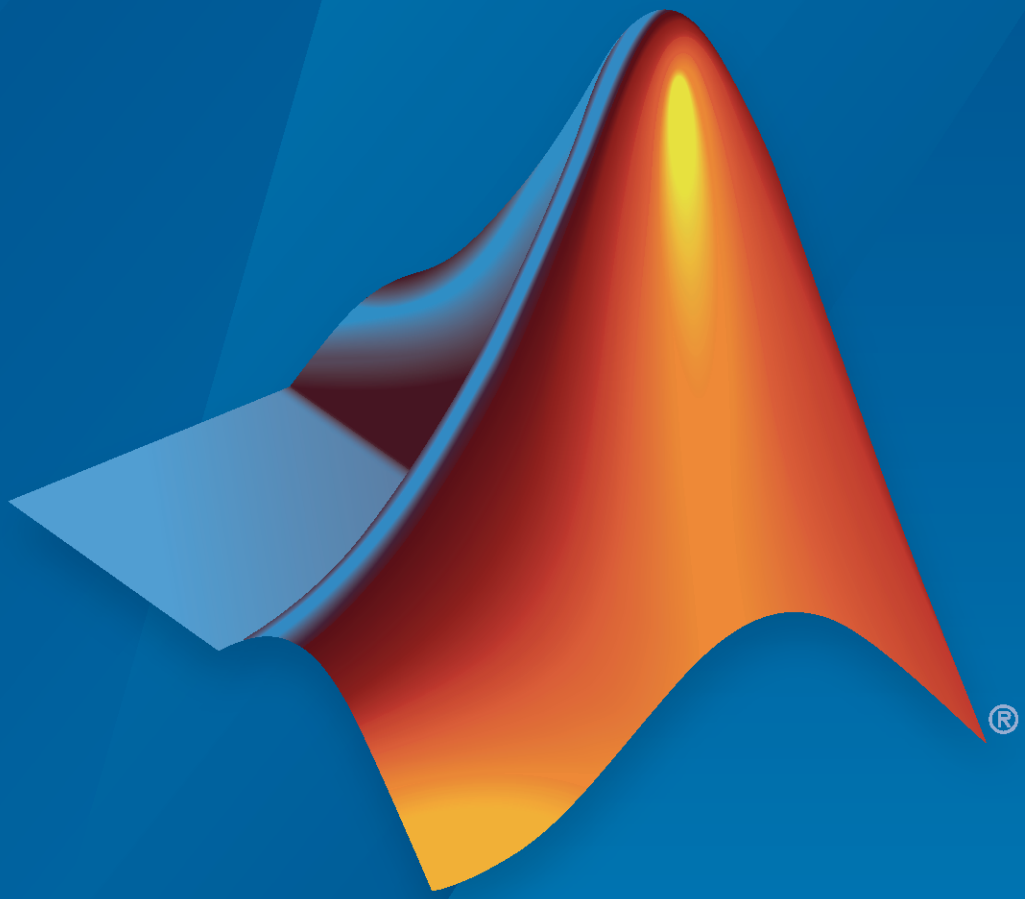
Polyspace® Code Prover™ Server™ Release Notes



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Polyspace® Code Prover™ Server™ Release Notes

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Checking Initialization Code: Analyze initialization code alone before checking remaining program

Summary: In R2020a, you can mark off a section of code as initialization code and check for run-time errors only in this section.

For instance, in this example, the initialization code starts from the beginning of `main` and continues upto the pragma `polyspace_end_of_init`. The verification stops when the pragma is encountered.

```
#include <limits.h>

int aVar;
const int aConst = INT_MAX;
int anotherVar;

int main() {
      aVar = aConst + 1;
#pragma polyspace_end_of_init
      anotherVar = aVar - 1;
      return 0;
}
```

For more information, see `Verify initialization section of code only (-init-only-mode)`.

Benefits: Often, issues in the initialization code can invalidate the analysis of the remaining code. For instance, in the preceding example, the overflow in the line `aVar = aConst+1` must be fixed first before the value of `aVar` is used in subsequent code. Now, you can check the initialization code alone and fix the issues found before verifying the remaining program.

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.

