓ Programming
  - ✓ Concurrency
  - ☐ Security
  - ☐ Cryptography
  - ☐ Tainted data
  - ☐ Good practice

☑ Run stricter checks considering all values of system inputs

Consider inputs to these functions: auto

Benefits: For a subset of **Numerical** and **Static memory** defect checkers, the analysis considers all possible values of:

- Global variables
- Reads of volatile variables
- Returns of stubbed functions
- Inputs to the functions you specify with the option `Consider inputs to these functions (-system-inputs-from)`

See also Extend Bug Finder Checkers to Find Defects from Specific System Input Values.

AUTOSAR C++14 Support: Check for 37 new rules related to lexical conventions, standard conversions, declarations, derived classes, special member functions, overloading and other groups

Summary: In R2020a, you can look for violations of these AUTOSAR C++14 rules in addition to previously supported rules.

AUTOSAR C++14 Rule	Description	Polyspace Checker
A0-1-5	There shall be no unused named parameters in the set of parameters for a virtual function and all the functions that override it.	`AUTOSAR C++14 Rule A0-1-5`
A2-3-1	Only those characters specified in the C++ Language Standard basic source character set shall be used in the source code.	`AUTOSAR C++14 Rule A2-3-1`
A2-7-1	The character \ shall not occur as a last character of a C++ comment.	`AUTOSAR C++14 Rule A2-7-1`
A2-10-1	An identifier declared in an inner scope shall not hide an identifier declared in an outer scope.	`AUTOSAR C++14 Rule A2-10-1`
A2-10-6	A class or enumeration name shall not be hidden by a variable, function or enumerator declaration in the same scope.	`AUTOSAR C++14 Rule A2-10-6`
A2-13-4	String literals shall not be assigned to non-constant pointers.	`AUTOSAR C++14 Rule A2-13-4`
A2-13-6	Universal character names shall be used only inside character or string literals.	`AUTOSAR C++14 Rule A2-13-6`
A3-3-2	Static and thread-local objects shall be constant-initialized.	`AUTOSAR C++14 Rule A3-3-2`
A4-5-1	Expressions with type enum or enum class shall not be used as operands to built-in and overloaded operators other than the subscript operator [], the assignment operator =, the equality operators == and !=, the unary & operator, and the relational operators <, <=, >, >=.	`AUTOSAR C++14 Rule A4-5-1`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A4-10-1	Only nullptr literal shall be used as the null-pointer-constraint.	`AUTOSAR C++14 Rule A4-10-1`
A7-1-3	CV-qualifiers shall be placed on the right hand side of the type that is a typedef or a using name.	`AUTOSAR C++14 Rule A7-1-3`
A7-1-8	A non-type specifier shall be placed before a type specifier in a declaration.	`AUTOSAR C++14 Rule A7-1-8`
A7-4-1	The asm declaration shall not be used.	`AUTOSAR C++14 Rule A7-4-1`
A8-2-1	When declaring function templates, the trailing return type syntax shall be used if the return type depends on the type of parameters.	`AUTOSAR C++14 Rule A8-2-1`
A8-5-3	A variable of type auto shall not be initialized using {} or ={} braced-initialization.	`AUTOSAR C++14 Rule A8-5-3`
A10-1-1	Class shall not be derived from more than one base class which is not an interface class.	`AUTOSAR C++14 Rule A10-1-1`
A10-3-1	Virtual function declaration shall contain exactly one of the three specifiers: (1) virtual, (2) override, (3) final.	`AUTOSAR C++14 Rule A10-3-1`
A10-3-2	Each overriding virtual function shall be declared with the override or final specifier.	`AUTOSAR C++14 Rule A10-3-2`
A10-3-3	Virtual functions shall not be introduced in a final class.	`AUTOSAR C++14 Rule A10-3-3`
A10-3-5	A user-defined assignment operator shall not be virtual.	`AUTOSAR C++14 Rule A10-3-5`
A11-0-2	A type defined as struct shall: (1) provide only public data members, (2) not provide any special member functions or methods, (3) not be a base of another struct or class, (4) not inherit from another struct or class.	`AUTOSAR C++14 Rule A11-0-2`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A12-0-1	If a class declares a copy or move operation, or a destructor, either via "=default", "=delete", or via a user-provided declaration, then all others of these five special member functions shall be declared as well.	`AUTOSAR C++14 Rule A12-0-1`
A12-4-1	Destructor of a base class shall be public virtual, public override or protected non-virtual.	`AUTOSAR C++14 Rule A12-4-1`
A12-8-6	Copy and move constructors and copy assignment and move assignment operators shall be declared protected or defined "=delete" in base class.	`AUTOSAR C++14 Rule A12-8-6`
A13-1-2	User defined suffixes of the user defined literal operators shall start with underscore followed by one or more letters.	`AUTOSAR C++14 Rule A13-1-2`
A13-2-3	A relational operator shall return a boolean value.	`AUTOSAR C++14 Rule A13-2-3`
A13-5-1	If "operator[]" is to be overloaded with a non-const version, const version shall also be implemented.	`AUTOSAR C++14 Rule A13-5-1`
A13-5-2	All user-defined conversion operators shall be defined explicit.	`AUTOSAR C++14 Rule A13-5-2`
A14-7-2	Template specialization shall be declared in the same file (1) as the primary template (2) as a user-defined type, for which the specialization is declared.	`AUTOSAR C++14 Rule A14-7-2`
A14-8-2	Explicit specializations of function templates shall not be used.	`AUTOSAR C++14 Rule A14-8-2`
A16-6-1	#error directive shall not be used.	`AUTOSAR C++14 Rule A16-6-1`
A17-6-1	Non-standard entities shall not be added to standard namespaces.	`AUTOSAR C++14 Rule A17-6-1`
A18-1-3	The std::auto_ptr shall not be used.	`AUTOSAR C++14 Rule A18-1-3`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A18-1-6	All std::hash specializations for user-defined types shall have a noexcept function call operator.	`AUTOSAR C++14 Rule A18-1-6`
A18-5-2	Operators new and delete shall not be called explicitly.	`AUTOSAR C++14 Rule A18-5-2`
A18-9-3	The std::move shall not be used on objects declared const or const&.	`AUTOSAR C++14 Rule A18-9-3`
A23-0-1	An iterator shall not be implicitly converted to const_iterator.	`AUTOSAR C++14 Rule A23-0-1`

CERT C Support: Check for CERT C rules related to threads and hardcoded sensitive data, and recommendations related to macros and code formatting

Summary: In R2020a, you can look for violations of these CERT C rules and recommendations in addition to the previously supported ones. With these new rules, all CERT C rules can be checked with Bug Finder.

Rules

CERT C Rule	Description	Polyspace Checker
CON34-C	Declare objects shared between threads with appropriate storage durations	`CERT C: Rule CON34-C`
CON38-C	Preserve thread safety and liveness when using condition variables	`CERT C: Rule CON38-C`
MSC41-C	Never hard code sensitive information	`CERT C: Rule MSC41-C`
POS47-C	Do not use threads that can be canceled asynchronously	`CERT C: Rule POS47-C`
POS50-C	Declare objects shared between POSIX threads with appropriate storage durations	`CERT C: Rule POS50-C`
POS53-C	Do not use more than one mutex for concurrent waiting operations on a condition variable	`CERT C: Rule POS53-C`

Recommendations

CERT C Recommendation	Description	Polyspace Checker
PRE10-C	Wrap multistatement macros in a do-while loop	`CERT C: Rec. PRE10-C`
PRE11-C	Do not conclude macro definitions with a semicolon	`CERT C: Rec. PRE11-C`
EXP15-C	Do not place a semicolon on the same line as an if, for, or while statement	`CERT C: Rec. EXP15-C`

CERT C++ Support: Check for CERT C++ rule related to hard coded sensitive data, order of initialization in constructor and other issues

Summary: In R2020a, you can look for violations of these CERT C++ rules in addition to previously supported rules.

CERT C++ Rule	Description	Polyspace Checker
DCL58-CPP	Do not modify the standard namespaces	`CERT C++: DCL58-CPP`
MSC41-C	Never hard code sensitive information	`CERT C++: MSC41-C`
OOP53-CPP	Write constructor member initializers in the canonical order	`CERT C++: OOP53-CPP`

CWE Support: Check for CWE rule related to incorrect block delimitation

Summary: In R2020a, you can check for violation of this CWE rule in addition to previously supported rules.

CWE Rule	Description	Polyspace Checkers
483	Incorrect block delimitation	• `Incorrectly indented statement` • `Semicolon on same line as if, for or while statement`

For the full mapping between CWE rules and Polyspace Bug Finder defect checkers, see CWE Coding Standard and Polyspace Results.

New Bug Finder Defect Checkers: Check for possible performance bottlenecks, hardcoded sensitive data and other issues

Summary: In R2020a, you can check for new types of defects.

A new category of C++-specific checkers checks for constructs that might cause performance issues and suggests more efficient alternatives. Other checkers include security checkers for hard coded sensitive data, good practice checkers for issues such as ill-formed macros and concurrency checkers for issues such as asynchronously cancellable threads.

Performance Checkers

Defect	Description
`Const parameter values may cause unnecessary data copies`	Const parameter values prevent a move operation resulting in a more performance-intensive copy operation
`Const return values may cause unnecessary data copies`	Const return values prevent a move operation resulting in a more performance-intensive copy operation
`Empty destructors may cause unnecessary data copies`	User-defined empty destructors prevent autogeneration of move constructors and move assignment operators
`Inefficient string length computation`	String length calculated by using string length functions on return from `std::basic_string::c_str()` instead of using `std::basic_string::length()`
`std::endl may cause an unnecessary flush`	`std::endl` is used instead of more efficient alternatives such as `\n`

Other Checkers

Defect	Description
`Asynchronously cancellable thread`	Calling thread might be cancelled in an unsafe state
`Automatic or thread local variable escaping from a thread`	Variable is passed from one thread to another without ensuring that variable stays alive for duration of both threads
`Hard-coded sensitive data`	Sensitive data is exposed in code, for instance as string literals
`Incorrectly indented statement`	Statement indentation incorrectly makes it appear as part of a block
`Macro terminated with a semicolon`	Macro definition ends with a semicolon
`Macro with multiple statements`	Macro consists of multiple semicolon-terminated statements, enclosed in braces or not
`Missing final step after hashing update operation`	Hash is incomplete or non-secure
`Missing private key for X.509 certificate`	Missing key might result in run-time error or non-secure encryption
`Move operation on const object`	`std::move` function is called with object declared `const` or `const&`
`Multiple mutexes used with same conditional variable`	Threads using different mutexes when concurrently waiting on the same condition variable is undefined behavior
`Multiple threads waiting on same condition variable`	Using `cnd_signal` to wake up one of the threads might result in indefinite blocking
`No data added into context`	Performing hash operation on empty context might cause run-time errors
`Possibly inappropriate data type for switch expression`	Switch expression has a data type other than char, short, int or enum
`Semicolon on the same line as an if, for or while statement`	Semicolon on same line results in empty body of if, for or while statement
`Server certificate common name not checked`	Attacker might use valid certificate to impersonate trusted host
`TLS/SSL connection method not set`	Program cannot determine whether to call client or server routines
`TLS/SSL connection method set incorrectly`	Program calls functions that do not match role set by connection method
`Unmodified variable not const-qualified`	Variable is not `const`-qualified but no modification anywhere in the program
`Use of a forbidden function`	Function appears in a blacklist of forbidden functions
`Redundant expression in sizeof operand`	`sizeof` operand contains expression that is not evaluated

Defect	Description
`X.509 peer certificate not checked`	Connection might be vulnerable to man-in-the-middle attacks

Changes to coding rules checking

Summary: In R2020a, the following changes have been made in checking of previously supported rules.

Rule	Description	Change
Some MISRA C: 2012 rules that were previously specific to a C standard	• C90-specific rules: `8.1`, `17.3` • C99-specific rules: `3.2`, `8.10`, `21.11`, `21.12`	These rules are now checked irrespective of the C standard. The reason is that the constructs flagged by these rules can be found in code using either standard, possibly with language extensions.
`MISRA C:2012 Rule 8.4`	A compatible declaration shall be visible when an object with an external linkage is defined.	• The checker now flags tentative definitions (variables declared without an `extern` specifier and not explicitly defined), for instance: `uint8_t var;` • The checker does not raise a violation on the `main` function.

`MISRA C++:2008 Rule 0-1-3`, `AUTOSAR C++14 Rule M0-1-3`	A project shall not contain unused variables.	The checker does not flag as unused constants used in template instantiations, such as the variable `size` here:
		`const std::uint8_t size = 2;`
		`std::array<uint8_t, size> arr = {0,1};`

`MISRA C++:2008 Rule 2-10-5`	The identifier name of a non-member object or function with static duration should not be reused.	The checker does not flag situations where a variable defined in a header file appears to be reused because the header file is included more than once, possibly along different inclusion paths.

Rule	Description	Change
`MISRA C++:2008 Rule 18-4-1`	Dynamic heap memory allocation shall not be used.	The checker now flags uses of the `alloca` function. Though memory leak cannot happen with the `alloca` function, other issues associated with dynamic memory allocation, such as memory exhaustion and nondeterministic behavior, can still occur.

Compatibility Considerations

If you checked for the rules mentioned above, you might see a change in the number of violations.

Updated Bug Finder defect checkers

Summary: In R2020a, these defect checkers have been updated.

Defect	Description	Update
`Copy constructor not called in initialization list`	Copy constructor does not call copy constructors of some data members	The checker no longer flags copy constructors in templates. In template declarations, the member data types are not known and it is not clear which constructors need to be called.
`Dead code`	Code does not execute	If a `try` block contains a `return` statement, the checker no longer flags the corresponding `catch` block as dead code. A `return` statement involves a copy and copy constructors that are called might throw exceptions, resulting in the `catch` block being executed.
`Missing explicit keyword`	One-parameter constructor missing the `explicit` specifier	The checker has been updated to include user-defined conversion operators declared or defined in-class without the `explicit` keyword.

Defect	Description	Update
`Missing return statement`	Function does not return value though the return type is not void	The checker respects the option `-termination-functions`. If Bug Finder incorrectly flags a missing `return` statement on a path where a process termination function exists, you can make the analysis aware of the process termination function using this option.

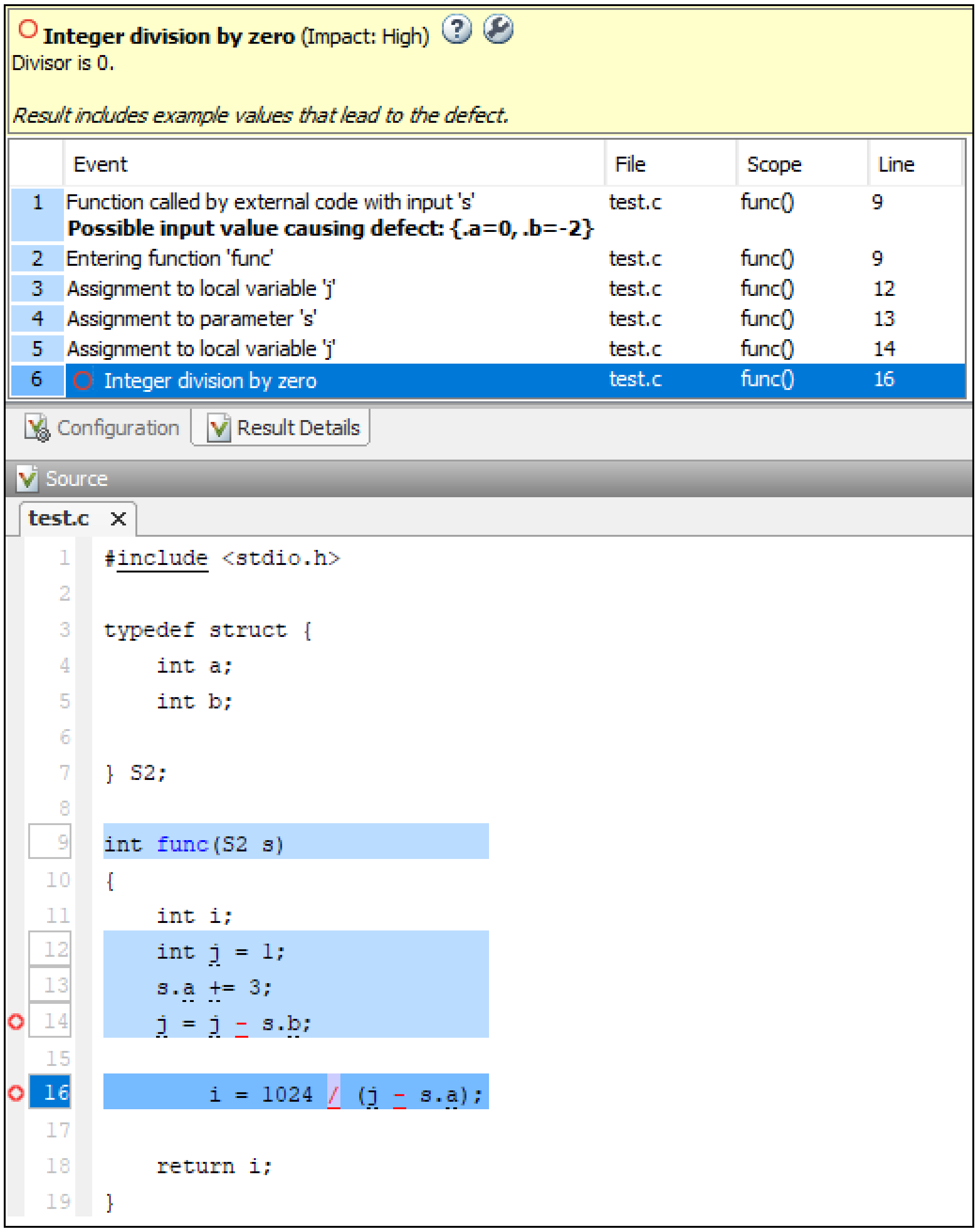
Compatibility Considerations

If you check for the defects mentioned above, you can see a difference in the number of issues found.

Reviewing Results

Extending Checkers: See example value for defect found with stricter analysis

Summary: In R2020a, if you enable `Run stricter checks considering all values of system inputs (-checks-using-system-input-values)`, you can see an example of values that lead to the detected defect in the **Results Details**.



Integer division by zero (Impact: High)
Divisor is 0.

Result includes example values that lead to the defect.

	Event	File	Scope	Line
1	Function called by external code with input 's' **Possible input value causing defect: {.a=0, .b=-2}**	test.c	func()	9
2	Entering function 'func'	test.c	func()	9
3	Assignment to local variable 'j'	test.c	func()	12
4	Assignment to parameter 's'	test.c	func()	13
5	Assignment to local variable 'j'	test.c	func()	14
6	Integer division by zero	test.c	func()	16

```
#include <stdio.h>

typedef struct {
    int a;
    int b;

} S2;

int func(S2 s)
{
    int i;
    int j = 1;
    s.a += 3;
    j = j - s.b;

        i = 1024 / (j - s.a);

    return i;
}
```

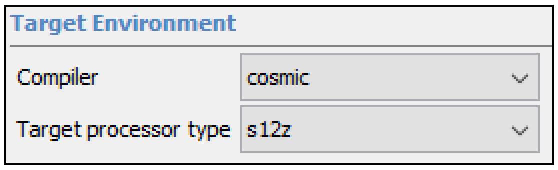
Benefits: You can use the example values to fix defects in your code that are due to specific system input values.

R2019b

Analysis Setup

Compiler Support: Set up Polyspace analysis easily for code compiled with Cosmic compilers

Summary: If you build your source code by using Cosmic compilers, in R2019b, you can specify the compiler name for your Polyspace analysis.


Target Environment

Compiler	cosmic
Target processor type	s12z

See also `Cosmic Compiler (-compiler cosmic)`.

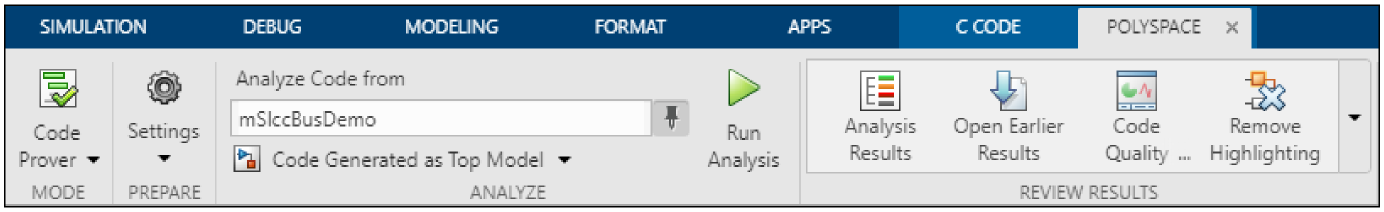
Benefits: You can now set up a Polyspace project without knowing the internal workings of Cosmic compilers. If your code compiles with your compiler, it will compile with Polyspace in most cases without requiring additional setup. Previously, you had to explicitly define macros that were implicitly defined by the compiler and remove unknown language extensions from your preprocessed code.

Simulink Support: Analyze generated code by using contextual buttons on the Simulink Editor toolstrip

Summary: In R2019b, a toolstrip with contextual buttons replaces the menus and toolbars in the Simulink Editor. For details, see release notes.

Code generation and verification tasks appear in separate tabs on the Simulink toolstrip.

- To generate code, open the **C Code** tab. To access this tab, on the **Apps** tab, select **Embedded Coder**.
- To analyze the generated code, open the **Polyspace** tab. To access this tab, on the **Apps** tab, select **Polyspace Code Verifier**.



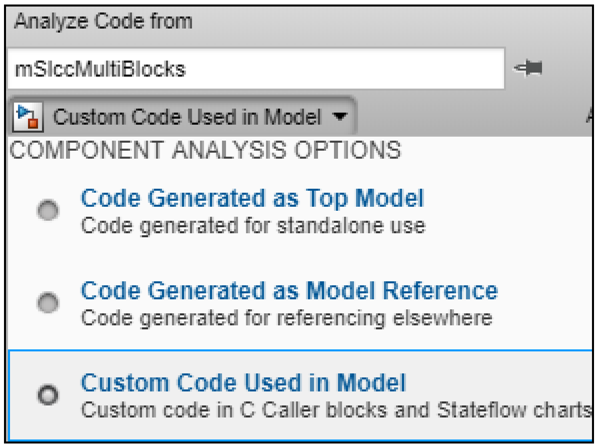
Benefits: The Simulink toolstrip includes contextual tabs, which appear only when you need them.

Additional Considerations

All menu items available earlier in the submenu **Code** > **Polyspace** now appear on the **Polyspace** tab. See Changes in Polyspace Analysis Workflows in Simulink in R2019b.

Simulink Support: Verify custom code called from C Caller blocks and Stateflow charts in context of model

Summary: In R2019b, Polyspace can check functions called from C Caller blocks for bugs and run-time errors. The analysis extracts the functions' inputs and other call context information from the model.


Analyze Code from
mSlccMultiBlocks
Custom Code Used in Model
COMPONENT ANALYSIS OPTIONS
Code Generated as Top Model
Code generated for standalone use
Code Generated as Model Reference
Code generated for referencing elsewhere
Custom Code Used in Model
Custom code in C Caller blocks and Stateflow charts

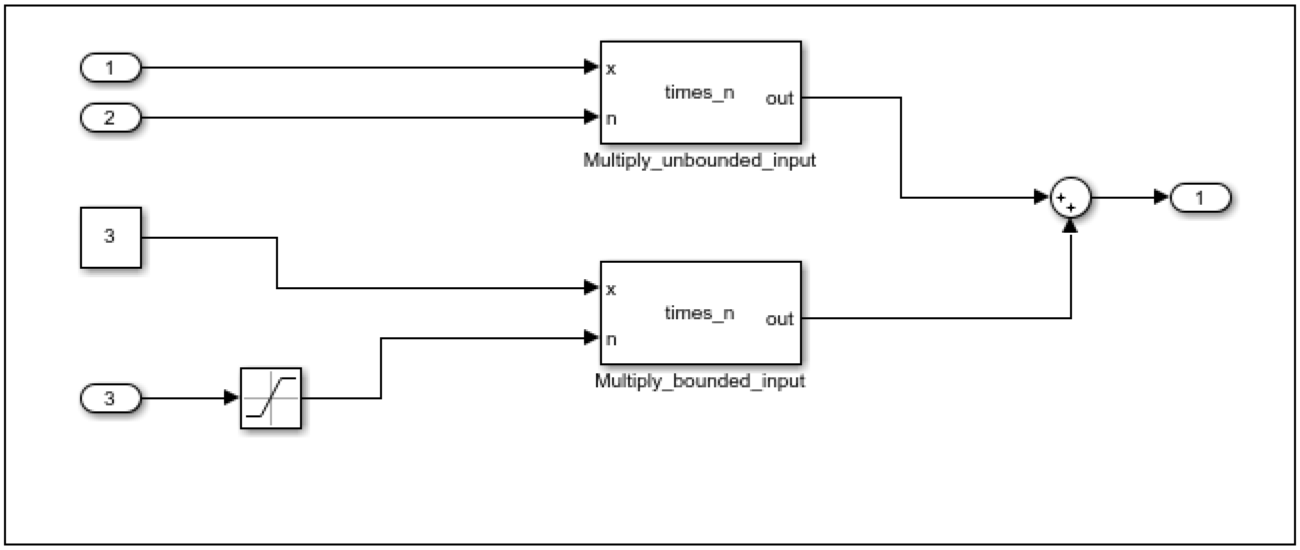
See Run Polyspace Analysis on Custom Code in C Caller Blocks and Stateflow Charts.

Benefits:

- Check whether handwritten code called from model has issues:

  You typically use model verification software such as Simulink Design Verifier™ to check for bugs and run-time errors in a model. The model verification software shows only a small subset of run-time errors in handwritten code loaded on C Caller blocks and Stateflow® charts. With Polyspace, you can check for bugs, run-time errors, coding standard violations and many other issues in handwritten code directly from your Simulink model and supplement the checks at the model level.
- Use call context information for handwritten functions from signal ranges in model:

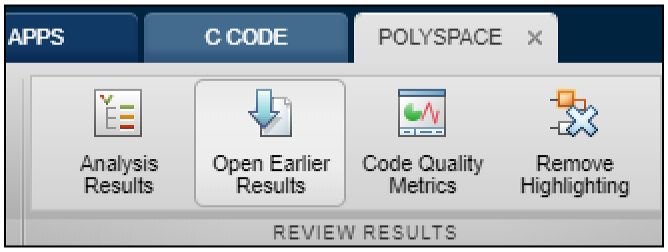
  The analysis uses call context information from the model. For instance, in this simple model, the function `times_n` is called in two C caller blocks (named `Multiply_unbounded_input` and `Multiply_bounded_input`).



When you analyze custom code, in this case the function `times_n`, the analysis shows that an operation in the custom code can overflow. From the analysis results, you can determine that the overflow occurs only when the function is called in the `Multiply_unbounded_input` block but not when it is called from the `Multiply_bounded_input` block.

Simulink Support: Compare two Polyspace result sets and see the effect of changes in model or code generation parameters

Summary: In R2019b, you can open previous Polyspace results on a model directly from the Simulink editor. You can look at two Polyspace result sets for side-by-side comparison.

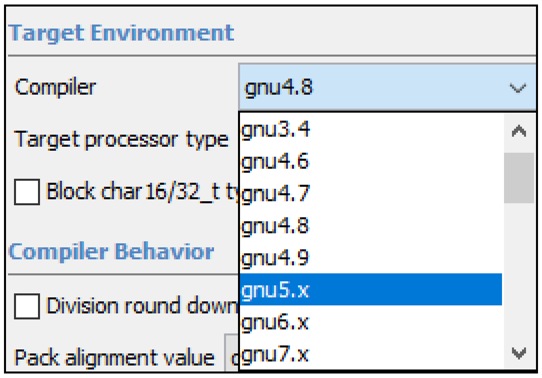


Benefits: Previously, you could open only the latest result from the Simulink Editor. To open a previous result, you had to locate the result outside Simulink in your file explorer and open the result in the Polyspace user interface. You can now perform these actions more easily:

- Change a section of the model or a code generation option, regenerate code, rerun Polyspace, open the new results, and compare with a previous result.
- Change a Polyspace analysis option, rerun Polyspace, open the new results, and compare with a previous result.

Configuration from Build System: Compiler version automatically detected from build system

Summary: In R2019b, if you create a Polyspace analysis configuration from your build system by using the `polyspace-configure` command or in the user interface, the analysis uses the correct compiler version for the option `Compiler (-compiler)` for GNU® C, Clang, and Microsoft® Visual C++® compilers. You do not have to change the compiler version before starting the Polyspace analysis.



Benefits: Previously, if you traced your build system to create a Polyspace analysis configuration, the latest supported compiler version was used in the configuration. If your code was compiled with an earlier version, you might encounter compilation errors and have to explicitly specify an earlier compiler version before starting the analysis.

For instance, if the Polyspace analysis configuration uses the version GCC 4.9 and some of the standard headers in your GCC version include the file `x86intrin.h`, you can see a compilation error such as this error:

```
/usr/lib/gcc/x86_64-linux-gnu/6/include/avx512bwintrin.h, line 2427:
                                                    error: invalid type conversion
|    return (__m512i) __builtin_ia32_packssdw512_mask ((__v16si) __A,
|
```

You had to connect the error to the incorrect compiler version, and then explicitly set a different version. Now, the compiler version is automatically detected when you create a project from your build command.

Changes in MATLAB functions, options object and properties

Direct file specification not allowed for CodingRulesCodeMetrics properties that denote rule subsets

Errors

The properties of a `polyspace.Project` object that indicate coding rule subsets no longer take a text file as argument. To specify a custom subset of rules, instead of specifying a text file directly, use the value `from-file` and then specify an XML file using the `CheckersSelectionByFile` property. For instance, if `proj` is a `polyspace.Project` object, instead of:

```
proj.Configuration.CodingRulesCodeMetrics.MisraCppSubset = 'C:\rules.txt';
```

use:

```
proj.Configuration.CodingRulesCodeMetrics.MisraCppSubset = 'from-file';
proj.Configuration.CodingRulesCodeMetrics.EnableCheckersSelectionByFile = true;
proj.Configuration.CodingRulesCodeMetrics.CheckersSelectionByFile = 'C:\rules.xml';
```

where `rules.xml` contains the same specifications as `rules.txt`.

You can convert existing text files into XML files in the Polyspace user interface. In the **Coding Standards & Code Metrics** node of the **Configuration** pane, click . In the **Findings selection** window, select the files then click **Save Changes**. Polyspace consolidates the files into a single XML file, and saves this file as `filename.xml`, where `filename` is the name of the first selected file alphabetically. For instance, if you select the text files `foo.conf` and `bar.conf`, they are saved as `bar.conf.xml`.

The change affects these subproperties of the `CodingRulesCodeMetrics` property:

- `AcAgcSubset`
- `JsfSubset`
- `MisraC3Subset`
- `MisraCSubset`
- `MisraCppSubset`

See also `polyspace.Project.Configuration Properties`.

Format for specifying properties of polyspace.CodingRulesOptions object changed
Errors

The properties of the `polyspace.CodingRulesOptions` object are now grouped into sections. Instead of specifying a rule directly, specify the containing section first and then the rule.

For instance, if `rules` is a `polyspace.CodingRulesOptions` object that specifies MISRA C:2012 rules, instead of:

```
rules.rule_2_1 = false;
```

use:

```
rules.Section_2_Unused_code.rule_2_1 = false;
```

To find the section number for a rule, see Coding Standards. To find the property corresponding to the section name, use auto-completion for MATLAB object properties.

See also `polyspace.CodingRulesOptions`.

Using checkers selection file required for polyspace.CodingRulesOptions object
Errors

If you assign a `polyspace.CodingRulesOptions` object to an analysis configuration, for instance:

```
misraRules = polyspace.CodingRulesOptions('misraC2012');
proj = polyspace.Project;
proj.Configuration.CodingRulesCodeMetrics.MisraC3Subset = misraRules;
```

You must also enable the use of a checkers selection file, for instance:

```
proj.Configuration.CodingRulesCodeMetrics.EnableCheckersSelectionByFile = true;
```

You have to enable checkers selection by file because the Polyspace run uses an XML file underneath to enable the coding rule checkers. The XML file is saved in a `.settings` subfolder of the results folder.

See also `polyspace.CodingRulesOptions`.

Analysis Results

AUTOSAR C++14 Support: Check for misuse of lambda expressions, potential problems with enumerations, and other issues

In R2019b, you can look for violations of these AUTOSAR C++14 rules in addition to previously supported rules.

AUTOSAR C++14 Rule	Description	Polyspace Checker
A0-1-4	There shall be no unused named parameters in non-virtual functions.	`AUTOSAR C++14 Rule A0-1-4`
A3-1-2	Header files, that are defined locally in the project, shall have a file name extension of one of: `.h`, `.hpp` or `.hxx`.	`AUTOSAR C++14 Rule A3-1-2`
A5-1-2	Variables shall not be implicitly captured in a lambda expression.	`AUTOSAR C++14 Rule A5-1-2`
A5-1-3	Parameter list (possibly empty) shall be included in every lambda expression.	`AUTOSAR C++14 Rule A5-1-3`
A5-1-4	A lambda expression shall not outlive any of its reference-captured objects.	`AUTOSAR C++14 Rule A5-1-4`
A5-1-7	A lambda shall not be an operand to `decltype` or `typeid`.	`AUTOSAR C++14 Rule A5-1-7`
A5-16-1	The ternary conditional operator shall not be used as a sub-expression.	`AUTOSAR C++14 Rule A5-16-1`
A7-2-2	Enumeration underlying base type shall be explicitly defined.	`AUTOSAR C++14 Rule A7-2-2`
A7-2-3	Enumerations shall be declared as scoped enum classes.	`AUTOSAR C++14 Rule A7-2-3`
A16-0-1	The preprocessor shall only be used for unconditional and conditional file inclusion and include guards, and using the following directives: (1) `#ifndef`, (2) `#ifdef`, (3) `#if`, (4) `#if defined`, (5) `#elif`, (6) `#else`, (7) `#define`, (8) `#endif`, (9) `#include`.	`AUTOSAR C++14 Rule A16-0-1`
A16-7-1	The `#pragma` directive shall not be used.	`AUTOSAR C++ 14 Rule A16-7-1`

AUTOSAR C++14 Rule	Description	Polyspace Checker
A18-1-1	C-style arrays shall not be used.	`AUTOSAR C++ 14 Rule A18-1-1`
A18-1-2	The `std::vector<bool>` specialization shall not be used.	`AUTOSAR C++ 14 Rule A18-1-2`
A18-5-1	Functions `malloc`, `calloc`, `realloc` and `free` shall not be used.	`AUTOSAR C++ 14 Rule A18-5-1`
A18-9-1	The `std::bind` shall not be used.	`AUTOSAR C++ 14 Rule A18-9-1`

For all supported AUTOSAR C++14 rules, see AUTOSAR C++14 Rules.

CERT C++ Support: Check for pointer escape via lambda expressions, exceptions caught by value, use of bytewise operations for copying objects, and other issues

In R2019b, you can look for violations of these CERT C++ rules in addition to previously supported rules.

CERT C++ Rule	Description	Polyspace Checker
DCL59-CPP	Do not define an unnamed namespace in a header file	`CERT C++: DCL59-CPP`
EXP61-CPP	A lambda object shall not outlive any of its reference captured objects.	`CERT C++: EXP61-CPP`
MEM57-CPP	Avoid using default operator new for over-aligned types	`CERT C++: MEM57-CPP`
ERR61-CPP	Catch exceptions by lvalue reference	`CERT C++: ERR61-CPP`
OOP57-CPP	Prefer special member functions and overloaded operators	`CERT C++: OOP57-CPP`

For all supported CERT C++ rules, see CERT C++ Rules.

CERT C Support: Check for undefined behavior from successive joining or detaching of the same thread

In R2019b, you can look for violations of these CERT C rules in addition to previously supported rules.

CERT C Rule	Description	Polyspace Checker
CON39-C	Do not join or detach a thread that was previously joined or detached	`CERT C: Rule CON39-C`

For all supported CERT C guidelines, see CERT C Rules and Recommendations.

New Bug Finder Defect Checkers: Check for new security vulnerabilities, multithreading issues, missing C++ overloads, and other issues

Summary: In R2019b, you can check for these new types of defects.

Defect	Description
`Unnamed namespace in header file`	Header file contains unnamed namespace leading to multiple definitions
`Lambda used as decltype or typeid operand`	`decltype` or `typeid` is used on lambda expression
`Operator new not overloaded for possibly overaligned class`	Allocated storage might be smaller than object alignment requirement
`Bytewise operations on nontrivial class object`	Value representations may be improperly initialized or compared
`Missing hash algorithm`	Context in EVP routine is initialized without a hash algorithm
`Missing salt for hashing operation`	Hashed data is vulnerable to rainbow table attack
`Missing X.509 certificate`	Server or client cannot be authenticated
`Missing certification authority list`	Certificate for authentication cannot be trusted
`Missing or double initialization of thread attribute`	Noninitialized thread attribute used in functions that expect initialized attributes or duplicated initialization of thread attributes
`Use of undefined thread ID`	Thread ID from failed thread creation used in subsequent thread functions
`Join or detach of a joined or detached thread`	Thread that was previously joined or detached is joined or detached again

MISRA C:2012 Directive 4.12: Dynamic memory allocation shall not be used

Summary: In R2019b, you can look for violations of MISRA C:2012 Directive 4.12. The directive states that dynamic memory allocation and deallocation packages provided by the Standard Library or third-party packages shall not be used. The use of these packages can lead to undefined behavior.

See `MISRA C:2012 Dir 4.12`.

Updated Bug Finder defect checkers

Summary: In R2019b, this defect checker has been updated.

Defect	Description	Update
`Pointer or reference to stack variable leaving scope`	Pointer to local variable leaves the variable scope	The checker now detects pointer escape via lambda expressions.

Compatibility Considerations

If you check for the defect mentioned above, you can see a difference in the number of issues found.

Reviewing Results

Code Annotations: Justify Bug Finder results by using annotations spread over multiple lines

Summary: In R2019b, you can enter multi-line code annotations to justify Polyspace results. Subsequent runs can use these annotations and automatically populate the severity, status, and comments fields for previously reviewed results.

See Annotate Code and Hide Known or Acceptable Results.

Benefits: Previously, the entire Polyspace annotation could span one line only. With the single-line constraint removed, you can add more detailed explanations in code annotations and view the entire annotation in your code editor, or let your code editor wrap the annotations. For instance, you can enter a code annotation like this annotation:

```
x++; /* polyspace DEFECT:FLOAT_OVFL "This operation
                           cannot overflow
                           because of
                           external constraints" */
```

R2019a

Analysis Setup

Polyspace-only Licenses: Install Polyspace without MATLAB installation

Summary: In R2019a, you can install the Polyspace products without a MATLAB installation.

Benefits: If you use Windows® or Linux® binaries to automate your Polyspace analysis and do not otherwise use MATLAB in your workflow, you do not require a MATLAB installation. However, if you want to use the conveniences of MATLAB scripting such as easy reading and visualization of Polyspace results and syntax completion for functions, you can install MATLAB separately and link with your Polyspace installation.

Compatibility Considerations

If you use MATLAB scripts to run Polyspace, you can continue to run your scripts as before. However, your initial set up is different from previous releases:

- Run the MathWorks® installer twice with separate licenses to install MATLAB and Polyspace in separate folders.
- Perform a setup step to link your Polyspace installation with your MATLAB installation.

See Integrate Polyspace with MATLAB and Simulink.

New Polyspace Products Supporting Continuous Integration: Perform automated code analysis after code submission with Polyspace Bug Finder Server and Polyspace Bug Finder Access

Summary: R2019a brings new Polyspace products for automated runs on server class machines:

- Polyspace Bug Finder Server and Polyspace Bug Finder Access
- Polyspace Code Prover Server and Polyspace Code Prover Access

The current products, Polyspace Bug Finder and Polyspace Code Prover™, can be used by individual developers on their desktops.

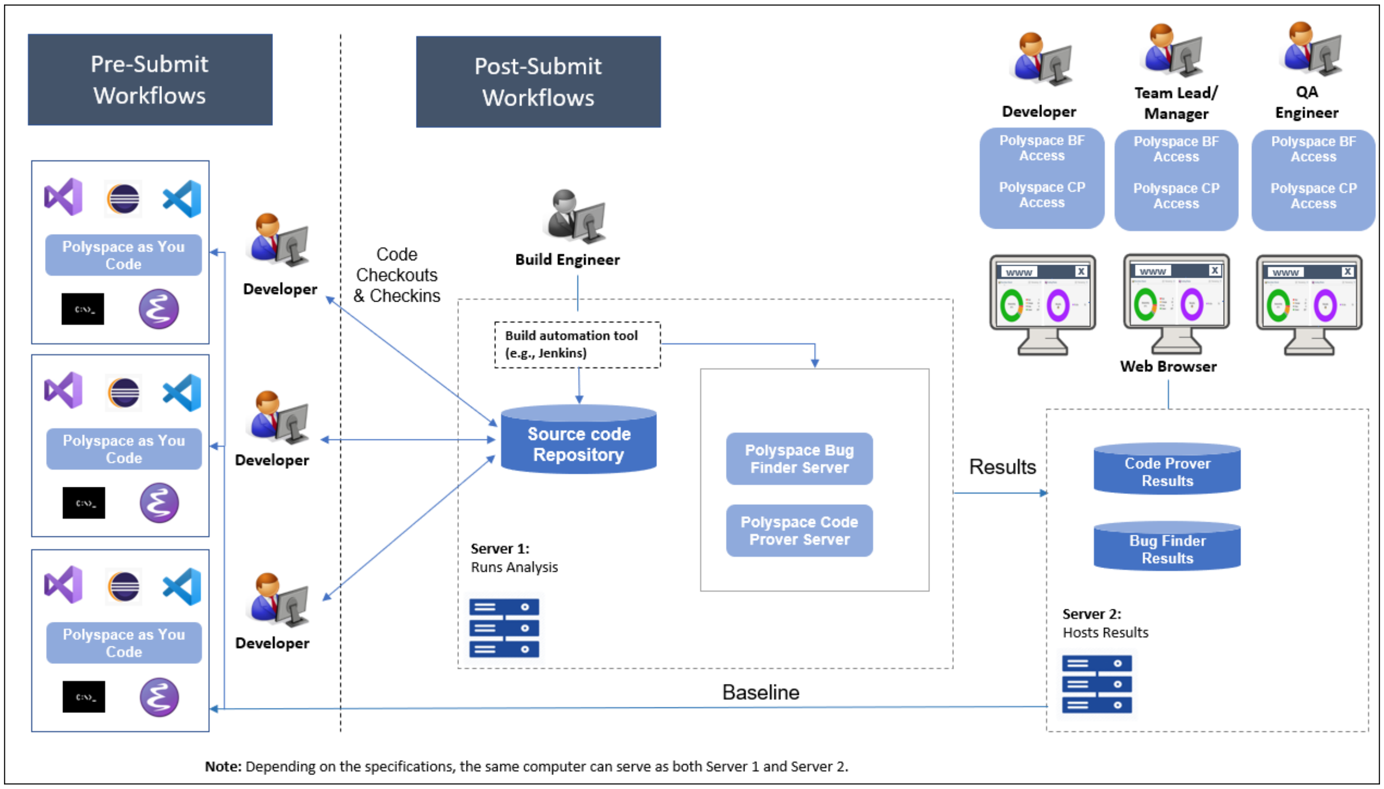
Benefits: The new Polyspace products are designed for automated runs in a continuous integration workflow. With the new products, the Polyspace suite of products now supports all phases of a software development process:

- *Prior to code submission*:

  Developers can run the Polyspace desktop products to check their code during development or right before submission to meet predefined quality goals.

  The desktop products can be plugged in IDEs such as Eclipse™ or run with scripts, for instance during compilation. The analysis results can be reviewed in IDEs such as Eclipse or in the graphical user interface of the desktop products.
- *After code submission*:

The Polyspace server products can run automatically on newly committed code as a build step in a continuous integration process (using tools such as Jenkins). The analysis runs on a server using the product Polyspace Bug Finder Server™ or Polyspace Code Prover Server and the results are uploaded to the Polyspace Access web interface for collaborative review.



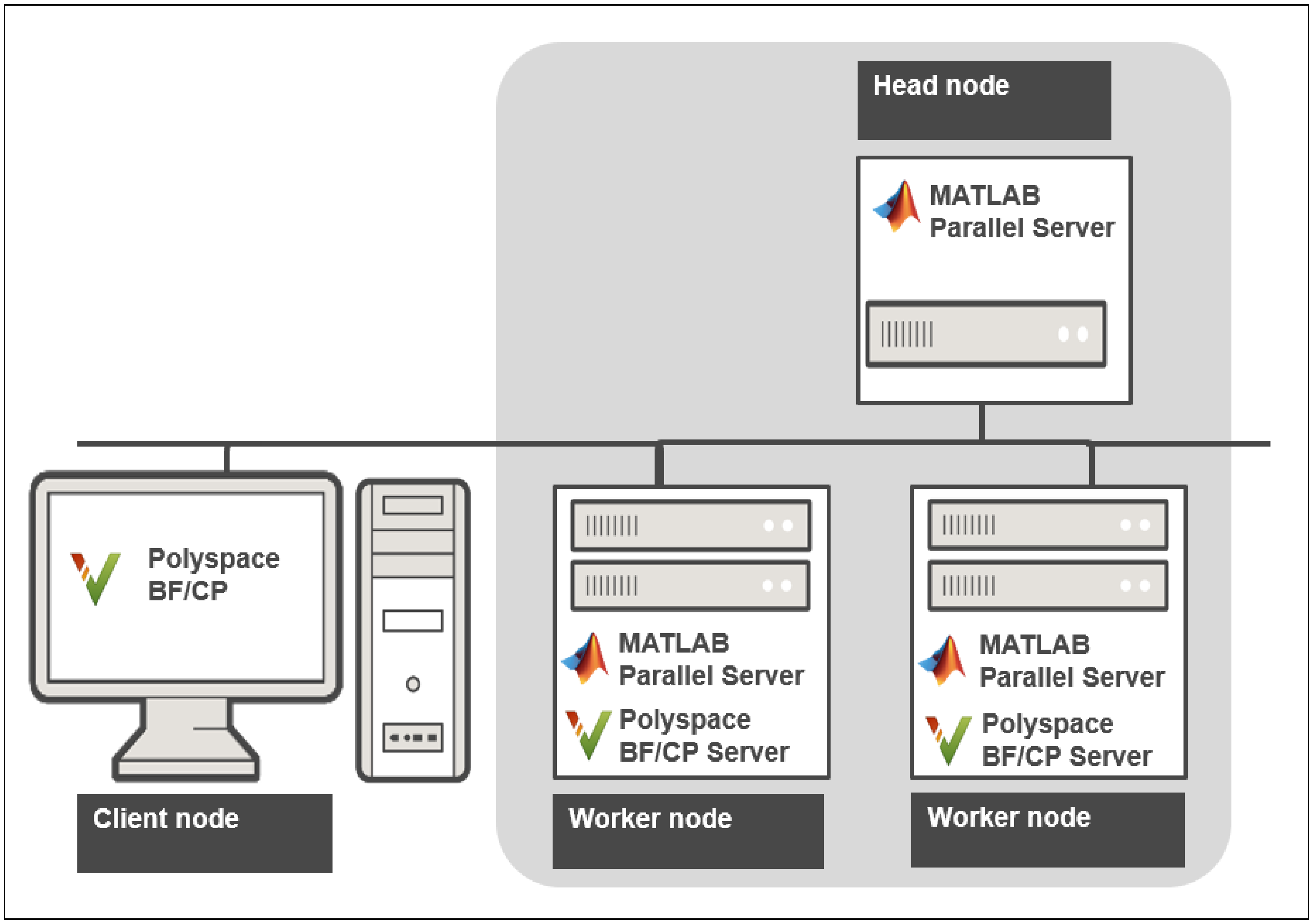
See Polyspace Products for Code Analysis and Verification.

