



Oprogramowanie  
Naukowo-Techniczne  
sp. z o.o.

18.10.2023 r.

# Static and Dynamic Code Analysis with Polyspace

Filip Babiec, ONT

## Ariane 5

*“The world’s most expensive firework”*



**Overflow error** – easily detected by Polyspace



GNC system malfunction.  
\$500M (uninsured) payload  
+ \$7B in development costs  
\$7.5B loss

# Agenda

1. What is Polyspace?
2. Code Prover & Bug Finder
3. Polyspace products
4. Example verification

# Polyspace

Polyspace is a static code analysis tool that uses abstract interpretation to detect, or prove the absence of, certain run-time errors in source code for the C, C++, and Ada programming languages.



**Improve Software Quality**



**Reduce Development Time**



**Low Cost of Ownership**

# Polyspace

```

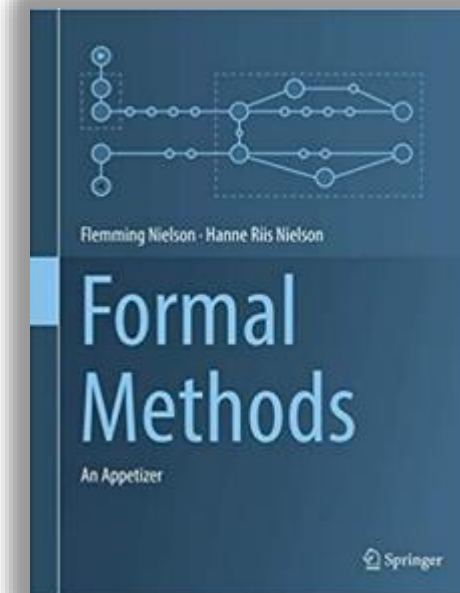
17 string sInput;
18 int iLength, iN;
19 double dblTemp;
20 bool again = true;
21
22 while (again) {
23     iN = -1;
24     again = false;
25     getline(cin, sInput);
26     system("cls");
27     stringstream(sInput) >> dblTemp;
28     iLength = sInput.length();
29     if (iLength < 4) {
30         again = true;
31         continue;
32     } else if (sInput[iLength - 3] != '.') {
33         again = true;
34         continue;
35     } while (++iN < iLength) {
36         if (isdigit(sInput[iN])) {
37             continue;
38         } else if (iN == (iLength - 3)) {
39             continue;
40         }
41     }
42     // ...
43 }
  
```

## Analyze software source code

- ✓ Semantic checking of source code
- ✓ Report findings as software properties
- ✓ No test, no execution, no target required

## Miss no bugs

- ✓ Sound mathematical framework
- ✓ Based on formal methods
- ✓ High-quality (accurate) results



# Polyspace Tools

## Bug Finder



→ High Quality, Secure, Compliant Code:

