AUTOCHECK

DJORDJE TODOROVIC
VLADIMIR VUKSANOVIC
PETAR JOVANOVIC
HTEC GROUP

ABOUT AUTOCHECK

- Static analysis tool for checking compliance with AUTOSAR/MISRA C++ Guidelines
- Command line tool
- Generate rule violation reports for a project provided
- IDE Integration (VSCode)
- AI Integration (llama.cpp)
- Presented at **2020 LLVM Developers' Meeting**
  - Extending Clang for Checking Compliance With Automotive Coding Standards - Milena Vujosevic Janicic - https://www.youtube.com/watch?v=-6dL-7xkIV0

AUTOSAR / MISRA C++ GUIDELINES

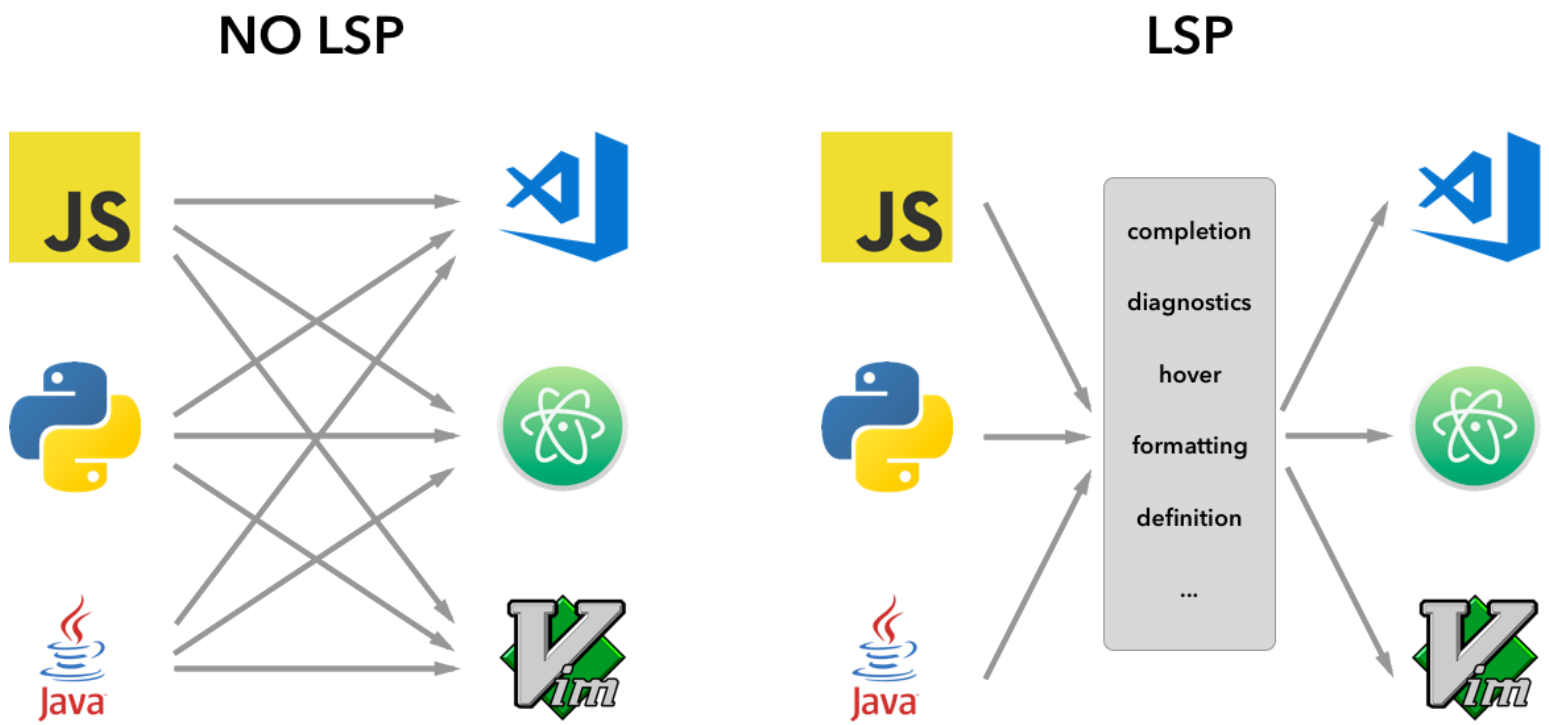
- Coding guidelines for using C++ in safety-related and critical systems
- Started as MISRA (Motor Industry Software Reliability Association) C++ in 2008
- Updated for newer C++ standards AUTOSAR (AUTOMOTIVE OPEN SYSTEM ARCHITECTURE) C++14
- Updated again as MISRA C++: 2023 for C++ 23