For more information on the new products, see:

- Polyspace Bug Finder Server
- Polyspace Code Prover Server
- Polyspace Bug Finder Access
- Polyspace Code Prover Access

Offloading Polyspace Analysis to Servers: Use Polyspace desktop products on client side and server products on server side

Summary: In R2019a, you can offload a Polyspace analysis from your desktop to remote servers by installing the Polyspace desktop products on the client side and the Polyspace server products on the server side. After analysis, the results are downloaded to the client side for review. You must also install MATLAB Parallel Server™ on the server side to manage submissions from multiple client desktops.



See Install Products for Submitting Polyspace Analysis from Desktops to Remote Server.

You can also follow a workflow where Polyspace runs on a dedicated server after code submission and uploads results to a web interface for review. In this case, you require one or more Polyspace Bug Finder Server license for running the analysis on dedicated servers and Polyspace Bug Finder Access licenses to review the results.

Benefits: The Polyspace desktop products have a graphical user interface. You can configure options in the user interface with assistance from features such as auto-population of option arguments and contextual help. To save processing time on your desktop, you can then offload the analysis to remote servers.

Compatibility Considerations

If you offloaded analysis results from your desktop to remote servers prior to R2019a, your initial setup is different from previous releases.

- On the client side, you do not require Parallel Computing Toolbox™. You only require the Polyspace desktop product, Polyspace Bug Finder.

- On the server side, instead of the desktop product, Polyspace Bug Finder, you must install the server product, Polyspace Bug Finder Server. You still require MATLAB Parallel Server (previously called MATLAB Distributed Computing Server).

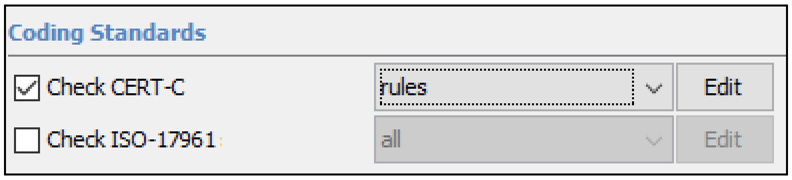
  You install the Polyspace server products and MATLAB Parallel Server in separate folders and link between them.

  See Install Products for Submitting Polyspace Analysis from Desktops to Remote Server.
- You do not have the quick start option to start the server with one worker (the **Metrics and Remote Analysis Server Settings** interface). Instead you must use the **Admin Center** interface in MATLAB Parallel Server. In this workflow, you first start the services on all remote computers, then assign responsibilities to these computers as either the head node that schedules jobs or worker nodes that run the analysis.

  See Install Products for Submitting Polyspace Analysis from Desktops to Remote Server.

Support for Security Standards: Check explicitly for subsets of CERT C, CERT C++ or ISO/IEC TS 17961 rules

Summary: In R2019a, you can check explicitly for violations of the CERT C, CERT C++ or ISO/IEC TS 17961 standard. You can check for all supported rules from the standard or reduce the checking to a predefined subset or your own subset of rules.


Coding Standards

✓ Check CERT-C	rules	Edit
Check ISO-17961	all	Edit

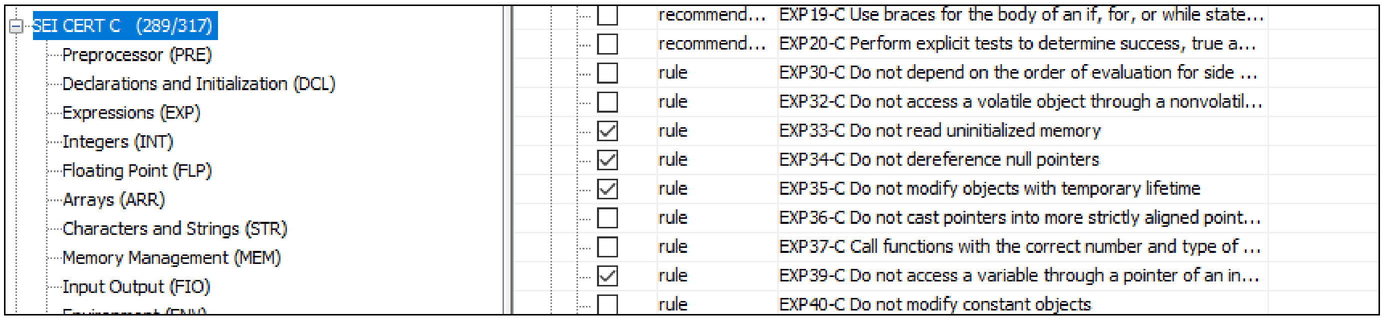
See Check for Coding Standard Violations.

Benefits:

- *Direct configuration of security standards*: You can specify rules from the security standards directly in your analysis configuration. Previously, to check for a security standard, you configured Bug Finder checkers by using an external mapping between the checkers and rules from the standard.
- *More fine-grained control on checking of security standards*: Instead of checking for all supported rules, you can configure smaller subsets of the standards based on your requirements. You can check your code for up to a single rule from a standard.

Compatibility Considerations

In previous releases, to check for a security standard, you configured Bug Finder checkers in your analysis configuration. In the list of results, you enabled a **CERT ID** or **ISO-17961 ID** column to see the CERT C or ISO/IEC TS 17961 rules corresponding to a defect. In R2019a, if you are interested in standards such as CERT C, CERT C++ or ISO/IEC TS 17961, use a workflow that is directly geared towards the standard. Enable rules from the standard that you are interested in and see rule violations explicitly in your analysis results.



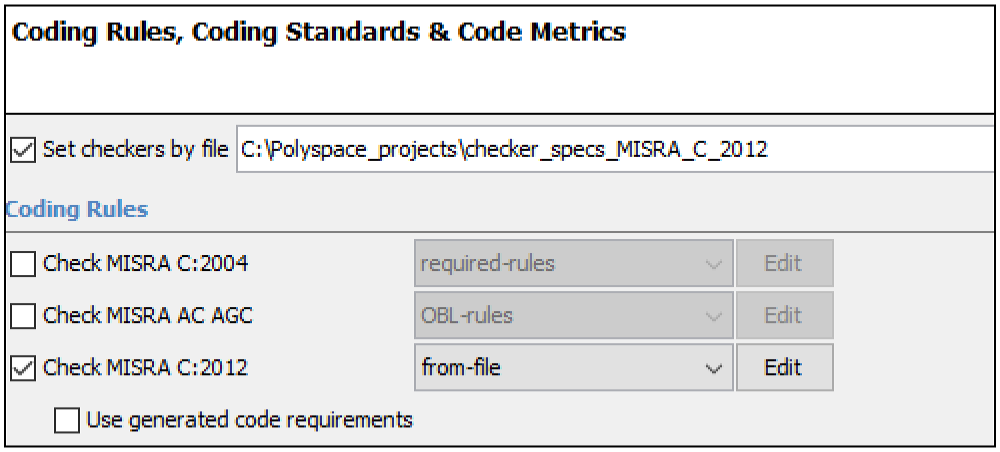
SEI CERT C (289/317)
- Preprocessor (PRE)
- Declarations and Initialization (DCL)
- Expressions (EXP)
- Integers (INT)
- Floating Point (FLP)
- Arrays (ARR)
- Characters and Strings (STR)
- Memory Management (MEM)
- Input Output (FIO)

☐	recommend…	EXP19-C Use braces for the body of an if, for, or while state…
☐	recommend…	EXP20-C Perform explicit tests to determine success, true a…
☐	rule	EXP30-C Do not depend on the order of evaluation for side …
☐	rule	EXP32-C Do not access a volatile object through a nonvolatil…
✓	rule	EXP33-C Do not read uninitialized memory
✓	rule	EXP34-C Do not dereference null pointers
✓	rule	EXP35-C Do not modify objects with temporary lifetime
☐	rule	EXP36-C Do not cast pointers into more strictly aligned point…
☐	rule	EXP37-C Call functions with the correct number and type of …
✓	rule	EXP39-C Do not access a variable through a pointer of an in…
☐	rule	EXP40-C Do not modify constant objects

See also Changes in Coding Standard Checking in R2019a.

Coding Standard Support: Enforce common standards across team or organization by reusing checker configuration

Summary: In R2019a, you can specify the coding standard checkers independently from the remaining analysis configuration. You can reuse this specification across multiple Polyspace projects.



Coding Rules, Coding Standards & Code Metrics

✓ Set checkers by file: C:\Polyspace_projects\checker_specs_MISRA_C_2012

Coding Rules

☐ Check MISRA C:2004	required-rules	Edit
☐ Check MISRA AC AGC	OBL-rules	Edit
✓ Check MISRA C:2012	from-file	Edit

☐ Use generated code requirements

Reusable coding standard specifications are supported for the standards MISRA C: 2004, MISRA C: 2012, MISRA C++, JSF++, CERT C, CERT C++, ISO/IEC TS 17961 and AUTOSAR C++14.

See Check for Coding Standard Violations.

Benefits:

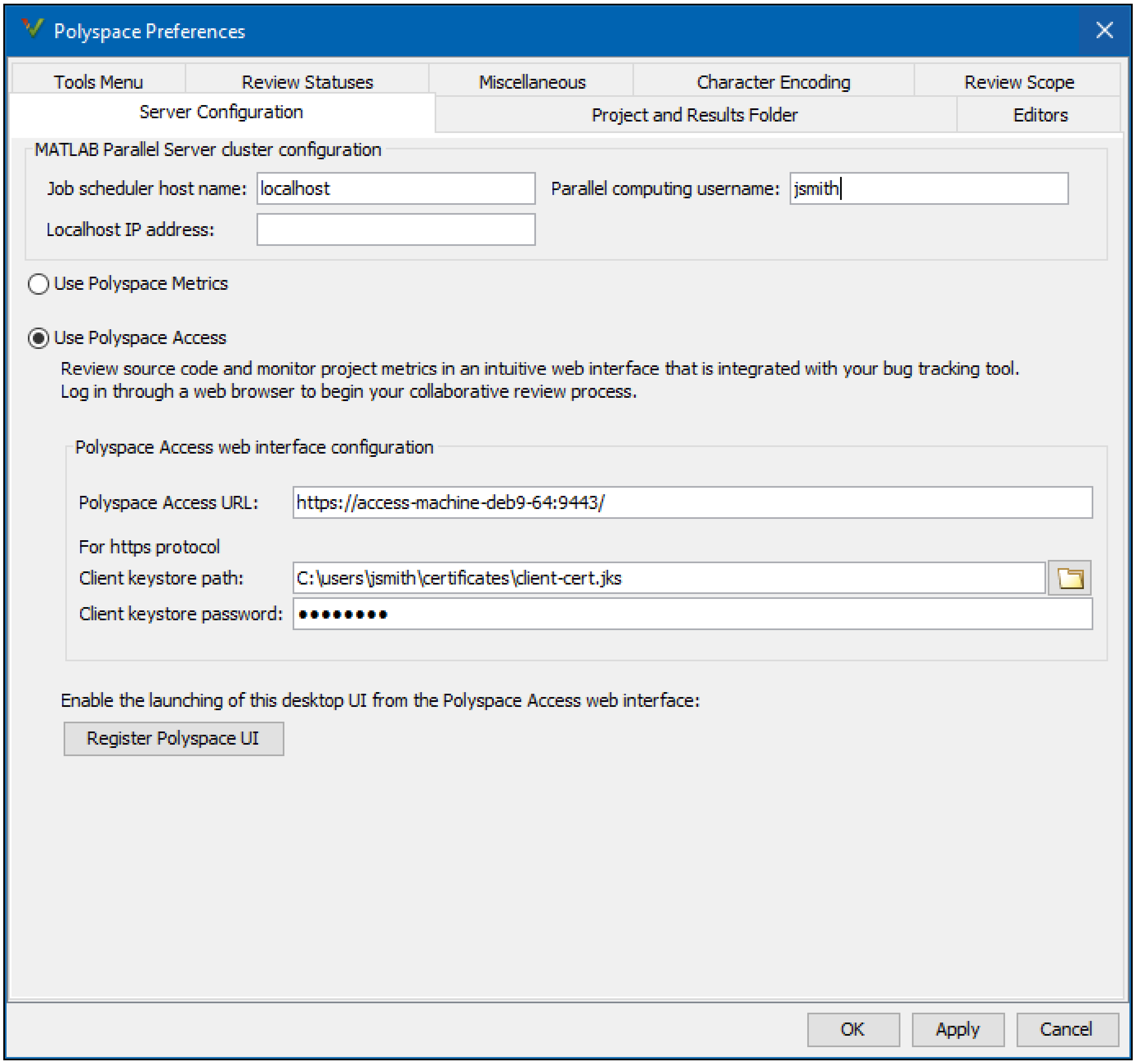
- *Project-specific settings decoupled from project-independent settings*: Analysis options such as macro definitions and entry points for multitasking can be specific to the source files in a project while the coding standard checkers can apply to multiple projects. You can now separate the checker specifications from the project-specific options and reuse the checkers across multiple projects. Previously, reusable checker specifications were not directly supported.

- *Common standard across team*: You can enforce common coding standards across a team or organization by reusing checker specifications across all projects.

Collaborative Review Support: Upload results from Polyspace user interface to Polyspace Access web interface and share results using web links

Summary: In R2019a, you can upload Polyspace Bug Finder results to the Polyspace Access web interface. Developers with a Polyspace Bug Finder Access license can review these results in the web interface and share the results using web links.

To upload results from the Polyspace user interface, select **Tools** > **Preferences**. On the **Server Configuration** tab, enter the URL of the Polyspace Access web interface and the client keystore path and password.



MATLAB Parallel Server cluster configuration

Job scheduler host name: localhost

Parallel computing username: jsmith

Localhost IP address:

Use Polyspace Metrics

[✓ Use Polyspace Access]

Review source code and monitor project metrics in an intuitive web interface that is integrated with your bug tracking tool.
Log in through a web browser to begin your collaborative review process.

Polyspace Access web interface configuration

Polyspace Access URL: https://access-machine-deb9-64:9443/

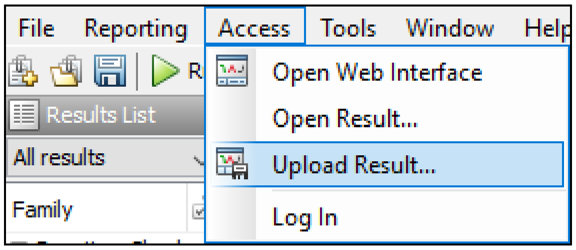
For https protocol

Client keystore path: C:\users\jsmith\certificates\client-cert.jks

Client keystore password: ●●●●●●●●

Enable the launching of this desktop UI from the Polyspace Access web interface:

After setting up communication between the Polyspace user interface and the Polyspace Access web interface, the **Access** menu appears in the Polyspace user interface. You can use this menu to open the web interface, open results from the web interface in the user interface of the desktop product or upload results from the desktop product to the web interface.



For details about setting up and reviewing results in the Polyspace Access web interface, see Polyspace Bug Finder Access documentation.

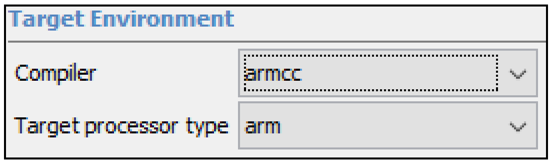
Benefits::

- *Facilitate collaborative review:* The web interface streamlines the review efforts of your team. For instance:
  - During a team meeting, findings can be assessed and assigned to developers.
  - Developers can log into the web interface to review findings assigned to them, and determine whether to justify the findings or fix them.
  - A project manager can track the progress of the review by filtering the list of results for findings that are still open.
- *Authenticate client access:* The web interface is behind a login. Only users with a Polyspace Bug Finder Access license and the appropriate credentials can view the results from their web browser.

Compiler Support: Set up Polyspace analysis easily for code compiled with ARM v5 and v6 compilers

Summary: If you build your source code using these compilers, in R2019a, you can specify the compiler name for your Polyspace analysis:

- ARM® v5

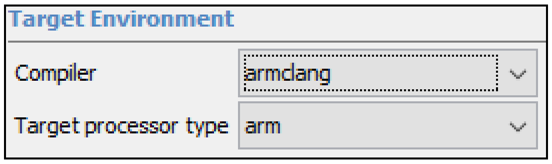
  Target Environment

  Compiler: armcc

  Target processor type: arm

  You can specify target `arm`.

  See `ARM v5 Compiler (-compiler armcc)`.
- ARM v6

  Target Environment

  Compiler: armclang

  Target processor type: arm

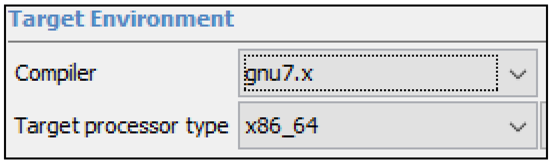
  You can specify targets `arm` and `arm64`.

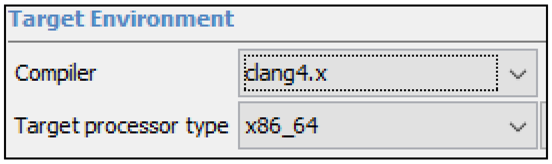
See `ARM v6 Compiler (-compiler armclang)`.

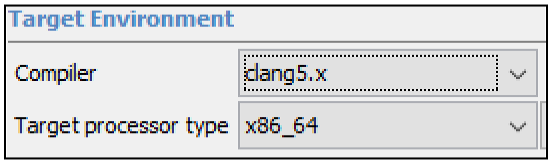
Benefits:You can now set up a Polyspace project without knowing the internal workings of these compilers. If your code compiles with your compiler, it will compile with Polyspace in most cases without requiring additional setup. Previously, you had to explicitly define macros that were implicitly defined by the compiler and remove unknown language extensions from your preprocessed code.

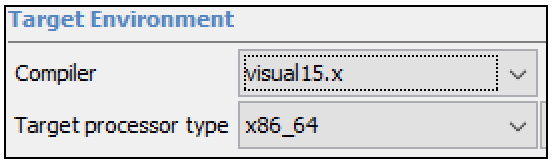
Updated GCC, Clang, and Visual C++ Compiler Support: Set up Polyspace analysis easily for code compiled with GCC versions 7.x, Clang versions 4.x or 5.x, or Microsoft Visual C++ 2017 compilers

Summary: In R2019a, if you build your source code using these version of GCC, Clang, or Microsoft Visual C++ compilers, you can specify the following compiler option values to setup your Polyspace analysis:

- 
  Target Environment
  Compiler: gnu7.x
  Target processor type: x86_64

  `gnu7.x` for GCC release 7.1, 7.2, and 7.3.
- 
  Target Environment
  Compiler: clang4.x
  Target processor type: x86_64

  `clang4.x` for LLVM release 4.0.0, and 4.0.1.
- 
  Target Environment
  Compiler: clang5.x
  Target processor type: x86_64

  `clang5.x` for LLVM release 5.0.0, and 5.0.1.
- 
  Target Environment
  Compiler: visual15.x
  Target processor type: x86_64

  `visual15.x` for Microsoft Visual C++ 2017 versions 15.0 to15.7.

The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.

For more information, see `Compiler (-compiler)`.

Simulink Toolstrip: Analyze generated code using contextual buttons in Simulink Editor

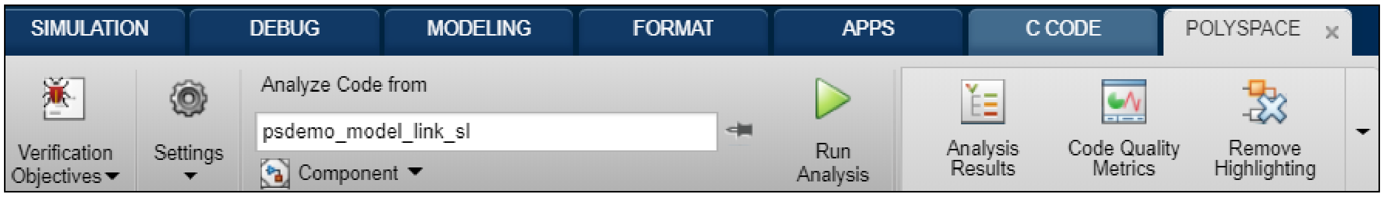
Summary: In R2019a, you have the option to turn on the Simulink Toolstrip.

- To enable the toolstrip, select **File** > **Simulink Preferences**. On the **Editor** node, select **Replace menus and toolbars with the Simulink Toolstrip (Tech Preview)**.
- To disable the toolstrip, on the **Modeling** tab, select **Environment** > **Simulink Preferences**. Clear the previous selection.

See Simulink Toolstrip Tech Preview replaces menus and toolbars in the Simulink Desktop for more details.

Benefits: The Simulink Toolstrip includes contextual tabs, which appear only when you need them. The Polyspace contextual tab includes options for completing actions that apply only to Polyspace.

- To generate code, open the **C Code** tab. To access this tab, on the **Apps** tab, select **Embedded Coder**.
- To analyze the generated code, open the **Polyspace** tab. To access this tab, on the **Apps** tab, select **Polyspace Code Verifier**.



On the **Polyspace** tab:

1. After code generation, from the **Verification Objectives** menu, choose **Find Bugs** (Bug Finder) or **Prove Code** (Code Prover).
2. Optionally, configure code analysis options. To configure the basic options related to the model, select **Settings** > **Polyspace Settings**. To configure advanced options related to the generated code, select **Settings** > **Project**.
3. To start an analysis, select **Run Analysis**. The analysis runs on the model element selected, provided code has been generated earlier from the same element. The selected element appears in the **Analyze Code from** field. To select the entire model, click anywhere on the canvas outside a model element.

Compatibility Considerations

The Simulink Toolstrip included with R2019a is a tech preview. You may encounter performance issues when you enable the toolstrip. Documentation does not reflect the addition of the Simulink Toolstrip and toolstrip customization is not available.

Changes in analysis options and binaries

polyspace-bug-finder-nodesktop renamed to polyspace-bug-finder
Warns

The command-line options available with `polyspace-bug-finder` are the same as those with `polyspace-bug-finder-nodesktop` (with the exception of changes mentioned below). Simply replace `polyspace-bug-finder-nodesktop` with `polyspace-bug-finder` in your batch files or shell scripts.

-report-template arguments changed for coding standard templates
Warns

A single report template `CodingStandards.rpt` is used for all coding standards (other than CWE). In particular, if you used these old templates as arguments for the option `-report-template`, switch to the new template:

- `CodingRules.rpt`
- `SecurityCERT.rpt`
- `SecurityISO_17961.rpt`

See also Changes in Coding Standard Checking in R2019a.

Find defects (-checkers) option values CERT-rules, CERT-all, and ISO-17961 are removed
Warns

`Find defects (-checkers)` option values `CERT-rules`, `CERT-all`, and `ISO-17961` are removed. Previously, you used **Find defects (-checkers)** with these options values to check your code for violations of the CERT C, CERT C++, and ISO/IEC TS 17961 coding standards. Use the new **Coding Standards & Code Metrics** analysis options `Check SEI CERT-C (-cert-c)`, `Check SEI CERT-C++ (-cert-cpp)`, and `Check ISO/IEC TS 17961 (-iso-17961)` instead.

The new analysis options simplify checking for violations of coding standards CERT C, CERT C++, and ISO/IEC TS 17961. For more information, see Changes in Coding Standard Checking in R2019a

In the Polyspace user interface, if an option is replaced by another option, the replacement occurs automatically in your configuration. To update your scripts, see these tables.

If the source code language is C:

Option	Use Instead
`-checkers CERT-rules`	`-cert-c all-rules`
`-checkers CERT-all`	`-cert-c all`
`-checkers ISO-17961`	`-iso-17961 all`

If the source code language is C++:

Option	Use Instead
`-checkers CERT-rules`	`-cert-cpp all`
`-checkers CERT-all`	

You get a warning and when you use the removed option values at the command line. The corresponding new options are applied automatically.

Check MISRA C:2012 (-misra3) option values CERT-rules, CERT-all, and ISO-17961 are removed
Warns

`Check MISRA C:2012 (-misra3)` option values `CERT-rules`, `CERT-all`, and `ISO-17961` are removed. Previously, you used **Check MISRA C:2012 (-misra3)** with these options values to check your code for violations of the CERT C and ISO/IEC TS 17961 coding standards. Use the new **Coding Standards & Code Metrics** analysis options `Check SEI CERT-C (-cert-c)` and `Check ISO/IEC TS 17961 (-iso-17961)` instead.

The new analysis options simplify checking for violations of coding standards CERT C and ISO/IEC TS 17961. For more information, see Changes in Coding Standard Checking in R2019a

In the Polyspace user interface, if an option is replaced by another option, the replacement occurs automatically in your configuration. To update your scripts, see this table.

Option	Use Instead
`-misra3 CERT-rules`	`-cert-c all-rules`
`-misra3 CERT-all`	`-cert-c all`
`-misra3 ISO-17961`	`-iso-17961 all`

You get a warning when you use the removed option values at the command line.

Check MISRA C++ rules (-misra-cpp) option values CERT-rules and CERT-all are removed
Warns

`Check MISRA C++:2008 (-misra-cpp)` option values `CERT-rules` and `CERT-all` are removed. Previously, you used **Check MISRA C++ rules (-misra-cpp)** with these options values to check your code for violations of the CERT C++ coding standards. Use the new **Coding Standards & Code Metrics** analysis option `Check SEI CERT-C++ (-cert-cpp)` instead.

The new analysis option simplifies checking for violations of the CERT C++ coding standard. For more information, see Changes in Coding Standard Checking in R2019a

In the Polyspace user interface, if an option is replaced by another option, the replacement occurs automatically in your configuration. To update your scripts, see this table.

Option	Use Instead
`-misra-cpp CERT-rules`	`-cert-cpp all`
`-misra-cpp CERT-all`	

You get a warning when you use the removed option values at the command line.

Changes in MATLAB functions, options object and properties

Initial setup required for running Polyspace from MATLAB
Behavior change

If you use MATLAB scripts to run Polyspace, you can continue to run your scripts as before. However, your initial setup is different compared to previous releases:

- Run the MathWorks installer twice with separate licenses to install MATLAB and Polyspace in separate folders.
- Perform a setup step to link your Polyspace installation with your MATLAB installation.

See Integrate Polyspace with MATLAB and Simulink.

polyspaceBugFinderNodesktop removed

Warns

Use `polyspaceBugFinder(projectFile, '-nodesktop')` instead of `polyspaceBugFinderNodesktop(projectFile)`.

BugFinderReportTemplate property values changed for coding standard compliance reports

Warns

A single report template is used for all coding standards (other than CWE).

To update your MATLAB code, use the new template `CodingStandards` for the property `BugFinderReportTemplate`:

```
proj = polyspace.Project;
proj.Configuration.MergedReporting.BugFinderReportTemplate = 'CodingStandards';
```

instead of these old templates:

- `CodingRules`
- `SecurityCERT`
- `SecurityISO_17961`

See also Changes in Coding Standard Checking in R2019a.

Property CustomRulesSubset is removed

Errors

`CodingRulesCodeMetrics` property `CustomRulesSubset` is removed. Previously, you used this property to specify the path to the file where you defined custom naming conventions to check against. Use the new property `CheckersSelectionByFile` instead.

With the new property, you specify a file in `.xml` format where you define custom rules to match identifiers in your code, and custom selections of checkers for all the coding standards that Polyspace supports. See `Set checkers by file (-checkers-selection-file)`.

To update your MATLAB code, see this table.

```
opts = polyspace.Project;
```

Property	Use Instead

`opts.CodingRulesCodeMetrics...`
`.EnableCustomRules=1;`
`opts.CodingRulesCodeMetrics...`
`.CustomRulesSubset='custom_rules.txt';`
	`opts.CodingRulesCodeMetrics...`
	`.EnableCustomRules=1;`
	`opts.CodingRulesCodeMetrics...`
	`.EnableCheckersSelectionByFile=1;`
	`opts.CodingRulesCodeMetrics...`
	`.CheckersSelectionByFile='custom_rules.xml';`

For more information, see `polyspace.Project.Configuration Properties`.

Option values CERT-rules, CERT-all, and ISO-17961 are removed for BugFinderAnalysis property CheckersPreset

Errors

`CheckersPreset` option values `CERT-rules`, `CERT-all`, and `ISO-17961` are removed. Previously, you used `CheckersPreset` with these options values to check your code for violations of the CERT C and ISO/IEC TS 17961 coding standards. Use the new `CodingRulesCodeMetrics` properties `CertC` and `EnableIso17961` instead.

The new `CodingRulesCodeMetrics` properties simplify checking for violations of coding standards CERT C and ISO/IEC TS 17961.

To update your MATLAB code, see this table.

```
opts = polyspace.Project;
```

Property	Use Instead

`opts.BugFinderAnalysis...`
`.EnableCheckers=1;`
`opts.BugFinderAnalysis...`
`.CheckersPreset='CERT-all';`
	`opts.CodingRulesCodeMetrics.EnableCertC=1;`
	`opts.CodingRulesCodeMetrics.CertC='all';`

`opts.BugFinderAnalysis...`
`.EnableCheckers=1;`
`opts.BugFinderAnalysis...`
`.CheckersPreset='CERT-rules';`
	`opts.CodingRulesCodeMetrics.EnableCertC=1;`
	`opts.CodingRulesCodeMetrics.CertC='all-rules';`

`opts.BugFinderAnalysis...`
`.EnableCheckers=1;`
`opts.BugFinderAnalysis...`
`.CheckersPreset='iso-17961';`
	`opts.CodingRulesCodeMetrics.EnableIso17961=1;`
	`opts.CodingRulesCodeMetrics.Iso17961='all'`

For more information, see `polyspace.Project.Configuration Properties`.

Option values CERT-rules, CERT-all, and ISO-17961 are removed for CodingRulesCodeMetrics property MisraCSubset
Errors

`MisraCSubset` option values `CERT-rules`, `CERT-all`, and `ISO-17961` are removed. Previously, you used `MisraCSubset` with these options values to check your code for violations of the CERT C and ISO/IEC TS 17961 coding standards. Use the new `CodingRulesCodeMetrics` properties `CertC` and `EnableIso17961` instead.

The new `CodingRulesCodeMetrics` properties simplify checking for violations of coding standards CERT C and ISO/IEC TS 17961.

To update your MATLAB code, see this table.

```
opts = polyspace.Project;
```

Property	Use Instead

`opts.CodingRulesCodeMetrics...`
`.EnableMisraC3=1;`
`opts.CodingRulesCodeMetrics...`
`.MisraC3Subset='CERT-all';`
	`opts.CodingRulesCodeMetrics.EnableCertC=1;`
	`opts.CodingRulesCodeMetrics.CertC='all';`

`opts.CodingRulesCodeMetrics...`
`.EnableMisraC3=1;`
`opts.CodingRulesCodeMetrics...`
`.MisraC3Subset='CERT-rules';`
	`opts.CodingRulesCodeMetrics.EnableCertC=1;`
	`opts.CodingRulesCodeMetrics.CertC...`
	`='all-rules';`

Property	Use Instead

`opts.CodingRulesCodeMetrics...`
`.EnableMisraC3=1;`
`opts.CodingRulesCodeMetrics...`
`.MisraC3Subset='iso-17961';`
	`opts.CodingRulesCodeMetrics.EnableIso17961...`
	`=1;`
	`opts.CodingRulesCodeMetrics.Iso17961='all';`

For more information, see `polyspace.Project.Configuration Properties`.

Option values CERT-rules and CERT-all are removed for CodingRulesCodeMetrics property MisraCppSubset

Errors

`MisraCppSubset` option values `CERT-rules` and `CERT-all` are removed. Previously, you used `MisraCSubset` with these options values to check your code for violations of the CERT C++ coding standard. Use the new `CodingRulesCodeMetrics` property `CertCpp` instead.

The new `CodingRulesCodeMetrics` property simplifies checking for violations of the CERT C++ coding standard.

To update your MATLAB code, see this table.

```
opts = polyspace.Project;
```

Property	Use Instead

`opts.CodingRulesCodeMetrics...`
`.EnableMisraCpp=1;`
`opts.CodingRulesCodeMetrics...`
`.MisraC3Subset='CERT-all';`
	`opts.CodingRulesCodeMetrics.EnableCertCpp...`
	`=1;`
	`opts.CodingRulesCodeMetrics.CertC='all';`

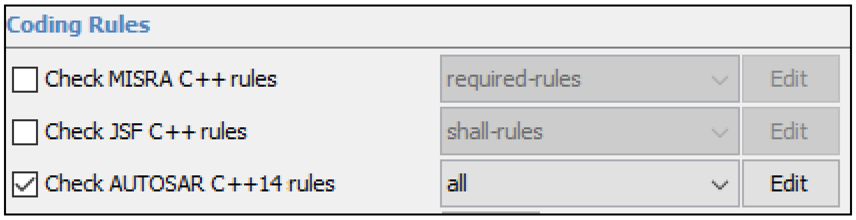
`opts.CodingRulesCodeMetrics...`
`.EnableMisraCpp=1;`
`opts.CodingRulesCodeMetrics...`
`.MisraC3Subset='CERT-rules';`	

For more information, see `polyspace.Project.Configuration Properties`.

Analysis Results

AUTOSAR C++14 Support: Check for violations of rules from the AUTOSAR C++14 coding standard

Summary: In R2019a, Bug Finder can detect violations of rules from the AUTOSAR C++14 coding standard.



☐ Check MISRA C++ rules: required-rules
☐ Check JSF C++ rules: shall-rules
☑ Check AUTOSAR C++14 rules: all

Bug Finder supports a significant number of AUTOSAR C++14 rules. See Supported AUTOSAR C++14 Rules.

Benefits: The AUTOSAR C++14 standard is an improved version of the earlier MISRA C++: 2008 standard and retains only a more relevant subset of MISRA C++: 2008 rules. The AUTOSAR C++14 standard also takes into account later C++ language versions such as C++14 and incorporates elements from other coding standards such as CERT C++ and High Integrity C++ (HIC++). With Bug Finder, you can directly check for violations of rules from the AUTOSAR C++14 standard.

Improved CERT C++ Support: Check for missing overloads, ambiguous declaration syntax and other rules from CERT C++ Coding Standard

Summary: In R2019a, you can look for violations of these CERT C++ rules (in addition to previously supported rules).

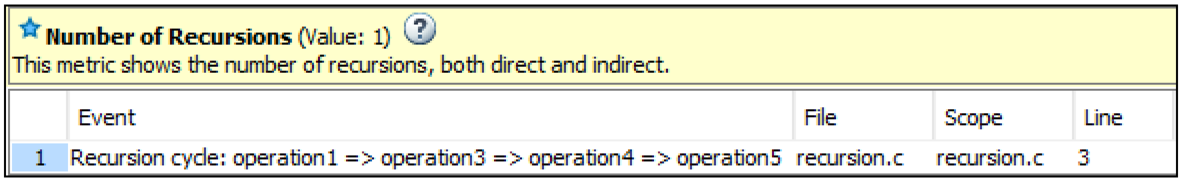
CERT C++ Rule	Description	Polyspace Checker
DCL52-CPP	Never qualify a reference type with const or volatile	`CERT C++: DCL52-CPP`
DCL53-CPP	Do not write syntactically ambiguous declarations (most vexing parse)	`CERT C++: DCL53-CPP`
DCL54-CPP	Overload allocation and deallocation functions as a pair in the same scope	`CERT C++: DCL54-CPP`
EXP58-CPP	Pass an object of the correct type to va_start	CERT C++: EXP58-CPP
EXP59-CPP	Use offsetof() on valid types and members	`CERT C++: EXP59-CPP`

See also CERT C++ Rules.

Recursion Detection: See list of recursion cycles in C/C++ project

Summary: In R2019a, the code metrics `Number of Recursions` and `Number of Direct Recursions` are displayed along with a list of recursion cycles in the project.

- For the metric **Number of Direct Recursions**, the list shows all direct recursions (self recursive functions or functions calling themselves).
- For the metric **Number of Recursions**, the list shows all direct recursions plus a partial list of indirect recursion cycles. For details, see `Number of Recursions`.



Number of Recursions (Value: 1)
This metric shows the number of recursions, both direct and indirect.

	Event	File	Scope	Line
1	Recursion cycle: operation1 => operation3 => operation4 => operation5	recursion.c	recursion.c	3

Benefits:

- *Easier navigation to recursion cycles*: Each row in the list shows one recursion cycle. You can click a row to navigate to one of the functions involved in the recursion cycle.
- *Checking metric computation*: You can check the value of the code metrics `Number of Recursions` and `Number of Direct Recursions`.

Compatibility Considerations

A slightly different algorithm is used to compute the number of recursions. You can see a different value of this metric compared to previous releases. For computation details, see `Number of Recursions`.

New Bug Finder Defect Checkers: Check for misplaced CV qualifiers, C ++ most vexing parse, ill-constructed variadic functions, and other issues

Summary: In R2019a, you can look for these new types of defects.

Defect	Description
`C++ reference type qualified with const or volatile`	Reference type declared with a redundant `const` or `volatile` qualifier
`C++ reference to const-qualified type with subsequent modification`	Reference to `const`-qualified type is subsequently modified
`Ambiguous declaration syntax`	Declaration syntax can be interpreted as object declaration or part of function declaration
`Missing overload of allocation or deallocation function`	Only one function in an allocation-deallocation function pair is overloaded

Defect	Description
`Incorrect type data passed to va_start`	Data type of second argument to `va_start` macro leads to undefined behavior
`Incorrect use of va_start`	`va_start` is called in a non-variadic function or called with a second argument that is not the rightmost parameter of a variadic function
`Incorrect use of offsetof in C++`	Incorrect arguments to `offsetof` macro causes undefined behavior

Updated code metrics specifications

Summary: In R2019a, these code metric specifications have been updated.

Code Metric	Update
`Number of Function Parameters`	In cases where a C++ function returns an object, you see a decrease in number of function parameters. Previously, the metric incorrectly included additional parameters corresponding to Polyspace internal variables.
`Number of Recursions`	You can see a change in the number of recursions in your project. The algorithm to compute recursions is slightly different from previous releases. The metric reports the number of direct recursions plus the number of strongly connected components formed by the indirect recursion cycles. The metric is also supported with events showing the recursion cycles. For details, see the release note about Recursion Detection.
`Number of Paths`	You can see a high value of the metric in some cases where the metric value was previously reported as zero. The number of paths increases exponentially with the branching in the code. If the number of paths exceeds an internal limit, the metric calculation stops and reports the value 9223372036854775807 (indicating the hexadecimal value 0x7fffffffffffffff). Previously, the metric value was reported as zero in those cases.

Code Metric	Update

Code complexity metrics for C++ templates	If you use C++ templates, you can see a difference in the value of certain metrics.
	
	Each instantiation of a C++ template is considered as a separate function. Code complexity metrics are reported separately for each instantiation.
	
	For instance, consider the function template `GetMax` instantiated twice in `main`:
	
	`// function template`
	`#include <iostream>`
	`using namespace std;`
	
	`template <class T>`
	`T GetMax (T a, T b)` `{`
	`  T result;`
	`  result = (a>b)? a : b;`
	`  return (result);`
	`}`
	
	`int main () {`
	`  int i=5, j=6, k;`
	`  long l=10, m=5, n;`
	`  k=GetMax<int>(i,j);`
	`  n=GetMax<long>(l,m);`
	`  cout << k << endl;`
	`  cout << n << endl;`
	`  return 0;`
	`}`
	
	In R2019a, the two instantiations of `GetMax` are considered as separate functions. All code metrics are reported separately for the two instantiations. Further, the number of called functions in `main` is 2.
	
	Previously, the two instantiations were considered as one.

Code Metric	Update

Sizes of local variables	You see a decrease in the metrics for a function if a local variable is an instance of a C++ class that inherits virtually from another class. Previously, a Polyspace internal variable was used to keep track of the virtual inheritance and the internal variable was taken into account in the size metrics. The calculation no longer considers the internal variable.
	
	For instance, consider this example:
	
	`class A { virtual void f(); };`
	`class B : virtual A { };`
	
	Previously, the size of an object of type `A` was shown as 8 and `B` as 16. Now both sizes are calculated as 8.

Compatibility Considerations

If you compute these code metrics, you can see a difference in results compared to previous releases.

Updated Bug Finder defect checkers

Summary: In R2019a, these defect checkers have been updated.

Defect	Description	Update
`Data race including atomic operations`	Operations on the same shared variable in two tasks can interrupt each other. All operations on shared variables including atomic operations are considered as potentially nonatomic.	The checker now considers situations where the two tasks have different priorities. For instance, if an atomic operation in a preemptable interrupt reads or writes to the same shared variable as an operation in a nonpreemptable interrupt, the checker can detect this issue. See Define Preemptable Interrupts and Nonpreemptable Tasks.
`Incorrect syntax of flexible array member size`	Flexible array member defined with size zero or one	The defect checker is disabled if you run a Bug Finder analysis on C90 code (using the option `-c-version c90`). See `C standard version (-c-version)`.

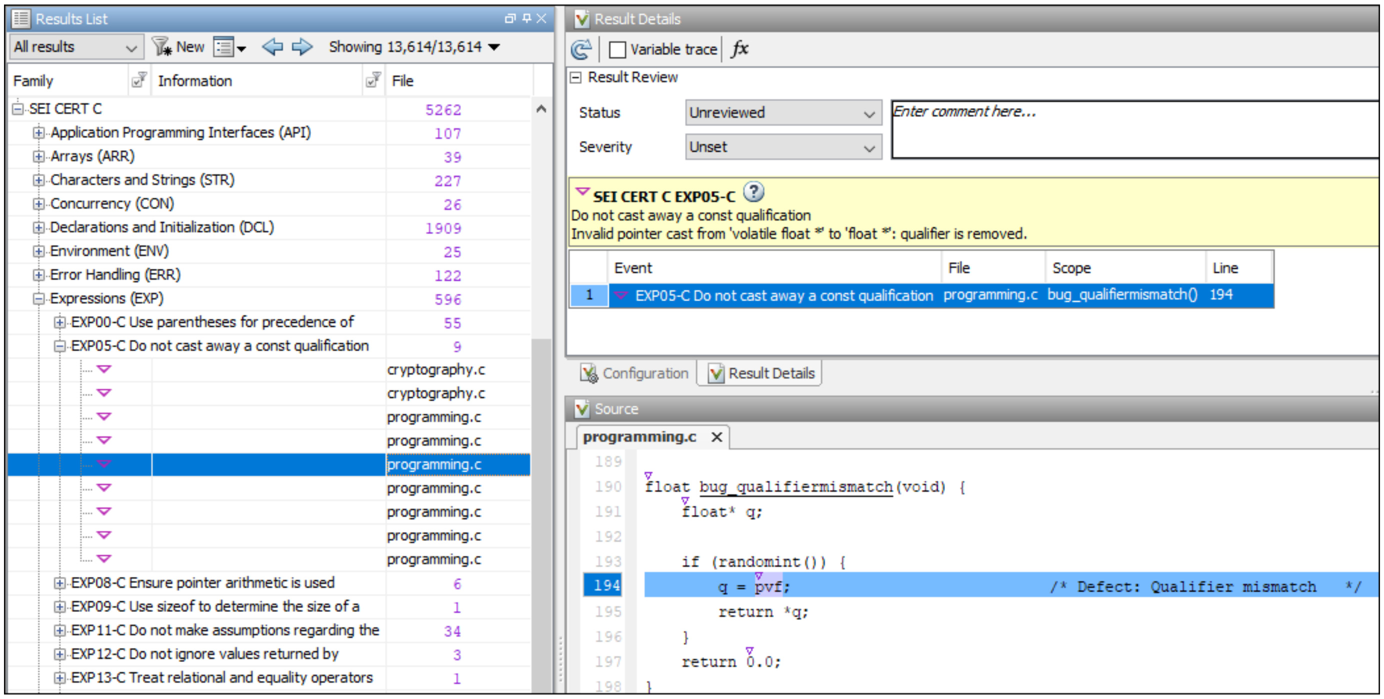
Compatibility Considerations

If you check for the defects mentioned above, you can see a difference in the number of issues found.

Reviewing Results

Support for Security Standards: See CERT C, CERT C++ or ISO/IEC TS 17961 rule violations explicitly in Polyspace analysis results and reports

Summary: In R2019a, if you check for violations of the CERT C, CERT C++ or ISO/IEC TS 17961 standard, the results list and reports show the rules violated as analysis results.