You specify a compiler using the option `Compiler (-compiler)`.

```
polyspace-code_prover-server -compiler microchip -target pic -sources file.c ....
```

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)`.

Checks on Initialization Code: Verify that global variables are initialized after warm reboot

Summary: In R2020a, you can mark off a section of a C program as initialization code and verify if all non-const global variables are explicitly initialized at declaration or in that section.

For instance, in this simple example, the initialization code starts from the beginning of `main` and continues upto the pragma `polyspace_end_of_init`. The global variable `aVar` is initialized in this section but the variable `anotherVar` is not.

```
int aVar;
const int aConst = -1;
int anotherVar;

int main() {
      aVar = aConst;
#pragma polyspace_end_of_init
      return 0;
}
```

For more information, see:

- `Check that global variables are initialized after warm reboot (-check-globals-init)`
- `Global variable not assigned a value in initialization code`

Benefits: In a warm reboot, to save time, the bss segment of a program, which might hold variable values from a previous state, is not loaded. Instead, the program is supposed to explicitly initialize all non-const variables without default values before execution. You can now delimit this initialization code and verify that all non-const global variables are indeed initialized in a warm reboot.

Exporting Results: Export only results that must be reviewed to satisfy software quality objectives (SQOs)

Summary: In R2020a, when exporting Polyspace results from the Polyspace Access web interface to a text file, you can export only those results that must be fixed or justified to satisfy your software quality objectives. The software quality objectives are specified through a progressively stricter set of SQO levels, numbered from 1 to 6.

See also:

- `polyspace-access`
- “Send Email Notifications with Polyspace Code Prover Results”
- “Software Quality Objectives” (Polyspace Code Prover Access)

Benefits: You can customize the requirements of each level in the Polyspace Access web interface, and then use the option `-open-findings-for-sqo` with the level number to export only those results that must be reviewed to meet the requirements.

Jenkins Support: Use sample Jenkins Pipeline script to run Polyspace as part of continuous delivery pipeline

Summary: In R2020a, you can start from a template Jenkins Pipeline script to run Polyspace analysis as part of a continuous delivery pipeline.

See “Sample Jenkins Pipeline Scripts for Polyspace Analysis”.

Benefits: You can make simple replacements to adapt the template to your Polyspace Server and Access installations, and include the script in a new or existing Jenkinsfile to get up and running with Polyspace in Jenkins Pipelines.

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 run-time checks

Summary: In R2020a, you see these changes in the results of Code Prover run-time checks.

Check	Change
`Uncaught exception`	The check no longer flags the case where a function throws an exception whose data type is not in the list of exception types that the function is declared to throw. For instance, the function `foo` is declared to throw exceptions of type `int` and `std::exception`: `void foo2() throw(std::exception, int);` Code Prover used to check if the function can throw exceptions outside the specified types. The check is not performed from R2020a onwards. Dynamic exception specification is deprecated in C++11 and removed in the later standard C++17. See also Dynamic exception specification in the C++ standard.

Compatibility Considerations

You can see a change in the number of results flagged by the updated run-time checks.

Report Generation: Configure report generator to communicate with Polyspace Access over HTTPS

In R2020a, if you generate reports for results that are stored on Polyspace Access, you can configure the `polyspace-report-generator` binary to communicate with Polyspace Access over HTTPS.

Use the `-configure-keystore` option to run this one-time configuration step. See `polyspace-report-generator`.

Previously, you needed a Polyspace Bug Finder™ desktop license to generate reports if Polyspace Access was configured with HTTPS.

Report Generation: Navigate to Polyspace Access Results List from report

In R2020a, if you generate a report for results that are stored on Polyspace Access, you can navigate from the report to the **Results List** in the Polyspace Access web interface.

ID	Guideline	Message	Function
68688	D1.1	Any implementation-defined behaviour on which the output of the program depends shall be documented and understood. The abort function returns an implementation-defined termination status to the host environment.	File Scope
68695	21.8	The library functions abort, exit and system of <stdlib.h> shall not be used.	File Scope
68841	8.4	A compatible declaration shall be visible when an object or function with external linkage is defined. Function 'bug_datarace_task1' has no visible prototype at definition.	File Scope
68835	8.4	A compatible declaration shall be visible when an object or function with external linkage is defined. Function 'bug_datarace_task2' has no visible prototype at definition.	File Scope

Click the link in the **ID** column to open Polyspace Access with the **Results List** filtered down to the corresponding finding.

