
MATLAB EXPO 2018
KOREA

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Reducing Testing Effort with Static Code Verification

테스팅 비용 감소를 위한 정적 코드 검증 활용 방안

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Agenda

- Misconceptions lead Testing effort high
- Polyspace helps you to reduce testing effort
- Conclusion

Misconceptions lead Testing Efforts High

1. Our expert programmers don’t make mistakes

2. I need Dynamic Testing only, I do not need Static Analysis

3. I do Static Analysis as the last quality gate before release

1. Our expert programmers don’t make mistakes

- They are infallible! Aren’t they?

- Look at this table,

Group	Average Bugs per KLOC
Top 1% developers	11.2
Top 10% developers	28.9
Top 25 % developers	61.9
All	120.8

Defect Injection Ranges for 810 Experienced Software Developers
The Ganssle Group, Derived from articles written by Watts Humphrey(Father of Software Quality)

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- Loo

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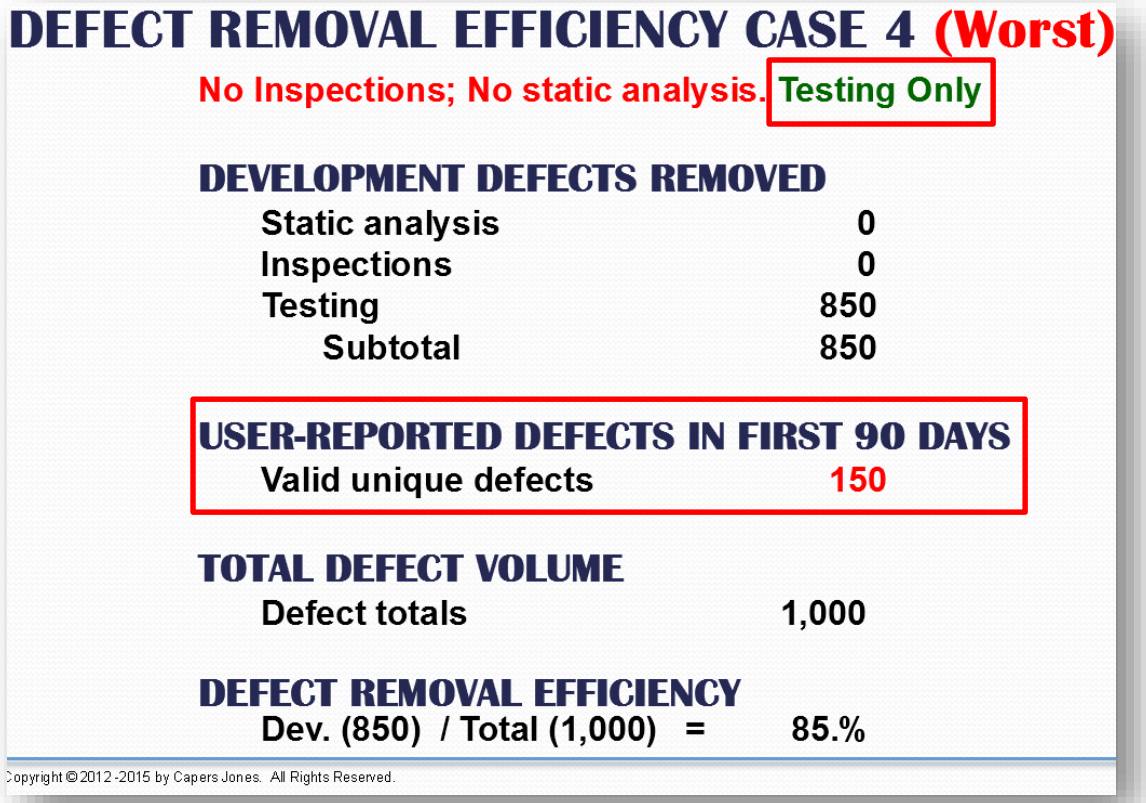
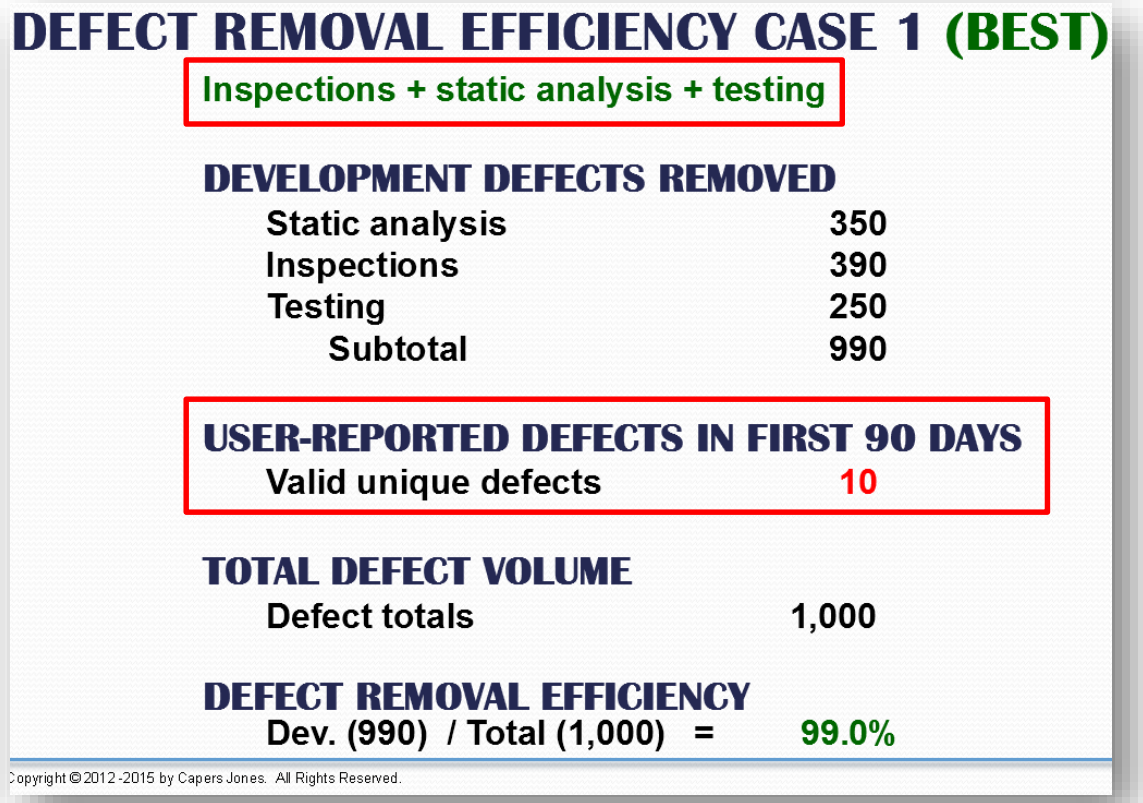
Finding Bugs with Right Tool is Must-Do-activity!