Results List

All results · New · Showing 13,614/13,614

Family	Information	File
SEI CERT C		5262
Application Programming Interfaces (API)		107
Arrays (ARR)		39
Characters and Strings (STR)		227
Concurrency (CON)		26
Declarations and Initialization (DCL)		1909
Environment (ENV)		25
Error Handling (ERR)		122
Expressions (EXP)		596
EXP00-C Use parentheses for precedence of		55
EXP05-C Do not cast away a const qualification		9
		cryptography.c
		cryptography.c
		programming.c
		programming.c
		programming.c
		programming.c
		programming.c
		programming.c
		programming.c
EXP08-C Ensure pointer arithmetic is used		6
EXP09-C Use sizeof to determine the size of a		1
EXP11-C Do not make assumptions regarding the		34
EXP12-C Do not ignore values returned by		3
EXP13-C Treat relational and equality operators		1

Result Details

Variable trace

Result Review

Status: Unreviewed

Severity: Unset

Enter comment here...

SEI CERT C EXP05-C
Do not cast away a const qualification
Invalid pointer cast from 'volatile float *' to 'float *': qualifier is removed.

	Event	File	Scope	Line
1	EXP05-C Do not cast away a const qualification	programming.c	bug_qualifiermismatch()	194

Configuration · Result Details

Source

programming.c

```
float bug_qualifiermismatch(void) {
    float* q;

    if (randomint()) {
        q = pvf;                                    /* Defect: Qualifier mismatch   */
        return *q;
    }
    return 0.0;
}
```

Benefits: You can directly see rules from the security standards in the Bug Finder analysis results and security-specific reports. You can explicitly filter specific rules for a more focused review. Previously, the Bug Finder analysis results contained defects mapped to rules from the standard. In the list of results, you enabled a **CERT ID** or **ISO-17961 ID** column to see the CERT C or ISO/IEC TS 17961 rules corresponding to a defect.

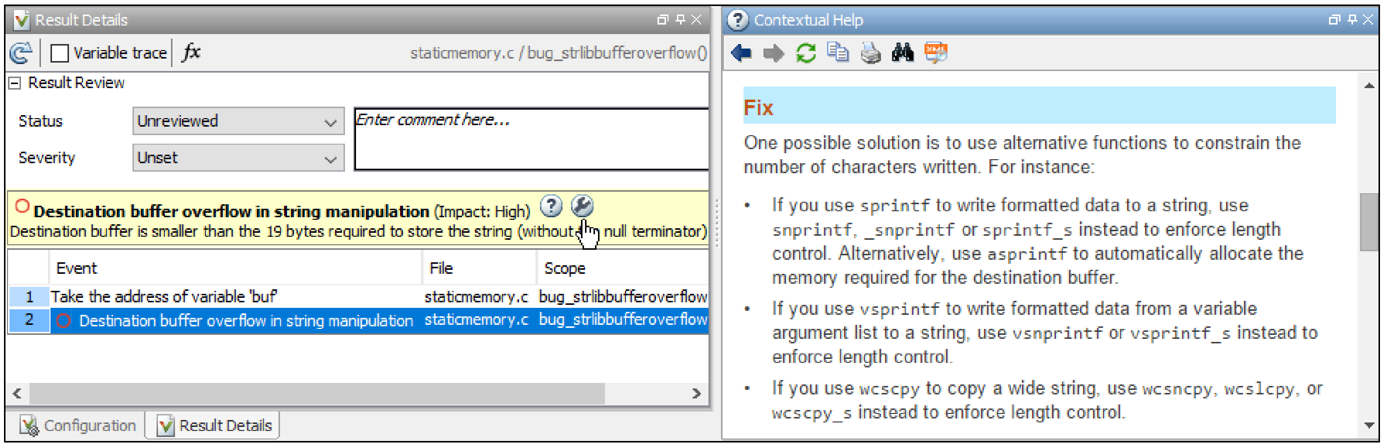
Compatibility Considerations

In previous releases, to review a CERT C or ISO/IEC TS 17961 rule violation, you reviewed defects or MISRA C: 2012 violations that are mapped to these security standards. Now, you can directly check for these standards and review the rule violations.

See also Changes in Coding Standard Checking in R2019a.

Bug Fix Suggestions: See possible fixes for types of defects found by Bug Finder

Summary: In R2019a, you can navigate from a defect found with Bug Finder to suggested fixes for the defect. To see these fix suggestions, click the icon in the details for the defect.


Result Details

Variable trace *fx* staticmemory.c / bug_strlibbufferoverflow()

Result Review

Status	Unreviewed	*Enter comment here...*
Severity	Unset	

Destination buffer overflow in string manipulation (Impact: High)
Destination buffer is smaller than the 19 bytes required to store the string (without null terminator)

	Event	File	Scope
1	Take the address of variable 'buf'	staticmemory.c	bug_strlibbufferoverflow
2	Destination buffer overflow in string manipulation	staticmemory.c	bug_strlibbufferoverflow

Configuration | Result Details

Contextual Help

Fix

One possible solution is to use alternative functions to constrain the number of characters written. For instance:

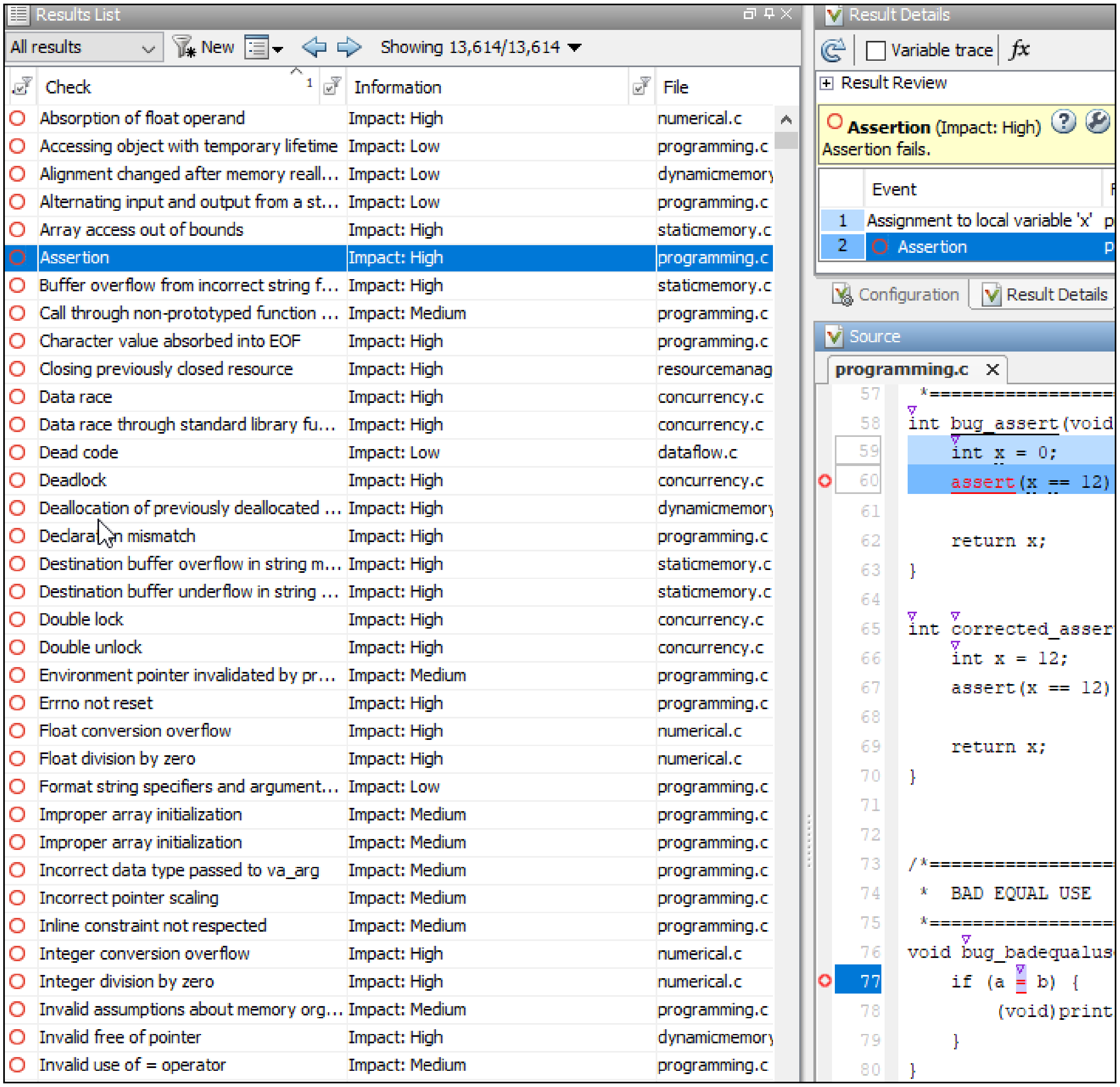
- If you use `sprintf` to write formatted data to a string, use `snprintf`, `_snprintf` or `sprintf_s` instead to enforce length control. Alternatively, use `asprintf` to automatically allocate the memory required for the destination buffer.
- If you use `vsprintf` to write formatted data from a variable argument list to a string, use `vsnprintf` or `vsprintf_s` instead to enforce length control.
- If you use `wcscpy` to copy a wide string, use `wcsncpy`, `wcslcpy`, or `wcscpy_s` instead to enforce length control.

Benefits: You can implement one of the suggested fixes. You can also use the suggested fixes and code examples for guidance and create your own fixes.

Source Code Navigation: Keep result pinned while navigating through source code

Summary: In R2019a, clicking a result in the source code does not change the result selection on the **Results List** and the details on the **Result Details** pane.

For instance, in this example, the result **Assertion** is selected on the **Results List** pane. The corresponding source code (line 60) appears on the **Source** pane and further details about the result on the **Result Details** pane. If you then navigate through the source code and select a token highlighting another result (for instance, the = operator in line 77), the selection in the results list and the details still show the **Assertion** result.



Check	Information	File
Absorption of float operand	Impact: High	numerical.c
Accessing object with temporary lifetime	Impact: Low	programming.c
Alignment changed after memory reall...	Impact: Low	dynamicmemory
Alternating input and output from a st...	Impact: Low	programming.c
Array access out of bounds	Impact: High	staticmemory.c
Assertion	Impact: High	programming.c
Buffer overflow from incorrect string f...	Impact: High	staticmemory.c
Call through non-prototyped function ...	Impact: Medium	programming.c
Character value absorbed into EOF	Impact: High	programming.c
Closing previously closed resource	Impact: High	resourcemanag
Data race	Impact: High	concurrency.c
Data race through standard library fu...	Impact: High	concurrency.c
Dead code	Impact: Low	dataflow.c
Deadlock	Impact: High	concurrency.c
Deallocation of previously deallocated ...	Impact: High	dynamicmemory
Declaration mismatch	Impact: High	programming.c
Destination buffer overflow in string m...	Impact: High	staticmemory.c
Destination buffer underflow in string ...	Impact: High	staticmemory.c
Double lock	Impact: High	concurrency.c
Double unlock	Impact: High	concurrency.c
Environment pointer invalidated by pr...	Impact: Medium	programming.c
Errno not reset	Impact: High	programming.c
Float conversion overflow	Impact: High	numerical.c
Float division by zero	Impact: High	numerical.c
Format string specifiers and argument...	Impact: Low	programming.c
Improper array initialization	Impact: Medium	programming.c
Improper array initialization	Impact: Medium	programming.c
Incorrect data type passed to va_arg	Impact: Medium	programming.c
Incorrect pointer scaling	Impact: Medium	programming.c
Inline constraint not respected	Impact: Medium	programming.c
Integer conversion overflow	Impact: High	numerical.c
Integer division by zero	Impact: High	numerical.c
Invalid assumptions about memory org...	Impact: Medium	programming.c
Invalid free of pointer	Impact: High	dynamicmemory
Invalid use of = operator	Impact: Medium	programming.c

Assertion (Impact: High)
Assertion fails.

	Event
1	Assignment to local variable 'x'
2	Assertion

```
 *=================
int bug_assert(void
    int x = 0;
    assert(x == 12)

    return x;
}

int corrected_asser
    int x = 12;
    assert(x == 12)

    return x;
}


/*=================
 *  BAD EQUAL USE
 *=================
void bug_badequalus
    if (a = b) {
        (void)print
    }
}
```

Benefits: To find the root cause of a result, you have to navigate through the source code. You can keep the result pinned on the **Results List** and **Result Details** pane during this navigation.

Compatibility Considerations

Previously, if you clicked a token in the source code showing a result, the selection on the **Results List** pane and the information on the **Result Details** pane changed to the clicked result. To emulate this behavior, `Ctrl`-click the token in the source code or right-click and select **Select Results At This Location**.

Report Generation: Generate Polyspace reports faster than previous releases

Summary: In R2019a, Polyspace report generation uses a more optimized algorithm.

Benefits: You can now generate PDF, HTML or Microsoft Word reports from Polyspace results much faster than before. For large reports, report generation can be more than ten times faster than before.

Report Generation: Generate single file for HTML reports

Summary: In R2019a, if you generate an HTML report, a single HTML file is created.

Benefits: The single HTML file allows easier archiving. Previously, several companion files were generated in HTML reporting. You had to archive all files together to be able to view the HTML report.

Compatibility Considerations

The structure of the new HTML report is different from prior releases. If you used scripts to parse the HTML reports, you might have to adapt the scripts to the new HTML structure.

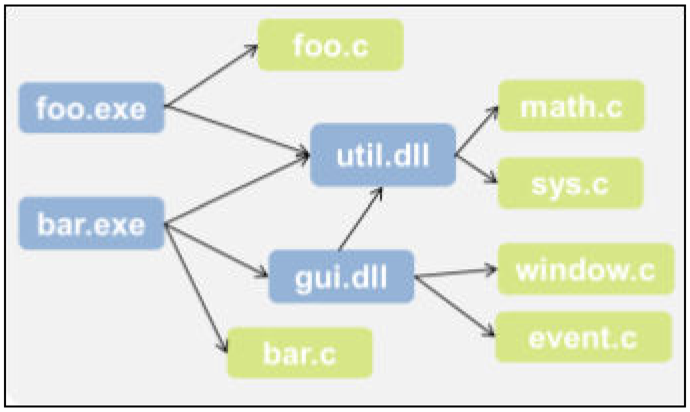
R2018b

Analysis Setup

Configuration from Build System: Automatically generate Polyspace configuration modules from build system

Summary: In R2018b, you can create a separate Polyspace analysis module for each binary in your build system.

Suppose a build system has the following dependencies and creates four binaries: the executables `foo.exe` and `bar.exe`, and the dynamic libraries `util.dll` and `gui.dll`.



Previously, you created a single Polyspace options file from this build system. You can now create a separate Polyspace options file for each binary created in your build system.

See also:

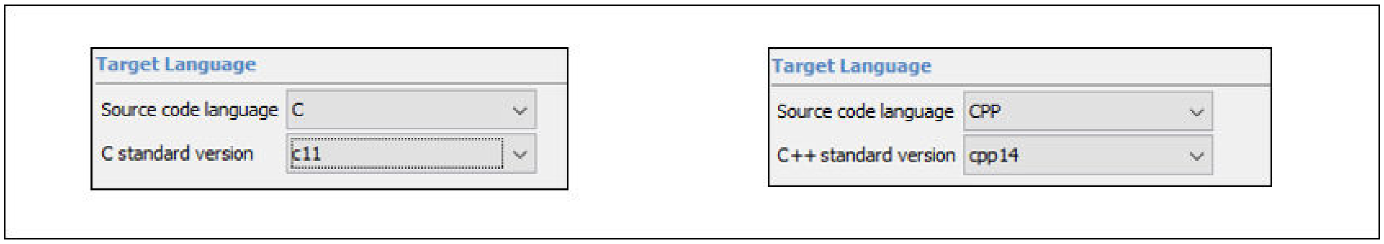
- Modularize Polyspace Analysis by Using Build Command
- `polyspace-configure`

Benefits:

- *More precise analysis*: You can perform a separate Polyspace analysis for each binary in your build system. The analysis does not mix files from distinct binaries.
- *Automated modularization*: You can reuse the modularization in your build system to create the Polyspace analysis modules.
- *Focused analysis*: You can analyze only specific modules instead of your entire codebase.
- *Minimal knowledge of build system required*: You do not need to know the details of your build system. With a `-module` flag, a separate options file is created for each binary in your build system. You can analyze only the code implementation of the binaries that you are interested in.

C11 and C++14 Support: Run Polyspace analysis on code with C11 or C++14 features

Summary: In R2018b, Polyspace can interpret the majority of C11 or C++14-specific features.



Target Language

Source code language	C
C standard version	c11

Target Language

Source code language	CPP
C++ standard version	cpp14

See also C/C++ Language Standard Used in Polyspace Analysis.

Benefits: You can now setup a Polyspace analysis for code containing C11 or C++14-specific features. Previously, some features were not recognized and caused compilation errors.

Autodetection of Concurrency Primitives: Multitasking model detected from C11 multithreading functions

Summary: In R2018b, if you use C11 functions for multitasking, the Polyspace analysis can interpret them semantically.

Polyspace interprets the following functions:

- `thrd_create`: Thread is created.
- `mtx_lock`: Critical section begins.
- `mtx_unlock`: Critical section ends.

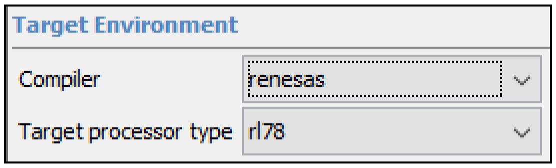
See also Auto-Detection of Thread Creation and Critical Section in Polyspace.

Benefits: You do not have to adapt your code or specify your multitasking model manually through analysis options. The analysis determines your multitasking model from the functions in your code and finds data races or other concurrency defects.

Compiler Support: Set up Polyspace analysis easily for code compiled with Renesas compilers

Summary: If you build your source code with the Renesas compiler, in R2018b, you can specify the compiler name for your Polyspace analysis. The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.

You can specify these target processors directly: `rl78`, `rh850`, or `rx`. See Renesas Compiler (`-compiler renesas`).



Target Environment

Compiler	renesas
Target processor type	rl78

Benefits: You can now set up a Polyspace project without knowing the internal workings of the Renesas compilers. If your code compiles with your compiler, it will compile with Polyspace in most cases without requiring additional setup. Previously, you had to explicitly define macros that were implicitly defined by the compiler and remove unknown language extensions from your preprocessed code.

Changes in analysis options and binaries

Polyspace Bug Finder has new Target & Compiler options

Behavior change

Polyspace Bug Finder has new **Target & Compiler** configuration options `C standard version (-c-version)` and `C++ standard version (-cpp-version)`.

Use these options to specify the C and C++ language standards you follow in your source code.

-compiler option has new value renesas

Behavior change

`Compiler (-compiler)` option has new value `renesas`. When you specify this option value, the analysis can interpret macros that are implicitly defined by the Renesas compiler and compiler-specific language extensions such as keywords and pragmas.

Target & Compiler options Respect C90 standard (-no-language-extensions) and C++11 extensions (-cpp11-extension) are removed

Warns

Options **Respect C90 standard** (`-no-language-extensions`) and **C++11 extensions** (`-cpp11-extension`) are removed. Use options `C standard version (-c-version)` and `C++ standard version (-cpp-version)` instead.

In the Polyspace user interface, if an option is replaced by another option, the replacement occurs automatically in your configuration. To update your scripts, see this table.

Option	Use Instead
Respect C90 standard (`-no-language-extensions`)	Set the option `C standard version (-c-version)` to `c90`.
C++11 extensions (`-cpp11-extension`)	Set the option `C++ standard version (-cpp-version)` to `cpp11`.

You get a warning when you use the removed options at the command line.

polyspace-configure option -lang is removed

Warns

Starting in R2018b, `polyspace-configure` detects the language of your source code.

Option `-lang` will be removed in a future release. You get a warning when you use this option and there is no replacement. To update your code, remove instances of `-lang`.

-compiler option value clang3.5 is removed

Errors

`Compiler (-compiler)` option value `clang3.5` is removed. Use `clang3.x` instead.

In the Polyspace user interface, if an option value is replaced by another option value, the replacement occurs automatically in your configuration. To update your scripts, see this table.

Option	Use Instead
`-compiler clang3.5`	`-compiler clang3.x`

You get an error when you use the removed option at the command line.

Changes in MATLAB option object properties and option values

polyspace.Project.Configuration has new TargetCompiler properties
Behavior change

`polyspace.Project.Configuration` has new `TargetCompiler` properties `CVersion` and `CppVersion`. Use these properties in your MATLAB code to specify the C and C++ language standards you follow in your source code.

For more information, see `Properties`.

TargetCompiler property has a new Compiler option value renesas
Behavior change

`TargetCompiler` property has a new `Compiler` option value `renesas`. When you specify this option value, the analysis can interpret macros that are implicitly defined by the Renesas compiler and compiler-specific language extensions such as keywords and pragmas.

For more information, see `Properties`.

TargetCompiler properties NoLanguageExtensions and Cpp11Extension will be removed
Still runs

Properties `NoLanguageExtensions` and `Cpp11Extension` will be removed. Use `CVersion` and `CppVersion` instead.

To update your MATLAB code, see this table.

```
opts = polyspace.Project;
```

Property	Use Instead
`opts.Configuration.TargetCompiler...` `.NoLanguageExtensions = true;`	`opts.Configuration.TargetCompiler...` `.CVersion = 'c90';`
`opts.Configuration.TargetCompiler...` `.Cpp11Extension = true;`	`opts.Configuration.TargetCompiler...` `.CppVersion = 'cpp11';`

Unlike `NoLanguageExtensions` and `Cpp11Extension` which let you specify one version of the C and C++ language standards, the new object properties `CVersion` and `CppVersion` let you specify different versions of these standards.

For more information, see `Properties`.

polyspaceConfigure option -lang is removed
Warns

Starting in R2018b, `polyspaceConfigure` detects the language of your source code.

Option `-lang` will be removed in a future release. You get a warning when you use this option and there is no replacement. To update your code, remove instances of `-lang`.

Analysis Results

CERT C++ Support: Identify CERT C++ violations by using defect checkers and coding rules

Summary: In R2018b, you can look for violations of these CERT C++ rules and CERT C rules that apply to C++. For a list of all Polyspace results that correspond to CERT C++ violations, see CERT C ++ Coding Standard and Polyspace Results.

CERT C++ Rule	Description	Polyspace Checker
CON54-CPP	Wrap functions that can spuriously wake up in a loop	`Function that can spuriously wake up not wrapped in loop`
EXP57-CPP	Do not cast or delete pointers to incomplete classes	`Conversion or deletion of incomplete class pointer`
OOP58-CPP	Copy operations must not mutate the source object	`Copy operation modifying source operand`
CON37-C	Do not call signal() in a multithreaded program	`Signal call in multithreaded program`

CON40-C	Do not refer to an atomic variable twice in an expression	`Atomic load and store sequence not atomic`
		
		`Atomic variable accessed twice in an expression`

CON41-C	Wrap functions that can fail spuriously in a loop	`Function that can spuriously fail not wrapped in loop`
EXP46-C	Do not use a bitwise operator with a Boolean-like operand	`Possible invalid operation on boolean operand`
FIO32-C	Do not perform operations on devices that are only appropriate for files	`Inappropriate I/O operation on device files`
FLP36-C	Preserve precision when converting integral values to floating-point type	`Precision loss in integer to float conversion`
INT30-C	Ensure that unsigned integer operations do not wrap	`Unsigned integer constant overflow`
INT32-C	Ensure that operations on signed integers do not result in overflow	`Integer constant overflow`

CERT C++ Rule	Description	Polyspace Checker

INT35-C	Use correct integer precisions	`Integer precision exceeded`
		
		`Possible invalid operation on boolean operand`

PRE31-C	Avoid side effects in arguments to unsafe macros	`Side effect in arguments to unsafe macro`
STR37-C	Arguments to character-handling functions must be representable as an unsigned char	`Misuse of sign-extended character value`
STR38-C	Do not confuse narrow and wide character strings and functions	`Misuse of narrow or wide character string`

Improved CERT C Support: Check for precision loss, blocking operations, and other rules from the CERT C Coding Standard

Summary: In R2018b, you can look for violations of these CERT C rules (in addition to previously supported rules).

CERT C Rule	Description	Polyspace Checker
CON05-C	Do not perform operations that can block while holding a lock	`Blocking operation while holding lock`
CON30-C	Clean up thread-specific storage	`Thread-specific memory leak`
CON36-C	Wrap functions that can spuriously wake up in a loop	`Function that can spuriously wake up not wrapped in loop`
CON37-C	Do not call signal() in a multithreaded program	`Signal call in multithreaded program`

CON40-C	Do not refer to an atomic variable twice in an expression	`Atomic load and store sequence not atomic`
		
		`Atomic variable accessed twice in an expression`

CON41-C	Wrap functions that can fail spuriously in a loop	`Function that can spuriously fail not wrapped in loop`
DCL38-C	Use the correct syntax when declaring a flexible array member	`Incorrect syntax of flexible array member size`
EXP46-C	Do not use a bitwise operator with a Boolean-like operand	`Possible invalid operation on boolean operand`

CERT C Rule	Description	Polyspace Checker
FIO32-C	Do not perform operations on devices that are only appropriate for files	`Inappropriate I/O operation on device files`
FLP36-C	Preserve precision when converting integral values to floating-point type	`Precision loss from integer to float conversion`

INT35-C	Use correct integer precisions	`Integer precision exceeded`
		
		`Possible invalid operation on boolean operand`

POS44-C	Do not use signals to terminate threads	`Use of signal killing thread`
POS52-C	Do not perform operations that can block while holding a POSIX lock	`Blocking operation while holding lock`
PRE31-C	Avoid side effects in arguments to unsafe macros	`Side effect in arguments to unsafe macro`
STR37-C	Arguments to character-handling functions must be representable as an unsigned char	`Misuse of sign-extended character value`
STR38-C	Do not confuse narrow and wide character strings and functions	`Misuse of narrow or wide character string`

See also Mapping Between CERT C Rules and Polyspace Results.

Constant Overflows: Check for overflows on integer constants

Summary: In R2018b, you can check for instances where a compile-time constant is assigned to a variable whose data type cannot accommodate the value.

For instance, `c` is an 8-bit signed `char` variable that cannot hold the value 255.

```
signed char c = 255;
```

See `Integer constant overflow` and `Unsigned integer constant overflow`.

Benefits: Most compilers wrap around overflowing constants with a warning. However, if you want to check for these instances, you can enable the constant overflow checkers in Bug Finder.

Updated Bug Finder defect checkers

Summary: In R2018b, these defect checkers have been updated.

Defect	Description	Update
`Write without a further read`	A variable is never read after assignment	The checker now detects redundant write operations on *global variables*. For instance, you perform two write operations on a global variable without an intermediate read operation. The first write operation is redundant.
`Misuse of sign-extended character value`	Data type conversion with sign extension causes unexpected behavior.	The checker now detects use of sign-extended plain `char` variables as argument to a character-handling function.

For new Bug Finder checkers, see the release notes about CERT C and CERT C++ support.

Changes to coding rules checking

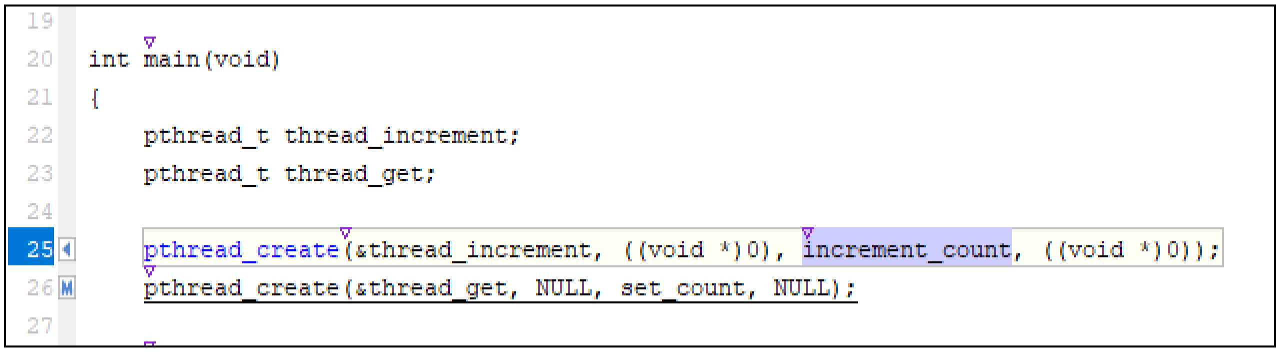
In R2018b, the following changes have been made in checking of previously supported MISRA C rules.

Rule	Description	Improvement
`MISRA C:2012 Rule 2.2`	There shall be no dead code.	The rule checker now flags redundant write operations on *global variables*. For instance, you perform two write operations on a global variable without an intermediate read operation. The first write operation is redundant.
`MISRA C:2012 Rule 10.3`	The value of an expression shall not be assigned to an object with a narrower essential type or of a different essential type category.	The checker now flags assignments to a boolean variable if the assigned value has a non-boolean essential type.
`MISRA C++:2008 Rule 5-0-15`	Array indexing shall be the only form of pointer arithmetic.	The checker does not flag array indexing on pointers that point to array variables.

Reviewing Results

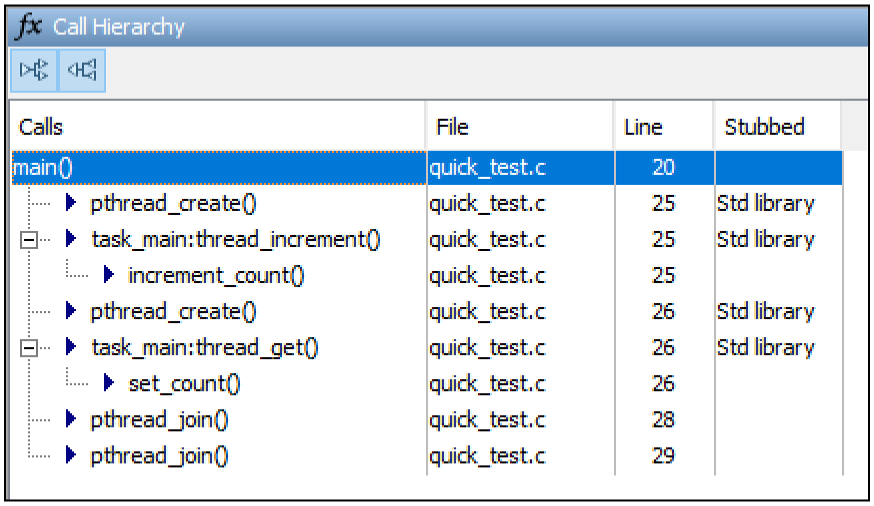
Function Call Hierarchy: View call tree of functions in source code

Summary: In R2018b, you can view information about the call tree of functions in your source code by opening the **Call Hierarchy** pane. To open this pane click the *fx* icon in the **Result Details** pane.



```
int main(void)
{
    pthread_t thread_increment;
    pthread_t thread_get;

    pthread_create(&thread_increment, ((void *)0), increment_count, ((void *)0));
    pthread_create(&thread_get, NULL, set_count, NULL);
```

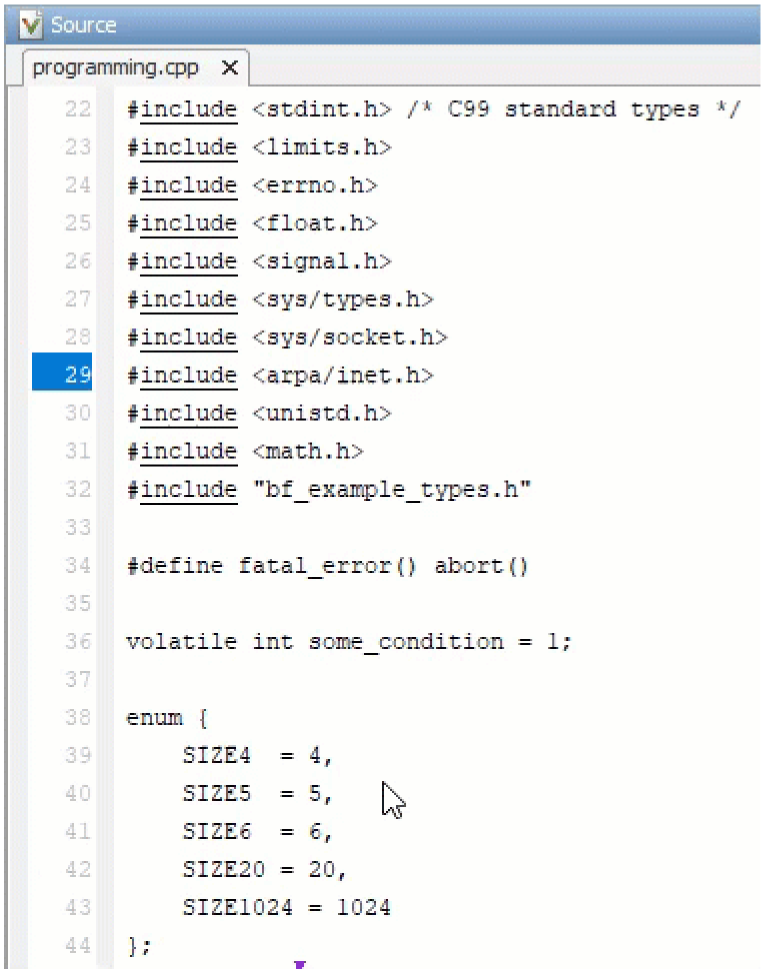


Calls	File	Line	Stubbed
main()	quick_test.c	20	
pthread_create()	quick_test.c	25	Std library
task_main:thread_increment()	quick_test.c	25	Std library
increment_count()	quick_test.c	25	
pthread_create()	quick_test.c	26	Std library
task_main:thread_get()	quick_test.c	26	Std library
set_count()	quick_test.c	26	
pthread_join()	quick_test.c	28	
pthread_join()	quick_test.c	29	

Benefits: For a function `foo` in your source code, you can see functions and tasks that call `foo` (callers), and those called by `foo` (callees).

Header Files Access: Open your project header files directly from the point of inclusion

Summary: In R2018b, you can open header files you reference in your code by right-clicking on the include directive in the **Source** pane.



```
#include <stdint.h> /* C99 standard types */
#include <limits.h>
#include <errno.h>
#include <float.h>
#include <signal.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <arpa/inet.h>
#include <unistd.h>
#include <math.h>
#include "bf_example_types.h"

#define fatal_error() abort()

volatile int some_condition = 1;

enum {
    SIZE4  = 4,
    SIZE5  = 5,
    SIZE6  = 6,
    SIZE20 = 20,
    SIZE1024 = 1024
};
```

If Polyspace determines that the header file is available, the `#include`, `#import`, or `#include_next` preprocessor directive is underlined in the source code.

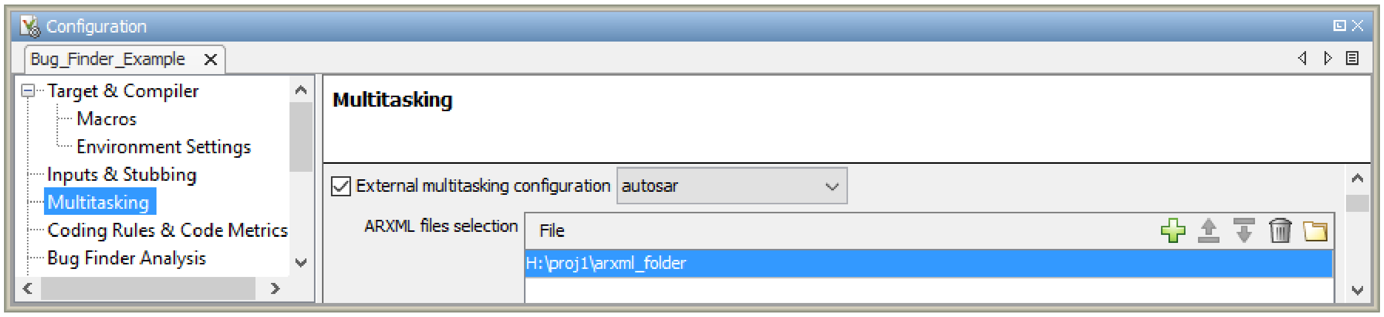
Benefits: When you review results, you can quickly see the contents of a header file without leaving the Polyspace user interface.

R2018a

Analysis Setup

AUTOSAR Support: Set up Polyspace multitasking configuration automatically from an AUTOSAR description

Summary: In R2018a, Polyspace can parse your AUTOSAR specifications (`.arxml` files) to determine your multitasking configuration.



External multitasking configuration: ✓ autosar

ARXML files selection: H:\proj1\arxml_folder

This feature supports AUTOSAR XML schema for releases 4.0 and later.

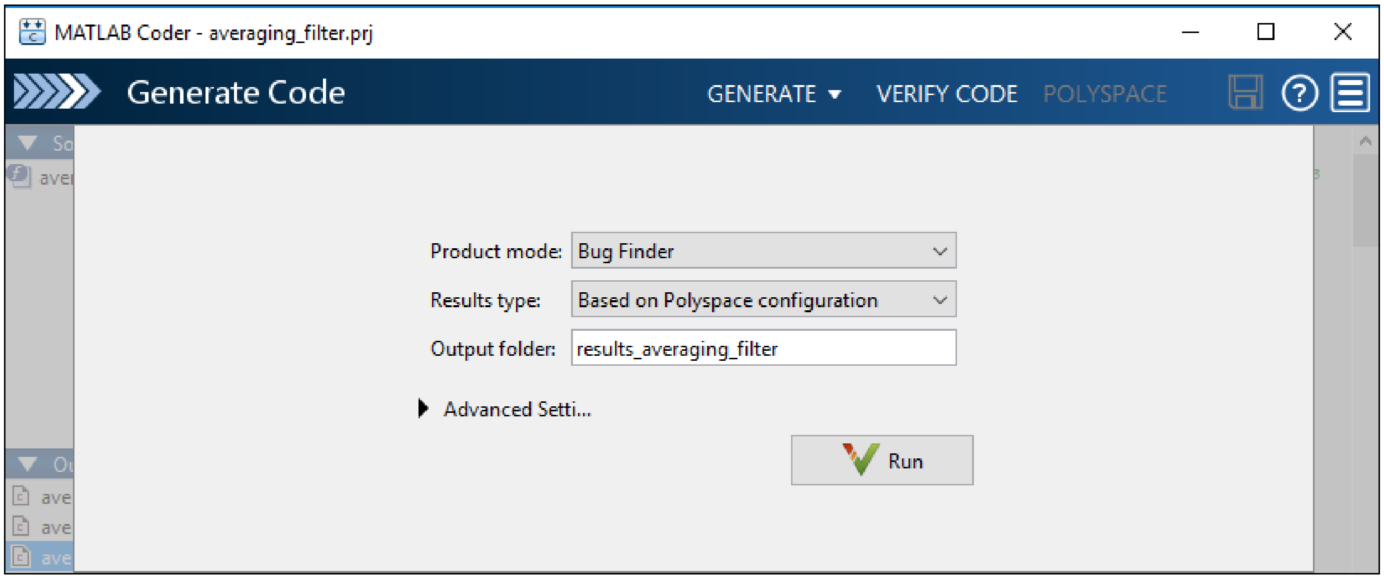
For more information, see `ARXML files selection (-autosar-multitasking)`.

Benefits:

- *Automatic configuration*: You do not need to specify your multitasking configuration manually. Polyspace can determine the tasks, interrupts and critical sections from your AUTOSAR specifications (specifically, the `ECUC-CONTAINER-VALUE` element).
- *Minimal knowledge required for setup*: You do not need to know the details of the AUTOSAR specifications for configuring a Polyspace analysis. You simply provide the folder containing your `.arxml` files.

MATLAB Coder Support: Run Polyspace on C/C++ code generated from MATLAB code without additional setup

Summary: In R2018a, if you install Embedded Coder and Polyspace, you can run Polyspace directly on C/C++ code generated from MATLAB code and check for defects (Bug Finder) or run time errors (Code Prover).


MATLAB Coder - averaging_filter.prj

Product mode: Bug Finder

Results type: Based on Polyspace configuration

Output folder: results_averaging_filter

For details, see:

- Run Polyspace on C/C++ Code Generated from MATLAB Code
- Configure Advanced Polyspace Options in MATLAB Coder App

Benefits:

- *Seamless integration*: You do not have to configure the Polyspace analysis manually, in the Polyspace user interface or otherwise. The Polyspace analysis is seamlessly integrated with the workflow in the MATLAB Coder™ App.
- *Easier scripting*: You do not have to know or specify names of files generated from your MATLAB code. You can simply use a specific folder for code generation output and provide that folder for code analysis. This way, you can have end-to-end scripting for the code generation and analysis.

Compiler Support: Set up Polyspace analysis easily for code compiled with Texas Instruments, IAR or CodeWarrior compilers

Summary: If you build your source code using these compilers, in R2018a, you can specify the compiler name for your Polyspace analysis:

- Texas Instruments™

  You can specify these target processors: `c28x`, `c6000`, `arm` and `msp430`.

  See Texas Instruments Compiler (`-compiler ti`) .
- IAR

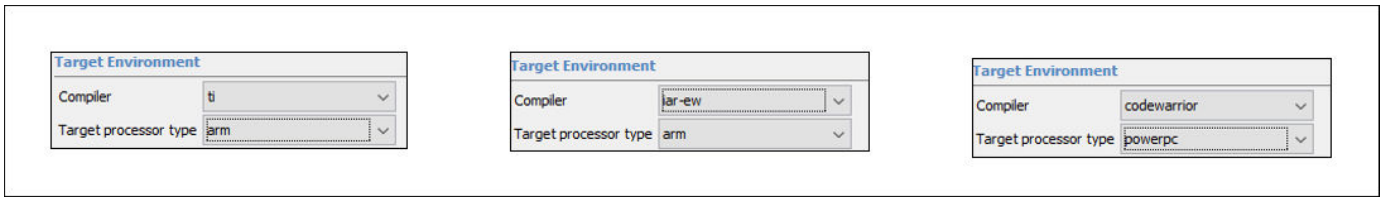
  You can specify these target processors: `arm`, `avr`, `msp430`, `rh850` and `rl78`.

  See IAR Embedded Workbench Compiler (`-compiler iar-ew`).
- CodeWarrior

  You can specify these target processors: `s12z` or `powerpc`.

See NXP CodeWarrior Compiler (`-compiler codewarrior`).

The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.



Compiler	ti
Target processor type	arm

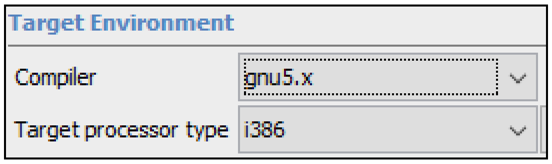
Compiler	iar-ew
Target processor type	arm

Compiler	codewarrior
Target processor type	powerpc

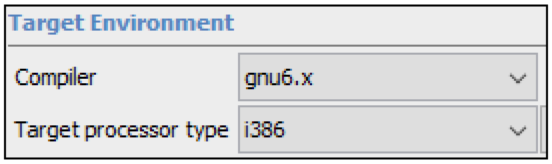
Benefits: You can now set up a Polyspace project without knowing the internal workings of these compilers. If your code compiles with your compiler, it will compile with Polyspace in most cases without requiring additional setup. Previously, you had to explicitly define macros that were implicitly defined by the compiler and remove unknown language extensions from your preprocessed code.

Updated GCC and Clang Compiler Support: Set up Polyspace analysis easily for code compiled with GCC versions 5.x or 6.x, or Clang version 3.x compilers

Summary: In R2018a, if you build your source code using these versions of GCC or Clang compilers, you can specify the following compiler option values to setup your Polyspace analysis:

- 

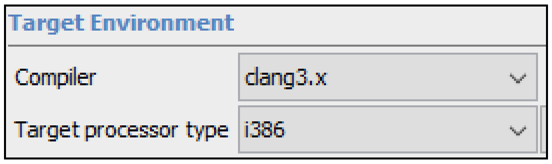
Compiler	gnu5.x
Target processor type	i386

  `gnu5.x`, for GCC release 5.1, 5.2, 5.3, and 5.4.
- 

Compiler	gnu6.x
Target processor type	i386

  `gnu6.x`, for GCC release 6.1, 6.2, and 6.3.

Starting GCC version 5, the version number increases by one for each major release, for instance,.from 5.x to 6.x. Polyspace follows this new naming convention.

- 

Compiler	clang3.x
Target processor type	i386

  `clang3.x`, for LLVM release 3.5, 3.6, 3.7, 3.8, and 3.9.

The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.

For more information, see `Compiler (-compiler)`.

Configuration from Build System: Include or exclude sources when generating Polyspace project using polyspace-configure

Summary: In R2018a, you can include or exclude source files or folders when generating a Polyspace project from your build system.

To create a Polyspace project that does not contain all files from your build system:

1. Trace your build command. Do not create a project yet. Optionally store the build trace and cache in specific locations (instead of the default).

   ```
   polyspace-configure -no-project make -B \
     -build-trace trace.txt -cache-path /tmp/cache
   ```
2. Create a Polyspace project using the build trace and cache. Include or exclude files as needed using shell GLOB patterns.

   ```
   polyspace-configure -no-build \
     -build-trace trace.txt -cache-path /tmp/cache \
     -include-sources 'src/' -exclude-sources '*_test.c'
   ```

   The preceding example includes sources in folder paths containing `src` and excludes `.c` files ending with `_test`.
3. Delete the build trace and cache.

For more information, see polyspace-configure.

Benefits:

- *Exclusion of irrelevant files*: You can avoid cluttering your Polyspace project with files that you do not want to analyze, for instance, files used for testing.
- *Modular analysis*: You can create a separate Polyspace project for each module covered by your build system. Trace your build command once. When creating a Polyspace project, include only files belonging to a specific module. Repeat the project creation step for each module.

Support for IBM Rational Rhapsody to be removed

The Polyspace integration with the IBM® Rational Rhapsody environment will be removed after R2018b.

Compatibility Considerations

To continue using the latest releases of Polyspace, run code analysis in the Polyspace user interface or using scripts.

Changes in analysis options and binaries

Polyspace Bug Finder has a new Multitasking option
Behavior change

Polyspace Bug Finder has a new **Multitasking** configuration option `ARXML files selection (-autosar-multitasking)`.

Use this option to automatically detect the multitasking configuration from your AUTOSAR specification.

Polyspace Bug Finder has new -compiler option values
Behavior change

Use the new `Compiler (-compiler)` option values to interpret macros that are implicitly defined by the compilers and compiler-specific language extensions such as keywords and pragmas..