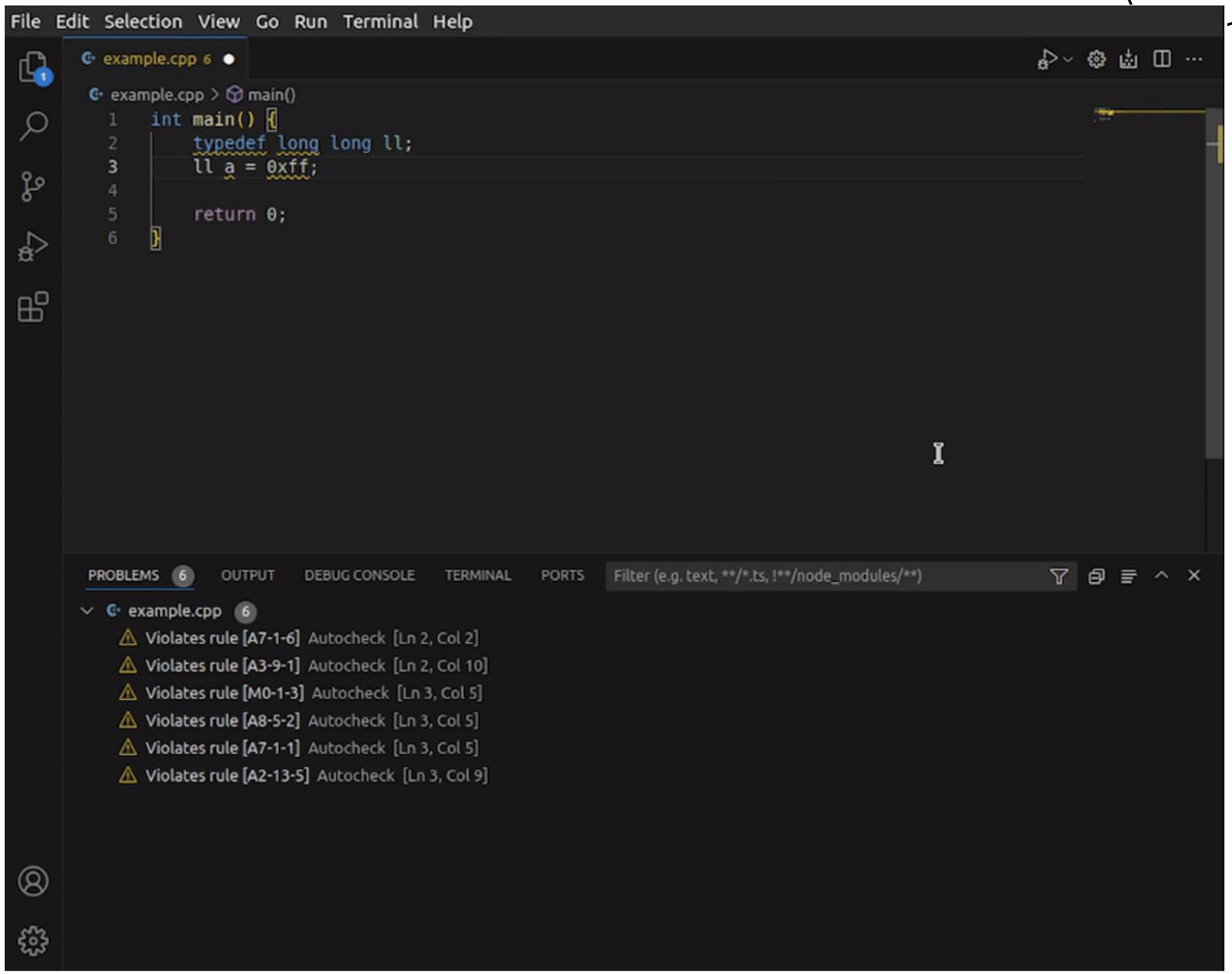
IMPLEMENTATION

- Based on the LLVM Compiler Infrastructure, like clang-tidy
  - libClang
- Works on multiple compilation stages:
  - Preprocessor
  - Lexer
  - Abstract syntax tree (AST)
    - AST Visitors
    - AST Matchers
  - Static Analyzer
  - LLVM Intermediate Representation (IR)

IDE INTEGRATION

- Language Server Protocol
- Supported by Visual Studio, VSCode, IntelliJ, vim, emacs, Qt Creator...