R2019b

Shared Variables Mode: Run a less extensive Code Prover analysis on complete application to compute global variable sharing and usage only

Summary: In R2019b, you can run a less extensive Code Prover analysis on your complete application to see a list of all global variables and their sharing and usage.

You specify this Code Prover mode using the option `-shared-variables-mode`:

```
polyspace-code-prover-server -shared-variables-mode -sources-list-file sourceList.txt ....
```

In this mode, the analysis stops before the run-time error detection phase and the results contain:

- Global variables (shared, unshared, used, unused)
- Coding rules, if coding rule checking is enabled
- Code metrics, if code metrics computation is enabled

See also `Show global variable sharing and usage only (-shared-variables-mode)`.

Benefits: You can now run Code Prover on your entire application to see global variable sharing and usage, and then run Code Prover component-by-component for run-time error detection. Previously, global variables were reported only in the full analysis that included run-time error detection. Run-time error detection can sometimes take significantly longer for complete applications. If you want to review only the global variable sharing and usage in your complete application, you no longer require the full analysis.

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

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

You specify a compiler using the option `Compiler (-compiler)`.

```
polyspace-code-prover-server -compiler cosmic -target s12z -sources-list-file sourceList.txt ....
```

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.

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 using the `polyspace-configure` command, 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 might 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.

Function Stub Improvements: See fewer orange checks from default conservative assumptions on pointer arguments

Summary: In R2019b, a Code Prover analysis assumes that stubbed function arguments passed by reference or pointer cannot remain uninitialized on return from the function. A function is stubbed if its definition is not available for the analysis.

Benefits: You see fewer orange checks from the previous default assumption that stubbed function arguments that are not initialized might remain uninitialized on return from the function.

For instance, in the following example, Code Prover assumes that `i` is initialized on return from the function `stub`. With this assumption, the non-initialized variable check on `i` in the line `j=i` appears green.

```
int main(void)
{
    int i, j;
    stub(&i);
    j = i;
    return 0;
}
```

Compatibility Considerations

You see fewer orange non-initialized variable checks compared to previous releases. To revert to the previous conservative assumptions for specific function stubs, specify external constraints. See External Constraints for Polyspace Analysis.

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`.