Option	New Value
`Compiler (-compiler)`	• New value `ti` added. See Compiler Support release note. • New value `iar-ew` added. See Compiler Support release note. Use this value to emulate IAR compilers. For older Polyspace projects, you can still use option value `iar`. • New value `codewarrior` added. See Compiler Support release note. • New value `gnu5.x` added. See Updated GCC and Clang Compiler Support release note. • New value `gnu6.x` added. See Updated GCC and Clang Compiler Support release note. • New value `clang3.x` added. See Updated GCC and Clang Compiler Support release note.

-compiler option value clang3.5 is removed
Warns

`Compiler (-compiler)` option value `clang3.5` is removed. Use `clang3.x` instead.

In the Polyspace user interface, if an option value is replaced by another option value, the replacement occurs automatically in your configuration. To update your scripts, see this table.

Option	Use Instead
`-compiler clang3.5`	`-compiler clang3.x`

You get a warning when you use the removed option value at the command line.

-compiler option values iso, none, gnu, and visual through visual10 are removed
Errors

`Compiler (-compiler)` option values `iso`, `none`, `gnu`, `visual`, `visual6`, `visual7.0`, `visual7.1`, `visual8`, and `visual10` are removed.

In the Polyspace user interface, if an option value is replaced by another option value, the replacement occurs automatically in your configuration. To update your scripts, see this table.

Option	Use Instead

`-compiler iso`
 	
`-compiler none`
	`-compiler generic`

`-compiler gnu`	`-compiler gnu3.4`

`-compiler visual`
 	
`-compiler visual6`
 	
`-compiler visual7.0`
 	
`-compiler visual7.1`
 	
`-compiler visual8`
 	
`-compiler visual10`
	`-compiler visual10.0`

You get a error when you use the removed options at the command line.

Target&Compiler options Set wchar_t to unsigned long (-wchar-t-is-unsigned-long) and Set size_t to unsigned long (-size-t-is-unsigned-long) are removed
Errors

Option **Set wchar_t to unsigned long** `(-wchar-t-is-unsigned-long)` is removed. Set Management of wchar_t (`-wchar-t-type-is`) to `unsigned-long` instead.

Option **Set size_t to unsigned long** `(-size-t-is-unsigned-long)` is removed. Set Management of size_t (`-size-t-type-is`) to `unsigned-long` instead.

In the Polyspace user interface, if an option is replaced by another option, the replacement occurs automatically in your configuration. To update your scripts, replace each instance of the removed option with the corresponding new option.

You get an error when you use the removed options at the command line.

-enum-type-definition option value defined-by-standard is removed
Errors

Enum type definition (`-enum-type-definition`) option value `defined-by-standard` is removed. Use `defined-by-compiler` instead.

In the Polyspace user interface, if an option value is replaced by another option value, the replacement occurs automatically in your configuration. To update your scripts, see this table.

Option	Use Instead
`-enum-type-definition defined-by-standard`	`-enum-type-definition defined-by-compiler`

You get an error when you use the removed option value at the command line.

Changes in MATLAB option object properties

polyspace.Project.Configuration has new Multitasking properties

Behavior change

`polyspace.Project.Configuration` has new `Multitasking` properties `EnableExternalMultitasking`, `ExternalMultitaskingType`, and `ArxmlMultitasking`. Use these properties to set up the multitasking configuration of your project from external files you provide.

For more information, see `Properties`.

TargetCompiler property has a new Compiler option values

Behavior change

Use the new `Compiler` option values to interpret macros that are implicitly defined by the compilers and compiler-specific language extensions such as keywords and pragmas.

```
opts=polyspace.Project;
```

Property	Description
`opts.Configuration...` `.TargetCompiler.Compiler`	• New value `ti` added. See Compiler Support release note. • New value `iar-ew` added. See Compiler Support release note. Use this value to emulate IAR compilers. For older Polyspace projects, you can still use property value `iar`. • New value `codewarrior` added. See Compiler Support release note. • New value `gnu5.x` added. See Updated GCC and Clang Compiler Support release note. • New value `gnu6.x` added. See Updated GCC and Clang Compiler Support release note. • New value `clang3.x` added. See Updated GCC and Clang Compiler Support release note.

For more information, see `Properties`.

Multitasking property EnableOsekMultitasking is removed

Errors

Property `EnableOsekMultitasking` is removed. To update your MATLAB code, see this table.

```
opts=polyspace.Project;
```

Property	Description
`opts.Configuration.Multitasking...` `.EnableOsekMultitasking`	`opts.Configuration.Multitasking...` `.EnableExternalMultitasking=1;` `opts.Configuration.Multitasking...` `.ExternalMultitaskingType='osek';`

If you use the removed property, you get an error.

For more information, see `Properties`.

TargetCompiler properties WcharTIsUnsignedLong and SizeTIsUnsignedLong are removed

Errors

Properties `WcharTIsUnsignedLong` and `SizeTIsUnsignedLong` are removed. To update your MATLAB code, see this table.

```
opts=polyspace.Project;
```

Property	Description
`opts.Configuration.TargetCompiler...` `.WcharTIsUnsignedLong`	`opts.Configuration.TargetCompiler...` `.WcharTTypeIs="unsigned-long"`

Property	Description

`opts.Configuration.TargetCompiler...`
`.SizeTIsUnsignedLong`
	`opts.Configuration.TargetCompiler...`
	`.SizeTTypeIs="unsigned-long"`

If you use the removed property, you get an error.

For more information, see `Properties`.

EnumTypeDefinition option value defined-by-dialect is removed
Errors

`EnumTypeDefinition` option value `defined-by-dialect` is removed. To update your MATLAB code, see this table.

```
opts=polyspace.Project;
```

Property	Description

`opts.Configuration.TargetCompiler...`
`.EnumTypeDefinition="defined-by-dialect"`
	`opts.Configuration.TargetCompiler...`
	`.EnumTypeDefinition="defined-by-compiler"`

If you use the removed property, you get an error.

For more information, see `Properties`.

Analysis Results

CERT C Support: Check for information leakage, invalid environment pointers, and other rules from the CERT C Coding Standard

Summary: In R2018a, you can look for violations of these CERT C rules (in addition to previously supported rules).

CERT C Rule	Description	Polyspace Checker
DCL39-C	Avoid information leakage when passing a structure across a trust boundary	`Information leak via structure padding`
ENV31-C	Do not rely on an environment pointer after following an operation that may invalidate it	`Environment pointer invalidated by previous operation`
ERR32-C	Do not rely on indeterminate values of errno	`Misuse of errno in a signal handler`
EXP35-C	Do not modify objects with temporary lifetime	`Accessing object with temporary lifetime`
EXP44-C	Do not rely on side effects in operands to sizeof, _Alignof, or _Generic	`Side effect of expression ignored`

EXP47-C	Do not call va_arg with argument of the incorrect type	`Incorrect data type passed to va_arg`
		
		`Too many va_arg calls for current argument list`

FIO41-C	Do not call getc(), putc(), getwc(), or putwc() with a stream argument that has side effects	`Stream argument with possibly unintended side effects`
FLP37-C	Do not use object representations to compare floating-point values	`Memory comparison of float-point values`
MSC38-C	Do not treat a predefined identifier as an object if it might only be implemented as a macro	`Predefined macro used as object`
MSC40-C	Do not violate constraints	`Inline constraint not respected`
PRE30-C	Do not create a universal character name through concatenation	`Universal character name from token concatenation`
PRE32-C	Do not use preprocessor directives in invocations of function-like macros	`Preprocessor directive in macro argument`

See also Mapping Between CERT C Rules and Polyspace Results.

Cryptography Checkers: Check for security vulnerabilities such as incorrect use of public key cryptography routines

Summary: In R2018a, using Bug Finder defects, you can identify incorrect use of public key cryptography routines from the OpenSSL library.

The software detects the following issues with your use of cryptography routines.

Public key cryptography

Defect	Issue Detected
`Context initialized incorrectly for cryptographic operation`	Context used for cryptography operation is initialized for a different operation. For instance, you mix up encryption and decryption.
`Incorrect key for cryptographic algorithm`	Cryptography operation is not supported by the algorithm used in context initialization. For instance, you use the DSA algorithm for encryption.
`Missing data for encryption, decryption or signing operation`	Data provided for cryptography operation is NULL or data length is zero.
`Missing parameters for key generation`	Context used for key generation is associated with NULL parameters or not associated with parameters at all.
`Missing peer key`	Context used for shared secret derivation is associated with a NULL peer key or not associated with a peer key at all.
`Missing private key`	Context used for cryptography operation is associated with a NULL private key or not associated with a private key at all.
`Missing public key`	Context used for cryptography operation is associated with a NULL public key or not associated with a public key at all.
`Nonsecure parameters for key generation`	Context used for key generation is associated with weak parameters, for instance, insufficient parameter length.

RSA algorithm specific

Defect	Issue Detected
`Incompatible padding for RSA algorithm operation`	Cryptography operation is not supported by the padding type set in context.
`Missing blinding for RSA algorithm`	Context used in decryption or signature verification is not blinded against timing attacks.
`Missing padding for RSA algorithm`	Context used in encryption or signing operation is not associated with any padding.

Defect	Issue Detected
`Nonsecure RSA public exponent`	Context used in key generation is associated with a low exponent value.
`Weak padding for RSA algorithm`	Context used in encryption or signing operation is associated with an insecure padding type.

Hash functions

Defect	Issue Detected
`Context initialized incorrectly for digest operation`	Context used for digest operation is initialized for a different digest operation. For instance, you mix up signing and signature verification.
`Nonsecure hash algorithm`	Context used for message digest creation is associated with a weak algorithm.

SSL/TLS connections

Defect	Issue Detected
`Nonsecure SSL/TLS protocol`	Context used for handling SSL/TLS connections is not associated with a weak protocol.

MISRA C++ Support: Check for overriding of standard library functions, missing const qualifiers, and other MISRA C++ rules

Summary: In R2018a, you can look for violations of these MISRA C++ rules (in addition to previously supported rules).

Rule	Description
0-1-3	A project shall not contain unused variables.
0-1-5	A project shall not contain unused type declarations.
4-10-1	NULL shall not be used as an integer value.
4-10-2	Literal zero (0) shall not be used as the null-pointer constant.
7-1-1	A variable which is not modified shall be const qualified.
7-1-2	A pointer or reference parameter in a function shall be declared as pointer to const or reference to const if the corresponding object is not modified.
9-3-3	If a member function cannot be made static then it shall be made static, otherwise if it can be made const then it shall be made const.
15-5-3	The terminate() function shall not be called implicitly.

Rule	Description
17-0-3	The names of standard library functions shall not be overridden.

See also MISRA C++ Coding Rules.

MISRA C:2012 Directive 4.8: Detect opportunities for data hiding

Summary: In R2018a, you can look for violations of MISRA C:2012 Directive 4.8. The directive states that if a pointer to a structure is never dereferenced in a translation unit, the implementation of the structure must be hidden in that unit.

See `MISRA C:2012 Directive 4.8`.

Benefits: Using this checker, you can find opportunities for defining opaque data types that hide the implementation of a structure.

Rule for Source Line Length: Constrain number of characters per line in your code

Summary: In R2018a, you can define a limit for number of characters per line in your code and use Polyspace to check for lines that fall outside that limit.

Use custom rule 20.1 and specify the character limit as the rule pattern. See Group 20: Style.

Improved Fast Analysis: Find some multi-file MISRA C violations in fast analysis

Summary: In R2018a, if you run fast analysis, the analysis also looks for these MISRA C violations that involve checking multiple files:

- MISRA C: 2004: Rules 8.8 and 8.9.
- MISRA C: 2012: Rules `8.5` and `8.6`.

For more information, see `Use fast analysis mode for Bug Finder`.

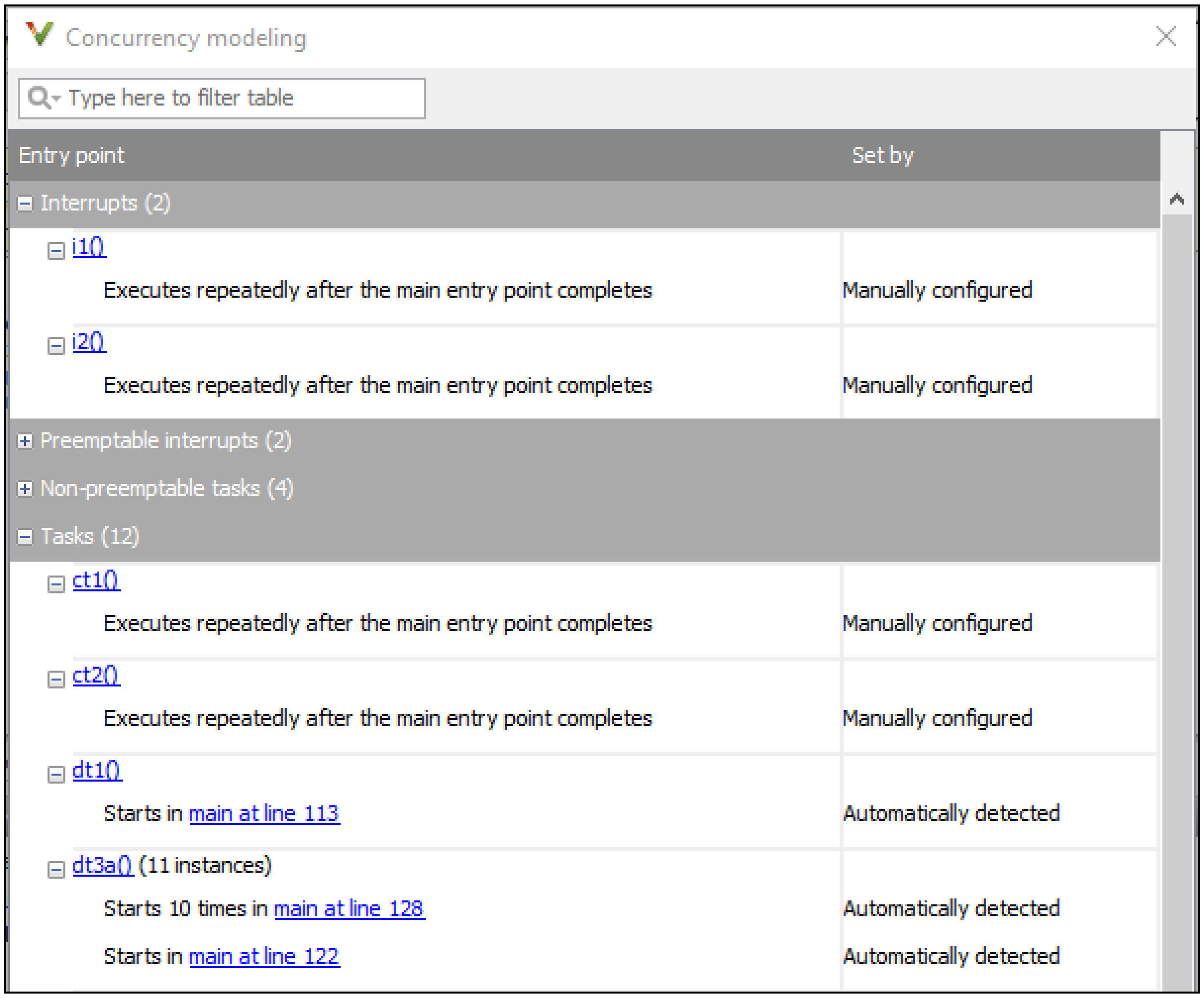
Benefits: You detect more violations in the fast analysis mode. Previously, fast analysis looked only for defects and coding rule violations that involved single files or functions.

Reviewing Results

Concurrency Modeling: View all tasks and interrupts extracted from code and Polyspace configuration in one view

Summary: In R2018a, you can see the tasks and interrupts extracted from your code and configuration in one view.

After analysis, click the **Concurrency modeling** link on the **Dashboard**.



Entry point	Set by
Interrupts (2)	
i1()	
Executes repeatedly after the main entry point completes	Manually configured
i2()	
Executes repeatedly after the main entry point completes	Manually configured
Preemptable interrupts (2)	
Non-preemptable tasks (4)	
Tasks (12)	
ct1()	
Executes repeatedly after the main entry point completes	Manually configured
ct2()	
Executes repeatedly after the main entry point completes	Manually configured
dt1()	
Starts in main at line 113	Automatically detected
dt3a() (11 instances)	
Starts 10 times in main at line 128	Automatically detected
Starts in main at line 122	Automatically detected

Benefits:

- *Easy spot-check for concurrency modelling*: You can verify if Polyspace correctly detected your multitasking configuration from your code. For instance, if you know a priori that a specific function acts as an interrupt, you can spot-check whether Polyspace considers the function as an interrupt.
- *Determination of priorities*: The entry points in this view are grouped in the order of priorities: interrupts, preemptable interrupts, non-preemptable tasks, (preemptable) tasks. To understand

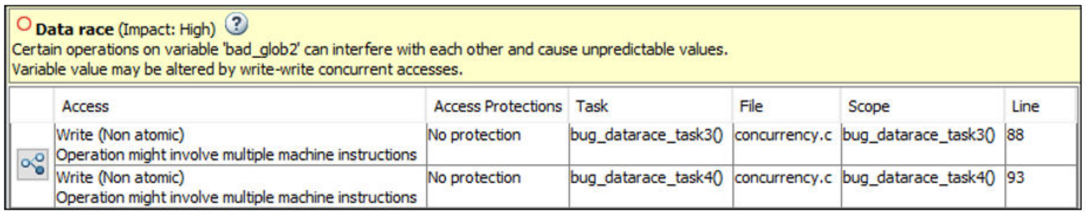
why a data race does not occur between two entry points (Bug Finder), you can check if one of the entry points has lower priority than the other. See Data race.

This information is also included in reports you generate from the analysis results.

Data Races: Distinguish write-write conflicts from more benign read-write conflicts

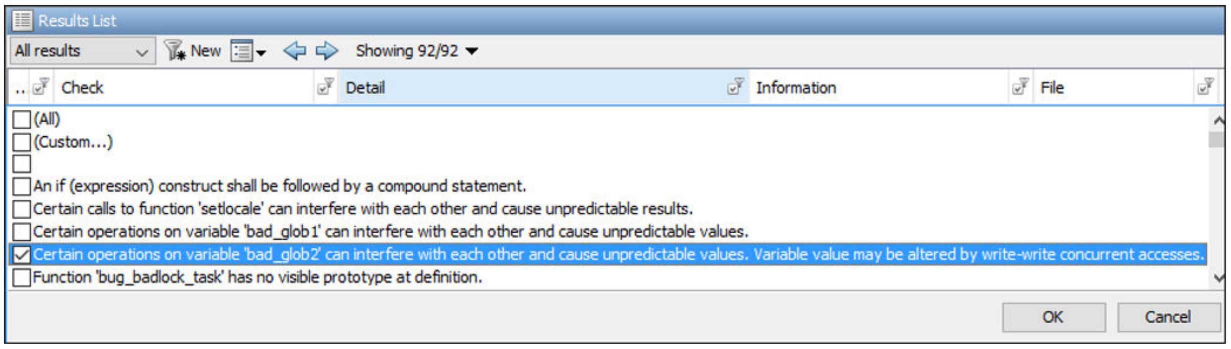
Summary: In R2018a, you can choose to review only data races that come from conflicts between two write operations.

The result details message for these data races have an additional line: `Variable value may be altered by write-write concurrent access`. Use the **Detail** column filters on the **Results List** pane to show only the data races that have this additional line.



Data race (Impact: High)
Certain operations on variable 'bad_glob2' can interfere with each other and cause unpredictable values.
Variable value may be altered by write-write concurrent accesses.

	Access	Access Protections	Task	File	Scope	Line
	Write (Non atomic) Operation might involve multiple machine instructions	No protection	bug_datarace_task3()	concurrency.c	bug_datarace_task3()	88
	Write (Non atomic) Operation might involve multiple machine instructions	No protection	bug_datarace_task4()	concurrency.c	bug_datarace_task4()	93



- [ ] (All)
- [ ] (Custom...)
- [ ]
- [ ] An if (expression) construct shall be followed by a compound statement.
- [ ] Certain calls to function 'setlocale' can interfere with each other and cause unpredictable results.
- [ ] Certain operations on variable 'bad_glob1' can interfere with each other and cause unpredictable values.
- [✓] Certain operations on variable 'bad_glob2' can interfere with each other and cause unpredictable values. Variable value may be altered by write-write concurrent accesses.
- [ ] Function 'bug_badlock_task' has no visible prototype at definition.

See also `Data race`.

Benefits: Conflicts between two write operations in different threads can lead to corruption of memory and indeterminate results. You can now distinguish these conflicts from more benign conflicts between a write and read operation.

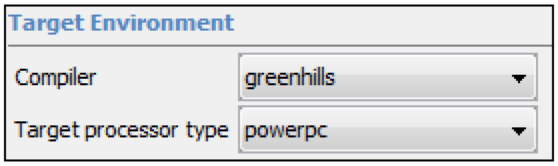
R2017b

Analysis Setup

Green Hills Compiler Support: Set up Polyspace analysis easily for code compiled with Green Hills MULTI Compiler

Summary: If you build your source code with the Green Hills® MULTI compiler, in R2017b, you can specify the compiler name for your Polyspace analysis. The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.

You can specify these target processors directly: `arm64`, `arm`, `i386`, `x86_64`, `powerpc`, `powerpc64`, `rh850` or `tricore`. See Green Hills Compiler (`-compiler greenhills`).

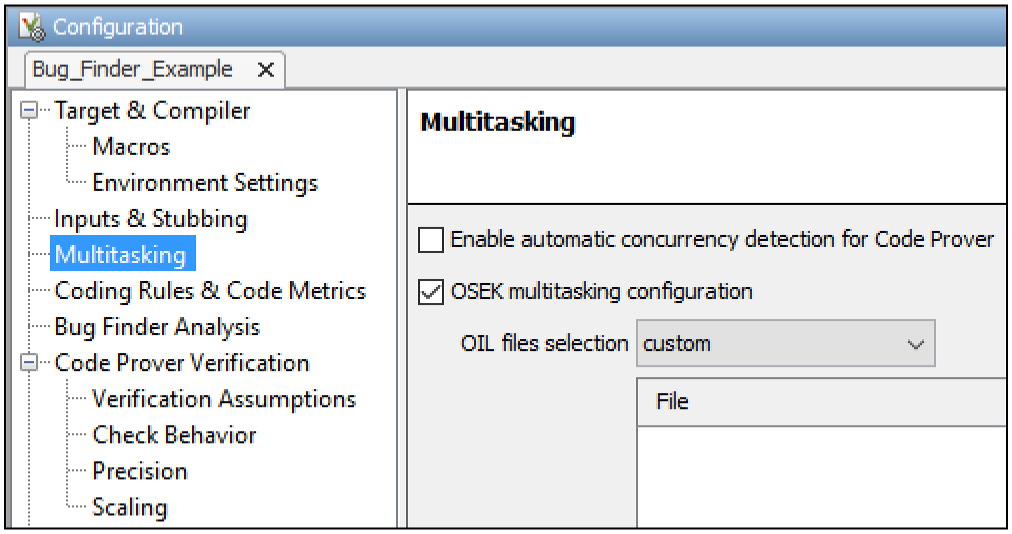

Target Environment

Compiler	greenhills
Target processor type	powerpc

Benefits: You can now set up a Polyspace project without knowing the internal workings of your MULTI compiler. If your code compiles with your compiler, it will compile with Polyspace in most cases without requiring additional setup. Previously, you had to explicitly define macros that were implicitly defined by the compiler and remove unknown language extensions from your preprocessed code.

OSEK Multitasking Support: Detect the multitasking configuration for your OSEK application automatically

Summary: In R2017b, you can provide an OIL file that Polyspace parses to detect the multitasking configuration for your OSEK application. Polyspace can interpret the OIL file definitions to set up your concurrency model.



☐ Enable automatic concurrency detection for Code Prover

☑ OSEK multitasking configuration

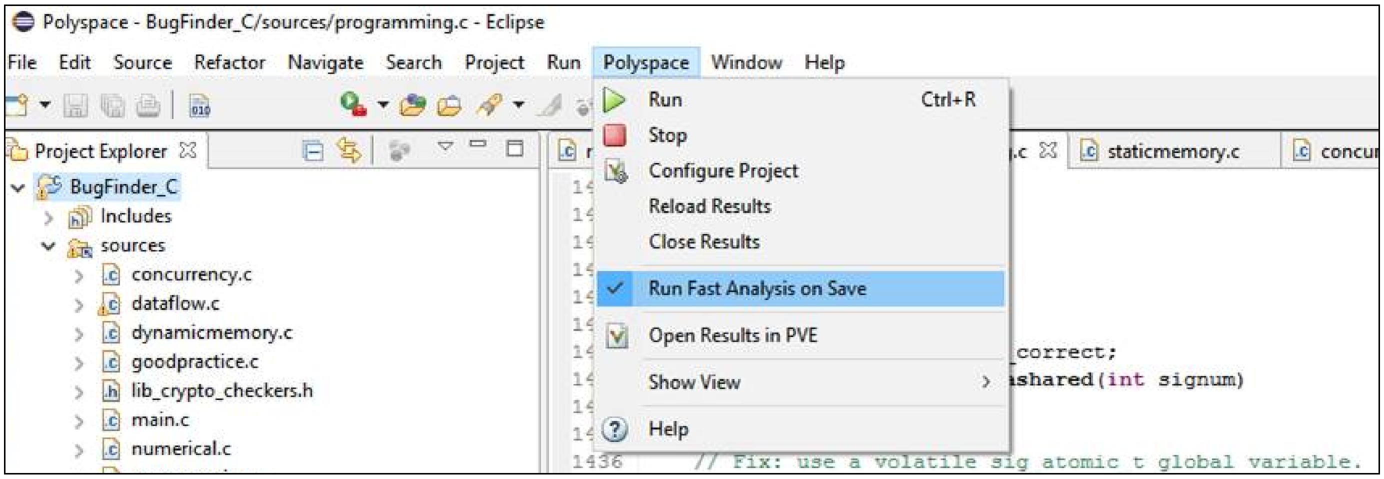
OIL files selection: custom

For more information, see `OSEK multitasking configuration (-osek-multitasking)`.

Benefits: You no longer need to configure multitasking manually to analyze your OSEK application. Polyspace detects the tasks, interrupts, and critical sections of your model.

Incremental Analysis in Eclipse: Detect bugs as you type and save code in your Eclipse IDE

Summary: In R2017b, if you install the Polyspace plugin in your Eclipse IDE, the analysis runs each time you save your code.



Benefits: You do not have to launch the Polyspace analysis explicitly. You can detect bugs during coding.

Additional Considerations

- *What types of bugs does the analysis look for?*

  The analysis looks for the defects that can be quickly detected. You get the same results as if you had specified the option Use fast analysis mode for Bug Finder (`-fast-analysis`).

  If you want to look for other kinds of defects, specify the defect checkers in your configuration and launch the analysis explicitly. See Run Polyspace Analysis in Eclipse.
- *Can I disable the automatic analysis?*

  You can enable or disable the automatic analysis. Select or clear **Polyspace > Run Fast Analysis on Save**.

Polyspace API in MATLAB: Configure analysis, run analysis, and read analysis results with a single MATLAB object

Summary: In R2017b, you can use a single MATLAB object for the entire Polyspace analysis. The analysis has two subobjects, one for configuring analysis and another for reading results.

```
obj = polyspace.Project

% Configure analysis
obj.Configuration.Sources = {fullfile(matlabroot, 'polyspace', 'examples',...
    'cxx', 'Bug_Finder_Example', 'sources', 'numerical.c')};
obj.Configuration.TargetCompiler.Compiler = 'gnu4.9';
obj.Configuration.ResultsDir = fullfile(pwd,'results');

% Run analysis
bfStatus = obj.run('bugFinder');

% Read results
bfSummary = obj.Results.getSummary();
```

For more information, see `polyspace.Project`.

Benefits: You need fewer variables for the Polyspace analysis. You can also use the same object for reading both Bug Finder and Code Prover results.

Additional Considerations

Are the pre-R2017b ways of scripting a Polyspace analysis still supported?

The objects `polyspace.Options`, `polyspace.BugFinderResults` and `polyspace.CodeProverResults` are still supported. For easier scripting, it is recommended that you make these replacements:

- To configure analysis, instead of the `polyspace.Options` object, use the `Configuration` subobject of the `polyspace.Project` object.

  For instance, instead of:

  ```
  opts = polyspace.Options

  opts.ResultsDir = fullfile(pwd,'results');
  ```

  Use:

  ```
  obj = polyspace.Project

  obj.Configuration.ResultsDir = fullfile(pwd,'results');
  ```
- To read results, instead of the `polyspace.BugFinderResults` and `polyspace.CodeProverResults` objects, use the `Results` subobject of the `polyspace.Project` object.

  For instance, instead of:

  ```
  resultsFolder = fullfile(pwd,'results');

  opts = polyspace.Options;
  opts.Sources = {fullfile(matlabroot, 'polyspace', 'examples',...
      'cxx', 'Bug_Finder_Example', 'sources', 'numerical.c')};
  opts.ResultsDir = resultsFolder;

  polyspaceBugFinder(opts);

  resObj = polyspace.BugFinderResults(resultsFolder);
  resSummary = resObj.getSummary();
  ```

  Use:

```
resultsFolder = fullfile(pwd,'results');

obj = polyspace.Project;
obj.Configuration.Sources = {fullfile(matlabroot, 'polyspace', 'examples',...
    'cxx', 'Bug_Finder_Example', 'sources', 'numerical.c')};
obj.Configuration.ResultsDir = resultsFolder;

bfStatus = obj.run('bugFinder');

resSummary = obj.Results.getSummary ();
```

Compiler-Specific Keywords: Nonstandard compiler-specific keywords are only supported when you specify compiler

Summary: In R2017b, compiler-specific keywords are enabled only when you specify a supporting compiler. For instance, `far` is a keyword for certain compilers but not a keyword for others.

Benefits: When configuring your Polyspace project, it is sufficient to specify your compiler. Previously, certain keywords were disabled irrespective of your compiler choice. If your compiler supported those keywords, you had to explicitly enable them.

Compatibility Considerations

In existing projects that use the compiler option `none` (now `generic`), you can see compilation errors. Previously, certain nonstandard keywords such as `data` were removed during preprocessing because they were not relevant for the analysis. This syntax did not cause compilation errors.

```
data int tab[10];
```

Now, the nonstandard keywords are recognized based only on your choice of compiler. If you use a generic compiler, the analysis does not recognize the nonstandard keywords as keywords and does not remove them during preprocessing. For instance, the preceding syntax causes compilation errors. For workarounds, see Errors Related to Generic Compiler.

POSIX and BSD Standards: Use functions from these standards without additional setup

Summary: In R2017b, you can run analysis on code containing POSIX or BSD-specific functions without additional setup, for instance, defining macros such as `_POSIX_SOURCE`. As an example, you can analyze code that uses functions from `unistd.h` out of the box. You do not have to specify the location of `unistd.h` or perform additional configuration.

Benefits: You can quickly run analysis on code that uses functions specific to POSIX or BSD. If you do not provide the headers, Polyspace uses its own implementation of the functions for analysis.

Changes in analysis options and binaries

In R2017b, the following options have been added, changed, or removed.

New Options

Option	Description
`OSEK multitasking configuration (-osek-multitasking)`	See OSEK Multitasking Support release note.
`-xml-annotations-description`	See Code Annotations release note.
Compiler options: • Management of size_t (`-size-t-type-is`) • Management of wchar_t (`-wchar-t-type-is`)	Replaces previous options related to `size_t` and `wchar_t`.

Updated Options

Option	Change
Compiler (`-compiler`)	• Option value `none` changed to `generic`. • New value `greenhills` added. See Green Hills Compiler Support. • Option value `iso` removed. Use `generic` instead. • Option values `visual`, `visual6`, `visual7.0`, `visual7.1`, `visual8` and `visual10` removed. Use `visual10.0` instead. • Option value `gnu` removed. Use `gnu3.4` instead.
Target processor type (`-target`)	Target `powerpc64` added for Diab compiler. See Diab Compiler (`-compiler diab`).
Options related to packing of data structures: • Ignore pragma pack directives (`-ignore-pragma-pack`) • Pack alignment value (`-pack-alignment-value`)	Available for all compilers.
Enum type definition (`-enum-type-definition`)	Option value `defined-by-standard` changed to `defined-by-compiler`.
Invalid use of floating point operation	You can detect a comparison to `0.0` when you add the option `-detect-bad-float-op-on-zero`. The defect is renamed in the user interface to : `Floating point comparison with equality operators`. The command-line parameter is still `BAD_FLOAT_OP`.

Option	Change
`-asm-begin` and `-asm-end`	Available for all compilers.

Removed Options

Option	Status	More Information
Management of 'for loop' index scope (`-for-loop-index-scope`)	Warning	Your choice of compilers determines the specification of `for` loop index variables. If you specify an older version of the Microsoft Visual C++ compiler such as `visual6`, `visual7.0` or `visual7.1`, the analysis considers that a `for` loop index is visible outside the loop. Otherwise, the analysis considers that the index is visible only inside the `for` loop.
Set size_t to unsigned long (`-size-t-is-unsigned-long`)	Warning	Use the option Management of size_t (`-size-t-type-is`).
`-wchar-t-is-unsigned-long` and `-wchar-t-is`	Warning `-wchar-t-is` has been removed from the user interface only.	Management of size_t (`-size-t-type-is`)Use the option Management of wchar_t (`-wchar-t-type-is`).
`-static-headers-object`	Warning	The permissive linking introduced by `-static-headers-object` now happens by default. The option is not required.

Compatibility Considerations

If you use scripts that contain the removed or updated options, update your scripts accordingly. In the Polyspace user interface, if an option is replaced by another option, the replacement occurs automatically in your configuration.

Analysis Results

Security Standards Support: Detect violations of all secure coding guidelines from ISO/IEC Technical Specification 17961:2013 and more guidelines from SEI CERT C Coding Standard

Summary: In R2017b, you can check your code against all the guidelines from the ISO/IEC TS 17961:2013 Standard, including guidelines for signal handlers and file manipulations. Polyspace Bug Finder also covers additional CERT C coding defects.

Signal Handler Defect Checkers

Defect	Issue Detected
`Shared data access within signal handler`	You use a signal handler to access a shared object that is neither of type `volatile sig_atomic_t` nor a lock-free atomic object.
`Signal call from within signal handler`	You call `signal()` from within an interruptible signal handler.
`Return from computational exception signal handler`	Your signal handler returns normally after a computational exception signal `SIGFPE`, `SIGILL`, or `SIGSEGV`.
`Function called from signal handler not asynchronous-safe`	You use a signal handler to call a function that is not asynchronous-safe per the POSIX standard.
`Function called from signal handler not asynchronous-safe (strict)`	You use a signal handler to call a function that is not asynchronous-safe per the C standard.

File and I/O manipulation Defect Checkers

Defect	Issue Detected
`Misuse of a FILE object`	You dereference a pointer to a FILE object or manipulate the object through its pointer.
`File descriptor exposure to child process`	You use the same file descriptor in multiple processes.
`Invalid file position`	You call `fsetpos()` with a file position that was not returned from `fgetpos()`.
`Alternating input and output from a stream without flush or positioning call`	You perform alternating read and write operations on a stream without a flush or positioning call.
`Use of indeterminate string`	You do not reset the output buffer of `fgets()` or `fwgets()` when they fail.

Memory and Pointer Manipulation Defect Checkers

Defect	Issue Detected
`Alignment changed after memory reallocation`	You change the memory allocation of an object to a less strict alignment.
`Mismatched alloc/dealloc functions on Windows`	In Windows, you deallocate memory with a function that does not match the allocation function.
`Subtraction or comparison between pointers to different arrays`	You subtract or compare pointers to different arrays, or null pointers.

Other Defect checkers

Defect	Issue Detected
`Missing byte reordering when transfering data`	You transfer data without matching the endianness of the host and network.
`Unsafe call to a system function`	You call `system()`, `popen()`, `_popen()`, or `_wopen()`.
`Use of automatic variable as putenv-family function argument`	You use an automatic duration variable as the argument of a `putenv`-family function.
`Misuse of structure with flexible array member`	You do not allocate and copy a structure with a flexible array member dynamically.
`Call through non-prototyped function pointer`	You declare a pointer to a function with unspecified parameters.

MISRA C:2012 Directive 1.1: Detect instances of implementation-specific behavior in your code

Summary: In R2017b, you can detect possible violations of MISRA C:2012 Directive 1.1. The directive requires that you understand and document any implementation-defined behavior that affects the program output. See MISRA C:2012 Dir 1.1.

Benefits: The analysis detects constructs that can have implementation-defined behavior. If you have such constructs in your code, you can find how your compiler implements them. Once you understand and document all implementation-defined behavior, you can be assured that all output of your program is intentional and not produced by chance.

Changes to coding rule checking

Updated Specifications

In R2017b, the following changes have been made in checking of previously supported MISRA C and MISRA C ++ rules.

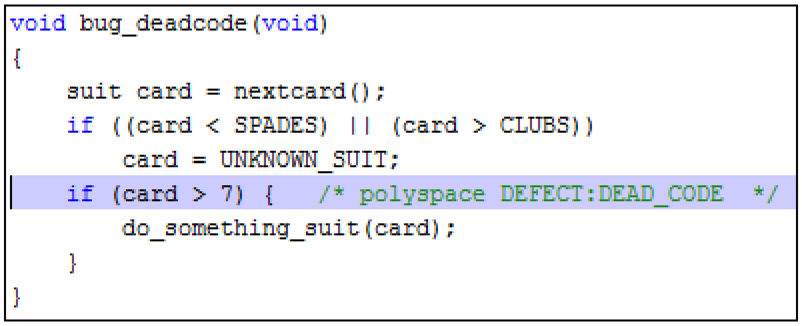
Rule	Description	Improvement
MISRA C: 2004 Rule 17.4 and MISRAC++ Rule 5-0-15	Array indexing shall be the only allowed form of pointer arithmetic.	The rule checker flags array indexing on nonarray pointers. Previously, the checker flagged only explicit pointer arithmetic on pointers.
MISRA C: 2012 Rule 18.2 and MISRA C++ 5-0-17	Subtraction between pointers shall only be applied to pointers that address elements of the same array.	The rule checker flags more complex cases, such as a subtraction between a pointer to a local array and a pointer to a function argument. These additional results correspond to defects flagged by the checker `Subtraction or comparison between pointers to different arrays`.

MISRA C:2004 Rule 8.9, MISRA C:2012 Rule 8.6 and MISRA C++ Rule 3-2-4	An identifier with external linkage shall have exactly one external definition.	The rule checkers flag multiple definitions only if the definitions occur in different files. The checkers do not consider tentative definitions as definitions.
		
		For instance, this code does not violate the rule:
		
		`int val;`
		`int val=1;`

Reviewing Results

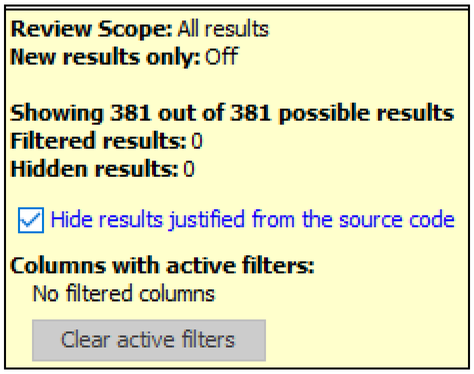
Result Review Workflow: Hide results that you reviewed once and justified through source code annotations

Summary: In R2017b, if you justify a result through source code annotations, subsequent analyses do not redisplay the result. The results do not appear in your results list or source code.



```
void bug_deadcode(void)
{
    suit card = nextcard();
    if ((card < SPADES) || (card > CLUBS))
        card = UNKNOWN_SUIT;
    if (card > 7) {    /* polyspace DEFECT:DEAD_CODE  */
        do_something_suit(card);
    }
}
```

If you want to revisit those justified results, you can make them visible in one-click.



Review Scope: All results
New results only: Off

Showing 381 out of 381 possible results
Filtered results: 0
Hidden results: 0

☑ Hide results justified from the source code

Columns with active filters:
No filtered columns

Benefits: When you decide not to fix a finding, you can justify it through source code annotations. That finding does not clutter your subsequent analysis results.

Suppose the analysis flags an error-handling statement as dead code. You do not want to remove the statement because future code can trigger the error and make the error-handling necessary. You can justify the dead code and choose not to see it again.

Additional Considerations

- *How can I use source code annotations to justify a result?*

  You can directly type source code annotations in the correct format. See Annotate and Hide Known or Acceptable Results.

  Alternatively, you can copy annotations from information in the user interface.

  - In Eclipse, right-click the result to insert a justification directly in the source code.

- In Eclipse and the Polyspace user interface, assign one of the statuses `Justified`, `No action planned`, or `Not a defect` to a result. Right-click the result to copy your justification and paste it in a source code editor. See Annotate and Hide Known or Acceptable Results.

- *Will the hidden results still appear in the report?*

  The hidden results still appear in the report. The results are hidden from view to save review effort. The reports are meant for complete documentation of your results. You cannot hide analysis results from the reports.

Code Annotations: Justify results or define your own format with a new annotation format

Summary: In R2017b, you can justify your results with the new Polyspace annotation syntax, or by using your own custom format. Polyspace also interprets existing code annotations that use a different syntax.

Benefits:

- *Easier results review:* With the new annotation format, you can provide a justification for multiple types of results on the same line. Previously, you had to enter the justification for different types of results, such as defects and coding rules violations, on different lines.
- *Custom annotation format:* You can use an XML file to define any annotation format and map it to the Polyspace syntax. When you analyze your code, Polyspace can interpret the annotations regardless of the format.

Additional Considerations:

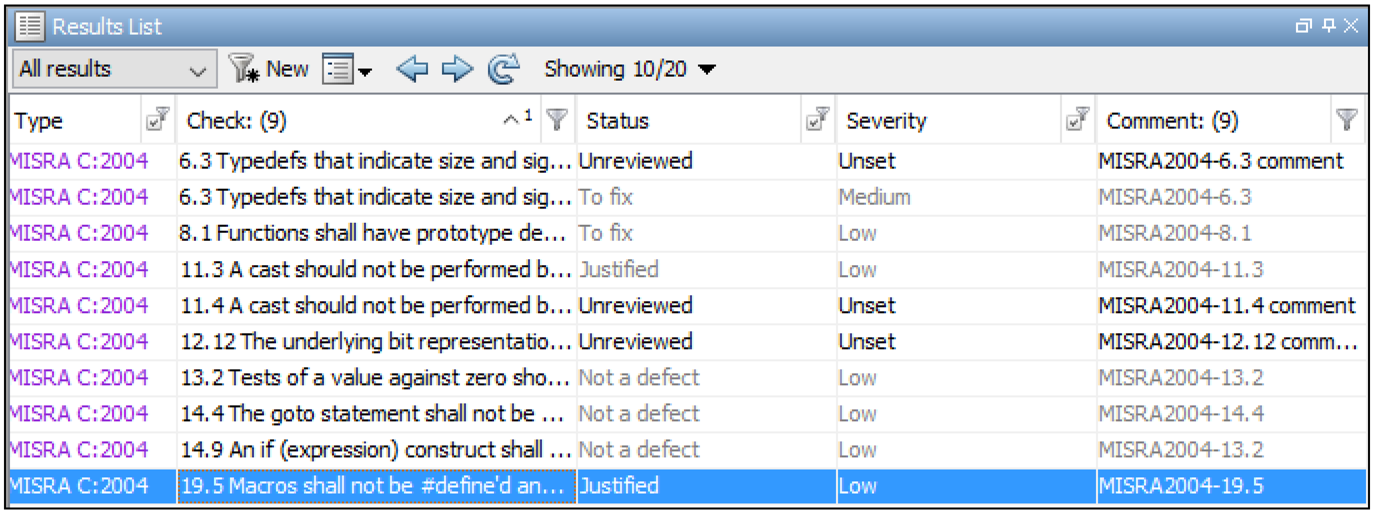
If you use the new annotation format and place your annotation on the line above the result you annotate, the annotation is ignored.

To apply the annotation to the line of code below, add `+1` after the `polyspace` keyword.

Polyspace still supports annotations that use the old syntax.

MISRA Comments and Code Annotations: Import your existing MISRA C:2004 justifications to MISRA C:2012 results

Summary: In R2017b, when you check your code against MISRA C:2012 rules, Polyspace imports existing justifications for MISRA C: 2004 violations.

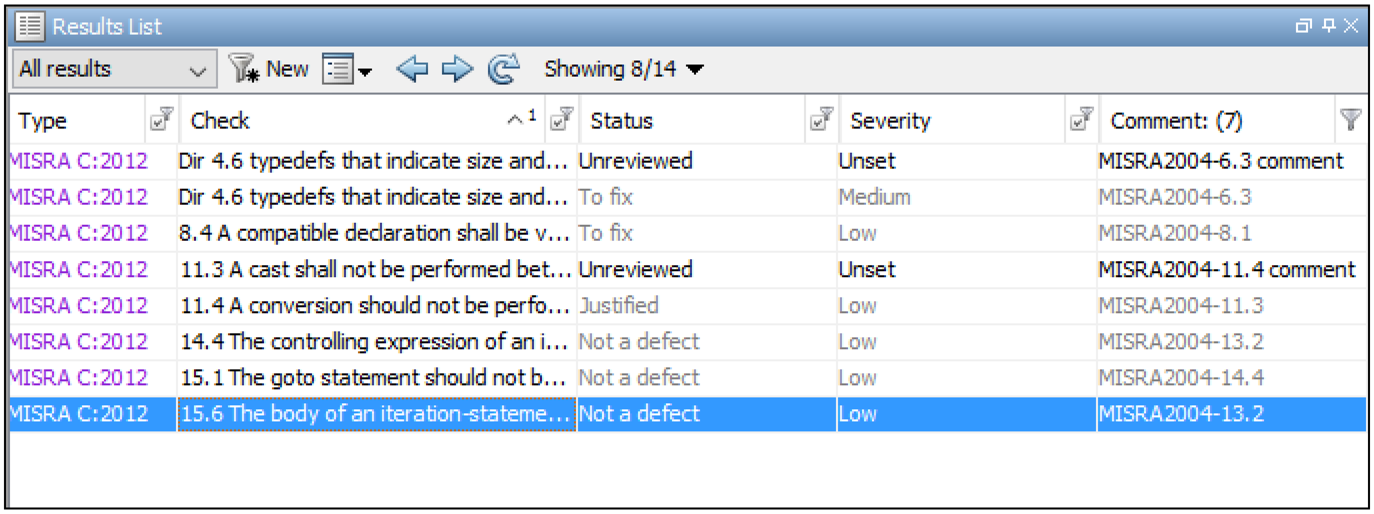


Results List

All results | New | Showing 10/20

Type	Check: (9)	Status	Severity	Comment: (9)
MISRA C:2004	6.3 Typedefs that indicate size and sig…	Unreviewed	Unset	MISRA2004-6.3 comment
MISRA C:2004	6.3 Typedefs that indicate size and sig…	To fix	Medium	MISRA2004-6.3
MISRA C:2004	8.1 Functions shall have prototype de…	To fix	Low	MISRA2004-8.1
MISRA C:2004	11.3 A cast should not be performed b…	Justified	Low	MISRA2004-11.3
MISRA C:2004	11.4 A cast should not be performed b…	Unreviewed	Unset	MISRA2004-11.4 comment
MISRA C:2004	12.12 The underlying bit representatio…	Unreviewed	Unset	MISRA2004-12.12 comm…
MISRA C:2004	13.2 Tests of a value against zero sho…	Not a defect	Low	MISRA2004-13.2
MISRA C:2004	14.4 The goto statement shall not be …	Not a defect	Low	MISRA2004-14.4
MISRA C:2004	14.9 An if (expression) construct shall …	Not a defect	Low	MISRA2004-13.2
MISRA C:2004	19.5 Macros shall not be #define'd an…	Justified	Low	MISRA2004-19.5

The analysis maps these justifications to the corresponding MISRA C: 2012 rules, if they exist.



