CEC Continuing Education Center

DesignNews

Introduction to Build Systems and CMake

DAY 1 : Introduction to Embedded Build Systems

Sponsored by

DigiKey

BENINGO EMBEDDED GROUP

informa markets

Webinar Logistics

- Turn on your system sound to hear the streaming presentation.
- If you have technical problems, click “Help” or submit a question asking for assistance.
- Participate in ‘Group Chat’ by maximizing the chat widget in your dock.

01

The Problem

The Problem

There are several problems that teams are facing:

- Managing multiple build configurations
- Slow builds
- Software quality issues
- Inability to use modern techniques like DevOps, Simulation, TDD, etc, effectively
- Productivity issues (time to market, product quality)

The Solution

A carefully designed CMake build system will:

- Simplify build configurations with better dependency management
- Allow for faster, cross-platform builds
- Enable consistency across different development environments
- Unlock modern development processes and tools like DevOps, Simulation, and TDD
- Increase productivity

CEC Continuing Education Center

BENINGO EMBEDDED GROUP

DigiKey

THE SPEAKER

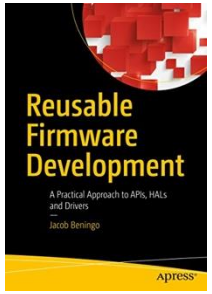
Jacob Beningo

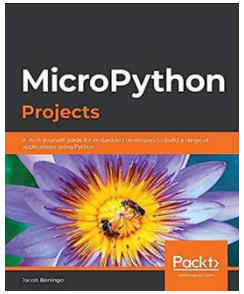
Jacob@beningo.com

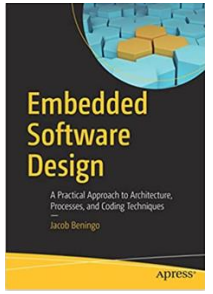
Beningo Embedded Group – CEO / Founder

Focus: Embedded Software Consulting and Training

Help teams deliver higher-quality embedded software faster. We specialize in creating and promoting embedded software excellence in businesses around the world.







Blogs for:

- DesignNews.com
- Embedded.com
- EmbeddedRelated.com
- MLRelated.com

Visit **www.beningo.com** to learn more

The Plan

Transform Your Build Process: Streamline, Modernize, and Boost Productivity with CMake

Step 1

Learn the Technology

Step 2

Design the Solution

Step 3

Adopt Modern Practices

Audience POLL Question

What problem are you struggling with the most?

a) Managing multiple build configurations
b) Slow builds
c) Software quality issues
d) Inability to use modern techniques like DevOps, Simulation, TDD, etc, effectively
e) Productivity issues (time to market, product quality)

CEC Continuing Education Center

BENINGO EMBEDDED GROUP

DigiKey

02

Embedded Build Systems

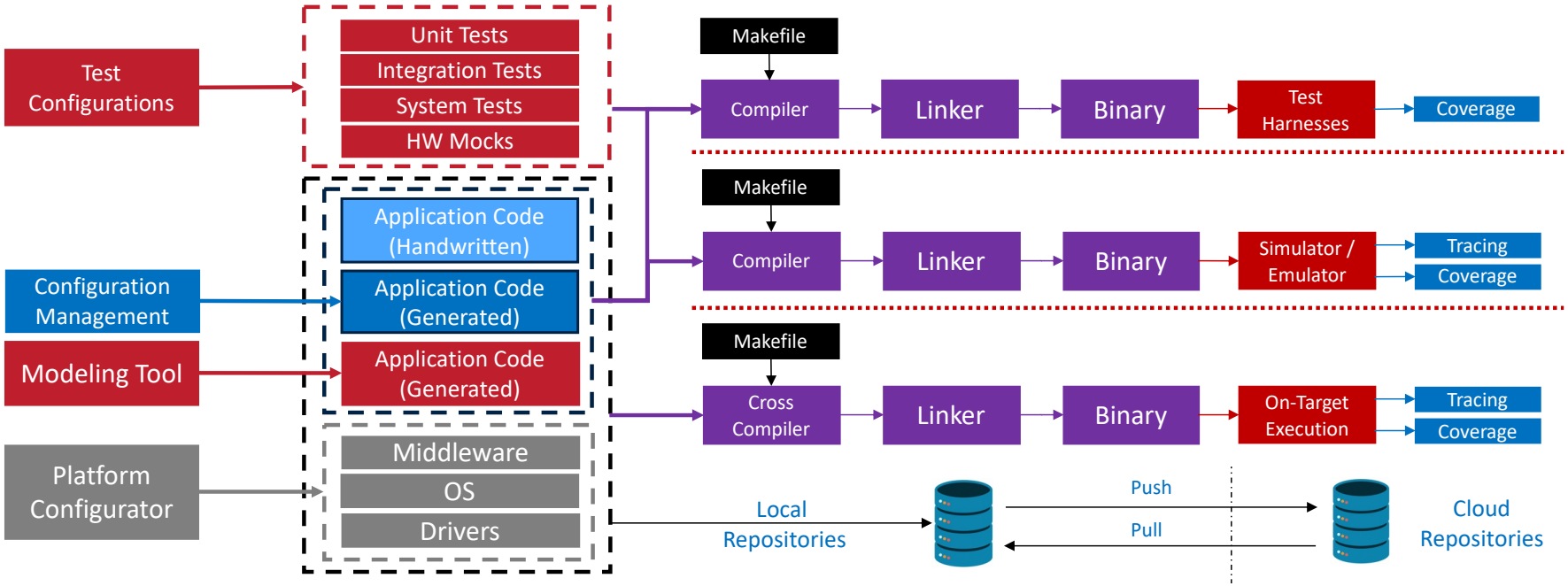
What is a build system?