2. I need Dynamic Testing only, I do not need Static Analysis

- I do sufficient testing: Unit testing, Integration testing, Field testing …
- It's redundant to do both of dynamic testing and static analysis





Capers Jones, "Software Quality in 2016: A Survey of the state of the art"

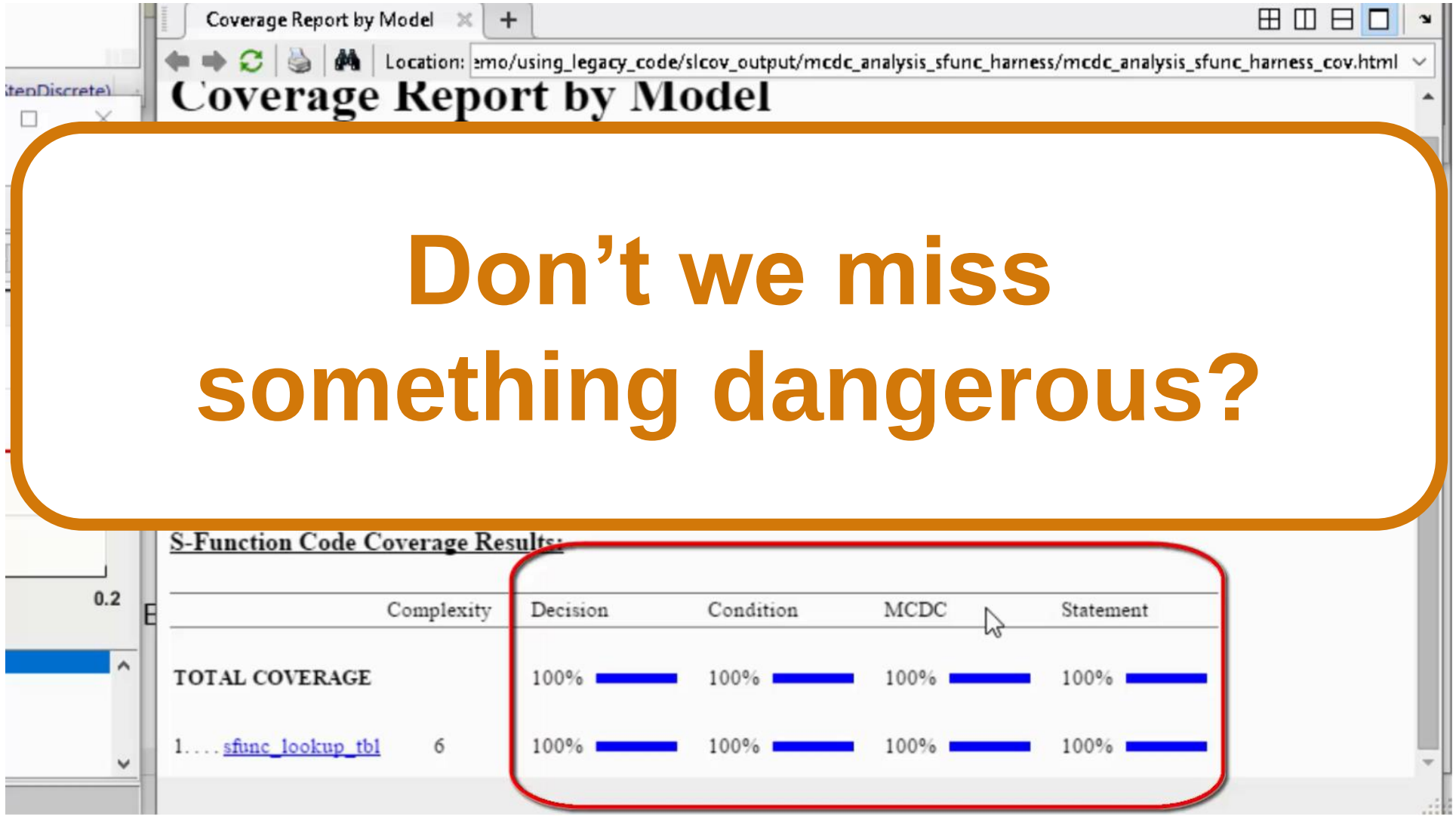
Quiz: How many tests to achieve 100% MCDC

```c
#include "simple_lookup_table.h"

const double x[10] = {1,  2,  3,  4,  5,  6,  7,  8,  9, 10};
const double y[10] = {3,  6,  9, 12, 15, 18, 21, 24, 27, 30};

double simple_lookup_tbl (double in1, sint8_t * stat)
{
    double out;
    double f;
    uint32_t i;

    if (in1 < x[0])
    {
        /* lower saturation */
        out = y[0];
        *stat = -1;
    }
    else if (in1 > x[9])
    {
        /* upper saturation */
        out = y[9];
        *stat = -1;
    }
    else
    {
        for (i = 4; in1 < x[i]; i--);

        if (i > 2 && in1 > 5.0F)
        {
            1.0F;

            while (in1 >= x[i + 1U]) {
                i++;
            }

            f = (in1 - x[i]) / (x[i + 1U] - x[i] + 0.0000000001F);

            out = (y[i + 1U] - y[i]) * f + y[i];
            *stat = 0;
        }

        return out;
}
```