Results List

All results | New | Showing 8/14

Type	Check	Status	Severity	Comment: (7)
MISRA C:2012	Dir 4.6 typedefs that indicate size and…	Unreviewed	Unset	MISRA2004-6.3 comment
MISRA C:2012	Dir 4.6 typedefs that indicate size and…	To fix	Medium	MISRA2004-6.3
MISRA C:2012	8.4 A compatible declaration shall be v…	To fix	Low	MISRA2004-8.1
MISRA C:2012	11.3 A cast shall not be performed bet…	Unreviewed	Unset	MISRA2004-11.4 comment
MISRA C:2012	11.4 A conversion should not be perfo…	Justified	Low	MISRA2004-11.3
MISRA C:2012	14.4 The controlling expression of an i…	Not a defect	Low	MISRA2004-13.2
MISRA C:2012	15.1 The goto statement should not b…	Not a defect	Low	MISRA2004-14.4
MISRA C:2012	15.6 The body of an iteration-stateme…	Not a defect	Low	MISRA2004-13.2

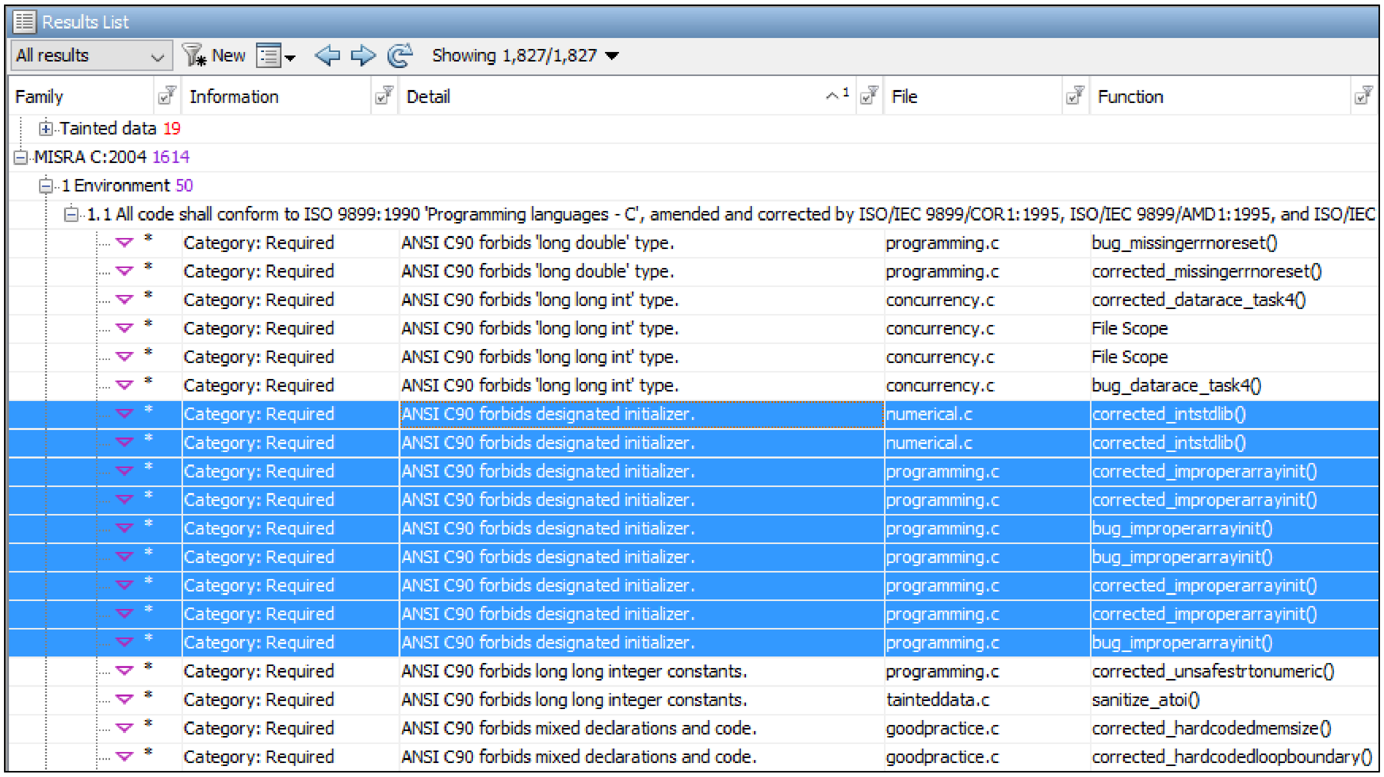
For more information, see Import Existing MISRA C: 2004 Justifications to MISRA C: 2012 Results.

Benefits: You can transition from MISRA C:2004 to MISRA C:2012 compliance. If you have already justified a coding rule violation for MISRA C: 2004, you do not need to review the same result for the corresponding MISRA C:2012 rule.

Results Review Workflow: Sort and filter results by subtype

Summary: In R2017b, you can group your results by subtype through the new **Detail** column in the **Results list** pane. This column shows the first line from the **Results Details** pane, which has additional information about a result.

For instance, multiple issues can trigger the same coding rule violation. The **Detail** column shows the specific issue that triggered the rule violation.



Results List

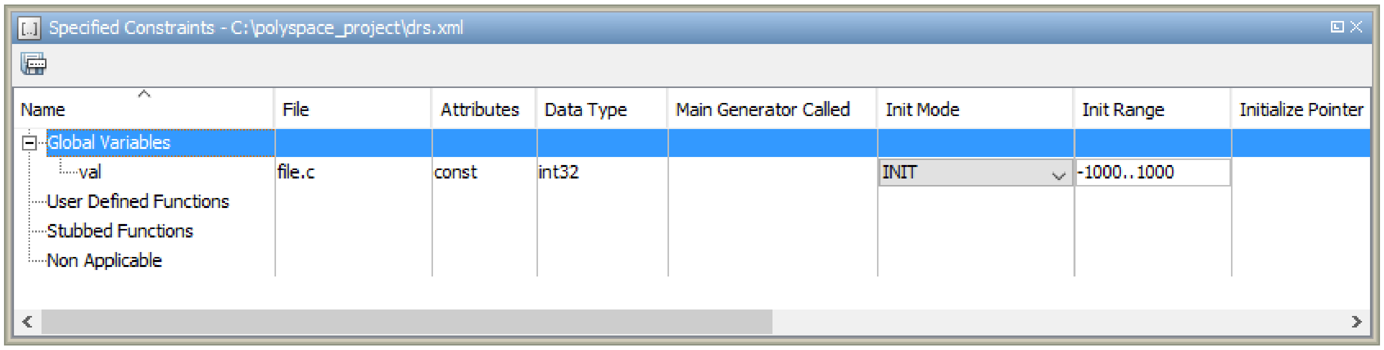
All results | New | Showing 1,827/1,827

Family	Information	Detail	File	Function
Tainted data 19				
MISRA C:2004 1614				
1 Environment 50				
1.1 All code shall conform to ISO 9899:1990 'Programming languages - C', amended and corrected by ISO/IEC 9899/COR1:1995, ISO/IEC 9899/AMD1:1995, and ISO/IEC				
*	Category: Required	ANSI C90 forbids 'long double' type.	programming.c	bug_missingerrnoreset()
*	Category: Required	ANSI C90 forbids 'long double' type.	programming.c	corrected_missingerrnoreset()
*	Category: Required	ANSI C90 forbids 'long long int' type.	concurrency.c	corrected_datarace_task4()
*	Category: Required	ANSI C90 forbids 'long long int' type.	concurrency.c	File Scope
*	Category: Required	ANSI C90 forbids 'long long int' type.	concurrency.c	File Scope
*	Category: Required	ANSI C90 forbids 'long long int' type.	concurrency.c	bug_datarace_task4()
*	Category: Required	ANSI C90 forbids designated initializer.	numerical.c	corrected_intstdlib()
*	Category: Required	ANSI C90 forbids designated initializer.	numerical.c	corrected_intstdlib()
*	Category: Required	ANSI C90 forbids designated initializer.	programming.c	corrected_improperarrayinit()
*	Category: Required	ANSI C90 forbids designated initializer.	programming.c	corrected_improperarrayinit()
*	Category: Required	ANSI C90 forbids designated initializer.	programming.c	bug_improperarrayinit()
*	Category: Required	ANSI C90 forbids designated initializer.	programming.c	bug_improperarrayinit()
*	Category: Required	ANSI C90 forbids designated initializer.	programming.c	corrected_improperarrayinit()
*	Category: Required	ANSI C90 forbids designated initializer.	programming.c	corrected_improperarrayinit()
*	Category: Required	ANSI C90 forbids designated initializer.	programming.c	bug_improperarrayinit()
*	Category: Required	ANSI C90 forbids long long integer constants.	programming.c	corrected_unsafestrtonumeric()
*	Category: Required	ANSI C90 forbids long long integer constants.	tainteddata.c	sanitize_atoi()
*	Category: Required	ANSI C90 forbids mixed declarations and code.	goodpractice.c	corrected_hardcodedmemsize()
*	Category: Required	ANSI C90 forbids mixed declarations and code.	goodpractice.c	corrected_hardcodedloopboundary()

Benefits: You can easily group edit statuses or comments for results of the same subtype. In the **Results List** pane, group results by family, then within a result family use the **Detail** column to sort and select a subset.

Constraint Specification: Navigate easily to the constraint specification interface for Bug Finder results

Summary: In R2017b, you can open the Specified Constraints window when viewing Bug Finder results. In this window, you can specify external constraints on global variables in your code.



Specified Constraints - C:\polyspace_project\drs.xml

Name	File	Attributes	Data Type	Main Generator Called	Init Mode	Init Range	Initialize Pointer
Global Variables							
val	file.c	const	int32		INIT	-1000..1000	
User Defined Functions							
Stubbed Functions							
Non Applicable							

To see the Specified Constraints window, with the Bug Finder results open, select **Window** > **Show/Hide View** > **Specified Constraints**.

Benefits: If a global variable has a fixed value assigned in your code:

```
const int var = 1;
```

but you want to analyze the code for multiple values of the variable, you can override the assignment by using external constraints. For instance, if you see **Dead code** defects in your results from the fixed value of a variable, you can navigate to the Specified Constraints window and specify a range for the variable.

Result Status: Assign statuses that directly correspond to stages of development workflow

Summary: In R2017b, you can assign these statuses to a result. Each status corresponds to a stage in your code analysis workflow.

- `Unreviewed` (default status)
- `To investigate`
- `To fix`
- `Justified`
- `No action planned`
- `Not a defect`
- `Other`

Benefits: You can follow your review progress more easily.

Additional Considerations

- *How can I use the statuses to follow my review progress?*

  You can follow your progress in the Polyspace user interface or the Polyspace Metrics web interface.

  - Polyspace user interface: You can filter all results that have a certain status.
  - Polyspace Metrics: You can see the percentage of results reviewed and justified. If you assign a status other than `Unreviewed` to a result, the software considers the result as reviewed. If you assign one of these statuses, the software considers the result as justified: `Justified`, `No action planned`, or `Not a defect`.
- *Can I create my own status?*

  You can still create custom statuses. Select **Tools** > **Preferences** and create your own statuses on the **Review Statuses** tab.

Compatibility Considerations

If you open results from a previous release, the statuses are updated to the new release. The updates are:

- `Fix` or `Investigate` → `To fix` or `To investigate`
- `Improve` → `To fix`
- `Undecided` → `Unreviewed`.

If you open results from a previous release, the severity `Not a defect` is updated to `Unset`.

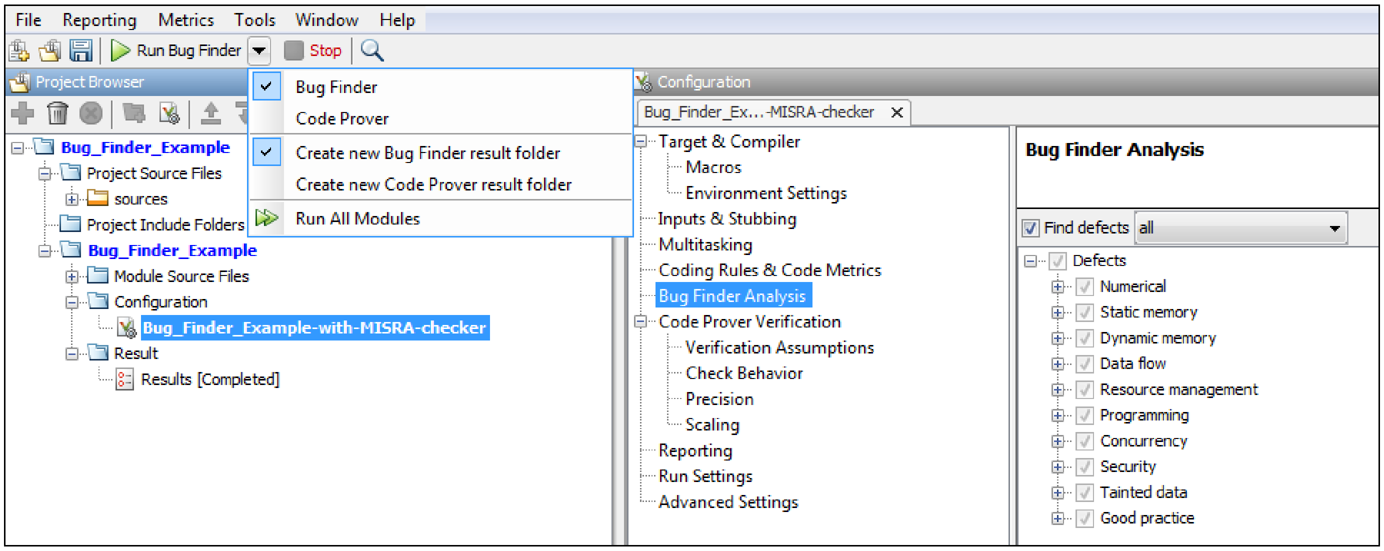
If your source code annotations use statuses from a previous release, the software reads your annotations using the updates. The software does not change the annotations themselves.

R2017a

Analysis Setup

Unified User Interface: Create and maintain a single Polyspace project for Bug Finder and Code Prover analysis

Summary: In R2017a, you can run Bug Finder and Code Prover analysis on the same Polyspace project in the same user interface.



Benefits:

- *Single entry point for two products*: You launch the Polyspace user interface only once from one icon on your desktop.
- *Easier switching between products*: After you run a Bug Finder analysis, you can switch to the more rigorous Code Prover analysis in one click.
- *One project, one configuration*: Add source files and specify your analysis options only once. After you set up your project, you can switch between the products without having to reconfigure.

Additional Considerations:

- *What if I only want to run a Bug Finder analysis?*

  You have to set the options that apply to a Bug Finder analysis. Most options are common between Bug Finder and Code Prover. So, you still have the benefit that most of your options will be set if you ever switch to Code Prover.

  The options specific to Bug Finder appear in the **Bug Finder Analysis** node, and the ones specific to Code Prover in the **Code Prover Verification** node and the nodes underneath.
- *If I run analysis in the two products, will the two sets of results appear together?*

  Yes, but not in the same view. The two sets of results appear under the same project, both in the user interface and in the physical folder locations.

  - In the user interface, in the **Project Browser**, the Bug Finder results appear with the icon and the Code Prover results appear with the icon.

- In your file explorer, you find the result folders for both analysis under one project folder.

  However, after you run the two analyses, you have to open the two sets of analysis results separately to review them. In the user interface, double-click one of the two result icons to open the results corresponding to that product.

- *Besides analysis options, are there other changes from pre-R2017a that I should be aware of?*

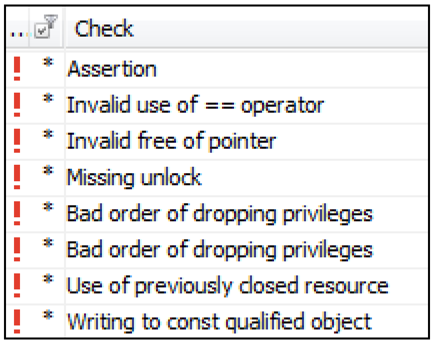
  If you were previously using only one of the two products, you will now notice the following differences.

  Bug Finder User:

  - You can now create multiple modules in your Polyspace project to analyze separate components of your source code.

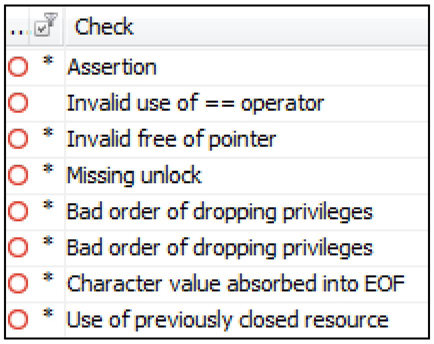
    When you create a project and add your source files, they are automatically added to the first module. If you add source files later, you have to select them and using the right-click option **Copy to Module_*n***, copy them to the module that you want.
  - You can now choose to create a new result folder for a second analysis on the same module. Use the option **Create new Bug Finder result folder** from the **Run** button dropdown. Prior to R2017a, there was one result folder for Bug Finder. If you ran a second analysis, it overwrote the previous results. Note that the overwriting is still *the default behavior*.
  - A new icon is used to denote defects.

    Before R2017a:



...		Check
!	*	Assertion
!	*	Invalid use of == operator
!	*	Invalid free of pointer
!	*	Missing unlock
!	*	Bad order of dropping privileges
!	*	Bad order of dropping privileges
!	*	Use of previously closed resource
!	*	Writing to const qualified object

    R2017a:



...		Check
○	*	Assertion
○		Invalid use of == operator
○	*	Invalid free of pointer
○	*	Missing unlock
○	*	Bad order of dropping privileges
○	*	Bad order of dropping privileges
○	*	Character value absorbed into EOF
○	*	Use of previously closed resource

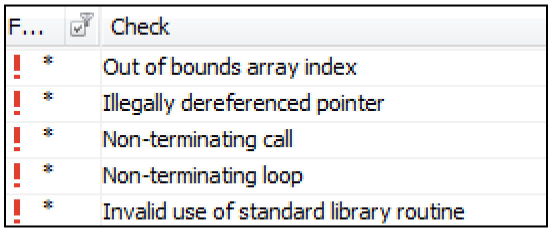
  Code Prover User:

- If you run a second analysis on the same module, by default, it overwrites the previous results. Prior to R2017a, a new result folder was created by default every time you ran an analysis.

  You can change this default behavior and create a new result folder for the second analysis. Use the option **Create new Code Prover result folder** from the **Run** button dropdown.
- If some of your files do not compile, the analysis continues with the remaining files. If a file with compilation errors contains a function definition, the analysis considers the function as undefined and uses a function stub instead. You can see which files did not compile on the **Output Summary** pane and also in the report generated from the verification results.

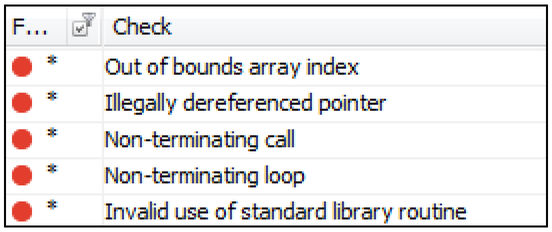
  Previously, the default analysis required that all of your files must compile. To revert to this default behavior, use the option Stop analysis if a file does not compile (`-stop-if-compile-error`).
- A new icon is used to denote definite run-time errors or red checks.

  Before R2017a:



F...		Check
!	*	Out of bounds array index
!	*	Illegally dereferenced pointer
!	*	Non-terminating call
!	*	Non-terminating loop
!	*	Invalid use of standard library routine

  R2017a:



F...		Check
●	*	Out of bounds array index
●	*	Illegally dereferenced pointer
●	*	Non-terminating call
●	*	Non-terminating loop
●	*	Invalid use of standard library routine

- *I use DOS/UNIX®/MATLAB scripts to launch the analysis. How does this change affect me?*

  The change does not affect you directly. For instance, you still use two separate commands `polyspace-bug-finder-nodesktop` and `polyspace-code-prover-nodesktop` to run analysis from the DOS/UNIX command line. However, if you specify your options in a Polyspace project in the user interface and then create a script from the project, you have to specify your options only once for both products.

  Once you specify your options in the Polyspace project, you can easily create a script for the individual products. For instance, to create a Windows batch file that runs a Code Prover analysis, run the command:

```
polyspace -generate-launching-script-for myproject.psprj
```

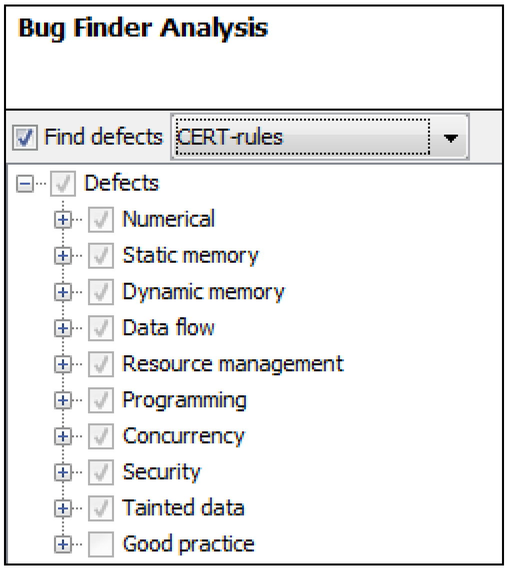
  To create a Windows batch file that runs a Bug Finder analysis, run the command:

```
polyspace -bug-finder -generate-launching-script-for myproject.psprj
```

Easier Compliance with Security Standards: Choose CWE, CERT C99, or ISO/IEC TS 17961 coding standard and address corresponding violations through Polyspace results and security reports

Summary: In R2017a, you can provide a security standard such as CWE, CERT C99 or ISO/IEC TS 17961 for Polyspace analysis.

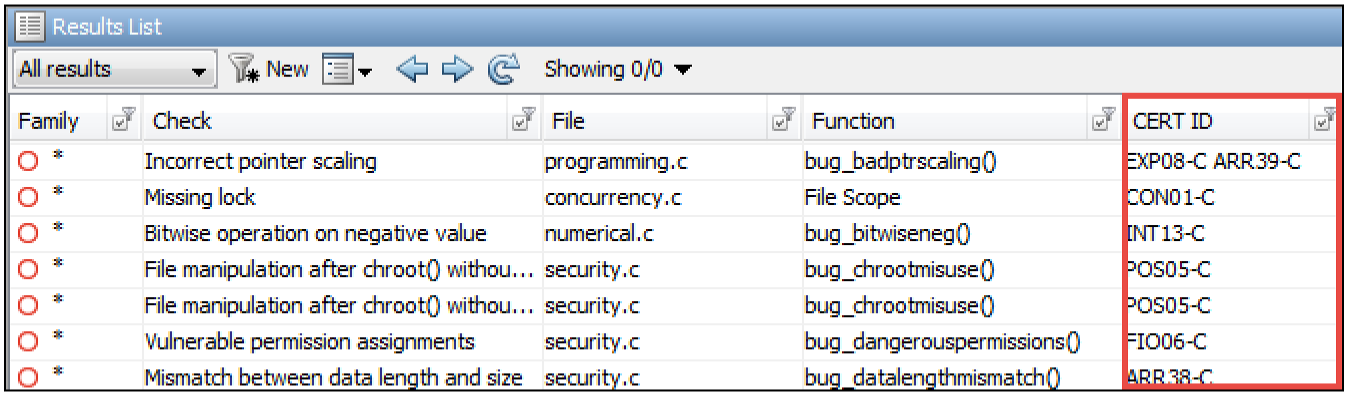
Analysis: The analysis runs defect and coding rule checkers that correspond to elements in the standard.


Bug Finder Analysis

☑ Find defects: CERT-rules

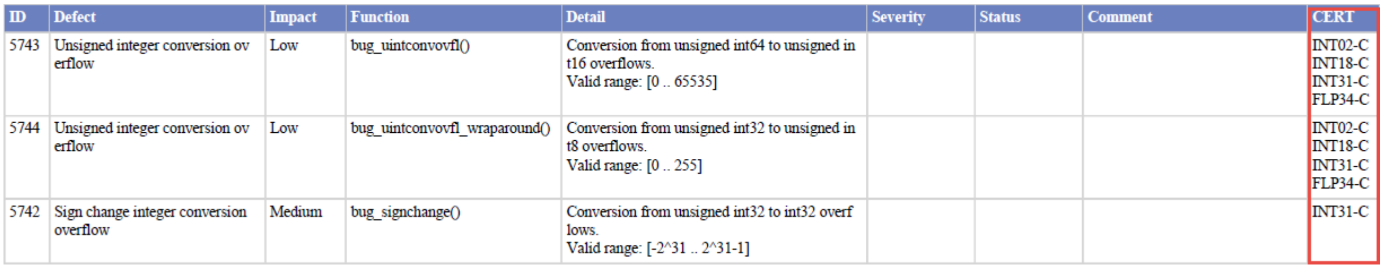
- ☑ Defects
  - ☑ Numerical
  - ☑ Static memory
  - ☑ Dynamic memory
  - ☑ Data flow
  - ☑ Resource management
  - ☑ Programming
  - ☑ Concurrency
  - ☑ Security
  - ☑ Tainted data
  - ☐ Good practice

Results: After analysis, you see the security standard ID-s corresponding to each result.



Family	Check	File	Function	CERT ID
○ *	Incorrect pointer scaling	programming.c	bug_badptrscaling()	EXP08-C ARR39-C
○ *	Missing lock	concurrency.c	File Scope	CON01-C
○ *	Bitwise operation on negative value	numerical.c	bug_bitwiseneg()	INT13-C
○ *	File manipulation after chroot() withou…	security.c	bug_chrootmisuse()	POS05-C
○ *	File manipulation after chroot() withou…	security.c	bug_chrootmisuse()	POS05-C
○ *	Vulnerable permission assignments	security.c	bug_dangerouspermissions()	FIO06-C
○ *	Mismatch between data length and size	security.c	bug_datalengthmismatch()	ARR38-C

Report: When you generate a report, you can choose a template tailored for a specific security standard. The report shows the security standard ID-s corresponding to each result.



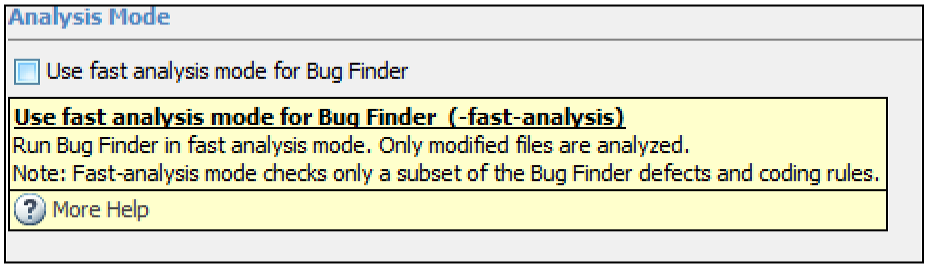
ID	Defect	Impact	Function	Detail	Severity	Status	Comment	CERT
5743	Unsigned integer conversion ov erflow	Low	bug_uintconvovfl()	Conversion from unsigned int64 to unsigned in t16 overflows. Valid range: [0 .. 65535]				INT02-C INT18-C INT31-C FLP34-C
5744	Unsigned integer conversion ov erflow	Low	bug_uintconvovfl_wraparound()	Conversion from unsigned int32 to unsigned in t8 overflows. Valid range: [0 .. 255]				INT02-C INT18-C INT31-C FLP34-C
5742	Sign change integer conversion overflow	Medium	bug_signchange()	Conversion from unsigned int32 to int32 overf lows. Valid range: [-2^31 .. 2^31-1]				INT31-C

Benefits: You can easily adhere to a security standard using Polyspace analysis.

For details of the workflow, see Check Code for Security Standards.

Incremental Analysis of Specific Checks: Analyze only files edited since previous analysis to quickly find new defects and coding rule violations

Summary: In R2017a, you can run a fast analysis mode in Bug Finder. In this mode, if you perform an analysis and then edit some files, a later analysis considers only the files that you edited.



Analysis Mode

☐ Use fast analysis mode for Bug Finder

Use fast analysis mode for Bug Finder (-fast-analysis)
Run Bug Finder in fast analysis mode. Only modified files are analyzed.
Note: Fast-analysis mode checks only a subset of the Bug Finder defects and coding rules.

More Help

Benefits: You wait less for analysis results from your second analysis onwards. During development, you can frequently run analysis in fast mode and quickly check for new defects.

Additional considerations:

- *Is the fast analysis mode different from a full Bug Finder analysis?*

  In fast analysis mode, Bug Finder checks for a subset of defects and coding rules only. In R2017a, these defects and rules can be found within a single compilation unit, such as a single function or file. The software does not perform interprocedural or cross-functional analysis.
- *If I enable a defect checker that cannot be checked fast, what happens in the fast analysis mode?*

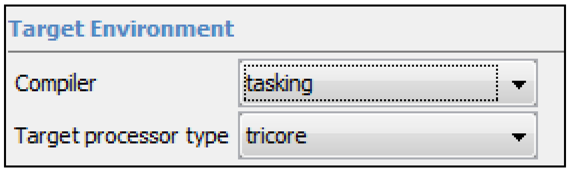
  The defect checker is internally disabled. When you switch back to full analysis, the defect checker is enabled again. For information on:

  - The defect checkers that can run fast, see Results Found by Fast Analysis.
  - The option to enable fast analysis, see Use fast analysis mode for Bug Finder (`-fast-analysis`).

TASKING Compiler Support: Set up Polyspace analysis easily for code compiled with Altium TASKING compiler

Summary: If you build your source code with the Altium® TASKING compiler, in R2017a, you can specify the compiler name for your Polyspace analysis. The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.

You can specify the following target processors directly: `tricore`, `c166`, `rh850` or `arm`. See TASKING Compiler (`-compiler tasking`).


Target Environment

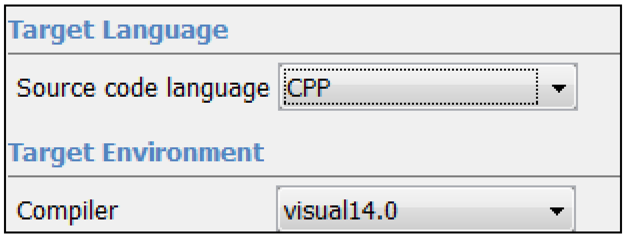
Compiler: tasking

Target processor type: tricore

Benefits: You can now set up a Polyspace project without knowing the internal workings of your TASKING compiler. If your code compiles with your compiler, it will compile with Polyspace in most cases without requiring additional setup. Previously, you had to explicitly define macros that were implicitly defined by the compiler and remove unknown language extensions from your preprocessed code.

Updated Visual C++ Support: Set up Polyspace analysis easily for code compiled with Microsoft Visual C++ 2015 compiler

Summary: If you build your source code with the Microsoft Visual C++ 2015 compiler, in R2017a, you can specify the compiler name for your Polyspace analysis. The analysis can interpret macros that are implicitly defined by the compiler and compiler-specific language extensions such as keywords and pragmas.


Target Language

Source code language: CPP

Target Environment

Compiler: visual14.0

For more information, see Compiler (`-compiler`).

Benefits:

- *Easier compilation*: You can now set up a Polyspace project without knowing the internal workings of your Microsoft Visual C++ 2015 compiler.
- *More precise analysis*: The analysis provides precise results when you use compiler-specific extensions.

Autodetection of Concurrency Primitives: Multitasking model detected from Windows, µC/OS II or C++11 multithreading functions

Summary: In R2017a, if you use the Windows, µC/OS II or C++11 functions for multitasking, the Polyspace analysis can interpret them semantically.

Polyspace interprets the following functions:

Family	Thread Created	Critical Section Begins	Critical Section Ends
Windows	`CreateThread`	`EnterCriticalSection`	`LeaveCriticalSection`
µC/OS II	`OSTaskCreate`	`OSMutexPend`	`OSMutexPost`
C++11	`std::thread::thread`	`std::mutex::lock`	`std::mutex::unlock`

Benefits: You do not have to adapt your code or specify your multitasking model manually through analysis options. The analysis determines your multitasking model from the functions in your code and finds data races or other concurrency defects.

Autodetection of Concurrency Primitives: Map Unsupported Thread Creation Functions to Supported Functions

Summary: In R2017a, you can map your thread creation functions to thread-creation functions that Polyspace can detect automatically. You can also perform the mapping for functions that begin and end critical sections.

For instance, for the following code, you can map the functions `createTask`, `takeLock` and `releaseLock` to the `Pthreads` functions, `pthread_create`, `pthread_mutex_lock` and `pthread_mutex_unlock` respectively.

```
/* Assume global variables and functions are defined */

void* task1(void* a) {
    takeLock(&lock);
    var1++;
    var2++;
    releaseLock(&lock);
    return 0;
}

void* task2(void* a) {
    takeLock(&lock);
    var1++;
    releaseLock(&lock);
    var2++;
    return 0;
}

void main() {
    createTask(task1,&t_id1,0,0);
    createTask(task2,&t_id2,0,0);
}
```

Benefits: Polyspace supports automatic concurrency detection only for certain families of concurrency primitives. You can extend the support to your family of concurrency functions by using this mapping.

If Polyspace determines your multitasking model from your code, the analysis can find possible race conditions and other defects, without additional setup efforts. Otherwise, you have to specify your multitasking model explicitly through the manual multitasking options.

Additional considerations:

- *How do I map an unsupported thread creation function to a supported function?*

  You specify the mapping in an XML file. You then provide the XML file as argument of the analysis option `-function-behavior-specifications`.

  For examples, see `-function-behavior-specifications`.
- *How do I know which function to map to?*

  Map your function to the supported function that is most similar to your function in the number and types of parameters.

  For instance, in the above example, you can map the function `createTask` to the thread creation functions `pthread_create` (POSIX®), `CreateThread` (Windows) or `OSTaskCreate` (µC/OS II). However, the arguments of `createTask` align most closely with `pthread_create`.

  For the list of supported functions that you can map to, see the sample mapping file `function-behavior-specifications-sample.xml` in *`matlabroot`*`\polyspace\verifier\cxx\`. *`matlabroot`* is the MATLAB installation folder, such as `C:\Program Files\MATLAB\R2017a`.

Manual Multitasking Setup: Specify routines that disable and reenable all interrupts

Summary: In R2017a, when specifying your multitasking model for analysis, you can provide a routine that disables all interrupts.

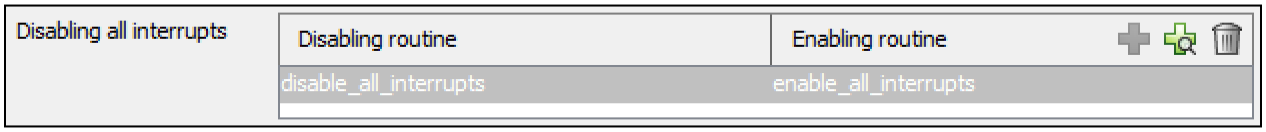
For instance, in the following code, the function `disable_all_interrupts` disables all interrupts until the function `enable_all_interrupts` is called. Even if `task`, `isr1` and `isr2` run concurrently, the operations `x=0` or `x=1` cannot interrupt the operation `x++`.

```
int x;

void isr1() {
   x = 0;
}

void isr2() {
   x = 1;
}

void task() {
   disable_all_interrupts();
   x++;
   enable_all_interrupts();
}
```


Disabling all interrupts

Disabling routine	Enabling routine
disable_all_interrupts	enable_all_interrupts

Benefits: If you protect operations on a shared variable by disabling interrupts, you can specify this protection for the Polyspace analysis. The analysis uses this information to give you more precise results for data race defects.

Additional considerations:

- *Does the routine disable all preemption or preemption by only a certain class of interrupts?*

  The routine that you specify for the option disables preemption by all:

  - Noncyclic entry points
  - Cyclic tasks
  - Interrupts

  In other words, the analysis considers that the body of operations between the disabling routine and the enabling routine is atomic and not interruptible at all.
- *How are routines to disable interrupts different from protection via critical sections?*

  In the Polyspace multitasking model, to protect two sections of code *from each other* via critical sections, you have to embed them in the same critical section. In other words, you have to place the two sections between calls to the same lock and unlock function.

  For instance, suppose you use critical sections as follows:

  ```
  void isr1() {
     begin_critical_section();
     x = 0;
     end_critical_section();
  }

  void isr2() {
     x = 1;
  }

  void task() {
     begin_critical_section();
     x++;
     end_critical_section();
  }
  ```

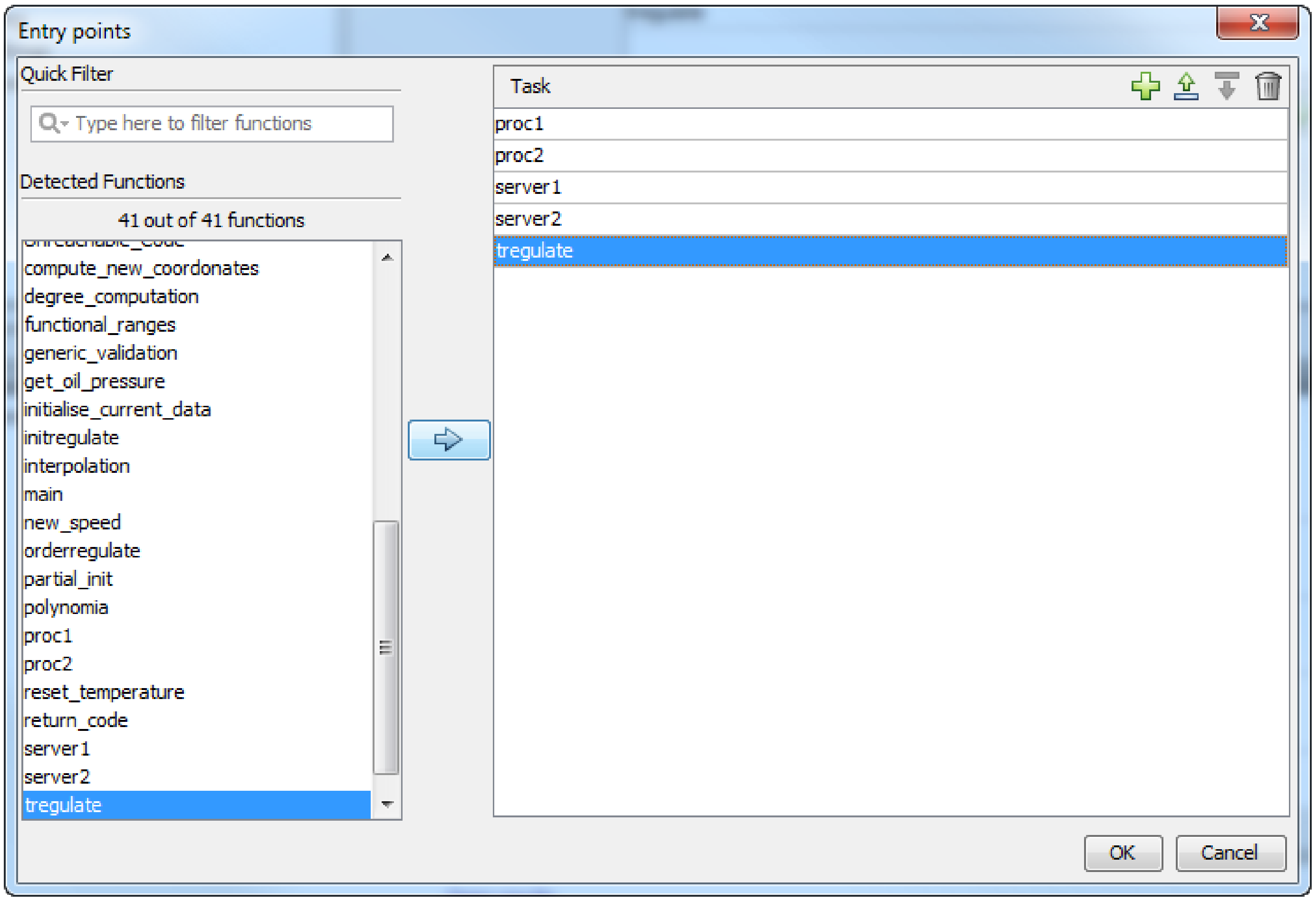
  Here, the operation `x++` is protected from the operation `x=0` in `isr1`, but not from the operation `x=1` in `isr2`. If the function `begin_critical_section` disabled *all interrupts*, calling it before `x++` would have been sufficient to protect it.

  In this way, critical sections are conceptually different from routines to disable all interrupts. Typically, you use one pair of routines in your code to disable and reenable interrupts, but you can have many pairs of lock and unlock functions that implement critical sections.

Specifying Function Names for Options: Choose from prepopulated list in user interface instead of entering manually

Summary: In R2017a, for options that take function names, you can choose the names from a list.

For instance, to specify which functions act as entry points to your multitasking application, you can choose the names from a list as follows:



compute_new_coordonates
degree_computation
functional_ranges
generic_validation
get_oil_pressure
initialise_current_data
initregulate
interpolation
main
new_speed
orderregulate
partial_init
polynomia
proc1
proc2
reset_temperature
return_code
server1
server2
tregulate

proc1
proc2
server1
server2
tregulate

Benefits: You do not have to enter the names manually. If the functions list is long, you can start typing the function name to reduce the list.

Polyspace API in MATLAB: Create MATLAB objects from Polyspace projects to run analysis

Summary: In R2017a, you can create a MATLAB object from a Polyspace project (`.psrpj` file). For instance, if you have a file `myProject.psprj` in the current working folder, enter:

```
opts = polyspace.loadProject('myProject.psprj')
```

Use the object `opts` in MATLAB scripts to run a Polyspace analysis:

```
polyspaceBugFinder(opts);
```

Benefits:

You can now consider the following workflows:

- *Set options in GUI and script analysis*: Use the Polyspace user interface to specify options in your Polyspace project, or adjust options based on results from a trial run. After the options are stable, create a MATLAB object `opts` from the project and store it in a MAT-file. As you move along in your development cycle, simply load `opts` from your MAT-file, update `opts.Sources` to add new source files, update other properties when required, and use `opts` to run analysis. For the object properties, see `polyspace.Options`.
- *Create project from your build command and script analysis*: Use the function `polyspaceConfigure` to create a `.psrpj` file from your build command (makefile). Create a MATLAB object from that file to run analysis. In this way, you can use a MATLAB script for the entire Polyspace analysis workflow beginning from your makefile.

Additional Considerations:

- *A single Polyspace project works for both Bug Finder and Code Prover. Can I likewise use the object to run both a Bug Finder and Code Prover analysis?*

  Yes, once you create the MATLAB object from a Polyspace project, you can use it with both functions `polyspaceBugFinder` and `polyspaceCodeProver`.
- *Can I create an object from a project that I have from a pre-R2017a version of Polyspace?*

  Yes, you can.

Support for 128-bit variables

Summary: In R2017a, Polyspace Bug Finder analysis supports 128-bit variables.

Benefits: 128-bit variables in your code do not cause compilation errors. For instance, if you use the GCC type `__int128`, you can run Polyspace Bug Finder on your code.

Improvement in automatic project creation from build systems

Summary: In R2017a, by default, automatic project creation will throw an error if a project with the same name exists in the output folder.

If you encounter an error, avoid the name conflict: change the project name, output folder, or remove your older project.

Benefits: You cannot overwrite existing projects by accident. If you use scripts that are intended to overwrite existing projects, use the additional option `-allow-overwrite`.

Changes in analysis options and binaries

In R2017a, the following options have been added, changed, or removed.

New Options

Option	Description
Use fast analysis mode for Bug Finder (`-fast-analysis`)	Run analysis using faster local mode of Bug Finder. See Incremental Analysis of Select Checks on page 9-6.
Disabling all interrupts (`-routine-disable-interrupts -routine-enable-interrupts`)	Specify routines that disable and reenable interrupts. See Manual Multitasking Setup on page 9-9.

Updated Options

Option	Change	More Information
Report template	Renamed in user interface	New name: **Bug Finder report** The command-line name is still `-report-template`.
Batch	Renamed in user interface	New name: **Run Bug Finder analysis on a remote cluster** The option is now in the **Run Settings** node in your project configuration. The command-line name is still `-batch`.
Add to results repository	Renamed in user interface	New name: **Upload results to Polyspace Metrics** The option is now in the **Run Settings** node in your project configuration. The command-line name is still `-add-to-results-repository`.
Compiler (`-compiler`)	New values added	You can specify the following arguments: • `tasking` See TASKING Compiler Support on page 9-7. • `visual14.0` See Microsoft Visual C++ Support on page 9-7.
Find defects (`-checkers`)	New value added	You can specify the following arguments: • `CWE` • `CERT-rules` • `CERT-all` • `ISO-17961` See Security Standards Checking on page 9-5.
Check MISRA C:2012 (`-misra3`)	New value added	You can specify the following arguments: • `CERT-rules` • `CERT-all` • `ISO-17961` See Security Standards Checking on page 9-5.