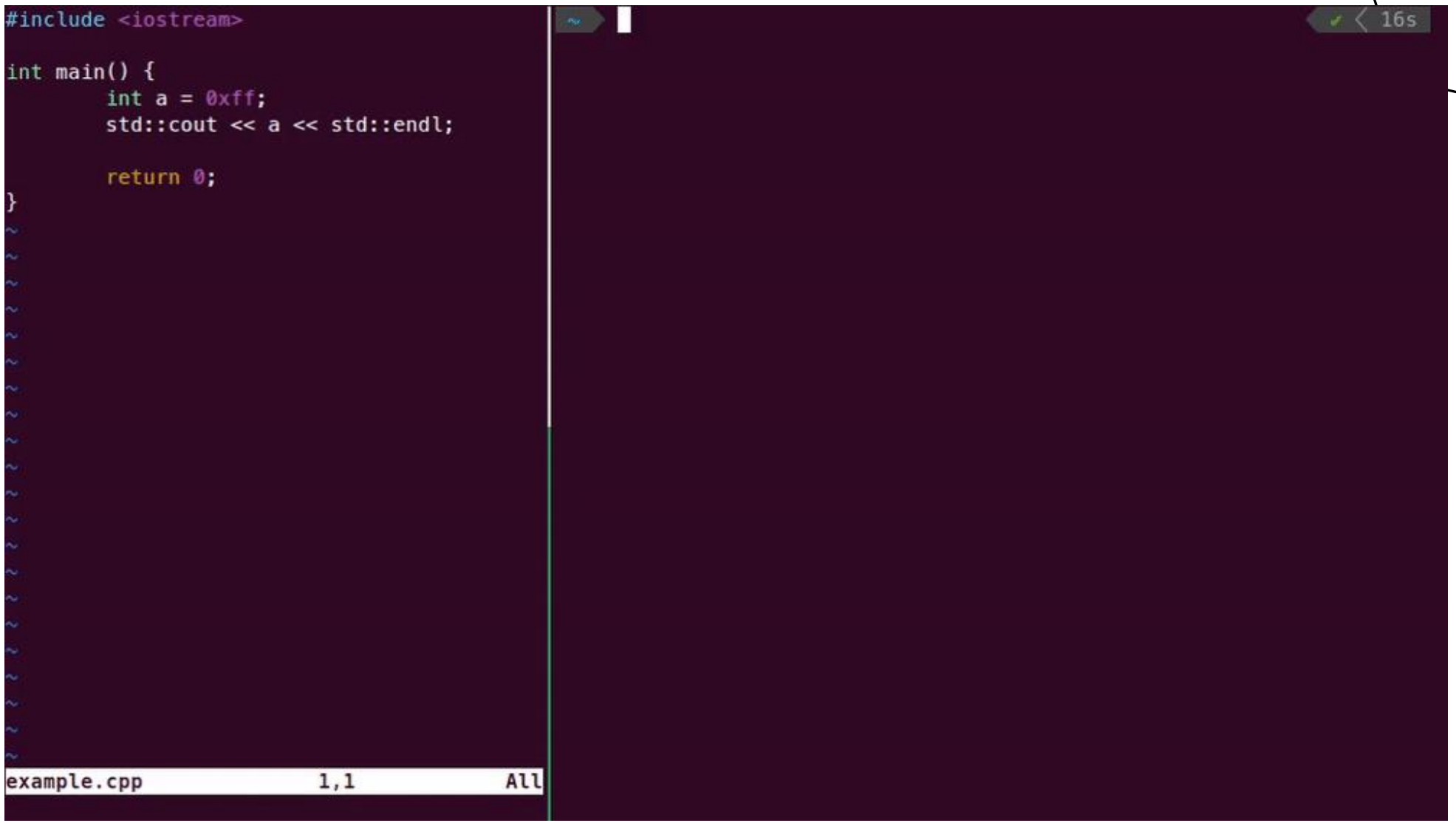

File Edit Selection View Go Run Terminal Help
example.cpp 6
example.cpp > main()
1 int main() {
2 typedef long long ll;
3 ll a = 0xff;
4
5 return 0;
6 }
PROBLEMS 6
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Filter (e.g. text, **/*.ts, !**/node_modules/**)
example.cpp 6
Violates rule [A7-1-6] Autocheck [Ln 2, Col 2]
Violates rule [A3-9-1] Autocheck [Ln 2, Col 10]
Violates rule [M0-1-3] Autocheck [Ln 3, Col 5]
Violates rule [A8-5-2] Autocheck [Ln 3, Col 5]
Violates rule [A7-1-1] Autocheck [Ln 3, Col 5]
Violates rule [A2-13-5] Autocheck [Ln 3, Col 9]