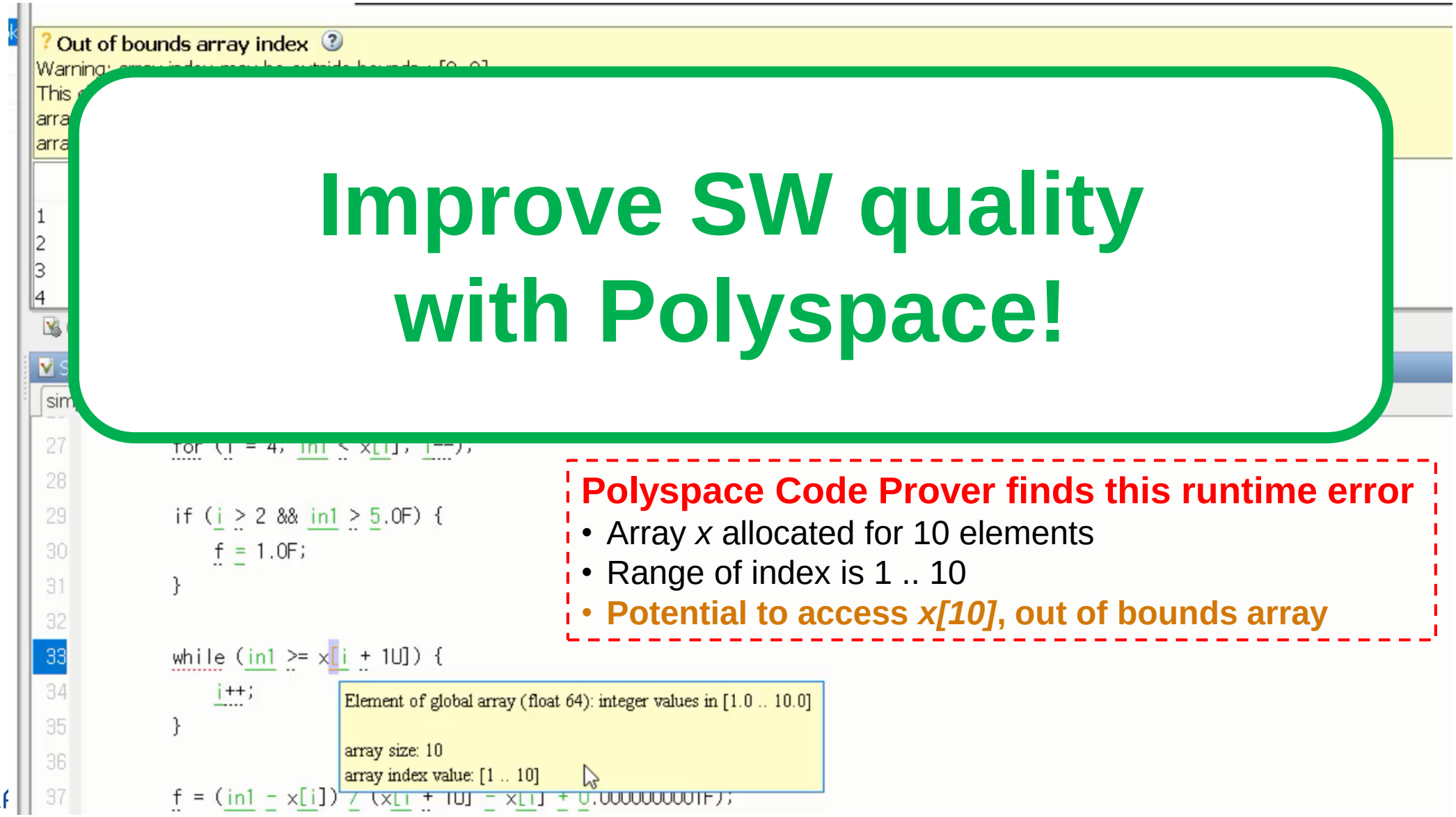
Answer: 6 tests

- Automatically-generated test for input = 5.9566, 1.9184, -5.4067, 9.8142, 11, 4

Let's see the coverage report of the hand-written code



Runtime error lurking in the code



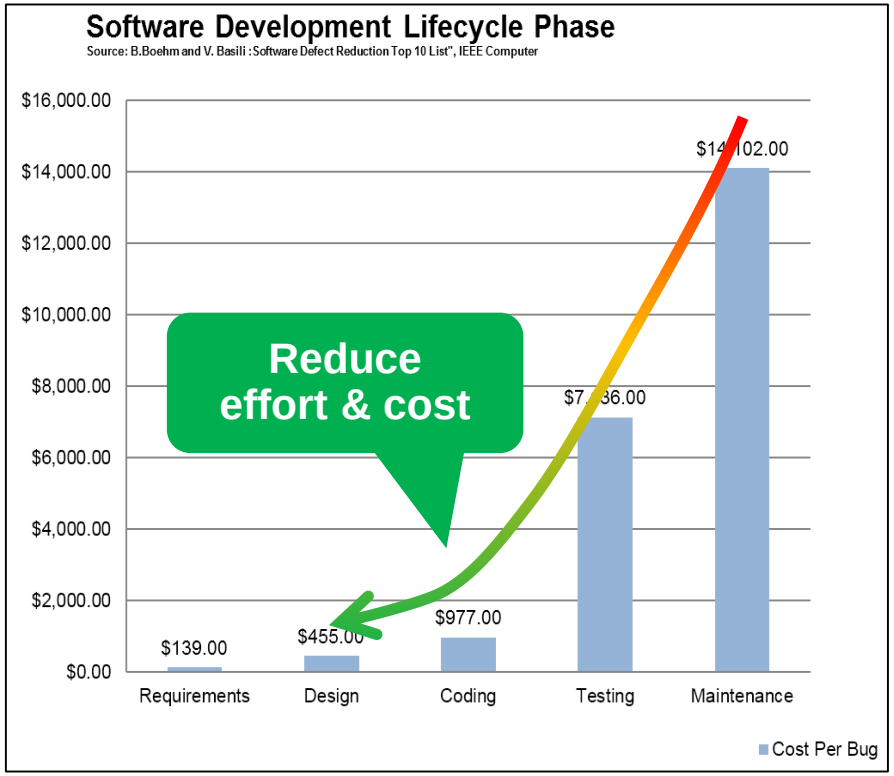
Improve SW quality with Polyspace!