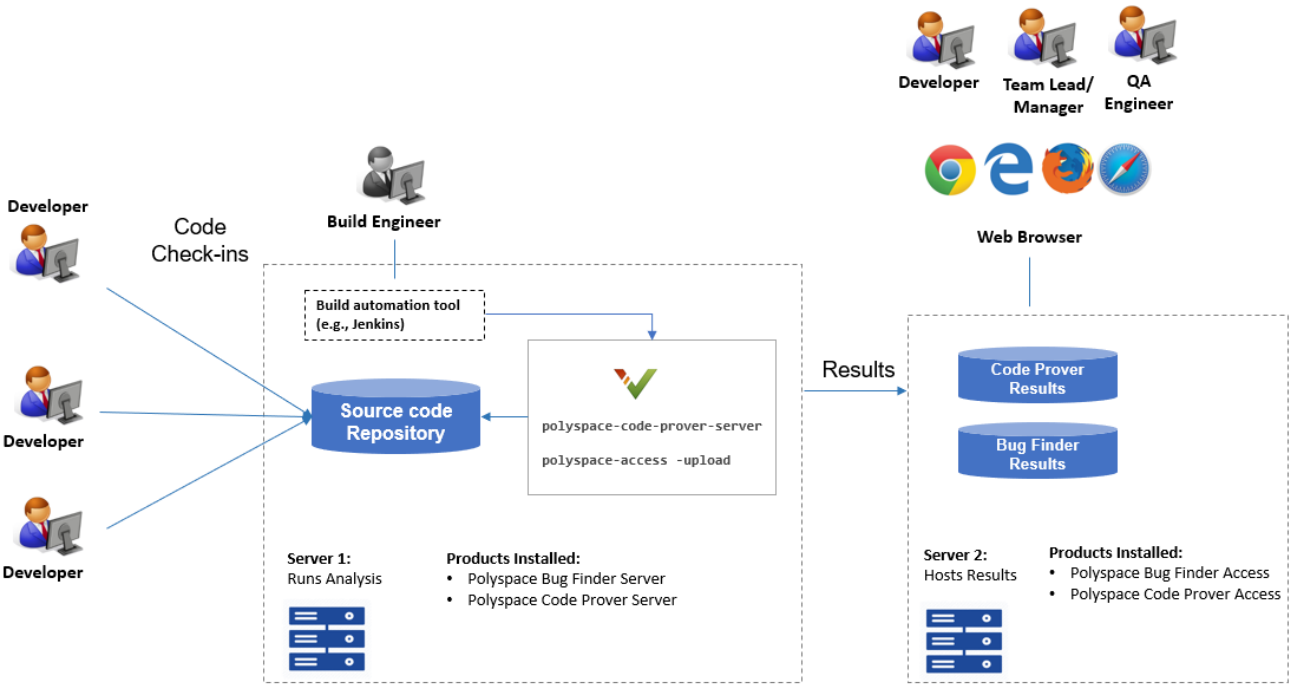
R2019a

Version: 10.0

New Features

Code Prover Analysis Engine Separated from Viewer: Run Code Prover analysis on server and view the results from multiple client machines

Summary: In R2019a, you can run Code Prover on a server with the new product, Polyspace Code Prover™ Server™. You can then host the analysis results on the same server or a second server with the product, Polyspace Code Prover Access™. Developers whose code was analyzed and other reviewers such as quality engineers and development managers can fetch these results from the server to their desktops and view the results in a web browser, provided they have a Polyspace Code Prover Access license.



Note: Depending on the specifications, the same computer can serve as both Server 1 and Server 2.

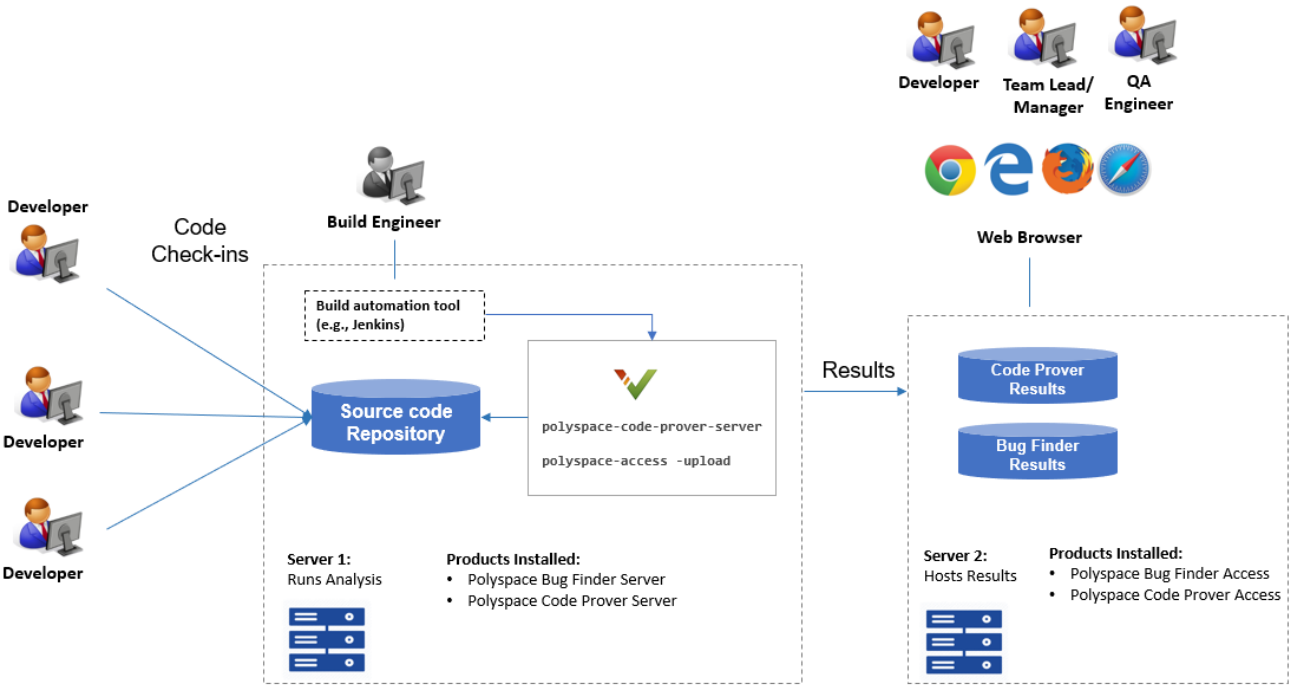
Benefits: You can run the Code Prover analysis on a few powerful server class machines but view the analysis results from many terminals.

