OpenMP®

SC'21 Booth Talk Series

St. Louis, MO | science & beyond.

# **Parallelware Analyzer:** Static Code Analyzer for vectorization using OpenMP

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www.appentra.com

appentra code performance

## What is Appentra aiming to achieve?

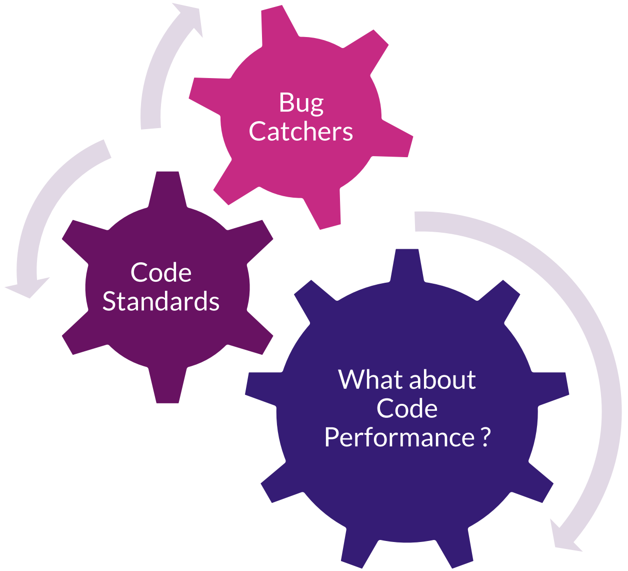
- **Boost the performance of C/C++ code** by taking advantage of the parallelism chip manufacturers have put in multicore processors
- **Introduce new developer tools** to boost the performance of C/C++ code by exploiting parallel hardware
- **Parallelware Analyzer, the first static code analyzer specialized in performance**
- Leveraging the expertise of senior performance optimization software engineers to deliver **faster applications for low-power multicore processors**

**Manuel Arenaz**
CEO and Co-Founder

**Boosting the performance of C/C++ code**

# Deep Performance Technology
## A different Static Analysis Capability

- **Traditional Static Analysis**
  Focus on Bugs, Automating coding standard enforcement, or provide support for industry requirements like
  ISO 26262, IEC 61508, DO 178B – DOD 330
- **Issues**
  Lots of noise, difficult to configure, overpriced?
- **Nothing deals with C/C++ code performance**
  Code is often not written with **Modern Hardware** performance in mind



PARALLELWARE ANALYZER

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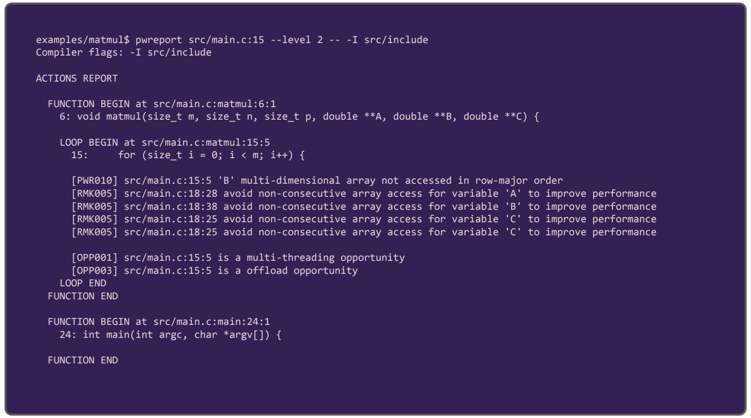
PARALLELWARE
# ANALYZER