Removed Options

Option	Status	Description
Disable automatic concurrency detection (`-disable-concurrency-detection`)	Removed	Option will be removed in a future release. Detecting concurrency primitives automatically saves time in setup and does not impact performance. The option is not required anymore.
Import Folder (`-import-dir`)	Warning	Option will be removed in a future release.
`-easy-setup-preprocess`	Error	Option will be removed in a future release.
`gui-api`	Error	Binary will be removed in a future release. Use instead, `polyspace-comments-import`.
`polyspace-automatic-verification`	Error	Binary will be removed in a future release.
`polyspace-remote`	Error	Binary will be removed in a future release.
`polyspace-verifier`	Error	Binary will be removed in a future release.
`rte-kernel`	Error	Binary will be removed in a future release.
Dialect (`-dialect`)	Error	Option will be removed in a future release. Use Compiler (`-compiler`) (Polyspace Code Prover) instead.
Target operating system (`-OS-target`)	Error	Option will be removed in a future release. If you use this option in scripts, see the list below for replacements: • `Linux`: If you get compilation errors, use Compiler (`-compiler`) (Polyspace Code Prover) `gnu`*`x.x`*. Sometimes, you might also have to set Preprocessor definitions (`-D`) (Polyspace Code Prover) to `linux`, `unix`, or `__linux__`. • `Visual`: Use Compiler (`-compiler`) (Polyspace Code Prover) `visual`*`x.x`* • `Vxworks`: Use the VxWorks® configured template. For more information, see Create Project Using Configuration Template (Polyspace Code Prover). • `Solaris`: Remove `-OS-target`. • `no-predefined-OS`: Remove `-OS-target`.

Option	Status	Description
Files and folders to ignore (`-includes-to-ignore`)	Removed	Use the option Do not generate results for (`-do-not-generate-results-for`) to suppress results from headers and sources in certain files or folders.
`-support-FX-option-results`	Removed	

Compatibility Considerations

If you use scripts that contain the removed or updated options, change your scripts accordingly.

Changes in MATLAB option object properties

These classes will be removed in a future release.

- `polyspace.BugFinderOptions`: To customize Polyspace analysis of handwritten code, use `polyspace.Options` instead.
- `polyspace.ModelLinkBugFinderOptions`: To customize Polyspace analysis of generated code, use `polyspace.ModelLinkOptions` instead.

The properties and methods of the new classes are almost the same as the original classes. If `optsOld` is an object of the original class and `optsNew` is an object of the new class, the following properties have changed.

Reporting

Removed	Use instead
`optsOld.Reporting.EnableReportGeneration`	`optsNew.MergedReporting.EnableReportGeneration`
`optsOld.Reporting.ReportTemplate`	`optsNew.MergedReporting.BugFinderReportTemplate`
`optsOld.Reporting. ReportOutputFormat`	`optsNew.MergedReporting.ReportOutputFormat`

ComputingSettings

Removed	Use instead
`optsOld.ComputingSettings.Batch`	`optsNew.MergedComputingSettings.BatchBugFinder`
`optsOld.ComputingSettings.AddToResultsRepository`	`optsNew.MergedComputingSettings.AddToResultsRepositoryBugFinder`

Compatibility Considerations

Replace instances of the old class names in your MATLAB scripts with the new class names. Then, replace the properties accordingly.

Even if you continue to use the old class names, you must change the properties, as described above.

Change in temporary folder location

In R2017a, Polyspace looks for standard environment variables such as `TMPDIR` to store temporary files during an analysis. Previously, Polyspace used the folders `/tmp` or `C:\Temp` during analysis.

You can also store Polyspace temporary files in a folder different from the standard temporary folders. To learn how Polyspace determines the temporary folder location, see Storage of Temporary Files.

Compatibility Considerations

If your analysis seems slower than before, check if the new temporary folder is on a network drive. For faster analysis, use a folder on a local drive instead.

Analysis Results

Additional Defect Checkers for Security: Check for security vulnerabilities such as incorrect use of cryptographic routines

Summary: In R2017a, Polyspace Bug Finder introduces new defect checkers for preventing security vulnerabilities in your code. The most notable are the cryptography defect checkers.

Cryptography Defect Checkers

Using Polyspace Bug Finder defects, you can identify incorrect use of the EVP cipher routines from the OpenSSL library.

The following issues are detected using the cryptography defects.

Initialization Vector

Defect	Issue Detected
`Constant block cipher initialization vector`	You used a constant for the initialization vector.
`Predictable block cipher initialization vector`	You used a weak random number generator for the initialization vector.
`Missing block cipher initialization vector`	You forgot to associate a non-null initialization vector with the cipher context.

Key

Defect	Issue Detected
`Constant cipher key`	You used a constant for the encryption or decryption key.
`Predictable cipher key`	You used a weak random number generator for the encryption or decryption key.
`Missing cipher key`	You forgot to associate a non-null encryption or decryption key with the cipher context.

Wrong Order of Operations

Defect	Issue Detected
`Inconsistent cipher operations`	You perform a decryption on the same context as an encryption and immediately following it, or vice versa.
`Missing cipher data to process`	Before performing a final step, you do not perform update steps for encrypting or decrypting the data.
`Missing cipher final step`	You do not perform a final step after update steps for encrypting or decrypting data.

Algorithms and Modes

Defect	Issue Detected
`Weak cipher algorithm`	You associated a weak encryption algorithm with the cipher context.
`Weak cipher mode`	You associated a weak mode with the cipher context.

Defect Checkers for errno Usage

Defect	Issue Detected
`Errno not checked`	You call a function that sets `errno` to indicate error conditions, but do not follow the function call with a check on `errno` to see if the error occurred.
`Errno not reset`	You call a function that sets `errno` but do not reset `errno` prior to the call.
`Misuse of errno`	You check `errno` for error conditions following calls to functions that do not necessarily set `errno` to indicate error conditions or sets other error indicators.

Defect Checkers for Type Conversions

Defect	Issue Detected
`Misuse of sign-extended character value`	You perform a data type conversion with sign extension and use the resulting sign-extended character value as array index or for comparison with EOF.
`Character value absorbed into EOF`	You perform a data type conversion that can convert a character value that is not EOF into EOF, and then compare the result with EOF.

Defect Checkers for Memory Comparisons

Defect	Issue Detected
`Memory comparison of padding data`	You use `memcmp` to compare two structures and in the process, compare garbage data stored in the structure padding.
`Memory comparison of strings`	You use `memcmp` to compare two strings and in the process, compare garbage data stored after the null terminator.

Other Defect Checkers

Defect	Issue Detected
`Misuse of return value from nonreentrant standard function`	You use the pointer to a static buffer from a nonreentrant standard function despite a subsequent call to the same function.
`Misuse of readlink()`	You pass a buffer size argument to `readlink()` that does not leave space for a null terminator in the buffer.

MISRA Amendment Support: Check your code for new security guidelines in MISRA C:2012 Amendment 1

Summary: In R2017a, you can check for violations of the additional security guidelines introduced in MISRA C:2012 Amendment 1.

Rule	Description
`MISRA C:2012 Directive 4.14`	The validity of values received from external sources shall be checked.
`MISRA C:2012 Rule 12.5`	The `sizeof` operator shall not have an operand which is a function parameter declared as "array of type".
`MISRA C:2012 Rule 21.13`	Any value passed to a function in `<ctype.h>` shall be representable as an unsigned char or be the value EOF.
`MISRA C:2012 Rule 21.14`	The Standard Library function `memcmp` shall not be used to compare null terminated strings.
`MISRA C:2012 Rule 21.15`	The pointer arguments to the Standard Library functions `memcpy`, `memmove` and `memcmp` shall be pointers to qualified or unqualified versions of compatible types.
`MISRA C:2012 Rule 21.16`	The pointer arguments to the Standard Library function memcmp shall point to either a pointer type, an *essentially signed type*, an *essentially unsigned type*, an *essentially Boolean type* or an *essentially enum type*.
`MISRA C:2012 Rule 21.17`	Use of the string handling function from `<string.h>` shall not result in accesses beyond the bounds of the objects referenced by their pointer parameters.
`MISRA C:2012 Rule 21.18`	The `size_t` argument passed to any function in `<string.h>` shall have an appropriate value.
`MISRA C:2012 Rule 21.19`	The pointers returned by the Standard Library functions `localeconv`, `getenv`, `setlocale` or `strerror` shall only be used as if they have pointer to `const`-qualified type.
`MISRA C:2012 Rule 21.20`	The pointer returned by the Standard Library functions `asctime`, `ctime`, `gmtime`, `localtime`, `localeconv`, `getenv`, `setlocale` or `strerror` shall not be used following a subsequent call to the same function.
`MISRA C:2012 Rule 22.7`	The macro EOF shall only be compared with the unmodified return value from any Standard Library function capable of returning EOF.
`MISRA C:2012 Rule 22.8`	The value of `errno` shall be set to zero prior to a call to an *`errno`-setting function*.
`MISRA C:2012 Rule 22.9`	The value of `errno` shall be tested against zero after calling an *`errno`-setting function*.
`MISRA C:2012 Rule 22.10`	The value of `errno` shall only be tested when the last function to be called was an *`errno`-setting function*.

New Code Metrics: See number of lines in header files and number of local variables per function

Summary: In R2017a, Polyspace can provide the following new code complexity metrics:

- Number of lines and number of lines without comments in header files
- Number of local non-static variables for every function and method
- Number of static variables for every function and method

Benefits: You can determine the memory footprints of your code using these new metrics (along with other already existing metrics).

Changes to coding rule checking

New Rules Supported

In R2017a, the following new rules are supported:

- Additional security guidelines in MISRA C: 2012 Amendment 1.

  See MISRA Amendment Support on page 9-20.
- `MISRA C:2012 Directive 4.7` (partially supported): If a function returns error information, then that error information shall be tested.

Updated Specifications

In R2017a, the following changes have been made in checking of previously supported MISRA C rules.

Rule	Rule	Improvement

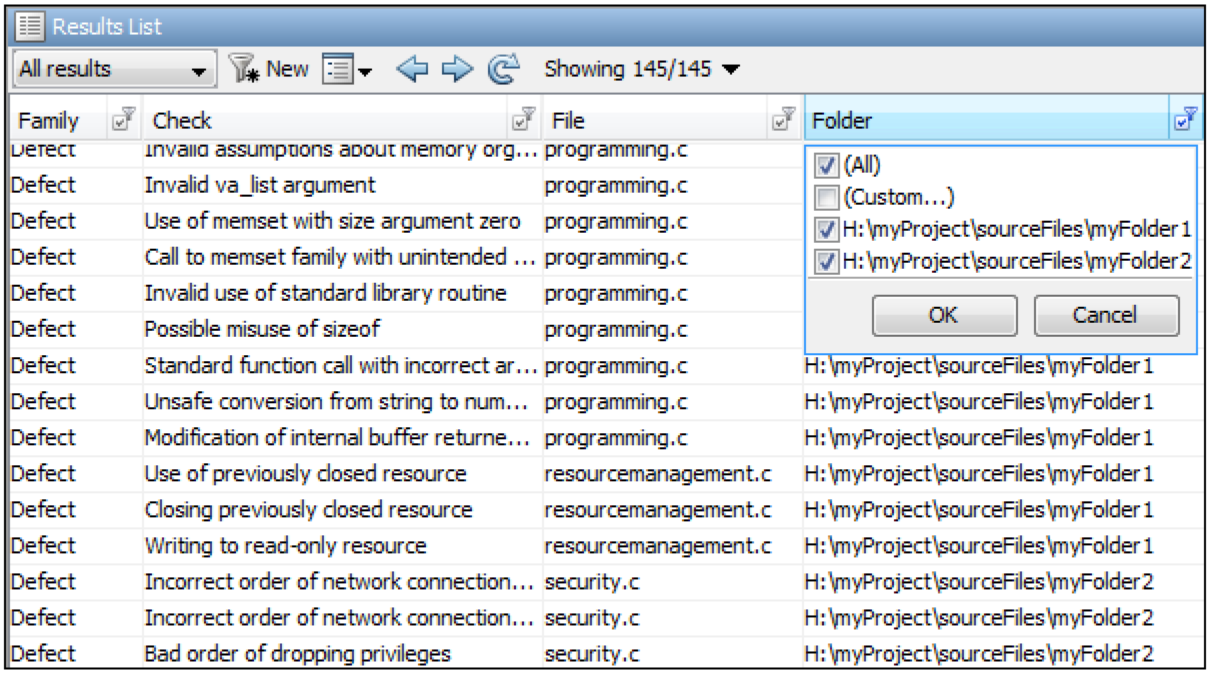
MISRA C: 2004 Rule 5.1	Identifiers (internal and external) shall not rely on the significance of more than 31 characters.	The rule checker shows all identifiers that have the same first 31 characters as one rule violation. Previously, every pair of identifiers with same 31 characters was shown as a separate violation.
		
		For instance, in the following code snippet, the rule violation appears only once.
		
		`extern int engine_exhaust_gas_temperature_raw;`
		`static int engine_exhaust_gas_temperature_scaled;`
		`static int engine_exhaust_gas_temperature_cutoff;`
		
		Previously, the violation was shown three times.
		
		You have to review only one rule violation for every group of identifiers with the same 31 characters. You can still see all instances of conflicting identifier names in the event history of that rule violation.

Rule	Rule	Improvement
`MISRA C:2012 Rule 8.5`	An external object or function shall be declared once in one and only one file.	The rule checker considers that variables or functions declared `extern` in a non-header file violates this rule.

Reviewing Results

Folder Names in Results: Filter or organize analysis results by source folder names

Summary: In R2017a, the source folder name is shown in the list of analysis results.



Results List

All results | New | Showing 145/145

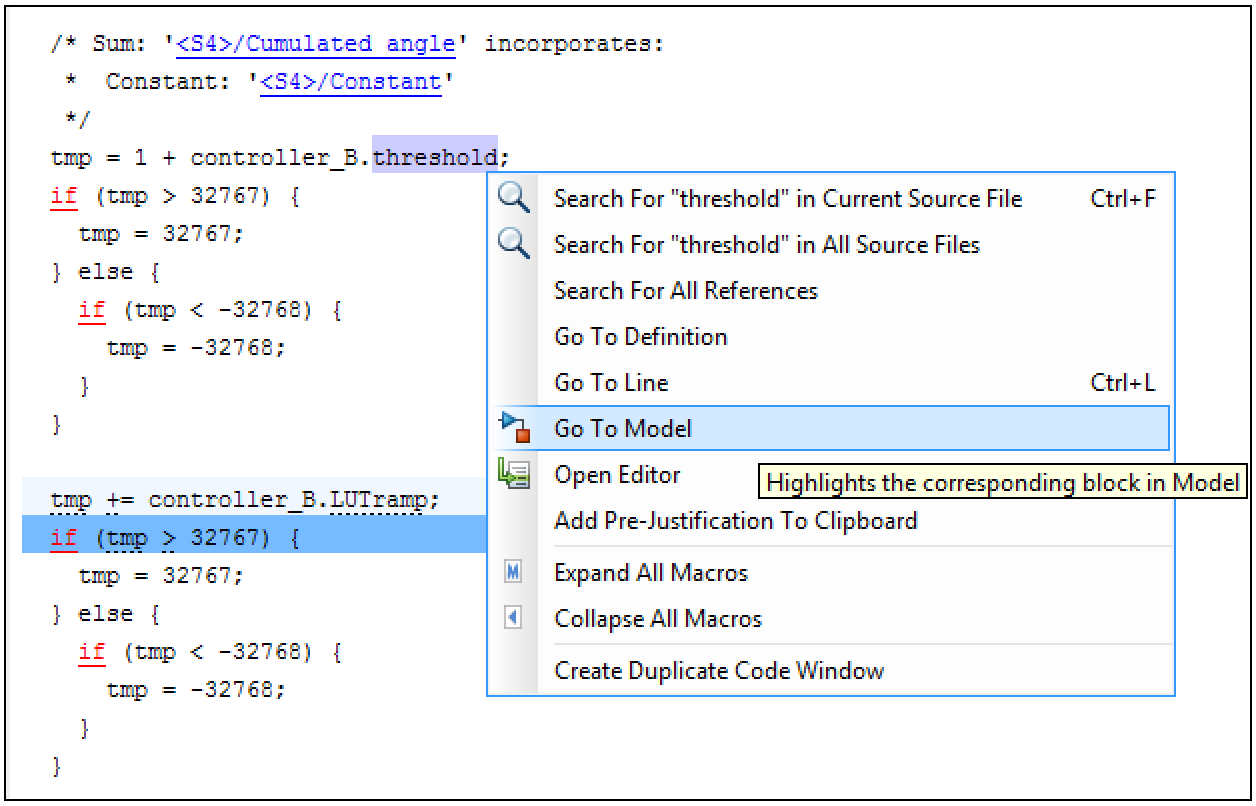
Family	Check	File	Folder
Defect	Invalid assumptions about memory org…	programming.c	
Defect	Invalid va_list argument	programming.c	
Defect	Use of memset with size argument zero	programming.c	
Defect	Call to memset family with unintended …	programming.c	
Defect	Invalid use of standard library routine	programming.c	
Defect	Possible misuse of sizeof	programming.c	
Defect	Standard function call with incorrect ar…	programming.c	H:\myProject\sourceFiles\myFolder1
Defect	Unsafe conversion from string to num…	programming.c	H:\myProject\sourceFiles\myFolder1
Defect	Modification of internal buffer returne…	programming.c	H:\myProject\sourceFiles\myFolder1
Defect	Use of previously closed resource	resourcemanagement.c	H:\myProject\sourceFiles\myFolder1
Defect	Closing previously closed resource	resourcemanagement.c	H:\myProject\sourceFiles\myFolder1
Defect	Writing to read-only resource	resourcemanagement.c	H:\myProject\sourceFiles\myFolder1
Defect	Incorrect order of network connection…	security.c	H:\myProject\sourceFiles\myFolder2
Defect	Incorrect order of network connection…	security.c	H:\myProject\sourceFiles\myFolder2
Defect	Bad order of dropping privileges	security.c	H:\myProject\sourceFiles\myFolder2

☑ (All)
☐ (Custom…)
☑ H:\myProject\sourceFiles\myFolder1
☑ H:\myProject\sourceFiles\myFolder2

Benefits: You can order your results by folders or filter results belonging to specific folders. Using custom filters, you can filter out subfolders of a folder in one click.

Code to Model Traceability: Switch easily between identifiers in generated code and corresponding blocks in model

Summary: In R2017a, you can trace an instance of a variable in generated code back to your model.

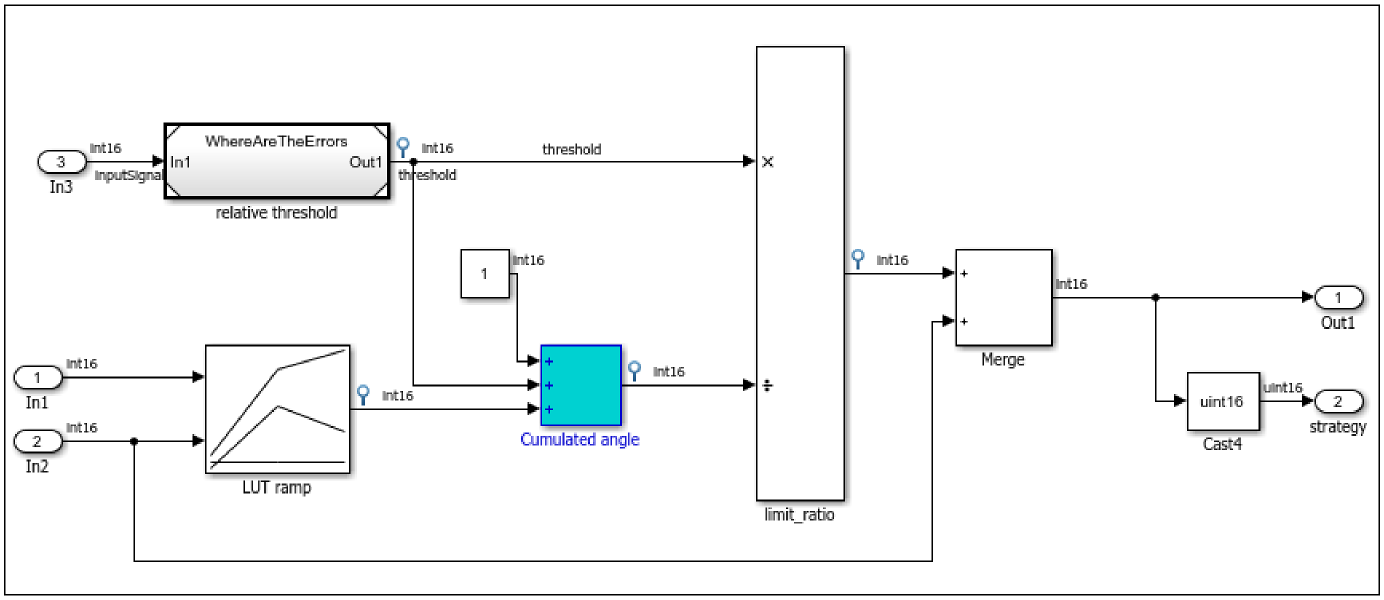


```
/* Sum: '<S4>/Cumulated angle' incorporates:
 *  Constant: '<S4>/Constant'
 */
tmp = 1 + controller_B.threshold;
if (tmp > 32767) {
  tmp = 32767;
} else {
  if (tmp < -32768) {
    tmp = -32768;
  }
}

tmp += controller_B.LUTramp;
if (tmp > 32767) {
  tmp = 32767;
} else {
  if (tmp < -32768) {
    tmp = -32768;
  }
}
```

Search For "threshold" in Current Source File Ctrl+F
Search For "threshold" in All Source Files
Search For All References
Go To Definition
Go To Line Ctrl+L
Go To Model
Open Editor
Highlights the corresponding block in Model
Add Pre-Justification To Clipboard
Expand All Macros
Collapse All Macros
Create Duplicate Code Window

The model shows the corresponding block highlighted in blue. If the block is in a subsystem, both the subsystem and the block are highlighted in blue.



Benefits:

- *More convenient navigation*: Previously, you traced back from code to model via links in code comments. You can now navigate from the code operations themselves.

- *More fine-grained navigation*: You can easily identify which block in your model leads to which operation in the generated code.

Polyspace API in MATLAB: Read Polyspace analysis results from MATLAB

Summary: You can read your Polyspace analysis results into a MATLAB table. For instance, if the folder `C:\MyResults` contains results of a Polyspace analysis, enter the following:

```
resObj = polyspace.BugFinderResults('C:\MyResults')
resSummary = getSummary(resObj)
resTable = getResults(resObj)
```

`resSummary` and `resTable` are two MATLAB tables containing summary and details of the Polyspace results.

See also `polyspace.BugFinderResults`.

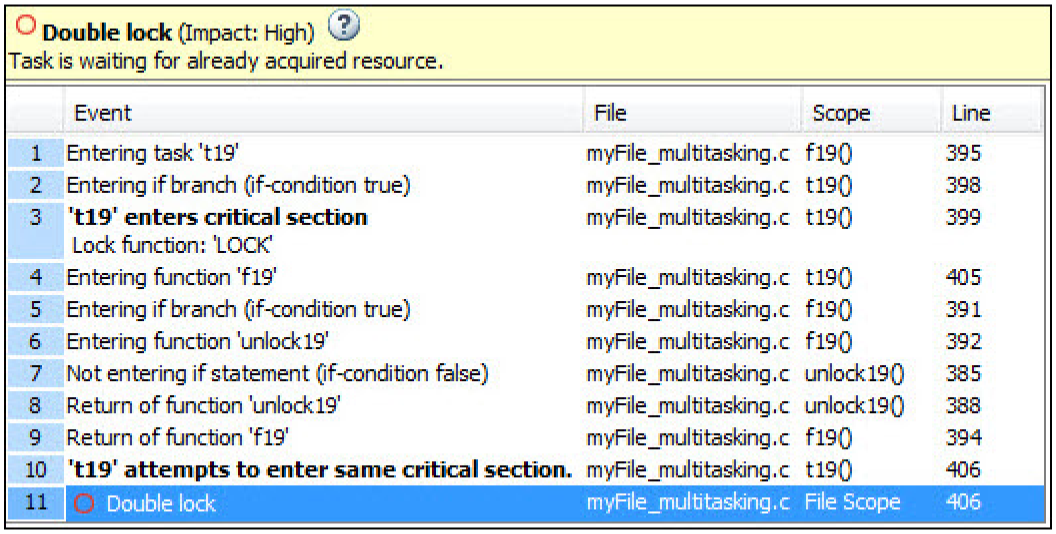
Benefits: You can use the capabilities of MATLAB to obtain graphs and statistics about your Polyspace results.

Double Lock and Other Concurrency Defects: Get help investigating the defects using detailed control flow information

Summary: In R2017a, you can see detailed control flow information for concurrency defects such as deadlock and double lock.

For instance, in the following traceback for a double lock defect, you see this information:

- Entry and exit from a function `f19`
- Entry or non-entry into `if` conditions.



Double lock (Impact: High)
Task is waiting for already acquired resource.

	Event	File	Scope	Line
1	Entering task 't19'	myFile_multitasking.c	f19()	395
2	Entering if branch (if-condition true)	myFile_multitasking.c	t19()	398
3	**'t19' enters critical section** Lock function: 'LOCK'	myFile_multitasking.c	t19()	399
4	Entering function 'f19'	myFile_multitasking.c	t19()	405
5	Entering if branch (if-condition true)	myFile_multitasking.c	f19()	391
6	Entering function 'unlock19'	myFile_multitasking.c	f19()	392
7	Not entering if statement (if-condition false)	myFile_multitasking.c	unlock19()	385
8	Return of function 'unlock19'	myFile_multitasking.c	unlock19()	388
9	Return of function 'f19'	myFile_multitasking.c	f19()	394
10	**'t19' attempts to enter same critical section.**	myFile_multitasking.c	t19()	406
11	Double lock	myFile_multitasking.c	File Scope	406

You can click each event to navigate to the corresponding location in your source code.

Benefits: To fix concurrency defects, you often have to decide where to place lock and unlock functions (functions that begin and end critical sections). Using the improved traceback, you can decide the placements more easily.

Spreadsheet of Checkers: Use spreadsheet to keep track of checkers that you enable

Summary: In R2017a, the software provides a spreadsheet containing the Polyspace Bug Finder defect and coding rule checkers. The spreadsheet also maps the defects to standards such as CWE, CERT-C or ISO-17961.

The spreadsheet is in `*matlabroot*\polyspace\resources`. Here, *`matlabroot`* is the MATLAB installation folder, such as `C:\Program Files\MATLAB\R2017a`.

Benefits: You can use this spreadsheet to keep track of the defect checkers that you enable and add notes explaining why you do not enable the other checkers.

R2016b

Analysis Setup

Diab Compiler Support: Set up Polyspace analysis easily for code compiled with Wind River Diab compiler

If you build your source code with the Wind River® Diab compiler, in R2016b, you can easily set up a Polyspace project to verify your code. After you specify the Diab compiler and your target processor, the verification:

- Implicitly defines macros that are defined for the Diab compiler. Previously, you defined the macros in your Polyspace project explicitly to avoid compilation errors.
- Understands language extensions such as keywords and pragmas that are specific to the Diab compiler. Previously, you removed unknown language extensions explicitly from the preprocessed code in your Polyspace project to avoid compilation errors.

You can now set up a Polyspace project manually without knowing the internal workings of your Diab compiler. Specify the Diab compiler and your target processor, and run an analysis without facing compilation errors. See Diab Compiler (-compiler diab).

The software supports version 5.9 and older versions of the Diab compiler.

Multitasking Code Analysis Setup: Specify cyclic tasks and nonpreemptable interrupts directly as analysis options

In R2016b, you can specify which entry points in your code represent cyclic tasks and nonpreemptable interrupts. Previously, to emulate the cyclic behavior of a task, you embedded instructions in a loop. To emulate a nonpreemptable interrupt, you specified temporally exclusive pairs where the interrupt was paired with the other interrupts.

For more information, see Cyclic tasks (-cyclic-tasks) and Interrupts (-interrupts).

Improved source and include folder management

Before R2016b, when you created a project, you added and removed source files and include folders individually. If you moved your source files or added new files to your programming project, you re-added the files into your Polyspace project.

Starting in R2016b, you create Polyspace projects with root source folders and include folders. The root folder location represents the top of the hierarchy for your source files. Polyspace shows all files relative to the root source locations. When you add a root source location, you can:

- See all source files under the root folder (and subfolders)
- Exclude files and subfolders in the hierarchy to change the active list of source files to analyze.
- Refresh the source file list to see new files or folders in the root source hierarchy.
- Modify the root source folder path.
- If you use a revision control system, change the root folder location to point to different versions of your source files.

For include folders, instead of adding individual folders, you add a root include folder location. Polyspace adds all include folders underneath the root include location that contains include files. You can refresh and modify the include folder path.

For more information, see Update Project.

Writable Examples: Modify example projects and restore original versions

The examples projects under **Help** > **Examples** are now easier to use. The first time that you open an example project, a writable version is saved in your `*Polyspace_Workspace*`. In the writable project, you can test configuration options, change sources, and rerun the example. If you want to refresh the example with a clean version, select **Help** > **Examples** > **Restore Default Examples**.

Run analysis on .psprj file from the command line

If you already have a project created in the Polyspace Interface, you can now use that `.psprj` file to run your analysis from a command line.

DOS or UNIX Command Line

Use the new option `polyspace-bug-finder -generate-launching-script-for` *`<PSPRJ FILE>`* to generate the files to run the analysis from the command line. These files are generated:

- `source_command.txt` — List of source files in the project
- `options_command.txt` — List of analysis option settings
- `launchingCommand.sh` or `launchingCommand.bat` — Script that runs the analysis using `options_command.txt`, `source_command.txt`, and `.polyspace_conf.psprj`. The script can also take additional analysis options as parameters.

For more information, see Create Command-Line Script from Project File.

MATLAB Command Prompt

At the MATLAB command prompt, you can now give a `.bf.psprj` file as an argument to `polyspaceBugFinder`.

The syntax `polyspaceBugFinder(`*`PSPRJ file`*`,'-nodesktop')` runs an analysis using the files and options from the *`PSPRJ file`*.

Support for local threads

Starting in R2016b, Polyspace adds support for these local thread modifiers:

- `__thread` — requires Compiler (-compiler) `gnu4.8`
- `__declspec(thread)` — requires **Compiler** `(-compiler)` `visual`
- `thread_local` — only for C++ code.

This support may eliminate compilation errors or false Data race results.

Polyspace API in MATLAB: Configure and run Polyspace using MATLAB objects

Polyspace scripting from the MATLAB command line is now easier and more MATLAB-friendly. R2016b introduces a set of classes, methods, and function improvements to help you run Polyspace from the MATLAB command line. For more information and examples, see the linked reference pages.

Classes

Name	Description
`polyspace.BugFinderOptions`	An options object with properties that map to the Polyspace environment configuration options. Use this object to customize analysis options and run analysis.
https://www.mathworks.com/help/releases/R2016b/bugfinder/ref/polyspace.modellinkbugfinderoptions-class.htmlpolyspace.ModelLinkBugFinderOptions	Another version of the `BugFinderOptions` object with properties specifically for model generated code. Use this object to customize analysis options and run analysis.
`polyspace.GenericTargetOptions`	A helper object for the `BugFinderOptions` classes. Use this object to customize a generic target.
`polyspace.DefectsOptions`	A helper object for the `BugFinderOptions` classes. Use this object to customize the list of defects checked during the analysis.
`polyspace.CodingRulesOptions`	A helper object for the `BugFinderOptions` object. Use this object to customize the list of coding rules checked during the analysis.

Methods

Name	Description
`polyspace.Options.copyTo`	Copy settings between options objects. You can use this method to copy options from a `BugFinderOptions` object to a `CodeProverOptions` object and vice versa.
`polyspace.Options.generateProject`	Generate a `.psprj` file from an options object to open in the Polyspace interface.

Functions

Name	Description
`polyspaceBugFinder`	Run an analysis using `BugFinderOptions` objects or `.psprj` files.

Configuration Parameters Help: View descriptions of Polyspace options in Simulink configuration parameters

When you use the Simulink plugin, you must set Simulink configuration parameters to run your analysis. If you need help setting the configuration parameters, you can now right-click a configuration parameter and get `What's This` help. When you select `What's This`, a help window opens with details about the different settings and limitations of the parameter.

Eclipse Build Support: Set up Polyspace analysis from Eclipse build command

In R2016b, if you use a build command to build your source code in Eclipse or an IDE based on Eclipse, you can easily set up your Polyspace verification. To obtain the compiler options for the analysis, trace the build command inside the IDE. For more information, see Customize Analysis Options.

Visual Studio 2010 add-in support to be removed from installation

In a future release, the Polyspace add-in for Visual Studio 2010 will no longer be included with the installation.

To run Polyspace on code from Visual Studio, use the automatic configuration tool instead. See Create Project Using Visual Studio Information.

If you still want to use the add-in, you will be able to download the add-in from MATLAB Answers.

Support for Rhapsody 8.1

The Polyspace plugin for IBM Rational® Rhapsody® supports Rhapsody 8.1. For more information, see Find Defects from IBM Rational Rhapsody.

DOS Mode Warning on Linux: Compilation warning for DOS inconsistencies

When using Polyspace on Linux, a new compilation warning may appear. On Windows, DOS is case-insensitive meaning you cannot have two files with the same name but different capitalization. If you select the option Code from DOS or Windows file system (-dos), Polyspace simulates this DOS behavior on Linux. If your source files include header files with inconsistent capitalization and it is unclear which file should be included, Polyspace issues a compilation warning.

For example, consider these two situations:

	Include Statements	Include Files

Situation 1	`#include "myheader.h"`
	`#include "MYHEADER.h"`
	`#include "MyHeader.h"`
		`myheader.h`

Situation 2	`#include "myheader.h"`
	`#include "MYHEADER.h"`
	`#include "MyHeader.h"`
		`myheader.h`
		`MYHEADER.h`

In the first situation, only one file exists with the name `myheader.h`. Because these include statements can only refer to one file, there is no ambiguity about which file to include. No warning is issued.

In the second situation, two files exist: `myheader.h` and `MyHeader.h`. Because they have the same name and different capitalization, the capitalization in the include statement affects which file is included. Polyspace can find perfect matches for the first and second include statements. The last include statement is not a perfect match, so could refer to either header file. Because there is ambiguity with the last include statement, Polyspace issues this compilation warning: `warning: could not find include file "MyHeader.h"`.

In a future release, this compilation warning will become a compilation error.

Faster Restart for Remote Verification: Reuse compilation results from a previous analysis

In R2016b, if a remote analysis stops after compilation, for instance because of communication problems between the server and client computers, you do not have to restart the analysis from the beginning. You can reuse compilation results from the previous failed analysis.

For more information, see `-submit-job-from-previous-compilation-results`.

Changes in Target & Compiler analysis options

In R2016b, these **Target & Compiler** options have been added, changed, or removed.

Option	Change	More Information
Compiler (-compiler)	New option	
Dialect (`-dialect`)	Removed from the user interface. If you use the option in your scripts, you see a warning.	Option will be permanently removed in a future release. Replace `-dialect` with `-compiler` while retaining the option argument. In the user interface, this replacement is done automatically for existing projects. If you use the Wind River Diab compiler to build your source code, use the option Compiler (-compiler) with argument `diab`.
Target processor type (-target)	Updated for the Wind River Diab compiler.	In the user interface, if you select `diab` for Compiler (-compiler), you see target processors that are tailored to the Diab compiler. For the processor specifications, see the contextual help.

Option	Change	More Information
Target operating system (`-OS-target`)	Removed from the user interface. If you use the option in your scripts, you see a warning.	Option will be permanently removed in a future release. Remove the option from your scripts. For some option arguments, you might have to perform these additional steps: • `Linux`: If you get compilation errors, use a `gnux.x` argument for Compiler (-compiler). Sometimes, you might have to explicitly define operating-system-specific macros such as `linux`, `unix`, or `__linux__`. See Preprocessor definitions (-D). • `Visual`: Use a `visualx.x` argument for Compiler (-compiler). • `Vxworks`: Use the options from the VxWorks templates. Create a Polyspace project using one of the VxWorks templates and generate a script from your project. Copy the options related to the VxWorks template from this script. For more information, see Create Project Using Configuration Templateand the reference page for `-generate-launching-scripts-for`. • `Solaris`: Just remove the option `-OS-target`. • `no-predefined-OS`: Just remove the option `-OS-target`.

Changes in analysis options and binaries

In R2016b, the following options have been added, changed, or removed.

For **Target & Compiler** options, see “Changes in Target & Compiler analysis options” on page 10-6. For other options, see here.

New Options

Option	Description
Cyclic tasks (-cyclic-tasks)	Specify functions that represent cyclic tasks.
Interrupts (-interrupts)	Specify functions that represent nonpreemptable interrupts.
-preemptable-interrupts	Specify functions that represent preemptable interrupts.
-non-preemptable-tasks	Specify functions that represent nonpreemptable tasks.

Updated Options

Option	Change	More Information
Coding rule subsets `single-unit-rules` and `system-decidable-rules`	Subsets now available from the drop-down list.	These subsets are available for Check MISRA C:2004 (-misra2), Check MISRA AC AGC (-misra-ac-agc), and Check MISRA C:2012 (-misra3)

Removed Options

Option	Status	Description
Import Folder (`-import-dir`)	Warning	Option will be removed in a future release.
`-easy-setup-preprocess`	Warning	Option will be removed in a future release.
`polyspace-automatic-verification`	Warning	Binary will be removed in a future release.
`polyspace-verifier`	Warning	Binary will be removed in a future release.
`rte-kernel`	Warning	Binary will be removed in a future release.
`polyspace-remote`	Warning	Binary will be removed in a future release.
`gui-api`	Warning	Binary will be removed in a future release. Use instead, `polyspace-comments-import`.
Files and folders to ignore (`-includes-to-ignore`)	Error	Use the option Do not generate results for (`-do-not-generate-results-for`) to suppress results from headers and sources in certain files or folders.
`-support-FX-option-results`	Error	Option will be removed in a future release.
`polyspace-vcproj`	Removed	Use `polyspace-configure` or the Polyspace Add-In for Visual Studio instead.

Compatibility Considerations

If you use scripts that contain the removed or updated options, change your scripts accordingly.

Analysis Results

CERT C Support: Identify CERT C violations using defect checkers and coding rules

In R2016b, you can comply with more CERT C Coding Standard rules using Polyspace defects and coding rules.

For more information, see Mapping Between CERT C Standards and Polyspace Results. The new defects added in R2016b specifically for CERT C support are listed here.

Concurrency

Name	Description	CERT C Rule
Data race through standard library function call	Certain standard library functions are called from multiple tasks without protection	CON33-C: Avoid race conditions when using library functions
Destruction of locked mutex	A task is trying to destroy a locked mutex that has not yet been unlocked	CON31-C: Do not destroy a mutex while it is locked

Good Practice

Name	Description	CERT C Rule
Bitwise and arithmetic operation on the same data	Code statement with mixed bitwise and arithmetic operations	INT14-C: Avoid performing arithmetic and bitwise operations on the same data
Missing reset of a freed pointer	Pointer free not followed by a reset statement to clear leftover data	MEM01-C: Store a new value in pointers immediately after free()
Missing break of switch case	No comments at the end of switch case without a break statement	MSC17-C: Finish every set of statements associated with a case label with a break statement
Hard-coded object size used to manipulate memory	Memory manipulation uses hard-coded size instead of `sizeof`	EXP09-C: Use sizeof to determine the size of a type or variable

Numerical

Name	Description	CERT C Rule
Use of plain char type for numerical value	Plain `char` variable used in arithmetic operation without explicit signedness	INT07-C: Use only explicitly signed or unsigned char type for numeric values
Bitwise operation on negative value	Undefined behavior for bitwise operations on signed values	INT13-C: Use bitwise operations only on unsigned operands

Programming

Name	Description	CERT C Rule
Unsafe conversion from string to numerical value	String to number conversion without validation checks	ERR34-C: Detect errors when converting a string to a number
Abnormal termination of exit handler	Exit handler function terminates incorrectly	ENV32-C: All exit handlers must return normally
Unsafe conversion between pointer and integer	Misaligned or invalid results from conversions between pointer and integer types	INT36-C: Unsafe conversion between pointer and integer

Resources

Name	Description	CERT C Rule
Opening previously opened resource	Opening an already opened file	FIO24-C: Do not open a file that is already open

Security

Name	Description	CERT C Rule
Returned value of a sensitive function not checked	Calls to sensitive or critical functions should be checked for unexpected return values and errors	EXP12-C: Do not ignore values returned by functions ERR33-C: Detect and handle standard library errors
Bad order of dropping privileges	Dropped user or primary group privileges before dropping primary/ supplementary group privileges	POS36-C: Observe correct revocation order while dropping privileges
Privilege drop not verified	Verify privilege relinquishment	POS37-C: Ensure that privilege relinquishment is successful

Local Variable Size Estimation: Find total size of local variables in a function

In R2016b, you can compute the total size of local variables in a function using the following two metrics:

- Lower Estimate of Local Variable Size: Total size of local variables taking nested scopes into account.

  If a function has variable definitions in nested scopes, the software computes the total variable size in each scope and uses whichever total is greatest. For instance, if a conditional statement has variables definitions, the software computes the total variable size in each branch and then uses whichever total is greatest.
- Higher Estimate of Local Variable Size: Total size of all local variables.

Metrics for C++ Templates: View code complexity metrics for instances of C++ templates

In R2016b, you can compute code complexity metrics for C++ templates. If you instantiate a C++ template function and specify the option Calculate code metrics (-code-metrics), you can now see function metrics for the template in your analysis results.

The metrics appear on the template definition. The software uses the first instance of the template to calculate the metrics. If you specialize a template, you see separate metrics for the original template and its specialization.

For more information, see Code Metrics.

Changes to coding rule checking

Expanded MISRA C++ Support

The following MISRA C++:2008 rules are now supported.

- 0-1-9: There shall be no dead code.
- 0-1-11: There shall be no unused parameters (named or unnamed) in nonvirtual functions.
- 0-1-12: There shall be no unused parameters (named or unnamed) in the set of parameters for a virtual function and all the functions that override it.
- 0-2-1: An object shall not be assigned to an overlapping object.
- 16-6-1: All uses of the #pragma directive shall be documented.

Updated Specifications

The Polyspace specifications for the following rules have been updated.

Standard	Rule	Change
MISRA C++:2008	5–0–3	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
	5–0–6	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
	5–0–8	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
MISRA C:2004 and MISRA AC AGC	10.1	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
	10.2	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
	10.3	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
	10.4	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
MISRA C:2012	10.3	If two types have the same size in the target configuration, Polyspace no longer raises a violation.

Standard	Rule	Change
	10.6	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
	10.7	If two types have the same size in the target configuration, Polyspace no longer raises a violation.
	10.8	If two types have the same size in the target configuration, Polyspace no longer raises a violation.

Updated Bug Finder defect checkers

For the new defects that explicitly correspond to CERT-C rules, see "CERT C Support: Identify CERT C violations using defect checkers and coding rules" on page 10-9.

Numerical

Name	Description	Update
Absorption of float operand	In an addition or subtraction, one operand is absorbed by the other and has no effect on the result	New defect

Programming

Name	Description	Update
Typedef mismatch	Mismatch between `typedef` statements	New defect

Static Memory

Name	Description	Update
Unreliable cast of function pointer	A function pointer is cast to another function pointer with different argument or return type	You can check C++ code for this defect.

Concurrency

Name	Description	Update
Data race	Multiple tasks perform unprotected non-atomic operations on shared variables	You can see a graphical view of the call sequence leading to conflicting operations on the shared variable. If you have existing critical sections, this graph also shows you the critical sections. Using this information, you can easily identify how to protect the shared variable from concurrent access.

Data Flow

Name	Description	Update
Write without a further read	Variable not read after assignment	The defect does not appear if the variable that is assigned the value `NULL` and not read again.

Reviewing Results

Data Race Graphs: Fix data race defects easily using graphical view of function call sequence

In R2016b, you can use a new graphical view to determine fixes for concurrency defects such as Data race. For each pair of conflicting operations on a shared variable, the graphical view shows:

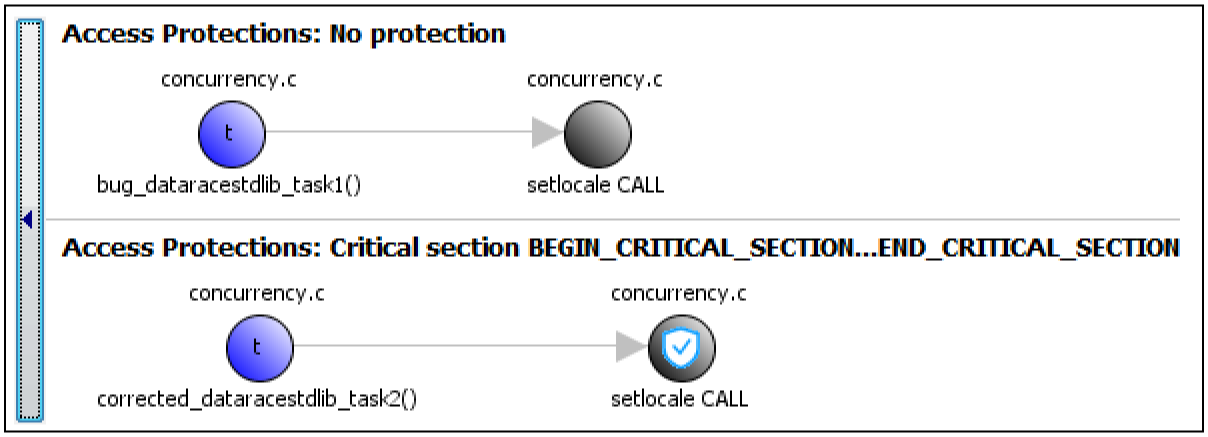
- Two function call sequences leading to the two operations.

  The first node in each sequence represents the entry point function. The last node represents the operation. The intermediate nodes represent functions call sequence leading from the entry point to the operations. To navigate to a function in your source code, click the corresponding node in the graph.
- Critical sections that are already active when a function is called.