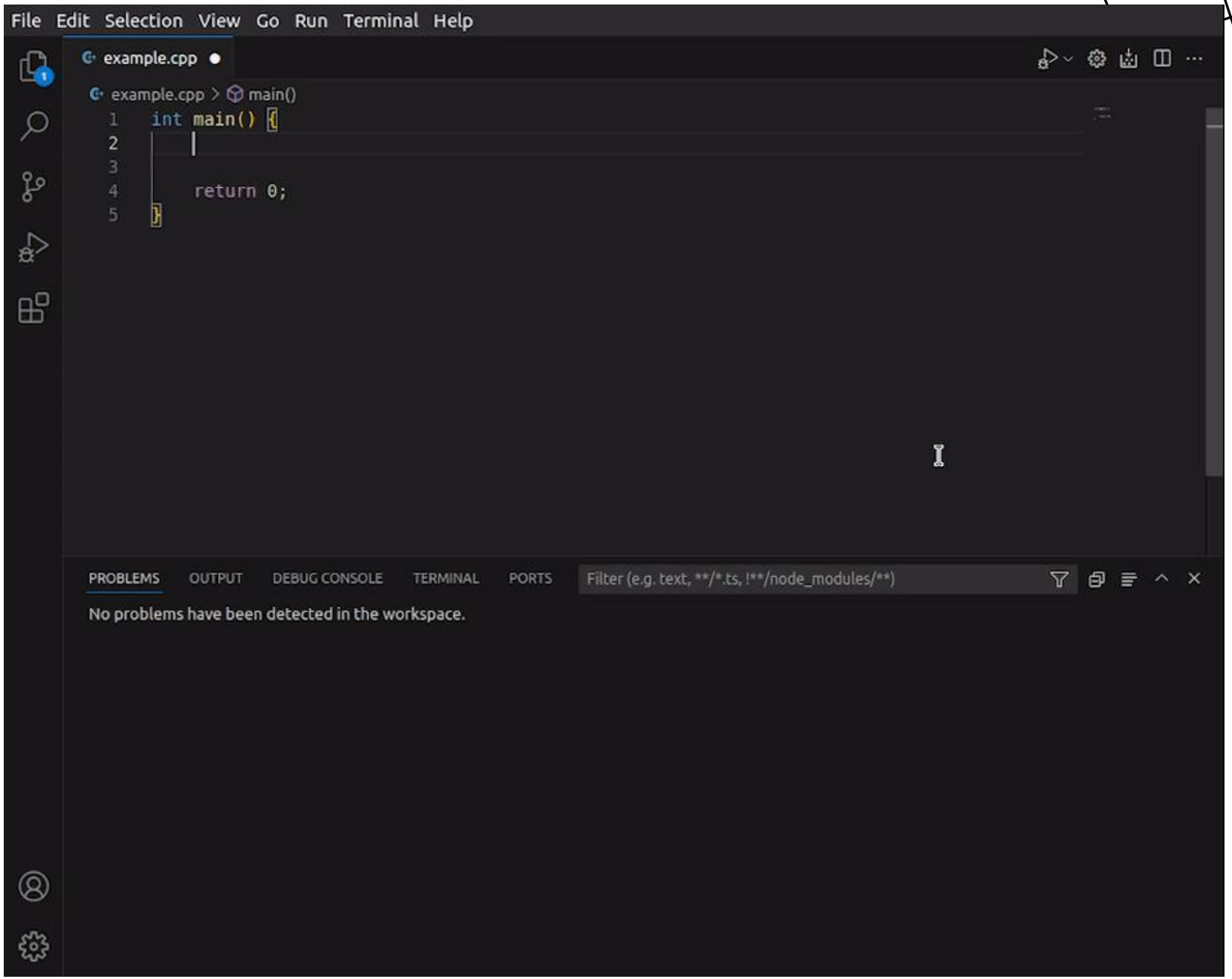
AI INTEGRATION

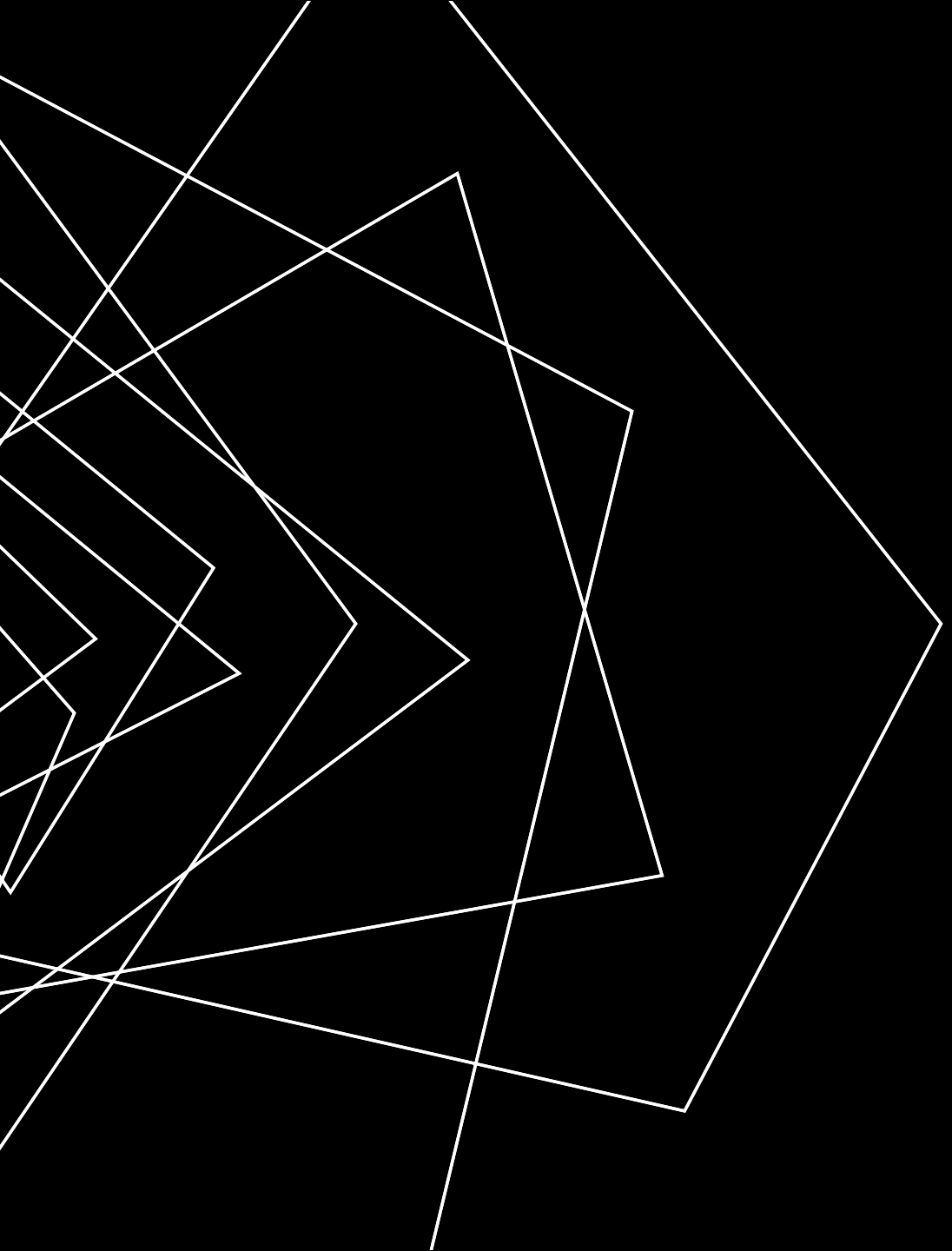
- Used for automatic code rewriting
- Local LLM instance using llama.cpp
- Llama.cpp enables inference of different LLMs (not just llama) locally either on a CPU, or GPU (CUDA, HIP)
- Used for rules where compiler technology cannot be applied – e.g. adding comments to functions that are missing it

CURRENT STATUS

- Private repo
- Willing to open source it
  - https://www.phoronix.com/news/Autocheck-LLVM-Safety-Critical
  - https://discourse.llvm.org/t/rfc-autocheck-a-source-code-analysis-tool-based-on-clang-llvm-for-automotive/76333
- Problem with Licensees
  - MISRA/AUTOSAR
  - You have an advice?
    - Drop us a message at
      - **djordje.todorovic@htecgroup.com**
      - **petar.jovanovic@htecgroup.com**




File Edit Selection View Go Run Terminal Help
example.cpp
example.cpp > main()
1 int main() {
2
3
4 return 0;
5 }
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Filter (e.g. text, **/*.ts, !**/node_modules/**)
No problems have been detected in the workspace.



THANK YOU