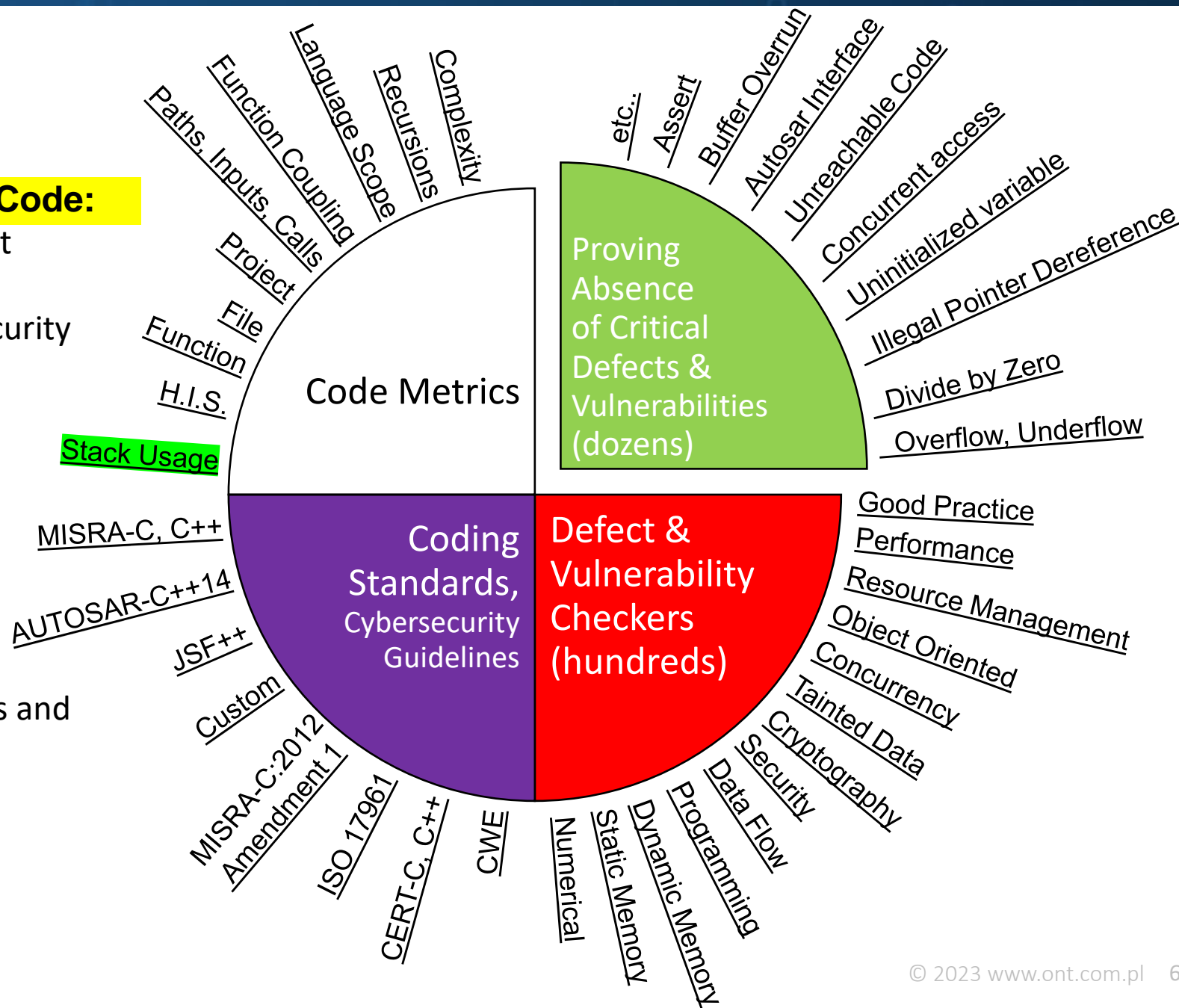
- Measurable, Maintainable, Consistent
- Very few defects or vulnerabilities
- Credits for functional safety, cybersecurity standards.