  If certain critical sections are active when a function is called, the corresponding node in the graph shows a icon. To see which critical sections are active, place your cursor on the node.

Using this information, you can easily determine how to place appropriate protections and prevent two operations in different tasks/threads from conflicting with each other.

For instance, the following graph shows two tasks calling the function `setlocale`. The two calls are not protected by the same critical section even though the second call uses a critical section. To protect the two calls from interfering with each other, see the **Access Protections** entry for the critical section on the second call and reuse this critical section for the first call.


Access Protections: No protection
concurrency.c
t
bug_dataracestdlib_task1()
concurrency.c
setlocale CALL
Access Protections: Critical section BEGIN_CRITICAL_SECTION...END_CRITICAL_SECTION
concurrency.c
t
corrected_dataracestdlib_task2()
concurrency.c
setlocale CALL

Interactive Graphical Display: Click graphs on Dashboard to filter results

In R2016b, you can narrow down the scope of your review by using a graphical display of analysis results. Previously you used the graphs to obtain an overview of the analysis results and determine which results to focus on. Now you can also select elements in the graphs to view only the results that you want to focus on. To see all results again, clear your filters in one click.

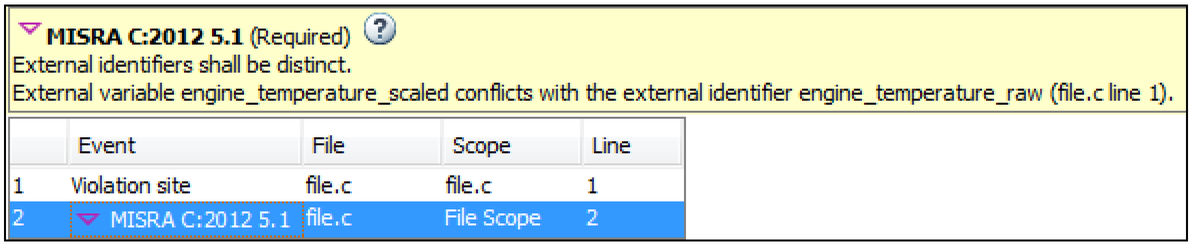
To filter results, you can use the following graphs:

- **Defect distribution by impact**: If you click a region on this pie chart that corresponds to the impact **High**, the **Results List** pane shows high-impact defects only.
- **Defect distribution by category (Top 10 only)**: If you click a column corresponding to a defect, the **Results List** pane shows instances of that defect only.
- ***`Coding rule`* violations by rule (Top 10 only)**: If you click a column corresponding to a coding rule, the **Results List** pane shows violations of that rule only.

For more information, see Filter and Group Results.

Event History for Coding Rules: Navigate easily between two locations in code that together cause a rule violation

In R2016b, for certain coding rules, the **Result Details** pane shows previous events causing the rule violation. You can click an event and navigate to the corresponding location in the source code.



MISRA C:2012 5.1 (Required)
External identifiers shall be distinct.
External variable engine_temperature_scaled conflicts with the external identifier engine_temperature_raw (file.c line 1).

	Event	File	Scope	Line
1	Violation site	file.c	file.c	1
2	MISRA C:2012 5.1	file.c	File Scope	2

This event history is shown for those rules which are related to more than one location in the code. For instance, the event history appears for the following rules:

- MISRA C:2004 Rule 5.2: Identifiers in an inner scope shall not use the same name as an identifier in an outer scope, and therefore hide that identifier.
- MISRA C:2012 Rule 5.1: External identifiers shall be distinct.
- MISRA C++ Rule 2-10-1: Different identifiers shall be typographically unambiguous.
- JSF C++ Rule 139: External objects will not be declared in more than one file.

Results in Macros Consolidated: View coding rule violations and defects on macro definitions instead of macro instances

When you run coding rules checking, violations from macro definitions can propagate throughout your code causing many results. In R2016b, coding rule violations and defects caused by a macro are now shown on the macro definition. This change reduces the number of results with the same root cause, making your review process simpler.

Analysis Objectives in Eclipse: Create review scopes to focus your review

From the Eclipse plugin, you can now create custom review scopes. Review scopes filter your results to only the defects, coding rules, or code metrics you want to see. For more information, see Limit Display of Defects.

Filtered Report: Reuse result filters for generated report

In R2016b, if you apply filters to your results, you can reuse those filters for the generated report. For instance, you can use filters to view only the following subset of results on the **Results List** pane and then reuse those filters for the report.

- View only high-impact defects and create a report with those defects only.
- View only new results found since the last analysis and create a report with the new results only.
- View only code metrics that exceed specified thresholds and create a report with those metrics only.

On the **Results List** pane, you can apply complicated filtering criteria to show only the results that are most meaningful to you. You can reuse these criteria for your generated report and show only the results that you want the report reviewer to focus on. For more information on the filters you can use, see Filter and Group Results.

The report shows which filters you have applied. Another person reviewing your report can see your filtering criteria.

Results Export: Export results to text file for computing graphs and statistics

In R2016b, you can export your results to a tab delimited text file. You can parse the text file using MATLAB or Excel® and generate graphs or statistics about your results that you cannot obtain readily from the user interface.

For more information, see Export Results to Text File.

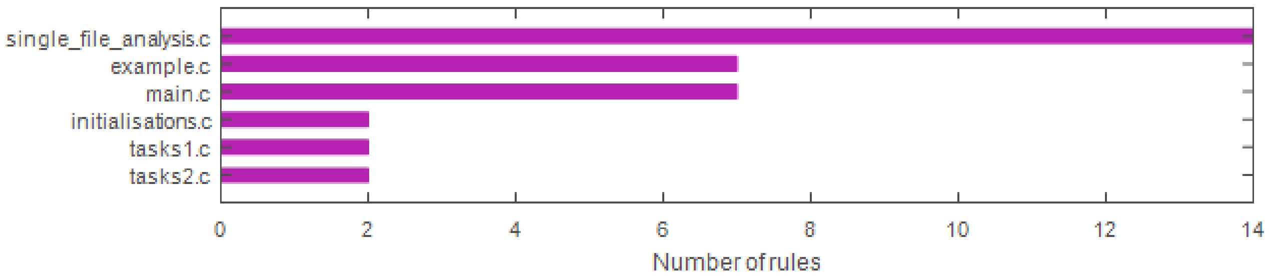
Coding Rules in Report: View improved presentation of coding rules violations in report

In R2016b, the following improvements have been made in how coding rule violations appear in the report.

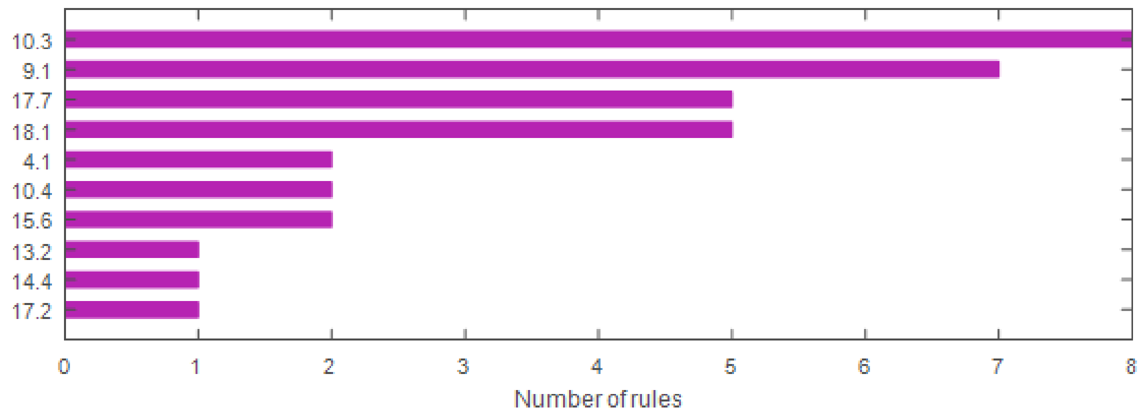
Coding Rule Graphs

If you choose to report coding rule violations, the report contains two new graphs.

- The first graph shows the number of coding rule violations broken down by file.



- The second graph shows the number of violations broken down by rule number.



Coding Rule Template

You can now create a report that shows coding rules violation only. The report does not show other Polyspace Bug Finder results.

For more information, see the description of template `CodingRules` in Report template (-report-template).

English Reports in Non-English Locales: Generate English reports on operating systems with a different language

In R2016b, even if your operating system has a display language (Windows) or locale (Linux) such as Japanese or Korean, you can still generate English reports. See Generate Reports from Command Line.

Change in report template location

The location of the report template files has changed to `*matlabroot*/toolbox/polyspace/psrptgen/templates`. Here, *`matlabroot`* is the MATLAB installation folder.

If you use the report templates provided by Polyspace, the change does not impact you. If you use MATLAB Report Generator™ to modify the Polyspace report templates, you can open the templates from this new location.

Improved PDF Report Generation

In R2016b, the generation of PDF reports is improved.

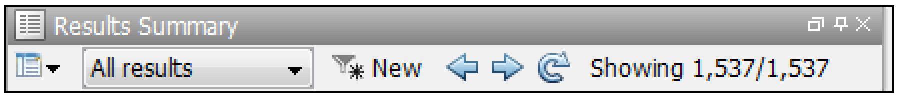
- The report generation is faster. For large results, the report generation is much less likely to cause out-of-memory errors.
- The reports use an improved visual display.

Changes in Polyspace User Interface

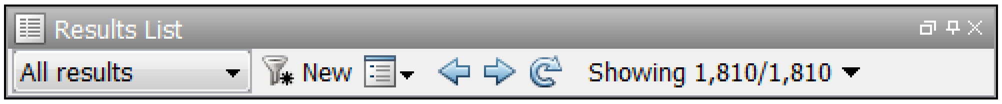
The following table lists minor changes to the user interface including new pane names and new icons.

- **Results List** — Window showing list of results, previously called **Results Summary**.
- 🗑 — Button to remove items in the configuration or projects.
- The icons on the **Results List** pane have been rearranged.

  In R2016a, the icons were arranged as below.



  In R2016b, the same icons are arranged as below.



R2016a

Analysis Setup

Files to Review: Generate results for only specified files and folders

In R2016a, you have greater control over the files on which you want analysis results. The default project configuration displays results on the set of files that are likely to be most relevant to you. You can add files or folders to this set based on your requirements.

For instance, by default, coding rule violations and code metrics are generated on header files that are located in the same folder as the source files. Often, other header files belong to a third-party library. Though these header files are required for a precise analysis, you are not interested in reviewing findings in those headers. Therefore, by default, results are not generated for those headers. If you are interested in certain headers from third-party libraries, you can add those headers to the subset on which results are generated.

For more information, see:

- Generate results for sources and (`-generate-results-for`)
- Do not generate results for (`-do-not-generate-results-for`)

Compatibility Considerations

In R2016a, by default, results are not generated for headers unless they are in the same location as source files. Previously, if you ran an analysis at the command line, by default, results were generated for all headers.

Due to the change in default behavior, if you rerun the analysis on a pre-R2016a project without explicitly changing the options, you can lose review comments on findings in some header files. To avoid losing the comments, set the option Generate results for sources and (`-generate-results-for`) to `all-headers`.

Faster MISRA Checking: Check coding rules more quickly and efficiently

In R2016a, you can use two predefined subsets to perform a quicker and more efficient check for coding rule violations. The new subsets turn on rules that have the same scope.

- `single-unit-rules` — Check rules that apply only to single translation units.
- `system-decidable-rules` — Check rules in the `single-unit-rules` subset and some rules that apply to the collective set of program files. The additional rules can be checked only at the integration level because the rules involve more than one translation unit.

Polyspace finds these subsets of rules in the early phases of the analysis. If your project is large, before checking all rules, you can check these subsets of rules for a quick preliminary analysis.

For more information, see Coding Rule Subsets Checked Early in Analysis.

S-Function Analysis: Launch analysis of S-Function code from Simulink

With the Polyspace plug-in for Simulink, you can now start a Polyspace analysis on S-Functions directly from an S-Function block.

To analyze an S-Function, right-click the S-Function block and select **Polyspace** > **Verify S-Function**. If the S-Function occurs in your model multiple times, you can choose to analyze every instance of the S-Function by analyzing with the different signal range inputs, or just a single instance of the S-Function analyzing with the specific signal ranges for that block.

Import signal ranges from model for generated code analysis

When you run a Polyspace Bug Finder analysis from Simulink, you can now include the signal range information with your analysis. The signal ranges become constraint specifications (formerly called DRS) for the variables in your analysis. For more information see, Configure Data Range Settings and Constraints.

Polyspace Metrics Tomcat Upgrade: Use upgraded default Tomcat server or custom Tomcat version

Polyspace Metrics now uses Tomcat 8.0.22 to run the Polyspace Metrics web interface.

If you want to use your own version of Tomcat, you can now specify a custom Tomcat server in the daemon configuration file. To add your custom tomcat web server, add the following line to the daemon configuration file.

```
tomcat_install_dir = <path/to/tomcat>
```

The daemon configuration file is located in:

- Windows — `\%APPDATA%\Polyspace_RLDatas\polyspace.conf`
- Linux — `/etc/Polyspace/polyspace.conf`

Polyspace Metrics Interface Updated: View project and metrics summary and defect impact

The Polyspace Metrics web interface has been updated to include new features:

- The Bug Finder analysis uploaded to Polyspace Metrics now includes new metrics summarizing the number of defects with High, Medium, and Low impact. For more information on the impact classification, see Classification of Defects by Impact.
- You can now view project-level metric summaries from the main Polyspace Metrics page using one of the following methods:
  - On the **Projects** tab, roll your mouse over the list of projects to open a window displaying a summary of the project and project metrics.
  - On the **Projects** or **Runs** tab, right-click the column headers to add new columns to the table. new columns you can add include Coding Rules, Bug-Finder Checks, Code Metrics, and Review Progress.

For more information, see View Projects in Polyspace Metrics.

Source Code Search: Search huge applications more quickly

In R2016a, search results are produced more quickly. If you search for a string in a huge application, it takes less time for search results to appear.

You can search for a string either by entering the search string in the box on the **Search** pane, or by right-clicking a word in your code on the **Source** pane, and then selecting a search option.

Default Layouts: Switch easily between project setup and results review in user interface

In R2016a, you have two default layouts of panes in the Polyspace user interface, one for project setup and another for results review.

When setting up your projects, select **Window** > **Reset Layout** > **Project Setup**. When reviewing results, select **Window** > **Reset Layout** > **Results Review**.

For more information, see Organize Layout of Polyspace User Interface.

Files Not Compiled: Receive alerts about compilation errors in dashboard and reports

If some of your source files contain compilation errors, Polyspace Bug Finder analyzes those files only for code metrics and some coding rules.

In R2016a, if some of your files are analyzed only partially because of compilation errors:

- On the **Dashboard** pane, you can see that some files failed to compile. Further information about the compilation errors is available on the **Output Summary** pane. For more information, see Dashboard.
- If you generate reports by using the `BugFinderSummary` or `BugFinder` template, the chapter **Polyspace Bug Finder Summary** lists the files that are partially analyzed. For more information, see Report template (`-report-template`).

Project Language Flexibility: Change your project language at any time

Projects in the Polyspace interface are no longer fixed to one language.

When you create your projects, you can add any file to the project. After you add files, select the language (C, C++, or C/C++) for your analysis using the Source code language (`-lang`) option. If you add or change the files in your project, you can change the language to reflect the most suitable analysis type.

Many options that were C only or C++ only are now available for both languages. To see which analysis options have changed, see “Changes in analysis options” on page 11-5.

Improvements in automatic project creation from build command

In R2016a, automatic project creation from build command is improved.

- If you trace your build command and create a Polyspace project from the command line, you do not have to specify a product name or project language. You can open the project in Polyspace Bug Finder or Polyspace Code Prover. The project language is determined by using the following rules:

   - If all your files are compiled as C, as C++03, or C++11, the corresponding language is assigned to the project.

Language	Options Set in Project
C	**Source code language**: `c`
C++03	**Source code language**: `cpp`
C++11	**Source code language**: `cpp` **C++11 Extensions**: On

   - If some files are compiled as C and the remaining files as C++03 or C++11, the **Source code language** option is set to `c-cpp`.

     The option **C++11 Extensions** is also enabled.

  For more information, see Source code language (`-lang`) and C++11 Extensions (`-cpp11-extensions`).

  Previously, you specified the product name by using options `-bug-finder` or `-code-prover`. If you did not specify a project language and your source code consisted of both `.c` and `.cpp` files, the language `cpp` was assigned to the project. The options `-bug-finder` and `-code-prover` have been removed.

  For more information, see Create Project Automatically at Command Line.
- The support for IAR compilers has improved. All variations of IAR compilers are now supported for automatic project creation from build command.

Polyspace TargetLink plug-in supports data from structures

The Polyspace plug-in for TargetLink® can now import data from structures in the constraint specifications (formerly called DRS) for your analysis.

Changes in analysis options

In R2016a, the following options have been added, changed, or removed.

New Options

Option	Description
Generate results for sources and (`-generate-results-for`)	Specify files on which you want analysis results.
Do not generate results for (`-do-not-generate-results-for`)	Specify files on which you do not want analysis results.

Updated Options

Option	Change	More Information
Source code language (`-lang`)	New value `c`	Select your project language to set compilation rules and enable language specific analysis options.
Dialect (`-dialect`)	Unified dialects for C, C/C++, and C++ projects. All projects can use any dialect option.	
Target processor type (`-target`)	Targets `i386` and `x86_64` now allow any alignment value.	
Sfr type support (`-sfr-types`)	Allowed for C, C++, C/C++	
Respect C90 standard (`-no-language-extensions`)	Allowed for mixed C/C++ projects	
Pack alignment value (`-pack-alignment-value`)	Allowed for C, C++, C/C++	
Import folder (`-import-dir`)	Allowed for C, C++, C/C++	
Ignore pragma pack directives (`-ignore-pragma-pack`)	Allowed for C, C++, C/C++	
Division round down (`-div-round-down`)	Allowed for C, C++, C/C++	

Removed Options

Option	Status	Description
Files and folders to ignore (`-includes-to-ignore`)	Warning	Use the option Do not generate results for (`-do-not-generate-results-for`) to suppress results from headers and sources in certain files or folders.
`-support-FX-option-results`	Warning	Option will be removed in a future release.

Compatibility Considerations

If you use scripts that contain the removed or updated options, change your scripts accordingly.

Analysis Results

Improvements to defect checkers

In R2016a, there are improvements in detection of certain defects. For instance, with the checkers for defects Dead code and Useless if:

- You see the code sequence leading to the defect in a greater number of situations. For more information, see Navigate to Root Cause of Defect.
- You see fewer false positives. For instance, you do not see false **Dead code** or **Useless if** defects associated with the following constructs:
  - `_setjmp`
  - Pointer parameter pointing to a global variable
- You do not see defects in templates.

Improvements in checking of previously supported MISRA C rules

In R2016a, the following changes have been made in checking of previously supported MISRA C rules.

MISRA C:2004 Rules

Rule	Description	Improvement
`MISRA C:2004 Rule 10.3`	The value of a complex expression of integer type may only be cast to a type that is narrower and of the same signedness as the underlying type of the expression.	The rule checker no longer raises a violation of this rule if an expression with a Boolean result is cast to a type that is also effectively Boolean. For instance, in your code, you define a type `myBool` using a `typedef` and cast the result of `(a && b)` to `myBool`. If you specify to Polyspace that `myBool` is effectively Boolean, the rule checker does not consider this cast as a violation of rule 10.3. For more information on how to specify effectively Boolean types, see Effective boolean types (-boolean-types).
`MISRA C:2004 Rule 12.2`	The value of an expression shall be the same under any order of evaluation that the standard permits.	The rule checker no longer flags expressions with the comma operator that can be evaluated in only one order. For instance, the statement `ans = (val++, val++)` does not violate this rule.

MISRA C:2012 Rules

Rule	Description	Improvement
`MISRA C:2012 Rule 13.2`	The value of an expression and its persistent side effects shall be the same under all permitted evaluation orders.	The rule checker no longer flags expressions with the comma operator that can be evaluated in only one order. For instance, the statement `ans = (val++, val++)` does not violate this rule.

Standards Mapped to Defects: Observe coding standards using Polyspace Bug Finder

CERT C mapping

In R2016a, you can now observe coding standards such as SEI CERT C Coding Standards by using Polyspace Bug Finder.

For more information, see Mapping Between CERT C Standards and Defects.

CWE ID mapping

In R2016a, the following changes have been made in the mapping between CWE IDs and Polyspace Bug Finder defects.

Defect	CWE ID: Prior to R2016a	CWE ID: R2016a
Invalid use of standard library integer routine	CWE-369: Divide By Zero	• CWE-227: Improper fulfillment of API contract • CWE-369: Divide By Zero • CWE-682: Incorrect Calculation • CWE-872: CERT C++ Secure Coding Section 04 - Integers (INT)

For more information, see Mapping Between CWE Identifiers and Defects.

Reviewing Results

More results available in real time

When you run a Bug Finder analysis, more results for blocks of code are now available while the analysis is running. For information about how to open results during the analysis, see Open Results.

Autocompletion for Review Comments: Partially type previous comment to select complete comment

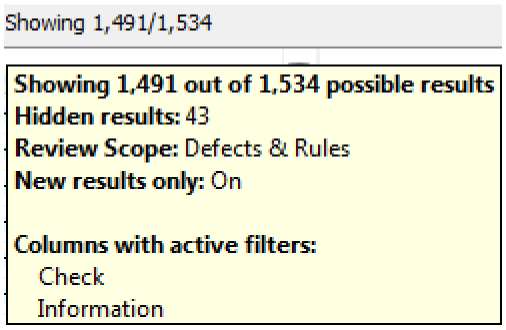
In R2016a, on the **Results Summary** or **Result Details** pane, if you start typing a review comment that you have previously entered, a drop-down list shows the previous entry. Select the previous comment from this list instead of retyping the comment.

If you want the autocompletion to be case sensitive, select **Tools** > **Preferences**. On the **Miscellaneous** tab, select **Autocomplete on Results Summary or Details is case sensitive**.

Persistent Filter States: Apply filters once and view filtered results across multiple runs

In R2016a, if you apply a set of filters to your analysis results and rerun analysis on the project, your filters are also applied to the new results. You can specify your filters once and suppress results that are not relevant for you across multiple runs.

The **Results Summary** pane shows the number of results filtered from the display. If you place your cursor on this number, you can see the applied filters.


Showing 1,491/1,534

Showing 1,491 out of 1,534 possible results
Hidden results: 43
Review Scope: Defects & Rules
New results only: On

Columns with active filters:
Check
Information

For instance, in the image, you can see that the following filters have been applied:

- The **Defects & Rules** filter to suppress code metrics and global variables.
- The New filter to suppress results found in a previous analysis.
- Filters on the **Information** and **Check** columns.

For more information, see Filter and Group Results.

Polyspace Eclipse plug-in results location moved

When you analyze projects using the Polyspace plug-in for Eclipse, your results used to be stored inside your Eclipse project under `*eclipse project folder*\polyspace`. For new Eclipse projects, Polyspace now stores results in the Polyspace Workspace under `*Polyspace_Workspace*\EclipseProjects\*Eclipse Project Name*`, where *`Polyspace_Workspace`* is the default project location specified in your Polyspace Interface preferences. For more information, see Results Location.

R2015aSP1

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Bug Fixes

R2015b

Analysis Setup

Mixed C/C++ Code: Run analysis on entire project with C and C++ source files

If your coding project contains C and C++ files, you can now analyze the entire project in one Polyspace project. Use the new C/C++ setting to compile `.c` files with C compilation rules and compile `.cpp` and other files with C++ compilation rules.

To create a mixed C and C++ project:

- At the command line, use the option `-lang C-CPP`.
- In the user interface:

  1. Select **File** > **New Project**.
  2. In the Project properties window, select **Project Language** > **C++** as the main project language. Enter your other project properties as before.
  3. When adding source files, add your `.c` and `.cpp` files with their include files.
  4. In the configuration, on the **Target & Compiler** pane, set **Source code language** > **C-CPP**. This setting indicates to the compiler to use C compilation rules for `.c` files and C++ compilation rules for `.cpp` files. For other file extensions, Polyspace uses C++ compilation rules.
  5. Set your other options as required. Some limitations to consider:

     - Coding rules — You can select only one C coding rule set and one C++ coding rule set.
     - Bug Finder Defects — You can select C/C++ or C++ defects. The C++ defects are checked only on `.cpp` files.

Autodetection of Multitasking Primitives: Analyze source code with multitasking primitives from POSIX and VxWorks without manual setup

If you use POSIX or VxWorks to perform multitasking, Polyspace can now interpret your multitasking code more easily.

Functions Polyspace can interpret:

POSIX

- `pthread_create`
- `pthread_mutex_lock`
- `pthread_mutex_unlock`

VxWorks

- `taskSpawn`
- `semTake`
- `semGive`

By default in R2015b, Polyspace detects thread creating and critical sections from supported multitasking functions.

For more information, see Modeling Multitasking Code.

Microsoft Visual C++ 2013: Analyze code developed in Microsoft Visual C++ 2013

You can analyze code developed in the Microsoft Visual C++ 2013 dialect.

To analyze code compiled with Microsoft Visual C++ 2013, set your dialect to `visual12.0`. Once you specify your dialect, Microsoft Visual C++ allows language extensions specific to Microsoft Visual C++ 2013. For more information, see Dialect (C) or Dialect (C++).

GNU 4.9 and Clang 3.5 Support: Analyze code compiled with GNU 4.9 or Clang 3.5

Polyspace now supports the GNU 4.9 and Clang 3.5 dialects for C and C++ projects.

To analyze code compiled with one of these dialects, set the **Target & Compiler** > **Dialect** option to `gnu4.9` or `clang3.5`.

For more information, see Dialect (C) or Dialect (C++).

Improvements to automatic project creation from build command

In R2015b, automatic project creation from your build command is improved:

- If you build your source code from the Cygwin environment (using either a 32-bit or 64-bit installation), Polyspace can trace your build and to create a Polyspace project or options file.
- Support for the following compilers has improved:
  - Texas Instruments C2000 compiler

    This compiler is available with Code Composer Studio™.
  - Cosmic HC08 C compiler
  - MPLAB XC8 C Compiler
- With certain compilers, the speed of tracing your build command has improved. The software now stores build information in the system temporary folder, thereby allowing faster access during the build.

  If you still encounter a slow build, use the advanced option `-cache-path ./ps_cache` when tracing your build. For more information, see Slow Build Process When Polyspace Traces the Build.
- If the software detects target settings that correspond to a standard processor type, it assigns that standard target processor type to your project. The target processor type defines the size of fundamental data types and the endianness of the target machine. For more information, see Target processor type (C/C++).

  Previously, when you created a project from your build command, the software assigned a custom target processor type. Although you saw the processor type in the form of an option such as -

`custom-target true,8,2,4,-1,4,8,4,8,8,4,8,1,little,unsigned_int,int,unsigned_short`, you could not identify easily how many bits were associated with each fundamental type. With this enhancement, when the software assigns a processor type, you can identify the number of bits for each type. Click the **Edit** button for the option **Target processor type**.

- Automatic project creation uses a configuration file written for specific compilers. If your compiler is not supported, you can adapt one of the existing configuration files for your compiler. The configuration file, written in XML, is now simplified with some new elements, macros and attributes.

  - The `preprocess_options_list` element supports a new `$(OUTPUT_FILE)` macro when the compiler does not allow sending the preprocessed file to the standard output.
  - A new `preprocessed_output_file` element allows the preprocessed file name to be adapted from the source file name.
  - The `semantic_options` element supports a new `isPrefix` attribute. This attribute provides a shortcut to specify multiple semantic options that begin with the same prefix.
  - The `semantic_options` element supports a new `numArgs` attribute. This attribute provides a shortcut to specify semantic options that take one or more arguments.

  For more information, see Compiler Not Supported for Project Creation from Build Systems.
- Sometimes, the build command returns a non-zero status even when the command succeeds. The non-zero status can result from warnings in the build process. However, Polyspace does not trace the build and create a Polyspace project. You can now use an option `-allow-build-error` to create a Polyspace project even if the build command returns an exit status or error level different from zero. This option helps you understand the error in the build process.

  For more information, see `-option value` arguments of `polyspaceConfigure`.

Start Page: Get oriented with Polyspace Bug Finder

In R2015b, when you open Polyspace Bug Finder for the first time, a **Start Page** pane appears. From this pane, you can:

- Open Polyspace recent results and examples.
- Start a new project.
- Get additional help using the **Getting Started**, **What's New**, and **Learn More** tabs.

If you select the **Show on startup** box, the pane appears each time you open Polyspace Bug Finder. Otherwise, if you close the pane once, it does not reopen. To open the pane, select **Window** > **Show/Hide View** > **Start Page**.

Saved Layouts: Save your preferred layouts of the Polyspace user interface

In R2015b, if you reorganize the Polyspace user interface and place the various panes in more convenient locations, you can save your new layout. If you change your layout, you can quickly revert to a saved layout.

With this modification, you can create customized layouts suitable for different requirements. You can switch between saved layouts quickly. For instance:

- You can have separate layouts for project configuration and results review.
- You can have a minimal layout with only the frequently used panes.

For more information, see Organize Layout of Polyspace User Interface.

Renaming of labels in Polyspace user interface

In the Polyspace user interface, the following labels have been renamed:

- On the **Configuration** pane, the **Coding Rules** node is renamed **Coding Rules & Code Metrics**.

  The new **Coding Rules & Code Metrics** node now contains the option **Calculate Code Metrics**, which previously appeared in the **Advanced Settings** node.
- On the **Results Summary** pane, the **Category** column title is changed to **Group**. This change avoids confusion with coding rule categories.
- On the **Results Summary** and **Result Details** pane, the field **Classification** is changed to **Severity**. You assign a **Severity** such as `High`, `Medium` and `Low` to a defect to indicate how critical you consider the issue.
- The labels associated with specifying constraints have changed as follows:

  - On the **Configuration** pane, the field **Variable/function range setup** is changed to **Constraint setup**.
  - When you click **Edit** beside the Constraint Setup field, a new window opens. The window name is changed from **Polyspace DRS Configuration** to **Constraint Specification**.

  For more information, see Specify Constraints.

Including options multiple times

You can specify analysis options multiple times. This new capacity is available only at the command line or using the command-line names in the **Advanced options** pane in the user interface. You can customize pre-made configurations without having to remove options.

If you specify an option multiple times, only the last setting is used. For example, if your configuration is:

```
-lang c
-prog test_bf_cp
-verif-version 1.0
-author username
-sources-list-file sources.txt
-OS-target no-predefined-OS
-target i386
-dialect none
-misra-cpp required-rules
-target powerpc
```

Polyspace uses the last target setting, `powerpc`, and ignores the other target specified, `i386`.

In the user interface, if you specify **c18** as the target on the Target and Compiler pane and in **Advanced options** enter `-target i386`, these two targets count as multiple analysis option specifications. Polyspace uses the target specified in the Advanced options dialog box, `i386`.

Updated Support for TargetLink

The Polyspace plug-in for TargetLink now supports versions 3.5 and 4.0 of the dSPACE® Data Dictionary and TargetLink Code Generator.

dSPACE and TargetLink version 3.4 is no longer supported.

For more information, see TargetLink Considerations.

Changes in analysis options

In R2015b, the following options have been added, changed, or removed.

New Options

Option	Status	Description
Respect C90 Standard (`-no-language-extensions`)	New	The analysis does not allow C language extensions that do not follow the ISO/IEC 9899:1990 standard.
Dialect `visual12.0`	New	Allows Microsoft Visual C++ 2013 (visual 12) language extensions.
Dialect `gnu4.9`	New	Allows GCC 4.9 language extensions.
Dialect `clang3.5`	New	Allows Clang 3.5 language extensions.
Source code language (C++) (`-lang`)	New in the user interface	The `-lang` option is now available in the Polyspace user interface. It is on the **Target & compiler** tab and called **Source code language**.
Source code language (C++) > **C-CPP** (`-lang C-CPP`)	New option setting	For C++ projects, you can choose `C-CPP` to analyze a mix of `.c` and `.cpp` source files.
Configure multitasking manually (C/C++)	New	A user interface option only. This option enables the previous multitasking options • **Entry points** • **Critical section details** • **Temporally exclusive tasks**
Disable automatic concurrency detection (C/C++)	New	By default, the new automatic concurrency detection is enabled. If you want to turn it off, select this option.

Updated Options

Option	Change	Description
Calculate Code Metrics (C/C++)	Moved in user interface	The option has been moved in the Configuration panel from the **Advanced Settings** pane to the **Coding Rules and Code Metrics** pane.
Signed right shift (C/C++) (`-logical-signed-right-shift`)	Now available in C ++ projects	
Division round down (C/C++) (`-div-round-down`)	Now available in C ++ projects	
Targets: • `tms320c3x` • `sharc21x61` • `necv850` • `hc08` • `hc12` • `mpc5xx` • `c18`	Now available in C ++ projects	
Enum type definition (C/C++) (`-enum-type-definition`)	Possible values updated	The possible values for `-enum-type-definition` now match for C and C++. Available values: • `defined-by-standard (default)` • `auto-signed-first` • `auto-unsigned-first`
`-support-FX-option-results`	No longer available in the user interface	
`-pointer-is-24bits`	Available in C++ projects	Available only if you use the **Target** setting `c18`.
`-asm-begin -asm-end`	Now available in C ++ projects	
Check MISRA C:2004	Now available in C ++ projects	Available only if you select **Source code language** > **C-CPP**.
Check MISRA AC AGC	Now available in C ++ projects	Available only if you select **Source code language** > **C-CPP**.
Check MISRA C:2012 and Use generated code requirements (C)	Now available in C ++ projects	Available only if you select **Source code language** > **C-CPP**.

Option	Change	Description
Effective boolean types (C)	Now available in C ++ projects	Available only if you select **Source code language** > **C-CPP**.
Allowed pragmas (C)	Now available in C ++ projects	Available only if you select **Source code language** > **C-CPP**.
Output format (C/C++) `-report-output-format`	Possible values updated	The output format `RTF` is deprecated and not available on the **Configuration** pane.

Removed Options

Option	Status	Description
`-dialect cfront2`	Removed	Choose a different dialect.
`-dialect cfront3`	Removed	Choose a different dialect.
`-passes-time`	Removed	Polyspace includes this behavior by default. Remove this option from existing configurations.
`-include-headers-once`	Removed	Polyspace includes this behavior by default. Remove this option from existing configurations.
`-discard-asm`	Removed	This option is no longer supported. Remove this option from existing configurations.
`-misra2 AC-AGC-OBL-subset`	Removed	Use `-misra-ac-agc OBL-rules` instead.

Compatibility Considerations

If you use scripts that contain the removed or updated options, change your scripts accordingly.

Binaries removed

The following binaries have been removed.

Removed binary	Use instead
`polyspace-rl-manager.exe`	`polyspace-server-settings.exe`
`polyspace-spooler.exe`	`polyspace-job-monitor.exe`
`polyspace-ver.exe`	`polyspace-bug-finder-nodesktop -ver`

The binaries to use instead are located in *`matlabroot`*`/polyspace/bin`.

Support for Visual Studio 2008 to be removed

The Polyspace Add-In for Visual Studio 2008 is no longer supported and will be removed in a future release.

Compatibility Considerations

To analyze your Visual Studio projects, use either:

- The Polyspace Add-in for Visual Studio 2010. See Install Polyspace Add-In for Visual Studio.
- The `polyspace-configure` tool to create a project using your build command. See Create Project Using Visual Studio Information.

Import Visual Studio project removed

The **Tools** > **Import Visual Studio project** has been removed.

To import your project information from Visual Studio, use the **Create from build system** option during new project creation. For more information, see Create Project Using Visual Studio Information.

Analysis Results

More Defect Categories: Detect security vulnerabilities, resource management issues, object oriented design issues

You can check your code against five new categories of defects:

- Resource management — Defects related to resource handling such as detection of unclosed file descriptors or use of a closed file descriptor.
- Object oriented — Defects related to C++ object-oriented programming such as detection of class design issues or issues in the inheritance hierarchy.
- Security — Defects related to security vulnerabilities such as vulnerable standard functions, use of sensitive data, and pseudo-random number generation.
- Tainted data — Defects related to using variables that someone outside your program can manipulate and externally controlled resources.
- Good practice — Defects that allow you to observe good coding practices such as detection of hard-coded memory buffer size or unused function parameters.

For information about the new defects, see “Changes to Bug Finder Defects” on page 13-12.

Complete MISRA C:2012 Support: Detect violations of all MISRA C:2012 rules

In R2015b, Polyspace Bug Finder supports the following MISRA C: 2012 coding rules.

Rule	Description
`MISRA C:2012 Directive 2.1`	All source files shall compile without any compilation errors.
`MISRA C:2012 Directive 4.5`	Identifiers in the same name space with overlapping visibility should be typographically unambiguous.
`MISRA C:2012 Directive 4.13`	Functions which are designed to provide operations on a resource should be called in an appropriate sequence.
`MISRA C:2012 Rule 2.6`	A function should not contain unused label declarations.
`MISRA C:2012 Rule 2.7`	There should be no unused parameters in functions.
`MISRA C:2012 Rule 17.5`	The function argument corresponding to a parameter declared to have an array type shall have an appropriate number of elements.
`MISRA C:2012 Rule 17.8`	A function parameter should not be modified.
`MISRA C:2012 Rule 21.12`	The exception handling features of `<fenv.h>` should not be used.
`MISRA C:2012 Rule 22.1`	All resources obtained dynamically by means of Standard Library functions shall be explicitly released.
`MISRA C:2012 Rule 22.2`	A block of memory shall only be freed if it was allocated by means of a Standard Library function.

Rule	Description
`MISRA C:2012 Rule 22.3`	The same file shall not be open for read and write access at the same time on different streams.
`MISRA C:2012 Rule 22.4`	There shall be no attempt to write to a stream which has been opened as read-only.
`MISRA C:2012 Rule 22.5`	A pointer to a `FILE` object shall not be dereferenced.
`MISRA C:2012 Rule 22.6`	The value of a pointer to a `FILE` shall not be used after the associated stream has been closed.

Improvements in checking of previously supported MISRA C rules

In R2015b, the following changes have been made in MISRA C checking:

MISRA C:2004

Rule	Description	Improvement
`MISRA C:2004 Rule 2.1`	Assembly language shall be encapsulated and isolated.	If an assembly language statement is entirely encapsulated in macros, Polyspace no longer considers that the statement violates this rule.
`MISRA C:2004 Rule 8.8`	An external object or function shall be declared in one file and only one file.	Polyspace considers that variables or functions declared `extern` in a non-header file violate this rule.
`MISRA C:2004 Rule 10.1`	The value of an expression of integer type shall not be implicitly converted to a different underlying type if it is not a conversion to a wider integer type of the same signedness.	Polyspace no longer raises violation of this rule on operations involving pointers.
`MISRA C:2004 Rule 19.2`	Nonstandard characters should not occur in header file names in `#include` directives.	If the character `\` or `\\` occurs between the `<` and `>` in `#include <filename>` (or between `"` and `"` in `#include "filename"`), Polyspace no longer raises violation of this rule. Therefore, you can use Windows paths to files in place of `filename` without triggering a rule violation.

MISRA C:2012

Rule	Description	Improvement
`MISRA C:2012 Directive 4.3`	Assembly language shall be encapsulated and isolated.	If an assembly language statement is entirely encapsulated in macros, Polyspace no longer considers that the statement violates this rule.
`MISRA C:2012 Rule 1.1`	The program shall contain no violations of the standard C syntax and constraints, and shall not exceed the implementation's translation limits.	If a rule violation occurs because your `.c` file contains too many macros, Polyspace places the rule violation at the beginning of the file instead on the last macro usage. Therefore, you can add a comment before the first line of the `.c` file justifying the violation. Previously, if you placed a justification comment before the last macro usage and later added another macro usage, the comment no longer applied. For information on adding code comments to justify results, see Annotate Code for Rule Violations.
`MISRA C:2012 Rule 10.4`	Both operands of an operator in which the usual arithmetic conversions are performed shall have the same essential type category.	• If one of the operands is the constant zero, Polyspace does not raise a violation of this rule. • If one of the operands is a signed constant and the other operand is unsigned, the rule violation is not raised if the signed constant has the same representation as its unsigned equivalent. For instance, the statement `u8b = u8a + 3;`, where `u8a` and `u8b` are `unsigned char` variables, does not violate the rule because the constants `3` and `3U` have the same representation.

Checking Coding Rules Using Text Files

In R2015b, if your coding rules configuration text file has an incorrect syntax, the analysis stops with an error message. The error message states the line numbers in the configuration file that contain the incorrect syntax.

For more information on checking for coding rules using text files, see Format of Custom Coding Rules File.

Changes to Bug Finder Defects

- “New Defects” on page 13-13
- “Updated Defects” on page 13-18

The following tables list updates and additions to the list of Bug Finder defect checkers.

New Defects

Tainted Data Defects

Name	Description
Array access with tainted index	Array index from unsecure source possibly outside array bounds
Command executed from externally controlled path	Path argument from an unsecure source
Execution of externally controlled command	Command argument from an unsecure source is vulnerable to OS command injection
Host change using externally controlled elements	Changing host id from an unsecure source
Library loaded from externally controlled path	Library argument from an externally controlled path
Loop bounded with tainted value	Loop controlled by a value from an unsecure source
Memory allocation with tainted size	Size argument to memory function is from an unsecure source
Pointer dereference with tainted offset	Offset is from an unsecure source and dereference may be out of bounds
Tainted division operand	Division operands from an unsecure source
Tainted modulo operand	Remainder operands from an unsecure source
Tainted NULL or non-null-terminated string	Argument is from an unsecure source and may be `NULL` or not `NULL`-terminated
Tainted sign change conversion	Value from an unsecure source changes sign
Tainted size of variable length array	Size of the variable-length array (VLA) is from an unsecure source and may be zero, negative, or too large
Tainted string format	Input format argument is from an unsecure source
Use of externally controlled environment variable	Value of environment variable from an unsecure source
Use of tainted pointer	Pointer from an unsecure source may be `NULL` or point to unknown memory

Good Practice Defects

Name	Description
Delete of void pointer	`delete` operates on a `void*` pointer pointing to an object
Hard coded buffer size	Size of memory buffer is a numerical value instead of symbolic constant
Hard coded loop boundary	Loop boundary is a numerical value instead of symbolic constant
Unused parameter	Function prototype has parameters not read or written in function body
Use of setjmp/longjmp	`setjmp` and `longjmp` cause deviation from normal control flow

Programming Defects

Name	Description
Bad file access mode or status	Access mode argument of function in `fopen` or `open` group is invalid
Call to memset with unintended value	`memset` or `wmemset` used with possibly incorrect arguments
Copy of overlapping memory	Source and destination arguments of a copy function have overlapping memory
Exception caught by value	`catch` statement accepts an object by value
Exception handler hidden by previous handler	`catch` statement is not reached because of an earlier `catch` statement for the same exception
Improper array initialization	Incorrect array initialization when using initializers
Incorrect pointer scaling	Implicit scaling in pointer arithmetic might be ignored
Invalid assumptions about memory organization	Address is computed by adding or subtracting from address of a variable
Invalid va_list argument	Variable argument list used after invalidation with `va_end` or not initialized with `va_start` or `va_copy`
Modification of internal buffer returned from nonreentrant standard function	Function attempts to modify internal buffer returned from a nonreentrant standard function
Overlapping assignment	Memory overlap between left and right sides of an assignment
Possible misuse of sizeof	Use of `sizeof` operator can cause unintended results
Possibly unintended evaluation of expression because of operator precedence rules	Operator precedence rules cause unexpected evaluation order in arithmetic expression
Standard function call with incorrect arguments	Argument to a standard function does not meet requirements for use in the function
Use of memset with size argument zero	Size argument of function in `memset` family is zero
Variable length array with nonpositive size	Size of variable-length array is zero or negative
Writing to const qualified object	Object declared with a `const` qualifier is modified

Resource Management Defects

Name	Description
Closing a previously closed resource	Function closes a previously closed stream
Resource leak	File stream not closed before `FILE` pointer scope ends or pointer is reassigned
Use of previously closed resource	Function operates on a previously closed stream
Writing to read-only resource	File opened earlier as read-only is modified

Security Defects

Name	Description
Deterministic random output from constant seed	Seeding routine uses a constant seed making the output deterministic
Execution of a binary from a relative path can be controlled by an external actor	Command with relative path is vulnerable to malicious attack
File access between time of check and use (TOCTOU)	File/directory may have changed state due to access race
File manipulation after chroot() without chdir("/")	Path-related vulnerabilities for file manipulated after call to `chroot`
Function pointer assigned with absolute address	Constant expression is used as function address is vulnerable to code injection
Incorrect order of network connection operations	Socket is not correctly established due to bad order of connection steps or missing steps
Load of library from a relative path can be controlled by an external actor	Library loaded with relative path is vulnerable to malicious attacks
Mismatch between data length and size	Data size argument is not computed from actual data length
Missing case for switch condition	Default case is missing and may be reached
Predictable random output from predictable seed	Seeding routine uses a predictable seed making the output predictable
Sensitive data printed out	Function prints out sensitive data
Sensitive heap memory not cleared before release	Sensitive data not cleared or released by memory routine
Umask used with chmod-style arguments	Unsafe argument to `umask` allows external user too much control
Uncleared sensitive data in stack	Variable in stack is not cleared and contains sensitive data
Unsafe standard encryption function	Function is not reentrant or uses a risky encryption algorithm
Unsafe standard function	Function unsafe for security-related purposes
Use of dangerous standard function	Dangerous functions cause possible buffer overflow in destination buffer
Vulnerable path manipulation	Path argument with `/../`, `/abs/path/`, or other unsecure elements
Vulnerable permission assignments	Argument gives read/write/search permissions to external users
Vulnerable pseudo-random number generator	Using a cryptographically weak pseudo-random number generator

Name	Description
Use of non-secure temporary file	Temporary generated file name is unsecure
Use of obsolete standard function	Obsolete routines can cause security vulnerabilities and/or portability issues

Object-Oriented Defects

Name	Description
`*this not returned in copy assignment operator`	`operator=` method does not return a pointer to the current object
Base class assignment operator not called	Copy assignment operator does not call copy assignment operators of base subobjects
Base class destructor not virtual	Class cannot behave polymorphically for deletion of derived class objects
Copy constructor not called in initialization list	Copy constructor does not call copy constructors of some members or base classes
Incompatible types prevent overriding	Derived class method hides a `virtual` base class method instead of overriding it
Missing explicit keyword	Constructor missing the `explicit` specifier
Missing virtual inheritance	A base class is inherited both virtually and non-virtually in the same hierarchy
Member not initialized in constructor	Constructor does not initialize some members of a class
Object slicing	Derived class object passed by value to function with base class parameter
Partial override of overloaded virtual functions	Class overrides a fraction of the inherited virtual functions with a given name
Return of non const handle to encapsulated data member	Method returns pointer or reference to internal member of object
Self assignment not tested in operator	Copy assignment operator does not test for self-assignment

Updated Defects

Name	Status	Additional Information
Integer conversion overflow Integer overflow Invalid use of standard library routine Shift operation overflow Sign change integer conversion overflow Shift of a negative value Unsigned integer conversion overflow Unsigned integer overflow	Updated	The defects do not appear on computations involving constants only. For instance, the assignment `unsigned int var = -1;` does not show a Sign change integer conversion overflow defect.
Format string specifiers and arguments mismatch	New category	Moved from **Other** to **Programming**
Invalid use of standard library routine	New category	Moved from **Other** to **Programming**
Assertion	New category	Moved from **Other** to **Good practice**
Large pass-by-value argument	New category	Moved from **Other** to **Good practice**
Line with more than one statement	New category	Moved from **Other** to **Good practice**

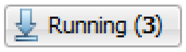
Reviewing Results

Results in Real Time: View results as they are produced

Previously, you could not review results until the analysis was complete. For local analyses in R2015b, you can start reviewing results as soon as they are available.