A build system is a set of tools and processes used to automate converting source code into executable programs. It includes:

- Cross-Compilation
- Configuration Management
- Automation
- Integration with Development Tools
- Resource Handling

Builds Every Embedded Team Needs

1) Debug
2) Release
3) Test
4) Simulate
5) Analyze



Build Tools

- GNU Make
  - The most widely used build automation tools in embedded software development.
  - It uses Makefile scripts to define rules for building different targets, including compiling source code, linking object files, and creating executables.
- Ninja
  - Is a small build system with a focus on speed. It is often used as a backend to other build systems like CMake and Meson.
- Commercial Solutions
  - IAR, Keil, etc

Audience POLL Question

Which build tools do you currently use?

a) Make
b) CMake
c) Meson
d) Other

CMake

03

What is CMake?

CMake is a cross-platform, open-source build system generator. It simplifies the process of managing build processes in a compiler-independent manner, making it ideal for projects that need to operate across different systems.

- Cross-Platform
- Configurable
- Modular
- Extensive language support
- Toolchain integration

Why use CMake?

- Platform and Compiler Independence: Generates build files for a variety of platforms and compilers, allowing developers to compile their projects on any system without modification.
- Simplifies Complex Builds: Manages complex project structures easily with powerful scripting capabilities, supporting conditional logic and looping constructs that are not typically available in traditional build files.
- Facilitates Code Reuse: Through its ability to organize and manage multiple library dependencies, CMake simplifies the integration and reuse of external libraries and modules.
- Streamlines Testing and Packaging: Integrates with testing frameworks and provides CPack for easy packaging of applications, which is essential for distribution and deployment.
- Supports Modern Practices: Ideal for continuous integration/continuous deployment (CI/CD) environments due to its capability to generate and configure builds automatically across different platforms and configurations.
- Community and Documentation: Benefits from a strong user and developer community that provides extensive documentation, tutorials, and third-party extensions, ensuring support and continuous improvement.

Installing CMake

Binary distributions:

Platform	Files
Windows x64 Installer:	cmake-3.30.2-windows-x86_64.msi
Windows x64 ZIP	cmake-3.30.2-windows-x86_64.zip
Windows i386 Installer:	cmake-3.30.2-windows-i386.msi
Windows i386 ZIP	cmake-3.30.2-windows-i386.zip
Windows ARM64 Installer:	cmake-3.30.2-windows-arm64.msi
Windows ARM64 ZIP	cmake-3.30.2-windows-arm64.zip
macOS 10.13 or later	cmake-3.30.2-macos-universal.dmg
	cmake-3.30.2-macos-universal.tar.gz
macOS 10.10 or later	cmake-3.30.2-macos10.10-universal.dmg
	cmake-3.30.2-macos10.10-universal.tar.gz
Linux x86_64	cmake-3.30.2-linux-x86_64.sh
	cmake-3.30.2-linux-x86_64.tar.gz
Linux aarch64	cmake-3.30.2-linux-aarch64.sh
	cmake-3.30.2-linux-aarch64.tar.gz

https://cmake.org/download/

Audience POLL Question

What is your experience with CMake?

a) No experience - I have never used CMake.
b) Beginner - I have basic understanding or have used CMake in simple projects.
c) Intermediate - I regularly use CMake and am comfortable with its core features.
d) Advanced - I have deep knowledge of CMake, including custom modules and complex build configurations.
e) Expert - I contribute to CMake's development or am recognized as an authority on using and teaching CMake effectively.

Next Steps

04

Embedded Build System

Transform your build system with the free Beningo Embedded Build System example:

- Docker container build system
- Makefile-based
- CMake with Ninja Example
- Compilation scripts
- Integrated tools like cpputest

https://mailchi.mp/beningo/beningo-devops

Additional Resources

Please consider the resources below:

- Jacob's Blogs
- Jacob's CEC courses
- Embedded Software Academy

- Embedded Bytes Newsletter
  - http://bit.ly/1BAHYXm

Consulting | Coaching | Training

www.beningo.com

Next Steps

- Introduction to Embedded Build Systems
- CMake Fundamentals
- CMake for Embedded Systems
- Designing your Build System
- Adopting Modern Practices

CEC Continuing Education Center

DesignNews

Thank You

Sponsored by

DigiKey

BENINGO EMBEDDED GROUP

informa markets