## Code Prover

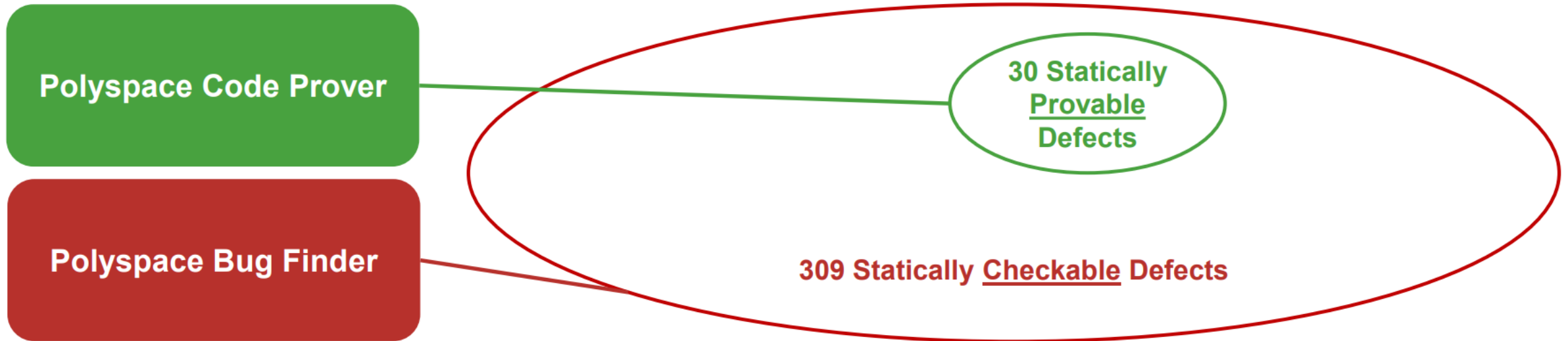


→ Fully Trusted Components:

- Robust, Safe, Secure
- Proven free of critical runtime defects and vulnerabilities
- Additional credits for standards.

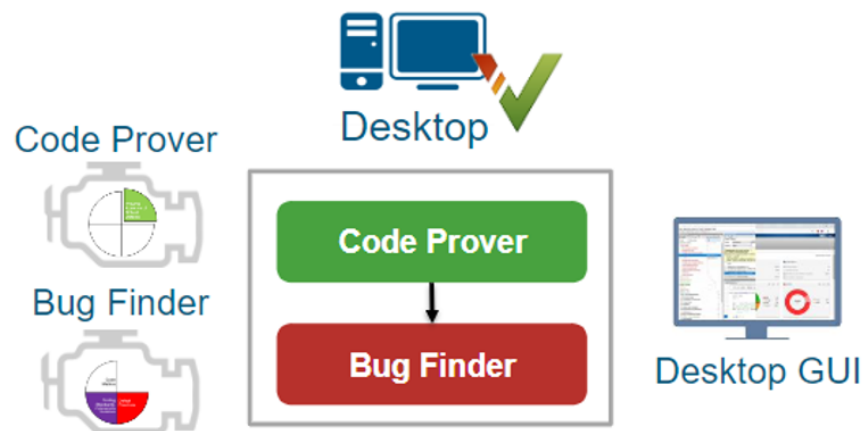
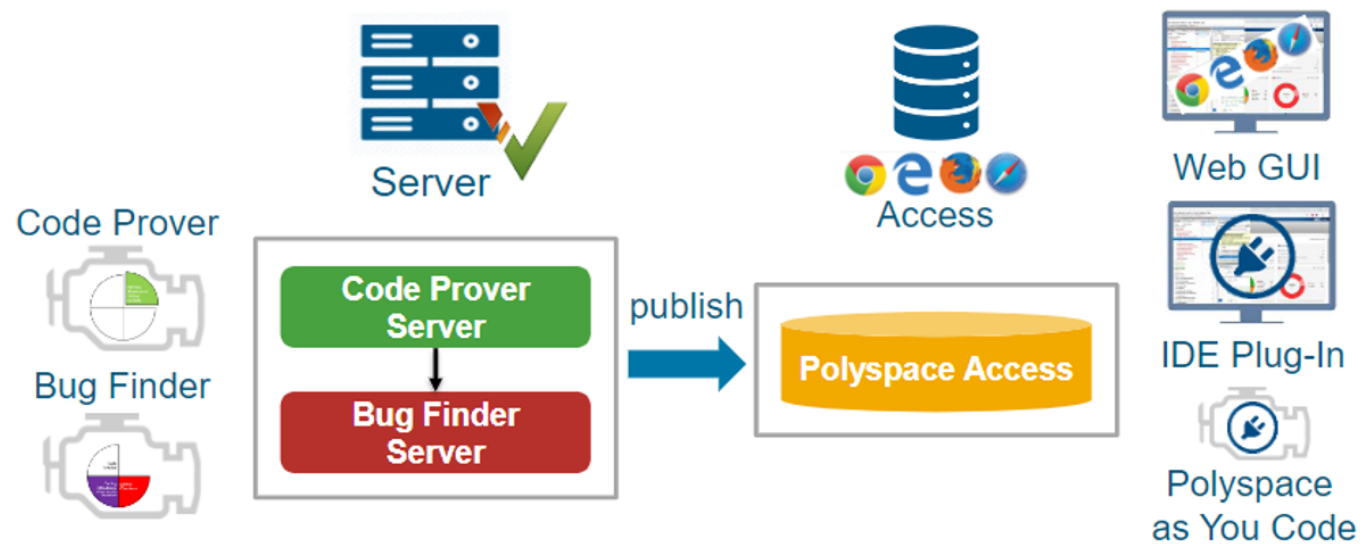