***The first static code analyzer specialized in performance***



```
examples/matmul$ pwreport src/main.c:15 --level 2 -- -I src/include
Compiler flags: -I src/include

ACTIONS REPORT

  FUNCTION BEGIN at src/main.c:matmul:6:1
    6: void matmul(size_t m, size_t n, size_t p, double **A, double **B, double **C) {

    LOOP BEGIN at src/main.c:matmul:15:5
      15:     for (size_t i = 0; i < m; i++) {

      [PWR010] src/main.c:15:5 'B' multi-dimensional array not accessed in row-major order
      [RMK005] src/main.c:18:28 avoid non-consecutive array access for variable 'A' to improve performance
      [RMK005] src/main.c:18:38 avoid non-consecutive array access for variable 'B' to improve performance
      [RMK005] src/main.c:18:25 avoid non-consecutive array access for variable 'C' to improve performance
      [RMK005] src/main.c:18:25 avoid non-consecutive array access for variable 'C' to improve performance

      [OPP001] src/main.c:15:5 is a multi-threading opportunity
      [OPP003] src/main.c:15:5 is a offload opportunity
    LOOP END
  FUNCTION END

  FUNCTION BEGIN at src/main.c:main:24:1
    24: int main(int argc, char *argv[]) {

  FUNCTION END
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**Recommendations (PWR)**
Boost performance and ensure best practices

**Opportunities (OPP)**
Sequential, vectorization, multi-threading and GPU offloading

**Defects (PWD)**
Find and fix bugs in parallel code and correctness verification

**Remarks (RMK)**
Proficient usage of tools

PARALLELWARE

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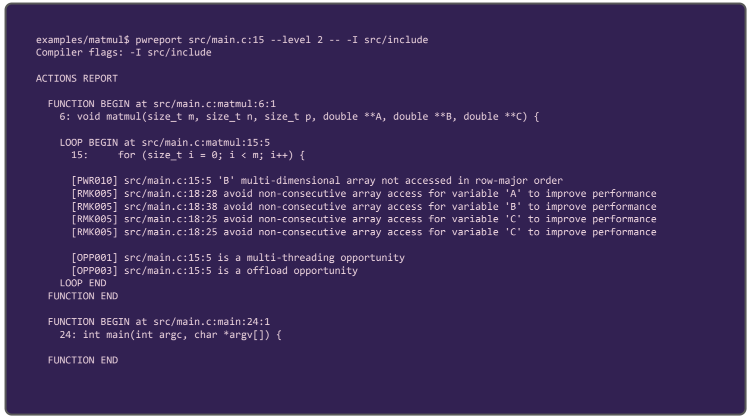

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Proficient usage of tools

**Scan** source code without executing that code

**List** human-readable actionable recommendations on where and how to fix performance issues

**Validate** code against industry best practices for performance optimization

**Integrate** with Dev Tools and CI/CD frameworks

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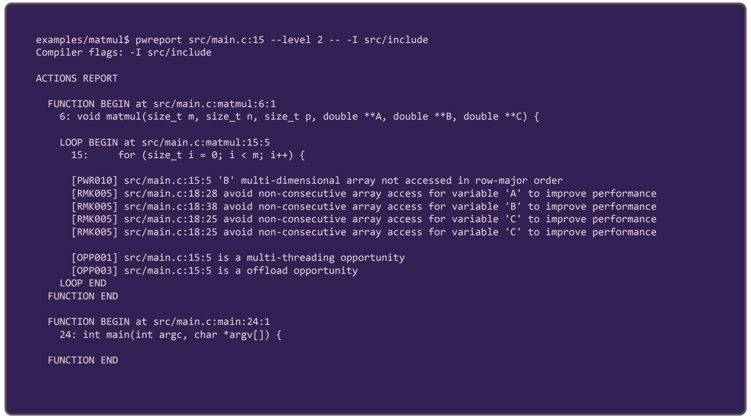

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Optimize performance on **multicore CPUs** (x86, Arm, Power)

Optimize performance on **accelerator devices** (GPU, FPGA)

**Identify** opportunities to enable performance techniques (sequential, vectorization, multi-threading, offload)

**Refactor** source code to actually implement parallelism

## Demo

Parallelware Analyzer 1.0
Vectorization Report
appentra
code performance
www.appentra.com

Parallelware Analyzer Demo
for Canny Edge Detector
appentra
code performance
www.appentra.com

Thanks to the **ORNL, NERSC, KAUST, PAWSEY** and **BSC** for helping with the adoption of Parallelware Analyzer.

Thanks to the Horizon 2020 programme.

The EPEEC project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement N° 801051.

This project has received funding from the European Union's Horizon 2020 research and innovation program through grant agreement 801101.

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