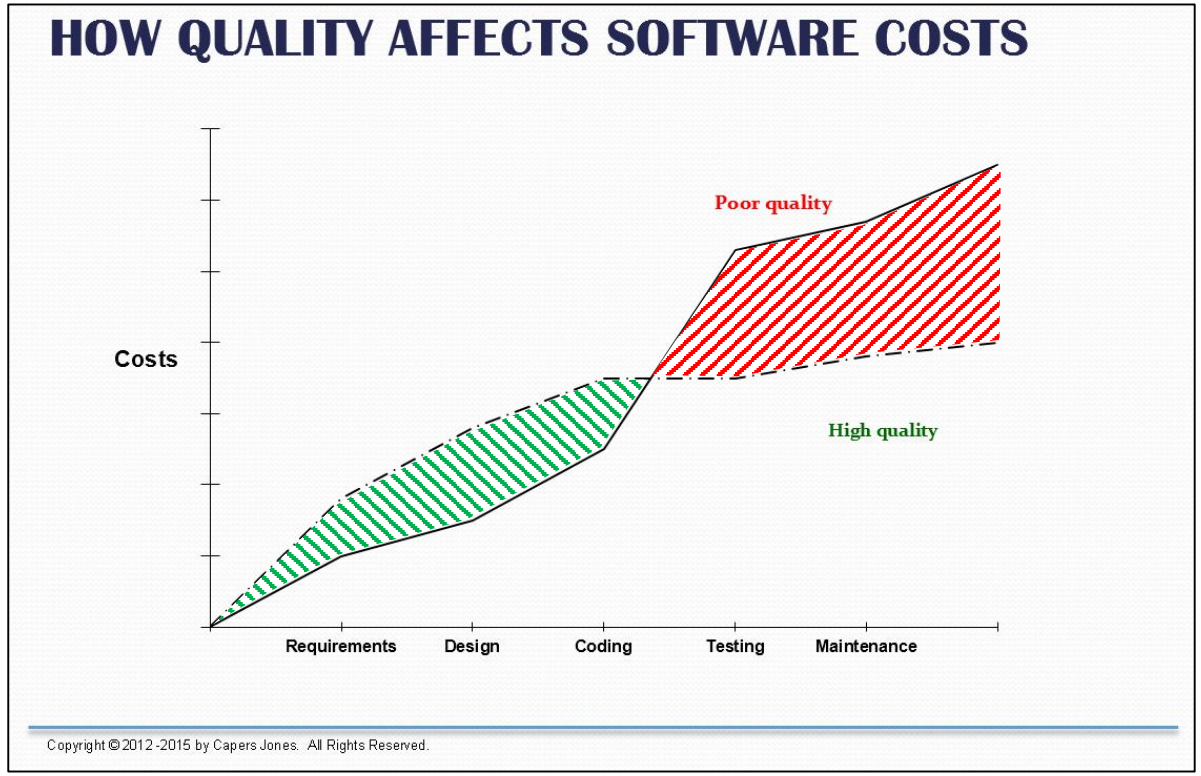
Polyspace Code Prover finds this runtime error

- Array *x* allocated for 10 elements
- Range of index is 1 .. 10
- **Potential to access *x[10]*, out of bounds array**

3. I do Static Analysis as the last quality gate before release

- Efficient Defect Reduction
  - Cost less in early stage
- Accumulated Technical Debt
  - Too many things to review or fix





[1] Barry Bohem, "Software Defect Reduction Top 10 List", IEEE
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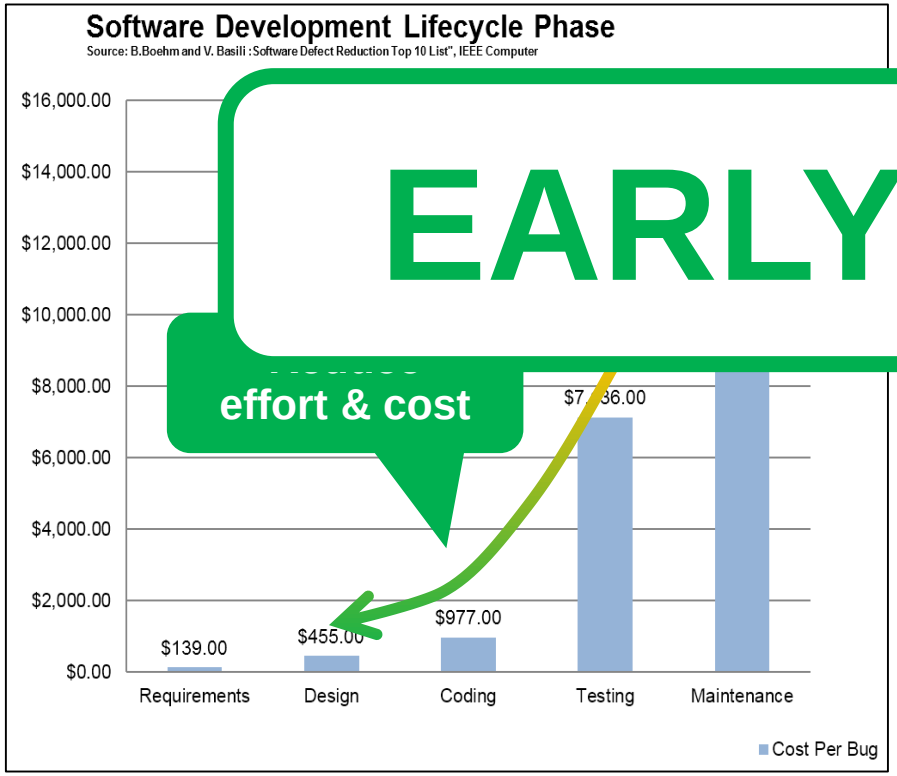