# Polyspace Tools – Comparison



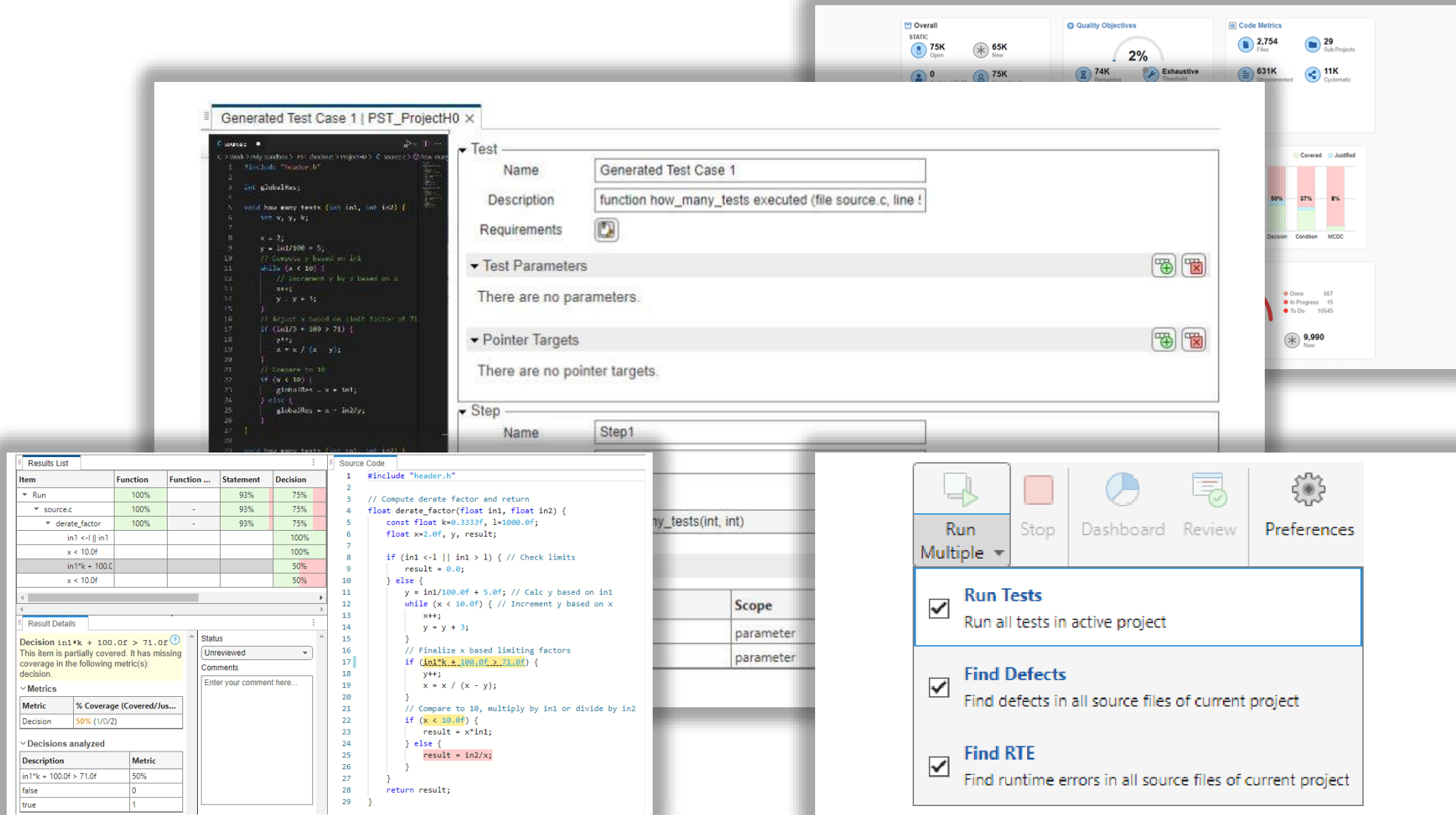
Bug Finder	Code Prover
Wide and shallow <i>quick</i>	Narrow and deep <i>exhaustive</i>

