Being Productive with Open Source
Eclipse Development Tools

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Agenda

> The Case for Open

> Software at OpenHW and Beyond

> CORE-V IDE and its building blocks
Openness Creates Ecosystems
What are your plans for implementing IoT solutions based on open source technology?

- 14% We are looking at purely proprietary (closed source) IoT solutions
- 37% We are looking at a mix of proprietary and open source
- 23% We are looking at purely open source IoT solutions
- 26% Don't know

60% of companies are factoring open source into their IoT deployment plans. This clearly means the dominant IoT platforms in the market will either be open source or based on an open source core.
2019 IoT Commercial Adoption Survey

Top 3 advantages of using open source technologies (% of question respondents)

Flexibility: 55%
Cost: 49%
More Control: 41%
OpenHW Group Software Task Group

- Compiler tool chains (GNU, LLVM, proprietary) and Operating systems (RTOS, *nix, *bsd)
  - Tool chain Includes assembler, linker, debugger and libraries
- Processor and platform models (ISS, cycle accurate, QEMU, OVPSim)
- IDEs (Eclipse family, PlatformIO, proprietary)
- Benchmarking (specifically Embench)
- Demonstration applications
OpenHW Group Software Task Group: Goals

- Create a thriving commercial ecosystem for CORE-V software tools, models and operating systems
- To see those tools, models and operating systems which are open source maintained as part of official upstream distributions
Open Source IoT Ecosystem

Integrated Development Environments

Tool Chains
Powering the world’s leading commercial IoT solutions
Eclipse IoT Community (as of 9/2020)

8M+ lines of code
45 projects
350+ contributors
46 member organizations
Who am I?

Alexander Fedorov @ ArSysOp

Eclipse Platform Committer
Eclipse CDT Committer
Eclipse Passage Project Lead

Leading IDE effort at Software Task Group
What do we expect from IDE?

> Configurability
> Extensibility
> Scalability
> Usability
> Agility
CORE-V IDE already aggregates:

- Eclipse Modeling Framework
- Eclipse Platform
- Eclipse CDT
- Eclipse Embedded CDT (GNU MCU/ARM Eclipse Plug-ins)
Eclipse Modeling Framework

The EMF project is a modeling framework and code generation facility for building tools and other applications based on a structured data model.

Learn more: https://www.eclipse.org/modeling/
Eclipse Platform

- OSGi-based extensible runtime
- Workspace to manage project metadata
- "natures" and "builders" to process content
- SWT and JFace to create reusable UI
- Workbench model to organize perspectives
- p2 to resolve dependencies during update
- User assistance capabilities
Eclipse CDT: the right choice for IDE
Eclipse CDT: project configuration
Eclipse CDT: before & after
Eclipse CDT: rich debug information

- Variables, Breakpoints, Expressions & Hovers
- Disassembly
  - Instruction Stepping
  - Gradients to easily visualize stepping
- Memory Browsing with Annotations
Eclipse CDT: CLI tools integration

- Integrated Terminals and Consoles
- Debugger Console View
  - Full GDB command line experience with all the niceties of an IDE
- Terminal View
  - Serial Connection target
  - Telnet/SSH (e.g. to openocd)
  - Local terminal (e.g. bash)
Eclipse Embedded CDT

- create/build/manage embedded ARM/AArch64/RISC-V applications
- ready to run templates for some ARM Cortex-M processors
- debugging support via JTAG/SWD
- examine and modify peripheral registers during debug sessions
- supports a wide range of 32 and 64-bit toolchains

Learn more https://projects.eclipse.org/projects/iot.embed-cdt
Eclipse Embedded CDT on Raspberry Pi 4 (based on Eclipse Platform for Aarch64)
More to consider

Eclipse LPS4J
Eclipse LPS4E
LSP & DAP

PlatformIO
Embedded development

Eclipse Passage
License checks
Usage constraints
Eclipse LSP4J

Java implementation of VSCode's language server protocol (LSP) and debug adapter protocol (DAP)

Learn more about LSP:
https://microsoft.github.io/language-server-protocol/

Learn more about DAP:
https://microsoft.github.io/debug-adapter-protocol/
Eclipse LSP4E

Move heavy tasks like AST building and traversing to a “language server” (separate process)
Debug Adapter Protocol

Development Tools

IDE  Generic Debugger

Editor  Generic Debugger

Other Tool  Generic Debugger

DAP

Node.js Debug Adapter  Node.js

Python Debug Adapter  Python

C# Debug Adapter  C#
Embedded development

PlatformIO is a professional collaborative platform for embedded development that support multiple IDE including Eclipse

- **800+ target boards** (development kits)

- **20+ software frameworks**
  
  (Arduino, ARM mbed, CMSIS, ESP-IDF, FreeRTOS, STM32Cube, Zephyr RTOS, and others)

- **30+ semiconductor architectures and development platforms**
  
  (ARM, AVR, Espressif 8266/32, MCS-51, MSP430, PIC32, STM8, RISC-V, and others)

- Over **10,000 libraries**

- **All famous operating systems**
  
  (Windows, macOS, Linux, FreeBSD, Linux ARMv6+, card-sized PCs)
PlatformIO Eclipse integration

- Multi-board and Multi-architecture programming experience
- Debugging, Unit Testing, Static Analysis, Firmware Inspection, and Remote Development out-of-the-box
- Developers can work simultaneously on the same embedded project using different development environments and the favourite operating system
- Code for any supported framework can be compiled and uploaded to a target platform in minutes
- Developers no longer have to manually find and assemble an environment of toolchains
Eclipse Passage

Define and control functionality constraints
What do we have in the nearest plans?

> Integrate toolchain from Embecosm
> Add “Hello World” sample project
> Provide project templates
> Publish binaries to be a foundation for downstream solutions
You are welcome to participate!

1. Create account at https://www.eclipse.org/
2. Sign Eclipse Contributor Agreement (electronically)
3. Specify your GitHub id in your Eclipse profile
4. Fork https://github.com/openhwgroup/core-v-ide-cdt
5. Don’t forget to add “signed-off-by” to commit message

Example:

Signed-off-by: Alexander Fedorov <alexander.fedorov@arsysop.ru>
Thank you!

Questions?

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