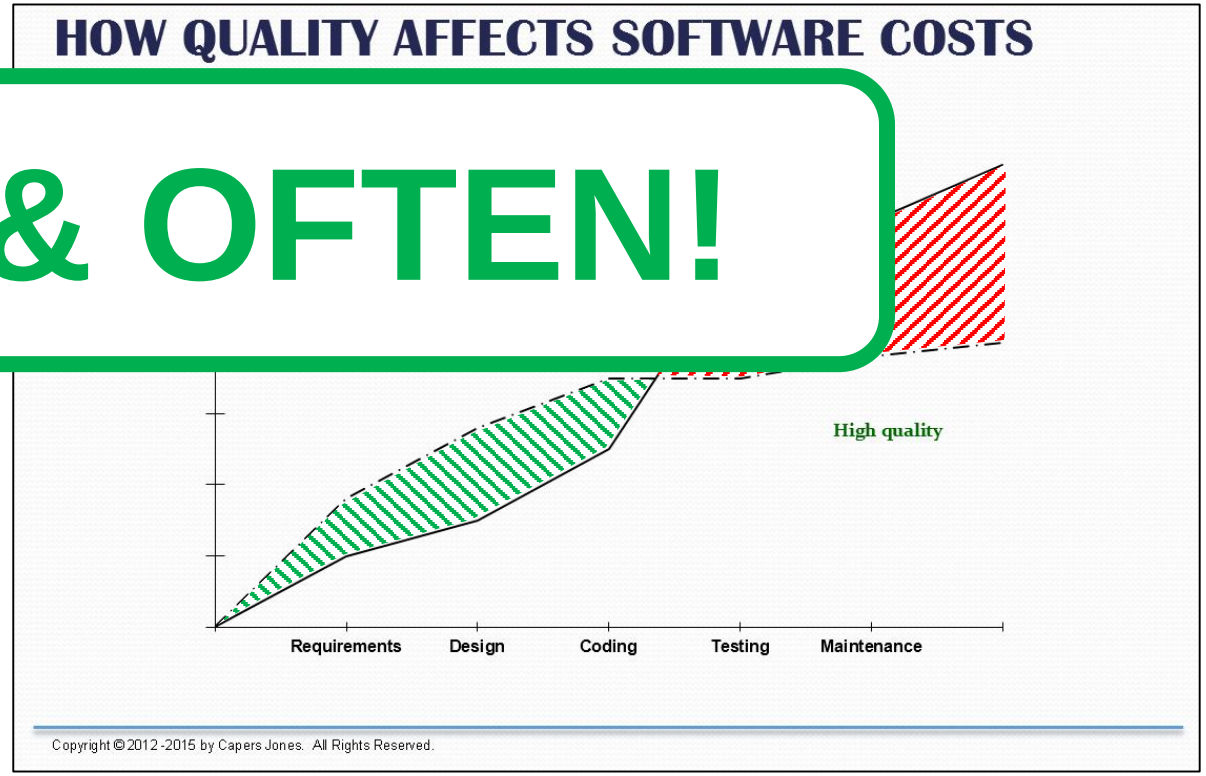

EARLY & OFTEN!

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Lessons learned from misconceptions

Lessons learned from misconceptions

Polyspace helps you to …

Bug Finder

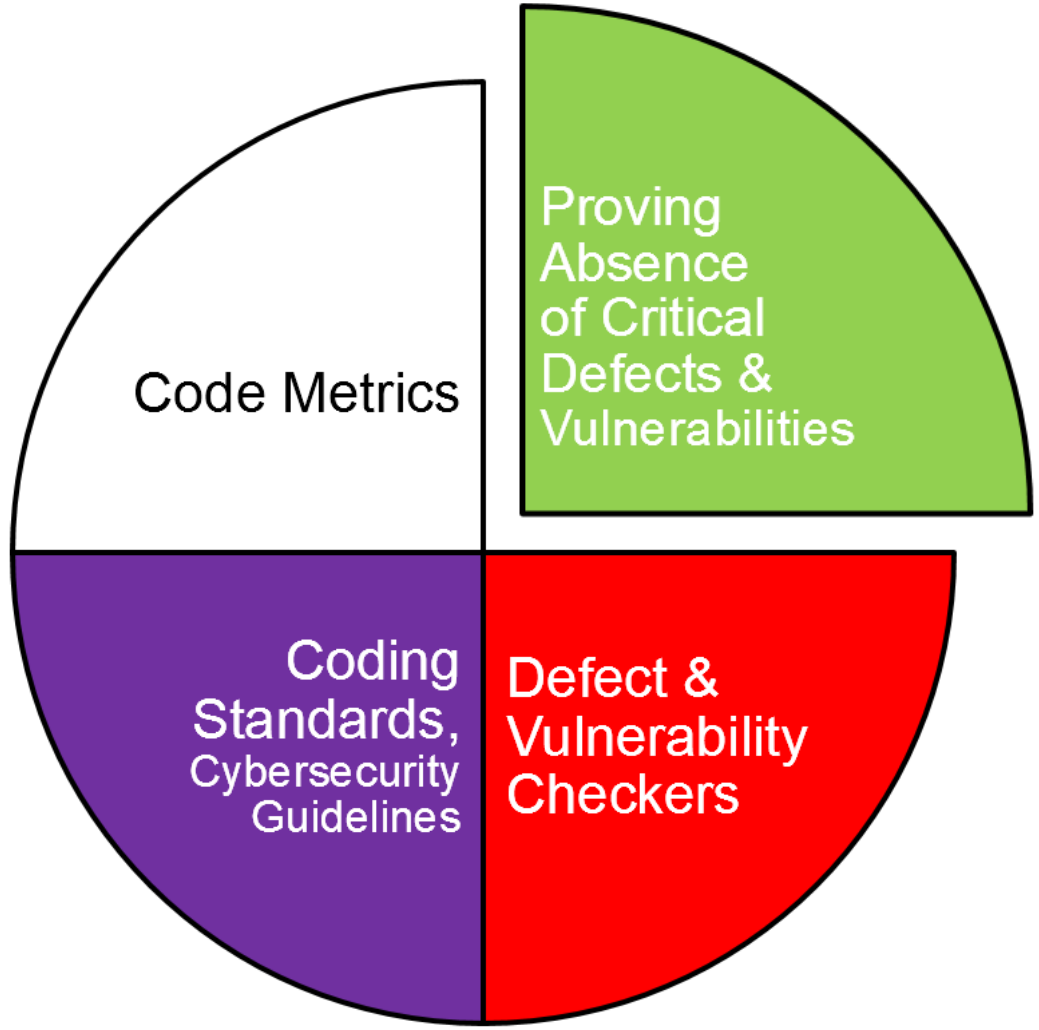
→High Quality, Secure, Compliant Code:

- Various defects or vulnerabilities
- Credits for functional safety, cybersecurity standards.