# Polyspace Products





# Polyspace Test



The screenshot displays the Polyspace Test interface with several key components:

- Dashboard (Top Right):** Shows overall statistics including 75K Open items, 65K New items, 2% Quality Objectives, 2,754 Files, 29 Sub-Projects, 631K Uncommented items, and 11K Cyclomatic complexity.
- Generated Test Case 1 (Top Center):**
  - Name:** Generated Test Case 1
  - Description:** function how\_many\_tests executed (file source.c, line 1)
  - Requirements:** (None listed)
  - Test Parameters:** There are no parameters.
  - Pointer Targets:** There are no pointer targets.
  - Step:** Name: Step1
- Source Code (Middle):** Shows C code for a function named `how_many_tests` with various calculations and loops.
- Results List (Bottom Left):**

Item	Function	Function ...	Statement	Decision
Run	100%	-	93%	75%
source.c	100%	-	93%	75%
derate_factor	100%	-	93%	75%
in1 <= 1    in1				100%
x < 10.0f				100%
in1*k + 100.0f				50%
x < 10.0f				50%
- Control Panel (Bottom Right):**
  - Run Multiple:** Run Tests (checked), Find Defects (checked), Find RTE (checked).
  - Other buttons:** Stop, Dashboard, Review, Preferences.

# Example Analysis



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[www.ont.com.pl](http://www.ont.com.pl)



[matlab.pl](http://matlab.pl)



oprogramowanie-  
naukowo-techniczne



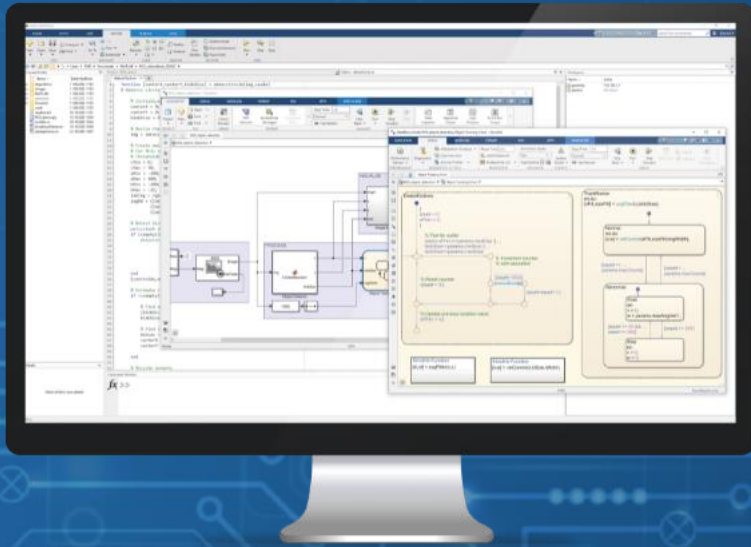
ONT MATLAB



Filip Babiec

Application Engineer, ONT

[filip.babiec@ont.com.pl](mailto:filip.babiec@ont.com.pl)



## APPLICATIONS

- ▶ Robotics and Automation
- ▶ Computational Finance
- ▶ Autonomous Vehicles
- ▶ Electronics
- ▶ Artificial Intelligence
- ▶ Biomedical Engineering
- ▶ Systems Engineering and certification
- ▶ Power Electronics and Systems
- ▶ Communications and Radar Systems

Let's stay in touch

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MATLAB and Simulink authorised reseller for Poland  
ul. Pod Fortem 19, 31-302 Kraków, Poland | [www.ont.com.pl](http://www.ont.com.pl)