With the desktop product, Polyspace Code Prover, you have to run the analysis and view the results on the same machine. To view the results on a different machine, you need a second instance of a desktop product. The desktop products can now be used by individual developers on their desktops prior to code submission and the server products used after code submission. See Polyspace Products for Code Analysis and Verification (Polyspace Bug Finder Server).

Continuous Integration Support: Run Code Prover on server class computers with continuous upload to Polyspace Access web interface

Summary: In R2019a, you can check exhaustively for run-time errors on server class machines as part of continuous integration. When developers submit code to a shared repository, a build automation tool such as Jenkins can perform the checks using the new Polyspace Code Prover Server

product. The analysis results can be uploaded to the Polyspace Access web interface for review. Each reviewer with a Polyspace Code Prover Access license can login to the Polyspace Access web interface and review the results.



Note: Depending on the specifications, the same computer can serve as both Server 1 and Server 2.

See:

- Install Polyspace Server and Access Products
- Run Polyspace Code Prover on Server and Upload Results to Web Interface

Benefits:

- *Automated post-submission checks*: In a continuous integration process, build scripts run automatically on new code submissions before integration with a code base. With the new product Polyspace Code Prover Server, a Code Prover analysis can be included in this build process. The analysis can run Code Prover checks on the new code submissions and report the results. The results can be reviewed in the Polyspace Access web interface with a Polyspace Code Prover Access license.
- *Collaborative review*: The analysis results can be uploaded to the Polyspace Access web interface for collaborative review. For instance:
  - Each quality assurance engineer with a Polyspace Code Prover Access license can review the Code Prover results for a project and assign issues to developers for fixing.
  - Each development team manager with a Polyspace Code Prover Access license can see an overview of Code Prover results for all projects managed by the team (and also drill down to details if necessary).

For further details, see the release notes of Polyspace Code Prover Access .

Continuous Integration Support: Set up testing criteria based on Code Prover static analysis results

Summary: In R2019a, you can run Code Prover on server class machines as part of unit and integration testing. You can define and set up testing criteria based on Code Prover static analysis results.

For instance, you can set up the criteria that new code submissions must have zero red checks (definite run-time errors) before integration with a code base. Any submission with red checks can cause a test failure and require code fixes.

See:

- `polyspace-code-prover-server` for how to run Code Prover on servers.
- `polyspace-access` for how to export Code Prover results for comparison against predefined testing criteria.

If you use Jenkins for build automation, you can use the Polyspace plugin. The plugin provides helper functions to filter results based on predefined criteria. See Sample Scripts for Polyspace Analysis with Jenkins.

Benefits:

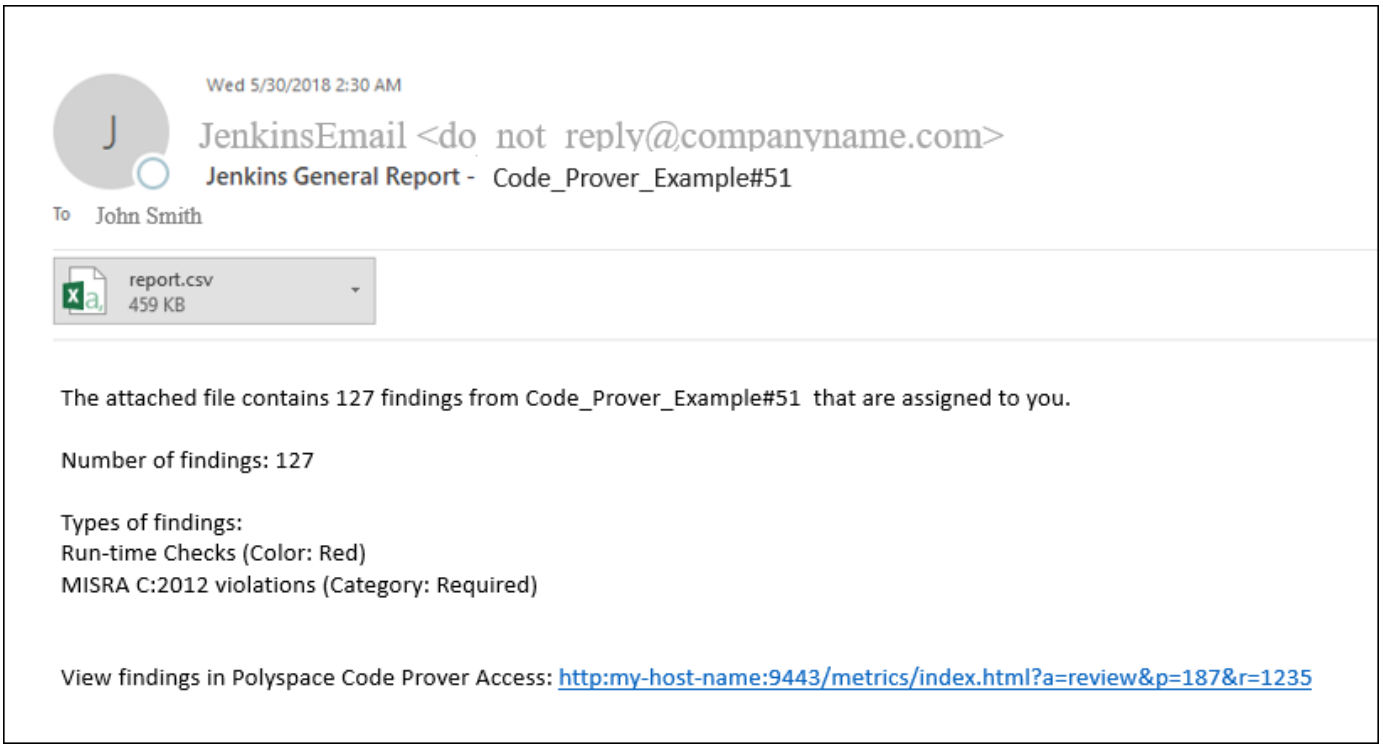
- *Automated testing*: After you define testing criteria based on Code Prover results, you can run the tests along with regular dynamic tests. The tests can run on a periodic schedule or based on predefined triggers.
- *Prequalification with Polyspace desktop products*: Prior to code submission, to avoid test failures, developers can check their submission with the same criteria as the server-side analysis. Using an installation of the desktop product, Polyspace Code Prover, developers can emulate the server-side analysis on their desktops and review the results in the user interface of the desktop product. For more information on the complete suite of Polyspace products available for deployment in a software development workflow, see Polyspace Products for Code Analysis and Verification (Polyspace Bug Finder Server).

  To save processing power on the desktop, the analysis can also be offloaded to a server and only the results reviewed on the desktop. See Install Products for Submitting Polyspace Analysis from Desktops to Remote Server (Polyspace Bug Finder Server).

Continuous Integration Support: Set up email notification with summary of Code Prover results after analysis

Summary: In R2019a, you can set up email notification for new Code Prover results. The email can contain:

- A summary of new results from the latest Code Prover run only for specific files or modules.
- An attachment with a full list of the new results. Each result has an associated link to the Polyspace Access web interface for more detailed information.