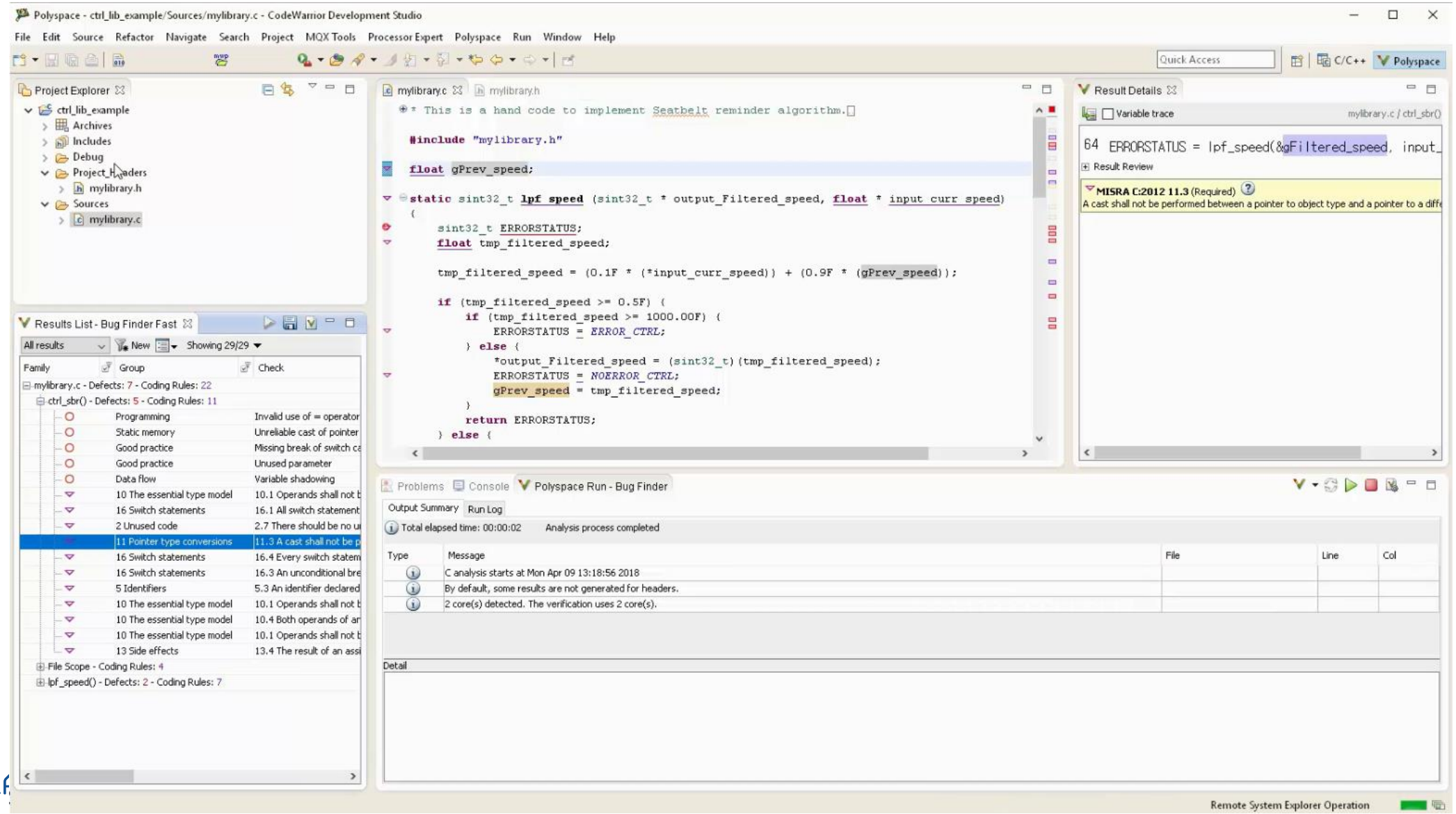
Code Prover

→Fully Trusted Components:

- Proven free of critical runtime defects and vulnerabilities
- Additional credits for standards.

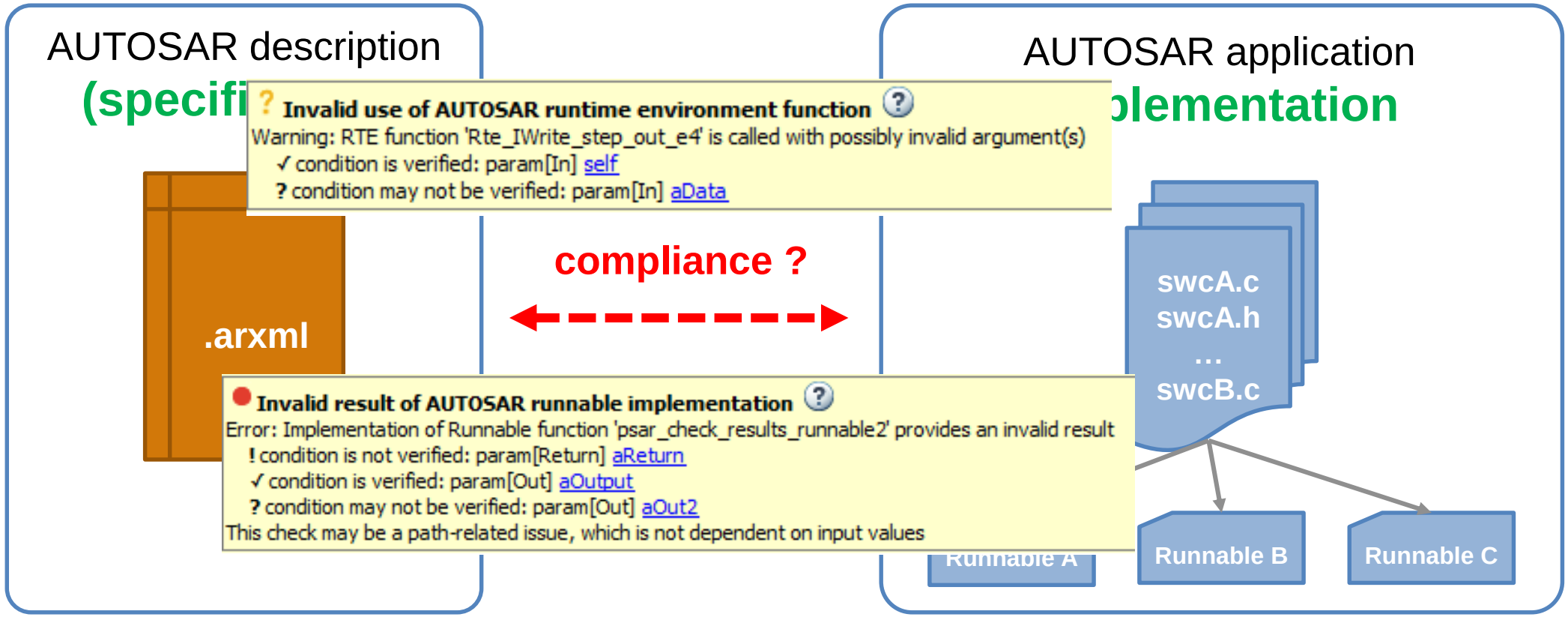


Save-time analysis workflow in Eclipse



Unit-proving of AUTOSAR components

- Detect runtime errors early in AUTOSAR design process
- Detect inconsistencies between AUTOSAR specification and Source code