When you run a local analysis, a new button appears on the toolbar.

When results are available, this button becomes active.



To start reviewing available results, click this button. The button reactivates every time results are available. To load additional results, click the button again.

When the analysis is complete, to load all your results, click the button.

For more information, see Open Results.

Improved Eclipse Support: View results embedded in source code and context-sensitive help

In R2015b, the following improvements have been made to the Polyspace plugin for Eclipse:

- Polyspace Bug Finder highlights defects in your source code in the following ways:
  - For defects, an ! mark appears before the line number on the left. For coding rule violations, a ▽ or ▼ mark appears before the line number on the left.
  - The operation containing the defect has a wavy red underlining.
  - For defects, a ▭ icon appears in the overview ruler to the right of the line containing the defect. For coding rule violations, a ▭ icon appears in the overview ruler to the right of the line containing the rule violation. If you place your cursor on the icon, a tooltip shows a brief description of the defect or coding rule.

    In addition, a ■ icon appears at the top of the overview ruler. If you place your cursor on the icon, a tooltip states the total number of defects and coding rule violations in the file.

  Using these indicators, you can track defects in your source code more easily. For more information, see Review and Fix Results.
- When you select a result in the **Results Summary - Bug Finder** view, the **Result Details** view displays additional information about the result. In the **Result Details** view, if you click the ⓘ button next to the result name, you can see a brief description and examples of the result. For defects, you can sometimes see the risk associated with not fixing the defect and the most common fix for the defect.

- You can switch to a Polyspace perspective that shows only the information relevant to a Polyspace Bug Finder analysis. To open the perspective, select **Window** > **Open Perspective** > **Other**. In the Open Perspective dialog box, select **Polyspace**.

  Once you switch to the Polyspace perspective, the source code shows the Polyspace Bug Finder defects only in this perspective.
- You can view results as they are produced instead of waiting till end of the analysis.
  - When you begin an analysis, a icon appears next to the button.
  - If results are available, the icon turns to . Click the icon to load available results.
  - With your results open, if additional results are available, the icon is still visible. Click the icon to load all available results.

Defects Classified by Impact: Prioritize defect review by using the impact attribute assigned to each defect type

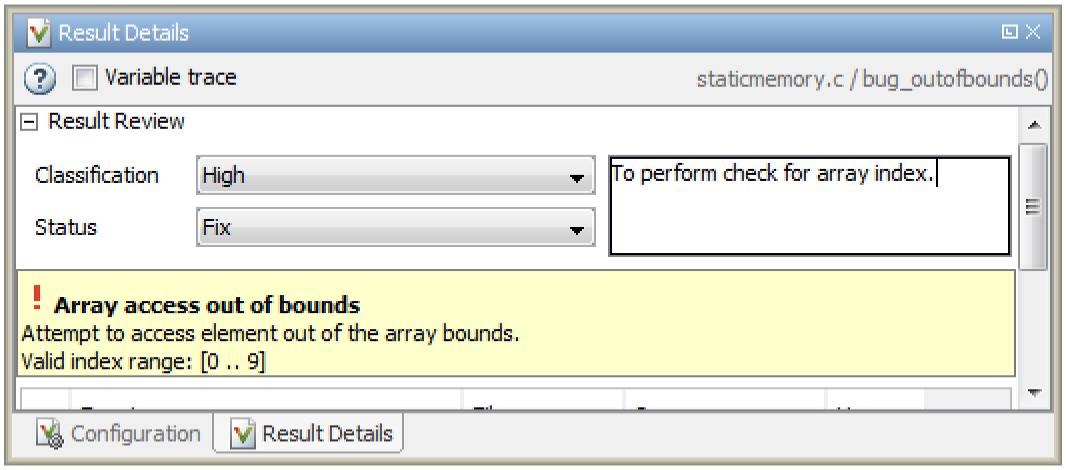
You can prioritize your result review using an **Impact** attribute assigned to the defects. The attribute is assigned based on the following considerations:

- Criticality, or whether the defect is likely to cause a code failure.
- Certainty, or the rate of false positives.

You can filter results on the **Results Summary** pane using the **Impact** attribute. Or, you can obtain a graphical visualization of the **Defect distribution by impact** on the **Dashboard** pane. For more information, see Classification of Defects by Impact.

Improved Review Capability: View result details and add review comments in one window

In R2015b, the **Check Details** pane is renamed as **Result Details**. On this pane, you can now enter review information such as **Classification**, **Status**, and comments. For more information, see Review and Fix Results.



Classification: High
Status: Fix
To perform check for array index.

Array access out of bounds
Attempt to access element out of the array bounds.
Valid index range: [0 .. 9]

Previously, to enter review information while keeping the **Results Summary** pane collapsed, you used the **Check Review** pane. This pane has been removed.

Enhanced Review Scope: Filter coding rule violations from display in one click

Previously, using custom options on the **Show** menu, you suppressed only defects and code metrics (if they fell below a certain threshold). In R2015b, you can suppress a certain number or percentage of coding rule violations from the display. You use custom options in the **Show** menu on the **Results Summary** pane. You can:

- Suppress violations of coding rules that are not relevant.
- Focus your results review by seeing only a certain number of coding rule violations in your display.
- Predefine a percentage of coding rule violations that you intend to review and view only that percentage in your analysis results.

You define an option on the **Show** menu only once. The option is available for one-click use every time that you open your results. For information on how to create an option to suppress coding rule violations, see Suppress Certain Rules from Display in One Click.

Configuration Associated with Result Not Opened by Default

In R2015b, when you open your result, the **Configuration** pane does not automatically display a read-only form of the associated configuration.

To view the configuration associated with the result, select the link **View configuration for results** on the **Dashboard** pane. If a corresponding project is open in the **Project Browser**, you can also right-click the **Results** node in the project and select **Open Configuration**.

Improvements in Report Templates

In R2015b, the major improvements in report templates include the following:

- The summary chapter in the template **BugFinder** now contains a breakup of Polyspace Bug Finder results by file, in addition to the project-wide summary.
- The summary now shows the total number of results along with the number of results reviewed.
- Instead of filenames, absolute paths to files appear in the reports.
- If you check for coding rules, the appendix about coding rules configuration states all rules along with the information whether they were enabled or disabled. Previously, the appendix only stated the enabled rules.
- The reports display the impact attribute associated with a defect.

  For more information on this attribute, see Classification of Defects by Impact.

For more information on templates, see Report template (C/C++).

XML and RTF report formats removed

The formats XML and RTF for report generation are not available from R2016a onwards. If you generated reports using one of these formats, use an alternative format instead.

For more information, see Output format (C/C++).

R2015a

Analysis Setup

Simplified workflow for project setup and results review with a unified user interface

In R2015a, the Project and Results Manager perspectives have been unified. You can run the analysis and review results without switching between two perspectives.

The unification has resulted in the following major changes:

- After an analysis, the result opens automatically.

  Previously, after an analysis, you had to double-click the result in the **Project Browser** to open your new results.
- You can have any of the panes open in the unified interface.

  Previously, you could open the following panes only in one of the two perspectives.

Project Manager	Results Manager
• **Project Browser**: Set up project. • **Configuration**: Specify analysis options for your project. • **Output Summary**: Monitor progress of analysis. • **Run Log**: Find information about an analysis.	• **Results Summary**: View Polyspace results. • **Source**: View read-only form of source code color coded with Polyspace results. • **Check Details**: View details of a particular result. • **Results Properties**: Same as **Run Log**, but associated with results instead of a project. This pane has been removed. To open the log associated with a result, with the results open, select **Window** > **Show/Hide View** > **Run Log**. • **Settings**: Same information as **Configuration**, but associated with results instead of a project. This pane has been removed. To open the configuration associated with a result, with the results open, select **Window** > **Show/Hide View** > **Configuration**.

Search improvements in the user interface

In R2015a, the **Search** pane allows you to search for a string in various panes of the user interface.

To search for a string in the new user interface:

1. If the **Search** pane is not visible, open it. Select **Window** > **Show/Hide View** > **Search**.

2. Enter your string in the search box.
3. From the drop-down list beside the box, select names of panes you want to search.

The **Search** pane consolidates the previously available search options.

Option to specify program termination functions

In R2015a, you can specify functions that behave like the exit function and terminate your program.

- At the command line, use the flag `-termination-functions`.
- In the user interface, on the **Configuration** pane, select **Advanced Settings**. Enter `-termination-functions` in the **Other** field.

For more information, see -termination-functions.

Support for GCC 4.8

Polyspace now supports the GCC 4.8 dialect for C and C++ projects.

To allow GCC 4.8 extensions in your Polyspace Bug Finder analysis, set the **Target & Compiler** > **Dialect** option to `gnu4.8`.

For more information, see Dialect (C) and Dialect (C++).

Polyspace plug-in for Simulink improvements

In R2015a, there are three improvements to the Polyspace Simulink plug-in.

Integration with Simulink projects

You can now save your Polyspace results to a Simulink project. Using this feature, you can organize and control your Polyspace results alongside your model files and folders.

To save your results to a Simulink project:

1. Open your Simulink project.
2. From your model, select **Code** > **Polyspace** > **Options**.
3. In the Polyspace parameter configuration tab, select the **Save results to Simulink project** option.

For more information, see Save Results to a Simulink Project.

Back-to-model available when Simulink is closed

In the Polyspace plug-in for Simulink, the back-to-model feature now works even when your model is closed. When you click a link in your Polyspace results, MATLAB opens your model and highlights the related block.

Note This feature works only with Simulink R2013b and later.

For more information about the back-to-model feature, see Review Generated Code Results.

Polyspace binaries being removed

The following binaries will be removed in a future release. The binaries to use are located in *`matlabroot`*`/polyspace/bin`. You get a warning if you run them.

Binary name	Use instead
`polyspace-rl-manager.exe`	`polyspace-server-settings.exe`
`polyspace-spooler.exe`	`polyspace-job-monitor.exe`
`polyspace-ver.exe`	`polyspace-bug-finder-nodesktop -ver`

Import Visual Studio project being removed

The **Tools > Import Visual Studio project** will be removed in a future release. Instead, use the **Create from build system** option during new project creation. For more information, see Create Project Automatically.

Analysis Results

Changes to Bug Finder defects

Defect	R2015a change
`Invalid use of floating point operation`	Off by default.
`Line with more than one statement`	Off by default.
`Invalid use of = (assignment) operator`	On by default for handwritten code (analyses started at the command-line or Polyspace environment). Off by default for generated code (analyses started from the Simulink plug-in).
`Invalid use of == (equality) operator`	On by default for handwritten code. Off by default for generated code.
`Missing null in string array`	On by default for handwritten code. Off by default for generated code.
`Partially accessed array`	On by default for handwritten code. Off by default for generated code.
`Variable shadowing`	On by default for handwritten code. Off by default for generated code.
`Write without further read`	On by default for handwritten code. Off by default for generated code.
`Wrong type used in sizeof`	On by default for handwritten code. Off by default for generated code.

Improvements in coding rules checking

MISRA C:2004 and MISRA AC AGC

Rule Number	Effect	More Information
Rule 12.6	More results on noncompliant `#if` preprocessor directives. Fewer results for variables cast to effective Boolean types.	MISRA C:2004 Rules — Chapter 12: Expressions
Rule 12.12	Fewer results when converting to an array of `float`	MISRA C:2004 Rules — Chapter 12: Expressions

MISRA C:2012

Rule Number	Effect	More Information
Rules 10.3	Fewer results on enumeration constants when the type of the constant is a named enumeration type. Fewer results on user-defined effective Boolean types.	MISRA C:2012 Rule 10.3
Rule 10.4	Fewer results on enumeration constants when the type of the constant is a named enumeration type. Fewer results for casts to user-defined effective Boolean types.	MISRA C:2012 Rule 10.4
Rule 10.5	Fewer results on enumeration constants when the type of the constant is a named enumeration type. Fewer results on user-defined effective Boolean types.	MISRA C:2012 Rule 10.5
Rule 12.1	More results on expressions with `sizeof` operator and on expressions with `?` operators. Fewer results on operators of the same precedence and in preprocessing directives.	MISRA C:2012 Rule 12.1
Rule 14.3	No results for non-controlling expressions.	MISRA C:2012 Rule 14.3

MISRA C++:2008

Rule Number	Effect	More Information
Rule 5-0-3	Fewer results on enumeration constants when the type of the constant is the enumeration type.	MISRA C++ Rules — Chapter 5
Rule 6-5-1	Fewer results on compliant vector variable iterators.	MISRA C++ Rules — Chapter 6
Rule 14-8-2	Fewer results for functions contained in the Files and folders to ignore (C++) option.	MISRA C++ Rules — Chapter 14
Rule 15-3-2	Fewer results for user-defined return statements after a `try` block.	MISRA C++ Rules — Chapter 15

Reviewing Results

Code complexity metrics available in user interface

In R2015a, code complexity metrics can be viewed in the Polyspace user interface. For more information, see Code Metrics. Previously, this information was available only in the Polyspace Metrics web interface.

In the user interface, you can:

- Specify a limit for the value of a metric. If the metric value for your source exceeds this limit, the metric appears red in **Results Summary**.
- Comment and justify the value of a metric. If a metric value exceeds specified limits and appears red, you can add a comment with the rationale.

Using Polyspace results in this way, you can enforce coding standards across your organization. For more information, see Review Code Metrics.

Reducing the complexity of your code improves code readability, reduces the possibility of coding errors, and allows more precise Polyspace analysis.

Context-sensitive help for code complexity metrics, MISRA-C:2012, and custom coding rules

In R2015a, context-sensitive help is available in the user interface for code metrics results, MISRA C:2012 rule violations, and custom coding rule violations.

To access the contextual help, see Getting Help.

For information about these results, see:

- Code Metrics
- MISRA C:2012 Directives and Rules
- Custom Coding Rules

Review of latest results compared to the last run

In R2015a, you can review only new results compared to the previous run.

If you rerun your analysis, the new results are displayed with an asterisk (*) against them on the **Results Summary** pane. To display only these results, select the **New results** box.

If you make changes in your source code, you can use this feature to see only the results introduced due to those changes. You can avoid reviewing the results in your existing source code.

Simplified results infrastructure

Polyspace results folders are reorganized and simplified. Files have been removed, combined, renamed, or moved. The infrastructure changes do not change the analysis results that you see in the Polyspace environment.

Some important changes and file locations:

- The main results file is now encrypted and renamed `ps_results.psbf`. You can view results only in the Polyspace environment.
- The log file, `Polyspace_R2015a_`*`project_date-time`*`.log` has not changed.

For more information, see Results Folder Contents.

Default statuses to justify results

Polyspace Bug Finder results use certain statuses to calculate the number of justified results in Polyspace Metrics.

In R2015a, the default statuses that mark results as justified are:

- `Justified` — Previously called `Justify`, renamed in R2015a.
- `No action planned` — Existing status added to justified list in R2015a.

You can change which statuses mark results as justified from the Polyspace preferences. For more information, see Define Custom Review Status.

Filters to limit display of results

In R2015a, you can use the **Show** menu on the **Results Summary** pane to suppress certain Polyspace Bug Finder results from display.

- To suppress code complexity metrics from display, select **Show** > **Defects & Rules**.
- Create your own options on the **Show** menu. Select **Tools** > **Preferences** and create new options through the **Review Scope** tab.

  For more information, see Limit Display of Defects.

R2014b

Analysis Setup

Parallel compilation for faster analysis

Starting in R2014b, Polyspace Bug Finder can run the compilation phase of your analysis in parallel on multiple processors. The software detects available processors and uses them to compile different source files in parallel.

Previously, the software ran post-compilation phases in parallel but compiled the source files sequentially. Starting in R2014b, the software can use multiple processors for the entire analysis process.

To explicitly specify the number of processors, use the command-line option `-max-processes`. For more information, see -max-processes.

Support for Mac OS

You can install and run Polyspace on Mac OS X. Polyspace is supported for Mac OS 10.7.4+, 10.8, and 10.9.

You can use Polyspace Metrics on Safari and set up your Mac as a Metrics server. However, if you restart your Mac machine that is setup as a Metrics server, you must restart the Polyspace server daemon.

Support for C++11

Polyspace can now fully analyze C++ code that follows the ISO®/IEC 14882:2011 standard, also called C++11.

Use two new analysis options when analyzing C++11 code. On the **Target & Compiler** pane, select:

- **C++11 extensions** to allow the standard C++11 libraries and functions during your analysis.
- **Block char 16/32_t types** to not allow `char16_t` or `char32_t` types during the analysis.

For more information, see C++11 Extensions (C++) and Block char16/32_t types (C++).

Code editor in Polyspace interface

In R2014b, you can edit your source files inside the Polyspace user interface.

- In the Project Manager perspective, on the **Project Browser** tree, double-click your source file.
- In the Results Manager perspective, right-click the **Source** pane and select **Open Source File**.

Your source files appear on a **Code Editor** tab. On this tab, you can edit your source files and save them.

Ignore files and folders during analysis

You can now use the analysis option **Files and folders to ignore** (command line `-includes-to-ignore`) to ignore files and folders during defect checking. Previously, the **Files and folders to**

ignore option (command line `-includes-to-ignore`) ignored files and folders during coding rule checking. In R2014b, Polyspace Bug Finder uses this option to ignore specified files or folders for coding rule checking AND defect analysis.

For more information, see Files and folders to ignore (C) or Files and folders to ignore (C++).

Simulink plug-in support for custom project files

With the Polyspace plug-in for Simulink, you can now use a project file to specify the analysis options.

On the **Polyspace** pane of the Configuration Parameters window, with the **Use custom project file** option you can enter a path or browse for a `.psprj` project file.

For more information, see Configure Polyspace Analysis Options.

TargetLink support updated

The Polyspace plug-in for Simulink now supports TargetLink 3.4 and 3.5. Older versions of TargetLink are no longer supported.

For more information, see TargetLink Considerations.

AUTOSAR support added

In R2013b, the Polyspace plug-in for Simulink added support for AUTOSAR generated code with Embedded Coder. If you use `autosar.tlc` as your **System target file** for code generation, Polyspace can analyze this generated code. Polyspace uses the same default analysis options and parameters as Embedded Coder.

For more information, see Embedded Coder Considerations.

Remote launcher and queue manager renamed

Polyspace renamed the remote launcher and the queue manager.

Previous name	New name	More information
`polyspace-rl-manager`	`polyspace-server-settings`	Only the binary name has changed. The interface title, **Metrics and Remote Server Settings**, is unchanged.
`polyspace-spooler`	`polyspace-job-monitor`	The binary and the interface titles have changed. Interface labels have changed in the Polyspace interface and its plug-ins.
Queue Manager or **Spooler**	**Job Monitor**	
`pslinkfun('queuemanager')`	`pslinkfun('jobmonitor')`	See `pslinkfun`

Compatibility Considerations

If you use the old binaries or functions, you receive a warning.

Improved global menu in user interface

The global menu in the Polyspace user interface has been updated. The following table lists the current location for the existing global menu options.

Goal	Prior to R2014b	R2014b
Open the Polyspace Metrics interface in your web browser.	**File** > **Open Metrics Web Interface**	**Metrics** > **Open Metrics**
Upload results from the Polyspace user interface to Polyspace Metrics.	**File** > **Upload in Polyspace Metrics repository**	**Metrics** > **Upload to Metrics**
Update results stored in Polyspace Metrics with your review comments and justifications.	**File** > **Save in Polyspace Metrics repository**	**Metrics** > **Save comments to Metrics**
Generate a report from results after analysis.	**Run** > **Run Report** > **Run Report**	**Reporting** > **Run Report**
Open a generated report.	**Run** > **Run Report** > **Open Report**	**Reporting** > **Open Report**
Import review comments from a previous analysis.	**Review** > **Import**	**Tools** > **Import Comments**
Specify code generator for generated code.	**Review** > **Code Generator Support**	**Tools** > **Code Generator Support**
Specify settings that apply to every Polyspace project.	**Options** > **Preferences**	**Tools** > **Preferences**
Specify settings for remote analysis.	**Options** > **Metrics and Remote Server Settings**	**Metrics** > **Metrics and Remote Server Settings**

Improved Project Manager perspective

The following changes have been made in the Project Manager perspective:

- The **Progress Monitor** tab does not exist anymore. Instead, after you start an analysis, you can view its progress on the **Output Summary** tab.
- In the **Project Browser**, projects appear sorted in alphabetical order instead of order of creation.
- On the **Configuration** pane, the **Interactive** option has been removed from the graphical interface. To use the interactive mode, use the `-interactive` flag at the command line, or in the **Advanced Settings** > **Other** text field. For more information, see `-interactive`

Polyspace binaries being removed

The following binaries will be removed in a future release. Unless otherwise noted, the binaries to use are located in *`matlabroot`*`/polyspace/bin`.

Binary name	What happens	Use instead
`polyspace-rl-manager.exe`	Warning	`polyspace-server-settings.exe`
`polyspace-spooler.exe`	Warning	`polyspace-job-monitor.exe`
`polyspace-ver.exe`	Warning	`polyspace-bug-finder-nodesktop -ver`
`setup-remote-launcher.exe`	Warning	*matlabroot*`/toolbox/polyspace /psdistcomp/bin/setup-polyspace-cluster`

Import Visual Studio project being removed

The **File > Import Visual Studio project** will be removed in a future release. Instead, use the **Create from build system** option during New Project creation. For more information, see Create Projects Automatically from Your Build System.

Analysis Results

Support for MISRA C:2012

Polyspace can now check your code against MISRA C:2012 directives and coding rules. To check for MISRA C:2012 coding rule violations:

1. On the **Configuration** pane, select **Coding Rules**.
2. Select **Check MISRA C:2012**.
3. The MISRA C:2012 guidelines have different categories for handwritten and automatically generated code.

   If you want to use the settings for automatically generated code, also select **Use generated code requirements**.

For more information about supported rules, see MISRA C:2012 Coding Directives and Rules.

Additional concurrency issue detection (deadlocks, double locks, and others)

Data race errors

The following defects deal with unprotected access of shared variables by multiple tasks.

Defect name	Status	More information
Race conditions	Removed	Replaced by `Data race` and `Data race including atomic operations`.
Data race	New	Checks for unprotected operations on variables shared by multiple tasks. This check applies to non-atomic operations only.
Data race including atomic operations	New	Checks for unprotected operations on variables shared by multiple tasks. This check applies to all operations, including atomic ones.

Locking errors

The following defects deal with incorrect design of critical sections. For multitasking analysis, to mark a section of code as a critical section, you must place it between two function calls. A lock function begins a critical section. An unlock function ends a critical section.

Defect name	Status	More information
Deadlock	New	Checks whether the sequence of calls to lock functions is such that two tasks block each other.
Missing lock	New	Checks whether an unlock function has a corresponding lock function.
Missing unlock	New	Checks whether a lock function has a corresponding unlock function.

Defect name	Status	More information
Double lock	New	Checks whether a lock function is called twice in a task without an unlock function being called in between.
Double unlock	New	Checks whether an unlock function is called twice in a task without a lock function being called in between.

For more information, see:

- Set Up Multitasking Analysis
- Review Concurrency Defects

New and updated defect checkers

Defect name	Status	More information
Dead code	Updated	Checks for non-executed code. No longer checks for: • `if` conditions that are always true without a corresponding `else`. This check is covered by the Useless if defect. • Code following control-flow statements such as `break`, `return`, or `goto` defect. This check is covered by the Unreachable code defect.
Useless if	New	Checks for if-conditions that are always true.
Unreachable code	New	Checks for code following control-flow statements such as `break`, `return`, or `goto`.
Declaration mismatch	Updated	Updated for `#pragma` packing statements.
`Race conditions`	Removed	Replaced by Data race and Data race including atomic operations.
Data race	New	Checks for unprotected operations on variables shared by multiple tasks. This check applies to non-atomic operations only.
Data race including atomic operations	New	Checks for unprotected operations on variables shared by multiple tasks. This check applies to all accesses, including atomic ones.
Deadlock	New	Checks whether the sequence of calls to lock functions is such that two tasks block each other.
Missing lock	New	Checks whether an unlock function has a corresponding lock function.
Missing unlock	New	Checks whether a lock function has a corresponding unlock function.
Double lock	New	Checks whether a lock function is called twice in a task without an unlock function being called in between.

Defect name	Status	More information
Double unlock	New	Checks whether an unlock function is called twice in a task without a lock function being called in between.

Reviewing Results

Context-sensitive help for analysis options and defects

Contextual help is available for analysis options in the Polyspace interface and its plug-ins. To view the contextual help for analysis options:

1 Hover your cursor over an analysis option in the **Configuration** pane.

2 Inside the tooltip, select the “More Help” link.

   The documentation for that analysis option appears in a dockable window.

Contextual help is available for defects in the Polyspace interface. To view the contextual help:

1 In the Results Manager perspective, select a defect from the Results Summary.

2 Inside the **Check Details** pane, select ⓘ.

   The documentation for that Bug Finder defect appears in a dockable window.

For more information, see Getting Help.

Improved Results Manager perspective

The following changes have been made in the Results Manager perspective:

- To group your defects, use the **Group by** menu on the **Results Summary** pane.
  - To leave your defects ungrouped, instead of **List of Checks**, select **Group by** > **None**.
  - To group defects by category, instead of **Checks by Family**, select **Group by** > **Family**.
  - To group defects by file and function, instead of **Checks by File/Function**, select **Group by** > **File**.
- On the **Source** pane:
  - If a color appears on a brace enclosing a code block, double-click the brace to highlight the block. If no color appears, click the brace once to highlight the code block.
  - If a code block is deactivated due to conditional compilation, it appears gray.

Error mode removed from coding rules checking

In R2014b, the **Error** mode has been removed from coding rules checking. Therefore, coding rule violations cannot stop an analysis.

Compatibility Considerations

For existing coding rules files, coding rules that use the keyword `error` are treated in the same way as that with keyword `warning`. For more information on `warning`, see Format of Custom Coding Rules File.

R2014a

Analysis Setup

Automatic project setup from build systems

In R2014a, you can set up a Polyspace project from build automation scripts that you use to build your software application. The automatic project setup runs your automation scripts to determine:

- Source files
- Includes
- **Target & Compiler** options

To set up a project from your build automation scripts:

- At the command line: Use the `polyspace-configure` command. For more information, see Create Project from DOS and UNIX Command Line.
- In the user interface: When creating a new project, in the Project – Properties window, select **Create from build command**. In the following window, enter:
    - The build command that you use.
    - The folder from which you run your build command.
    - Additional options. For more information, see Create Project in User Interface.

  Click Run. In the **Project Browser**, you see your new Polyspace project with the required source files, include folders, and **Target & Compiler** options.
- On the MATLAB command line: Use the `polyspaceConfigure` function. For more information, see Create Project from MATLAB Command Line.

Support for GNU 4.7 and Microsoft Visual Studio C++ 2012 dialects

Polyspace supports two additional dialects: Microsoft Visual Studio C++ 2012 and GNU 4.7. If your code uses language extensions from these dialects, specify the corresponding analysis option in your configuration. From the **Target & Compiler** > **Dialect** menu, select:

- `gnu4.7` for GNU 4.7
- `visual11.0` for Microsoft Visual Studio C++ 2012

For more information, see Dialects for C or Dialects for C++.

Simplification of coding rules checking

In R2014a, the **Error** mode has been removed from coding rules checking. This mode applied only to:

- The option `Custom` for:
    - **Check MISRA C rules**
    - **Check MISRA AC AGC rules**
    - **Check MISRA C++ rules**
    - **Check JSF C++ rules**

- **Check custom rules**

The following table lists the changes that appear in coding rules checking.

Coding Rules Feature	R2013b	R2014a
New file wizard for custom coding rules.	For each coding rule, you can select three results: • **Error**: Analysis stops if the rule is violated. The rule violation is displayed on the **Output Summary** tab in the Project Manager perspective. • **Warning**: Analysis continues even if the rule is violated. The rule violation is displayed on the **Results Summary** pane in the Result Manager perspective. • **Off**: Polyspace does not check for violation of the rule.	For each coding rule, you can select two results: • **On**: Analysis continues even if the rule is violated. The rule violation is displayed on the **Results Summary** pane in the Result Manager perspective. • **Off**: Polyspace does not check for violation of the rule.

Format of the custom coding rules file.	Each line in the file must have the syntax:
	`rule off|error|warning #comments`
	For example:
	`# MISRA configuration - Proj1`
	`10.5 off #don't check 10.5`
	`17.2 error`
	`17.3 warning`
		Each line in the file must have the syntax:
		`rule off|warning #comments`
		For example:
		`# MISRA configuration - Proj1`
		`10.5 off #don't check 10.5`
		`17.2 warning`
		`17.3 warning`

Compatibility Considerations

For existing coding rules files that use the keyword `error`:

- If you run analysis from the user interface, it will be treated in the same way as the keyword `warning` The analysis will not stop even if the rule is violated. The rule violation will however be reported on the **Results Summary** pane.
- If you run analysis from the command line, the analysis will stop if the rule is violated.

Preferences file moved

In R2014a, the location of the Polyspace preferences file has been changed.

Operating System	Location before R2014a	Location in R2014a
Windows	`%APPDATA%\Polyspace`	`%APPDATA%\MathWorks\MATLAB\R2014a\Polyspace`
Linux	`/home/$USER/.polyspace`	`/home/$USER/.matlab/$RELEASE/Polyspace`

For more information, see Storage of Polyspace Preferences.

Security level support for batch analysis

When creating an MDCS server for Polyspace batch analyses, you can now add additional security levels through the **MATLAB Admin Center**. Using the **Metrics and Remote Server Settings**, the MDCS server is automatically set to security level zero. If you want additional security for your server, use the **Admin Center** button. The additional security levels require authentication by user name, cluster user name and password, or network user name and password.

For more information, see Set MJS Cluster Security.

Interactive mode for remote analysis

In R2014a, you can select an additional **Interactive** mode for remote analysis. In this mode, when you run Polyspace Bug Finder on a cluster, your local computer is tethered to the cluster through Parallel Computing Toolbox and MATLAB Parallel Server.

- In the user interface: On the **Configuration** pane, under **Distributed Computing**, select **Interactive**.
- On the DOS or UNIX command line, append `-interactive` to the `polyspace-bug-finder-nodesktop` command.
- On the MATLAB command line, add the argument `'-interactive'` to the `polyspaceBugFinder` function.

For more information, see Interactive.

Default text editor

In R2014a, Polyspace uses a default text editor for opening source files. The editor is:

- WordPad in Windows
- vi in Linux

You can change the text editor on the **Editors** tab under **Options** > **Preferences**. For more information, see Specify Text Editor.

Support for Windows 8 and Windows Server 2012

Polyspace supports installation and analysis on Windows Server® 2012 and Windows 8.

For installation instructions, see Installation, Licensing, and Activation.

Function replacement in Simulink plug-in

The following functions have been replaced in the Simulink plug-in by the function `pslinkfun`. These functions will be removed in a future release.

Function	What Happens?	Use This Function Instead
PolyspaceAnnotation	Warning	pslinkfun('annotations',...)
PolySpaceGetTemplateCFGFile	Warning	pslinkfun('gettemplate')
PolySpaceHelp	Warning	pslinkfun('help')
PolySpaceEnableCOMServer	Warning	pslinkfun('enablebacktomodel')
PolySpaceSpooler	Warning	pslinkfun('queuemanager')
PolySpaceViewer	Warning	pslinkfun('openresults',...)
PolySpaceSetTemplateCFGFile	Warning	pslinkfun('settemplate',...)
PolySpaceConfigure	Warning	pslinkfun('advancedoptions')
PolySpaceKillAnalysis	Warning	pslinkfun('stop')
PolySpaceMetrics	Warning	pslinkfun('metrics')

For more information, see pslinkfun

Check model configuration automatically before analysis

For the Polyspace Simulink plug-in, the **Check configuration** feature has been enhanced to automatically check your model configuration before analysis. In the **Polyspace** pane of the Model Configuration options, select:

- `On, proceed with warnings` to automatically check the configuration before analysis and continue with analysis when only warnings are found.
- `On, stop for warnings` to automatically check the configuration before analysis and stop if warnings are found.
- `Off` does not check the configuration before an analysis.

If the configuration check finds errors, Polyspace stops the analysis.

For more information about **Check configuration**, see Check Simulink Model Settings.

Data range specification support

Data range specification (DRS) is available with Polyspace Bug Finder. You can add range information to global variables.

You can also use DRS information with Polyspace Code Prover. Similarly, you can use DRS information from Code Prover in Bug Finder.

For more information, see Inputs & Stubbing.

Polyspace binaries being removed

The following Polyspace binaries will be removed in a future release:

- `polyspace-report-generator.exe`
- `polyspace-results-repository.exe`

- `polyspace-spooler.exe`
- `polyspace-ver.exe`

Analysis Results

Classification of bugs according to the Common Weakness Enumeration (CWE) standard

In R2014a, Polyspace Bug Finder associates CWE™ IDs with many defects. For the covered defects, the IDs are listed in the **CWE ID** column on the **Results Summary** pane. To view the **CWE ID** column, right-click the **Results Summary** tab and select the **CWE ID** column.

For more information, see Common Weakness Enumeration from Bug Finder Defects.

Additional coding rules support (MISRA-C:2004 Rule 18.2, MISRA-C++ Rule 5-0-11)

The Polyspace coding rules checker now supports two additional coding rules: MISRA C 18.2 and MISRA C++ 5-0-11.

- MISRA C 18.2 is a required rule that checks for assignments to overlapping objects.
- MISRA C++ 5-0-11 is a required rule that checks for the use of the plain `char` type as anything other than storage or character values.
- MISRA C++ 5-0-12 is a required rule that checks for the use of the signed and unsigned `char` types as anything other than numerical values.

For more information, see MISRA C:2004 Coding Rules or MISRA C++ Coding Rules.

Additional analysis checkers

Polyspace Bug Finder can now check for two additional defects in C and C++:

- **Wrong allocated object size for cast** checks for memory allocations that are not multiples of the pointer size.
- **Line with more than one statement** checks for lines that have additional statements after a semicolon.

For more information, see Wrong allocated object size for cast and Line with more than one statement.

Improvement of floating point precision

In R2013b, Polyspace improved the precision of floating point representation. Previously, Polyspace represented the floating point values with intervals, as seen in the tooltips. Now, Polyspace uses a rounding method.

For example, the analysis represents `float arr = 0.1;` as,

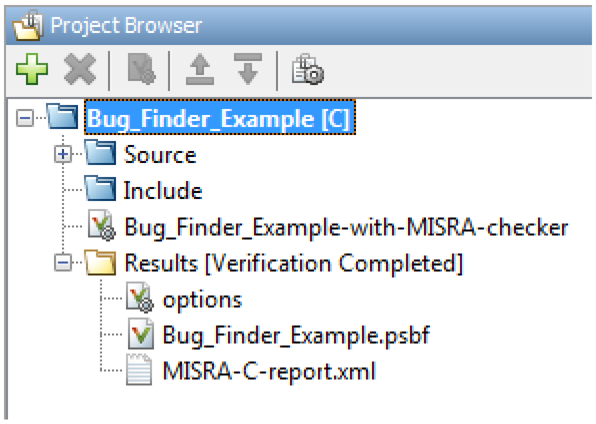
- Pre-R2013b, `arr = [9.9999E^-2,1.0001E-1]`.
- Now, `arr = 0.1`.

Reviewing Results

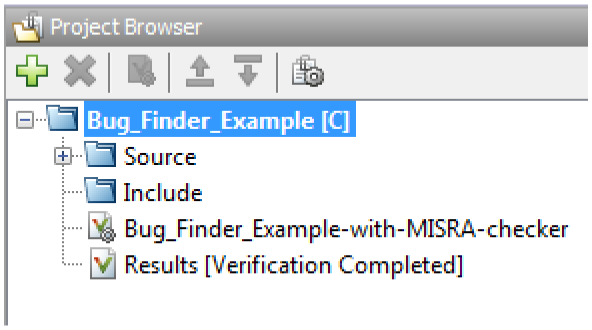
Results folder appearance in Project Browser

In R2014a, the results folder appears in a simplified form in the **Project Browser**. Instead of a folder containing several files, the result appears as a single file.

- Format before R2014a



- Format in R2014a


Project Browser
Bug_Finder_Example [C]
Source
Include
Bug_Finder_Example-with-MISRA-checker
Results [Verification Completed]

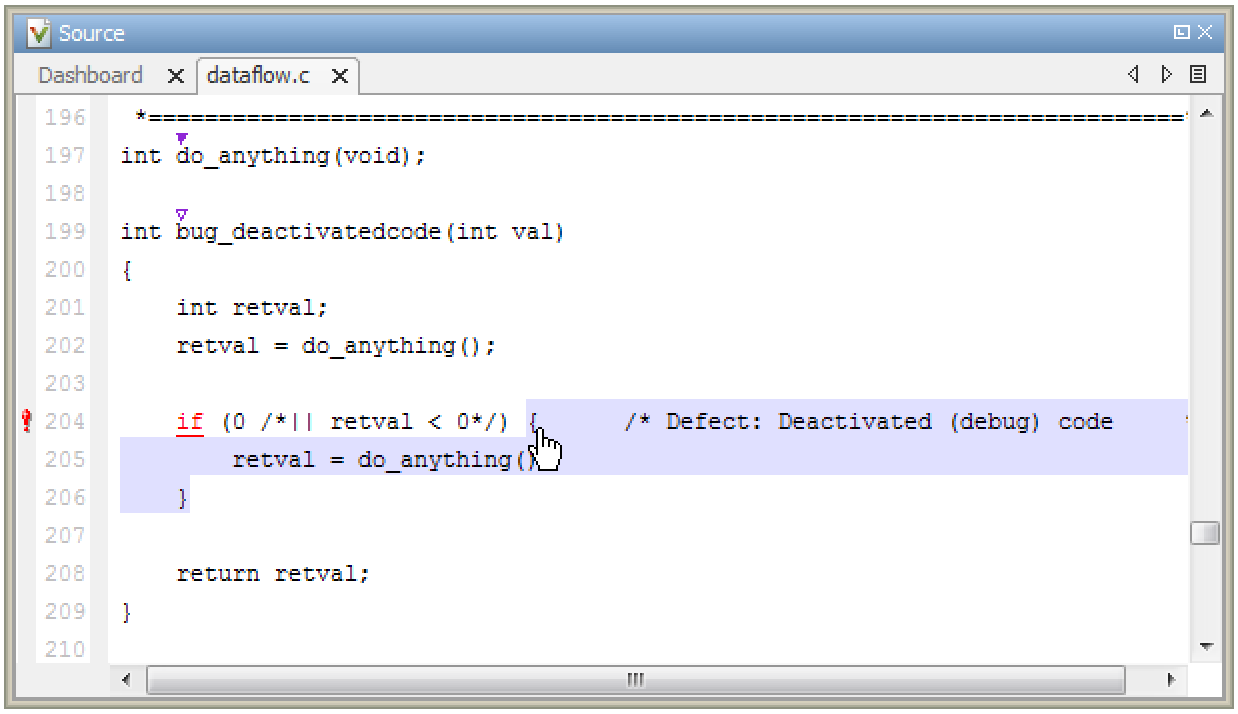
The following table lists the changes in the actions that you can perform on the results folder.

Action	R2013b	R2014a
Open results.	In the result folder, double-click result file with extension `.psbf`.	Double-click result file.
Open analysis options used for result.	In the result folder, select **options**.	Right-click result file and select **Open Configuration**.
Open metrics page for batch analyses if you had used the analysis option **Distributed Computing > Add to results repository**.	In the result folder, select **Metrics Web Page**.	Double-click result file. If you had used the option **Distributed Computing > Add to results repository**, double-clicking the results file for the first time opens the metrics web page instead of the Result Manager perspective.

Action	R2013b	R2014a
Open results folder in your file browser.	Navigate to results folder. To find results folder location, select **Options > Preferences**. View result folder location on the **Project and Results Folder** tab.	Right-click result file and select **Open Folder with File Manager**.

Results manager improvements

- In R2014a, you can view the extent of a code block on the **Source** pane by clicking either its opening or closing brace.



```
 *=========================================================================
int do_anything(void);

int bug_deactivatedcode(int val)
{
    int retval;
    retval = do_anything();

    if (0 /*|| retval < 0*/) {      /* Defect: Deactivated (debug) code
        retval = do_anything();
    }

    return retval;
}
```

Note This action does not highlight the code block if the brace itself is already highlighted. The opening brace can be highlighted, for example, with a **Dead code** defect for the code block.

- In R2014a, the **Verification Statistics** pane in the Project Manager and the **Results Statistics** pane in the Results Manager have been renamed **Dashboard**.

  On the **Dashboard**, you can obtain an overview of the results in a graphical format. You can see:

  - Code covered by analysis.
  - Defect distribution. You can choose to view the distribution by:
    - **File**
    - **Category** or defect name.
  - Distribution of coding rule violations. You can choose to view the distribution by:

    - **File**
    - **Category** or rule number.

    The **Dashboard** displays violations of different types of rules such as MISRA C, JSF C++, or custom rules on different graphs.

  For more information, see Dashboard.

- In R2014a, on the **Results Summary** pane, you can distinguish between violations of predefined coding rules such as MISRA C or C++ and custom coding rules.

  - The predefined rules are indicated by ▽ .
  - The custom rules are indicated by ▼ .

  In addition, when you click the **Check** column header on the **Results Summary** pane, the rules are sorted by rule number instead of alphabetically.
- In R2014a, you can double-click a variable name on the **Source** pane to highlight other instances of the variable.

Additional back-to-model support for Simulink plug-in

In R2014a, the back-to-model feature is more stable. Additionally, support has been added for Stateflow charts in Target Link and Linux operating systems.

For more information, see Identify Errors in Simulink Models.

R2013b

Version: 1.0

New Features

Analysis Setup

Introduction of Polyspace Bug Finder

Polyspace Bug Finder is a new companion product to Polyspace Code Prover. Polyspace Bug Finder analyzes C and C++ code to find possible defects and coding rule violations. Bug Finder can run fast analyses on large code bases with low false-positive results. Polyspace Bug Finder also calculates code complexity metrics with Polyspace Metrics.

Bug Finder integrates with Simulink, Eclipse, Visual Studio, and Rhapsody to help you analyze code from within your development environment.

Fast analysis of large code bases

Polyspace Bug Finder uses an efficient analysis method which produces results quickly, even from large code bases. Therefore you can fix errors and rerun the analysis without having to wait. You can find more issues early on in the development process and produce better quality code overall.

Eclipse integration

Polyspace Bug Finder comes with an Eclipse plug-in that integrates Polyspace into your development environment. You can set up options, run analyses, view results, and fix bugs in the Eclipse interface. Using the Polyspace plug-in, you can quickly find and fix bugs as you code.

For a tutorial on using the Polyspace Bug Finder plug-in, see Find Defects from the Eclipse Plug-In.

Analysis Results

Detection of run-time errors, data flow problems, and other defects in C and C++ code

Polyspace Bug Finder uses static analysis to find various defects for C and C++ code with few false-positive results. The analysis does not require program execution, code instrumentation, or test cases.

Some categories of defects are:

- Numeric
- Programming
- Static memory
- Dynamic memory
- Data-flow

To see a list of defects you can find, see Polyspace Bug Finder Defects.

Bug Finder analysis runs quickly, so you can fix errors and rerun analysis.

For information about running analyses, see Find Bugs.

Compliance checking for MISRA-C:2004, MISRA-C++:2008, JSF++, and custom naming conventions

Polyspace Bug Finder can also check for compliance with coding rules. There are four industry-defined rules you can select:

- MISRA C
- MISRA AC-AGC
- MISRA C++
- JSF C++

In addition, you can define rules to check for naming conventions.

You can run the coding rules checker separately, or at the same time as your analysis.

For more information, see Check Coding Rules.

Cyclomatic complexity and other code metrics

Using Polyspace Metrics, Polyspace Bug Finder calculates various code metrics, including cyclomatic complexity. These statistics are displayed using Polyspace Metrics, an integrated Web interface. You can use these results to track code quality over time. You can also share the code metrics, allowing others to track your project’s progress.

Reviewing Results

Traceability of code analysis results to Simulink models

For generated code from Simulink models, Polyspace analysis results link directly back to your Simulink model. You can trace defects back to the block that is causing the bug.

In the Source Code view of the Results Manager, the block names appear as links. When you select a link, the corresponding block is highlighted in Simulink.

For a tutorial on using Polyspace Bug Finder with Simulink models, see Find Defects from Simulink.

Access to Polyspace Code Prover results

A Polyspace Bug Finder installation also includes the Polyspace Code Prover user interface. With only a Polyspace Bug Finder license, you cannot run local Polyspace Code Prover verifications in the Polyspace Code Prover interface. However, you can use the Polyspace Code Prover interface to review results and upload comments to Polyspace Metrics.

For more information, see the Polyspace Code Prover Documentation.