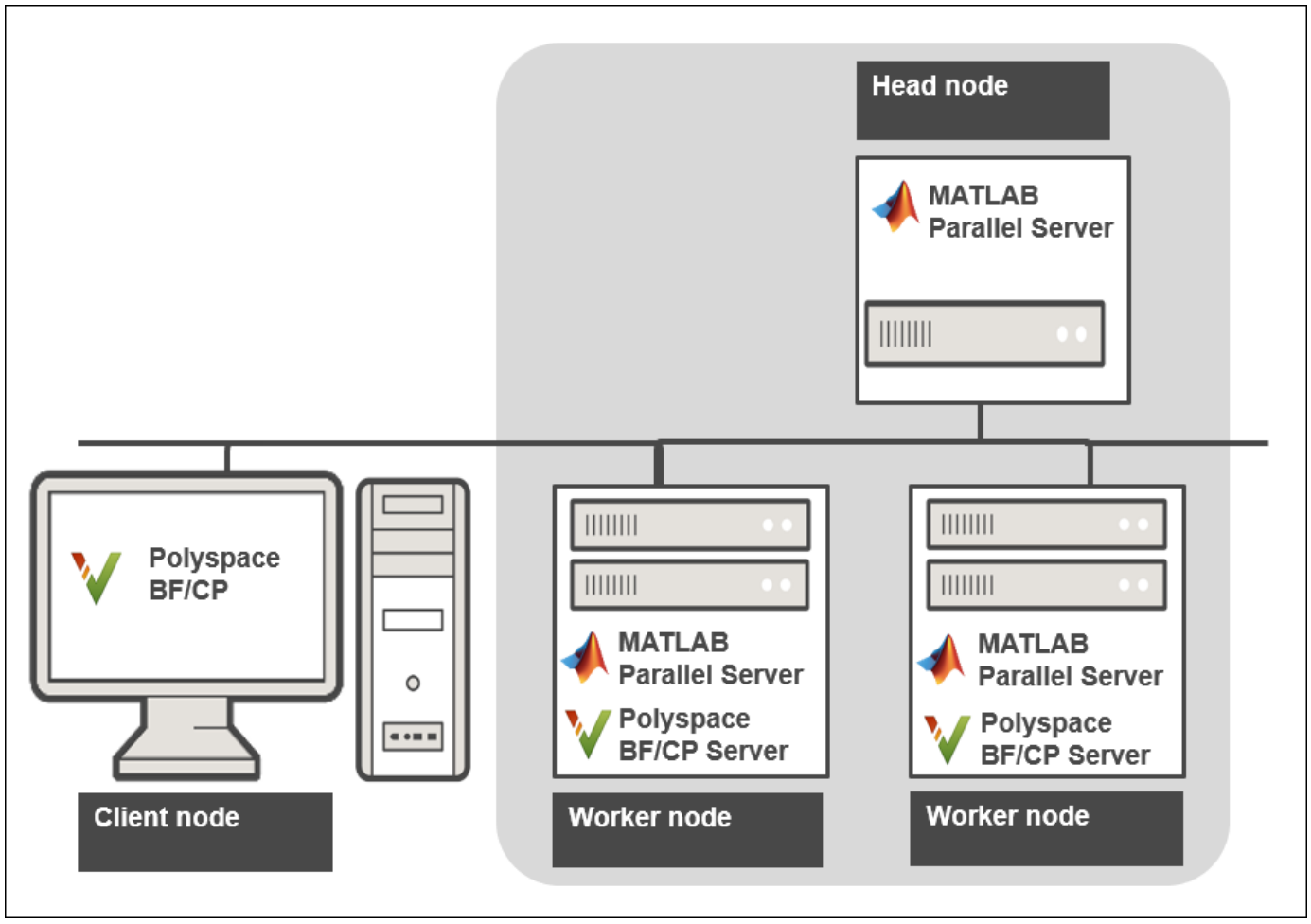
See Send E-mail Notifications with Polyspace Code Prover Results.

Benefits:

- *Automated notification*: Developers can get notified in their e-mail inbox about results from the last Code Prover run on their submissions.
- *Preview of Code Prover results*: Developers can see a preview of the new Code Prover results. Based on their criteria for reviewing results, this preview can help them decide whether they want to see further details of the results.
- *Easy navigation from e-mail summary to Polyspace Access web interface*: Each developer with a Polyspace Code Prover Access license can use the links in the e-mail attachments to see further details of a result in the Polyspace Access web interface.

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.

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.