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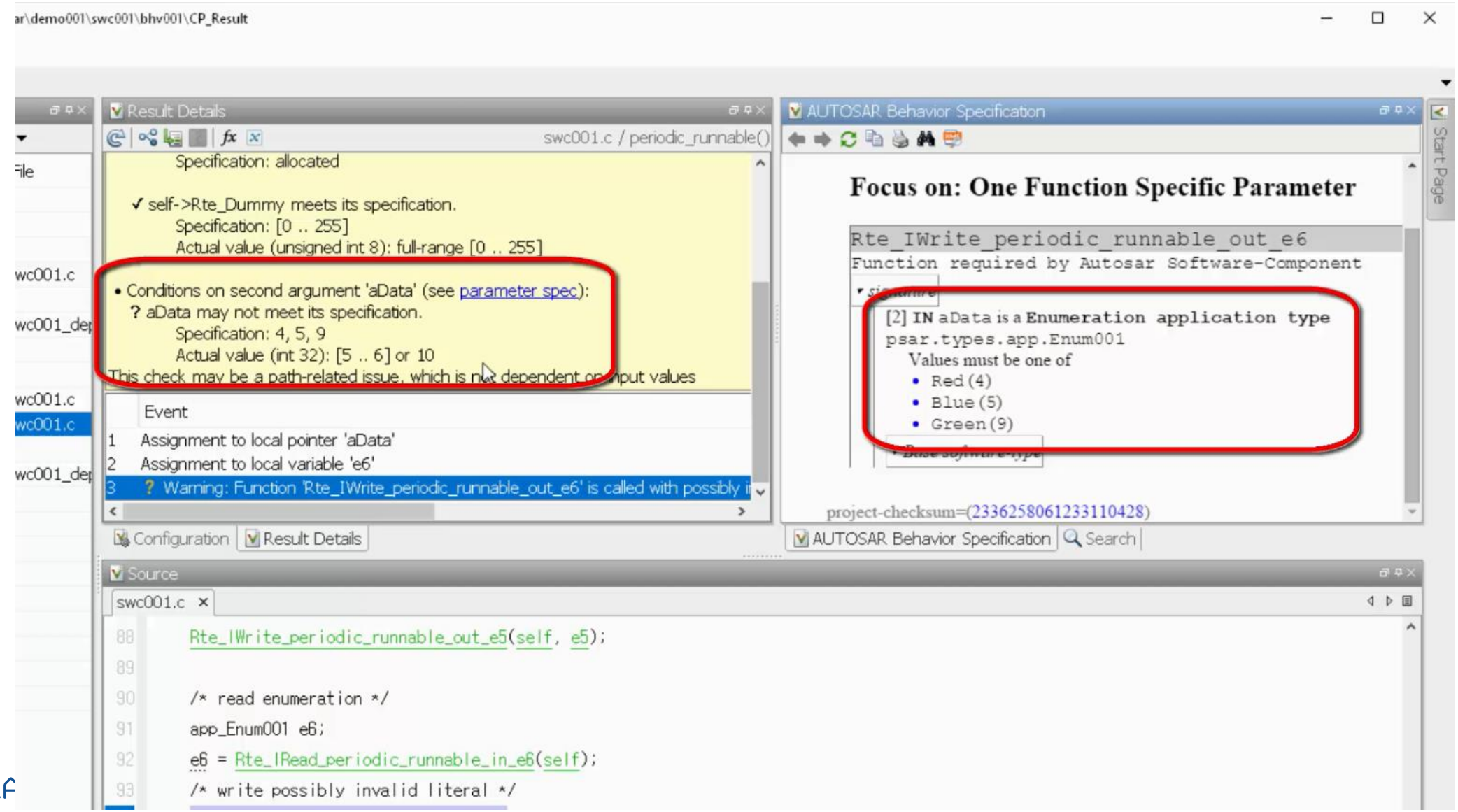
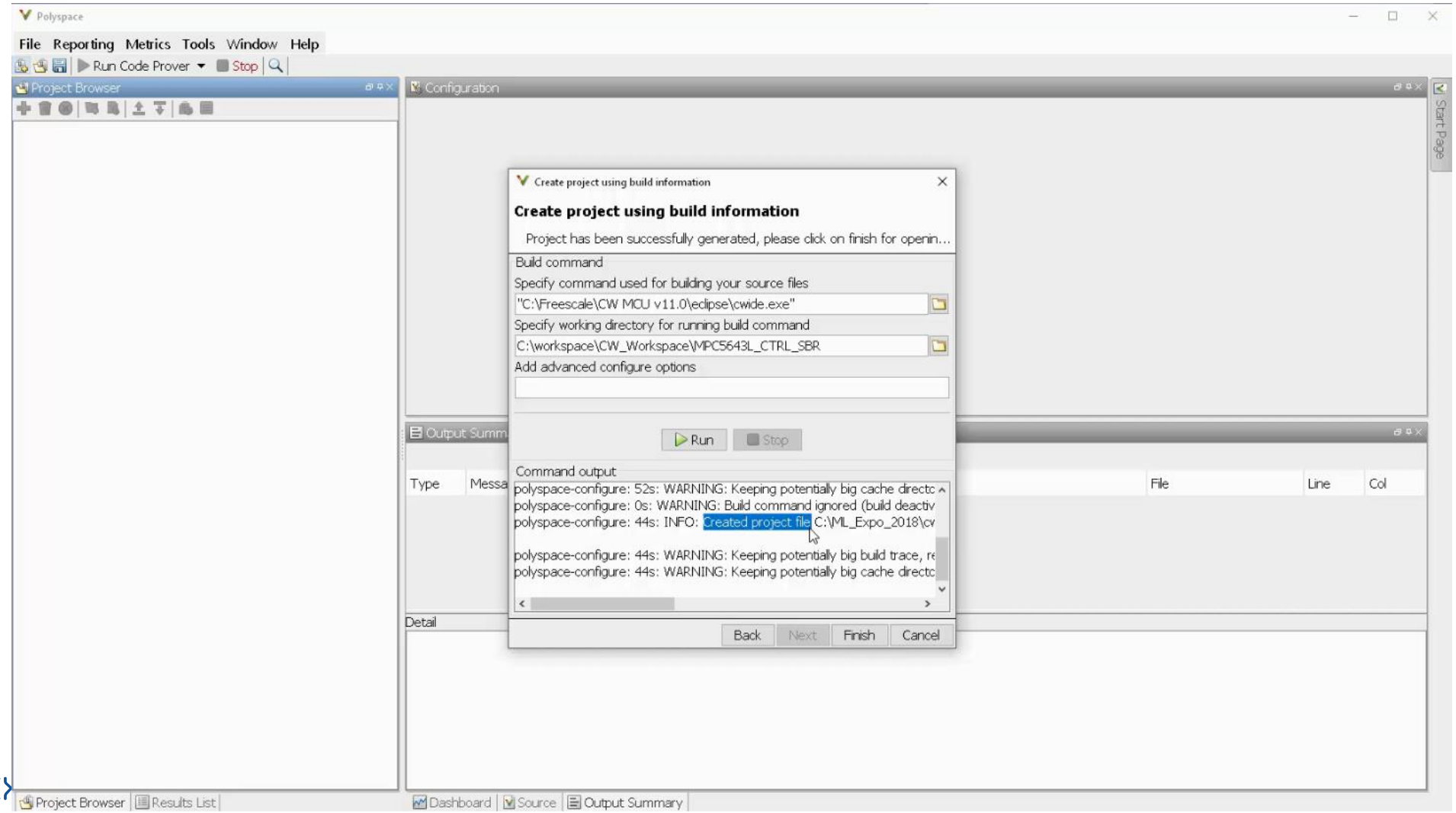
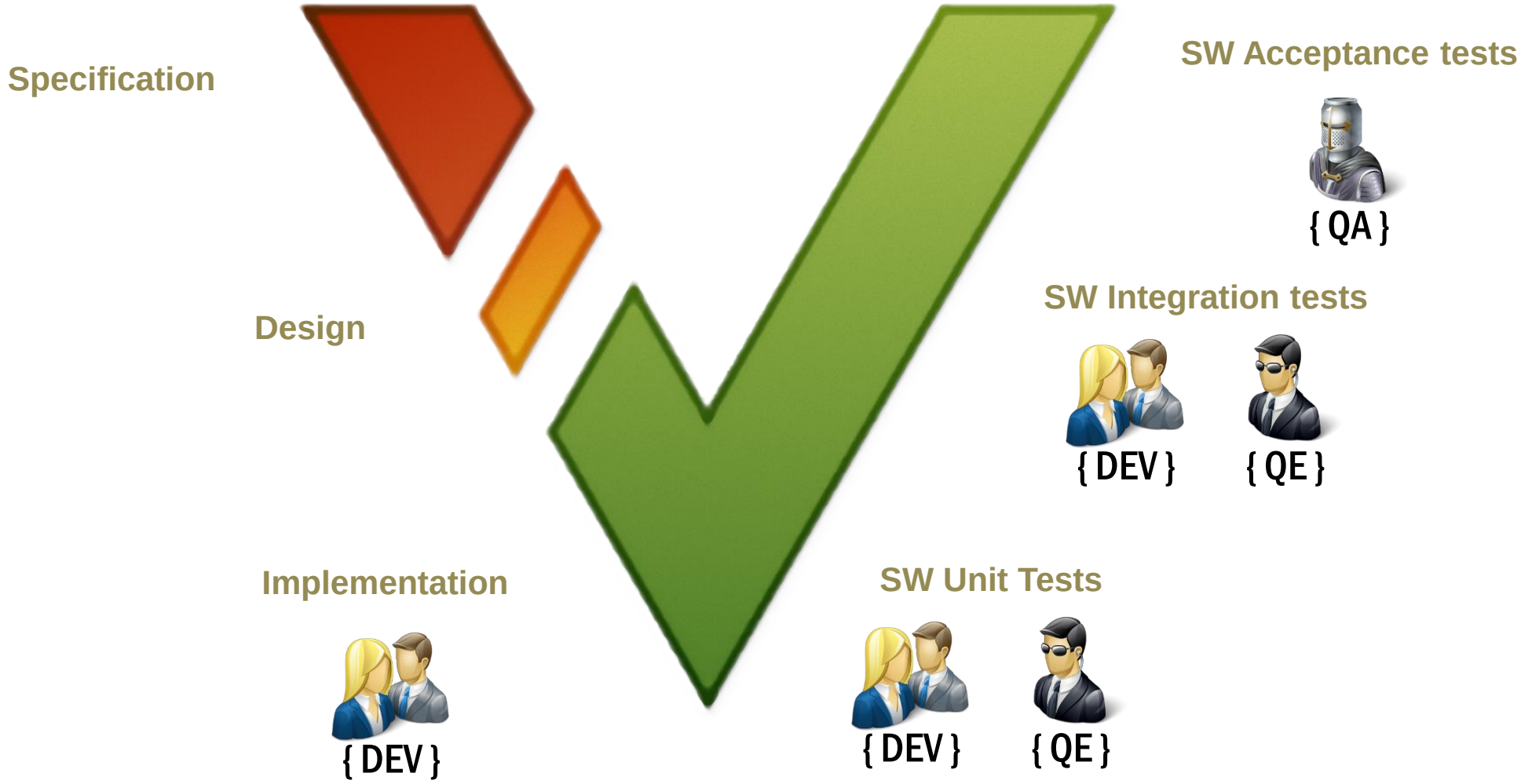


Ease of configuring projects

- **Create project automatically** (DIAB, TASKING, GreenHills, IAR, CodeWarrior, TI CCS, GCC, Visual Studio)



When/Who using Polyspace products?



Conclusion

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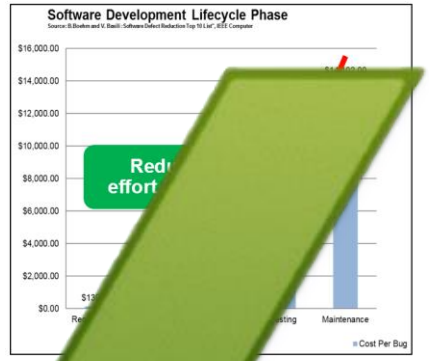

- Accumulated Technical Debt
  - Too many things to review or fix