MINIMUM PLATFORM

OPEN SOURCE UEFI FIRMWARE FOR INTEL BASED PLATFORMS

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How to Build Intel UEFI FW For a System?

tianocore

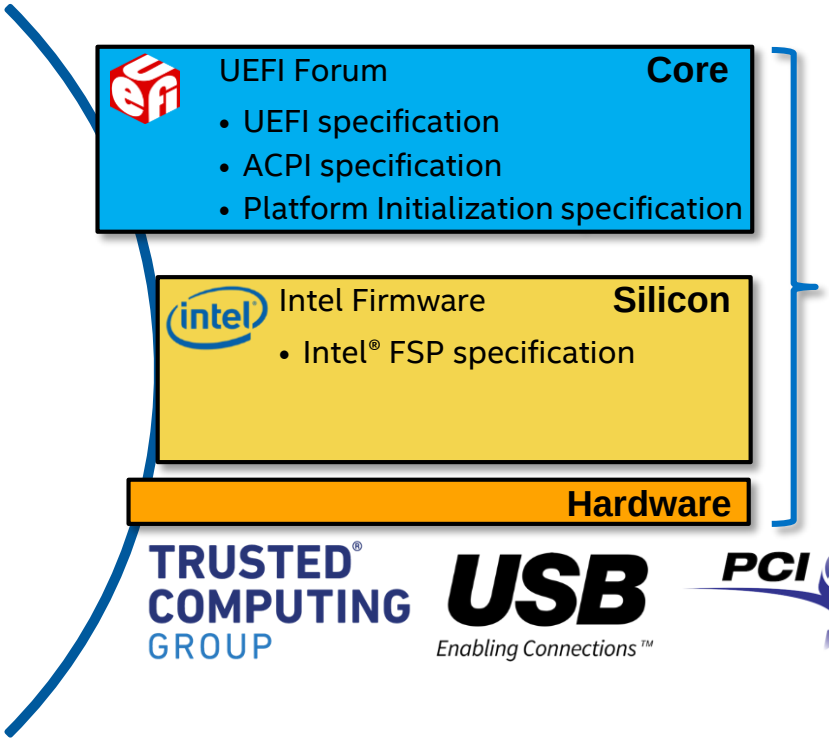
https://github.com/tianocore/edk2

intel

https://github.com/IntelFsp/FSP

Core	Silicon	Platform
• Typically open source. • Industry standard drivers. • Generic firmware infrastructure code.	• Typically closed source. • Has some tie to a specific class of physical hardware. • Sometimes governed by industry standards, sometimes proprietary.	• Typically closed source. • Advanced or platform feature code. • Board specific code for one or more motherboards.

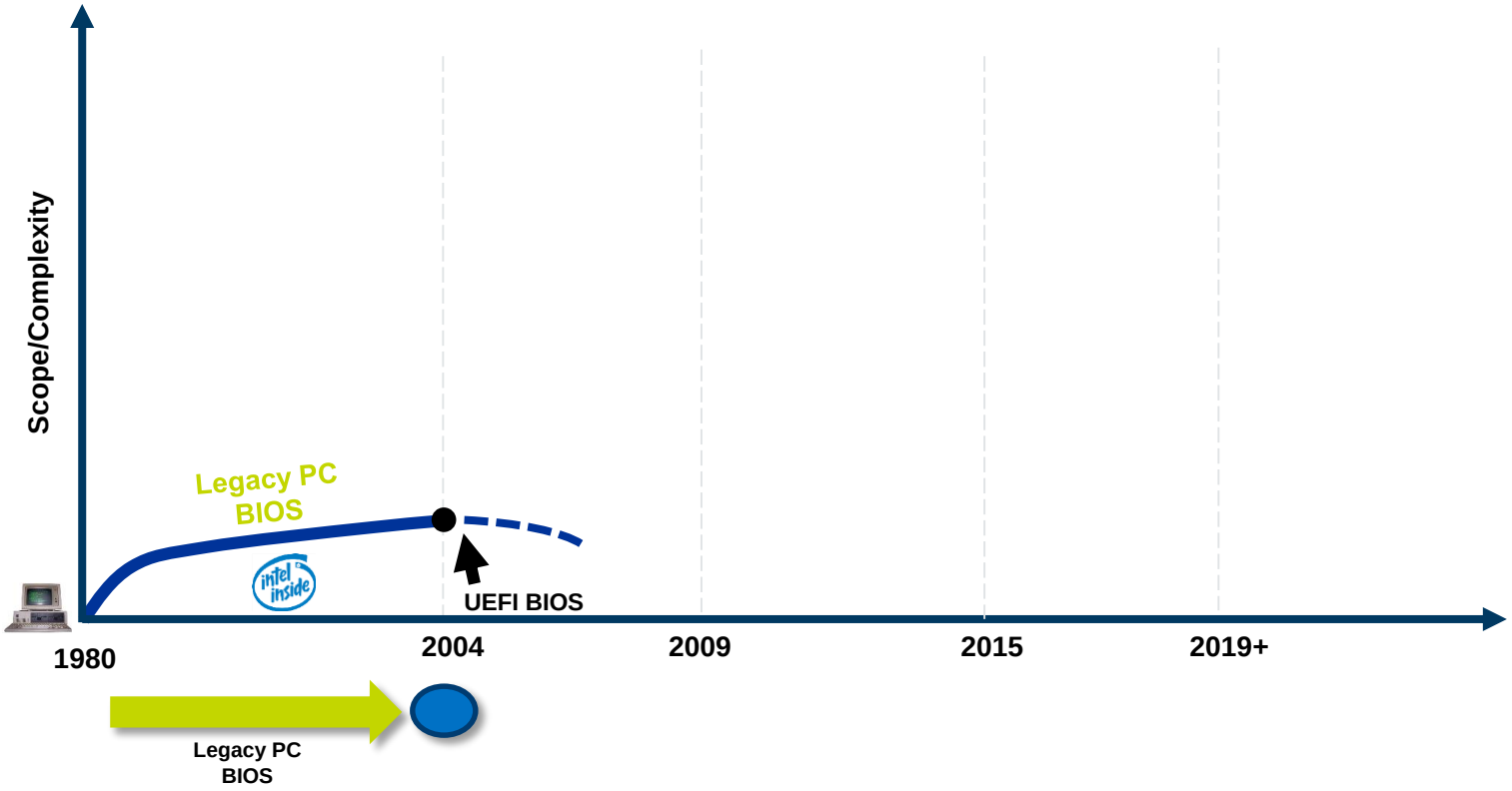
Firmware is Built on Standards



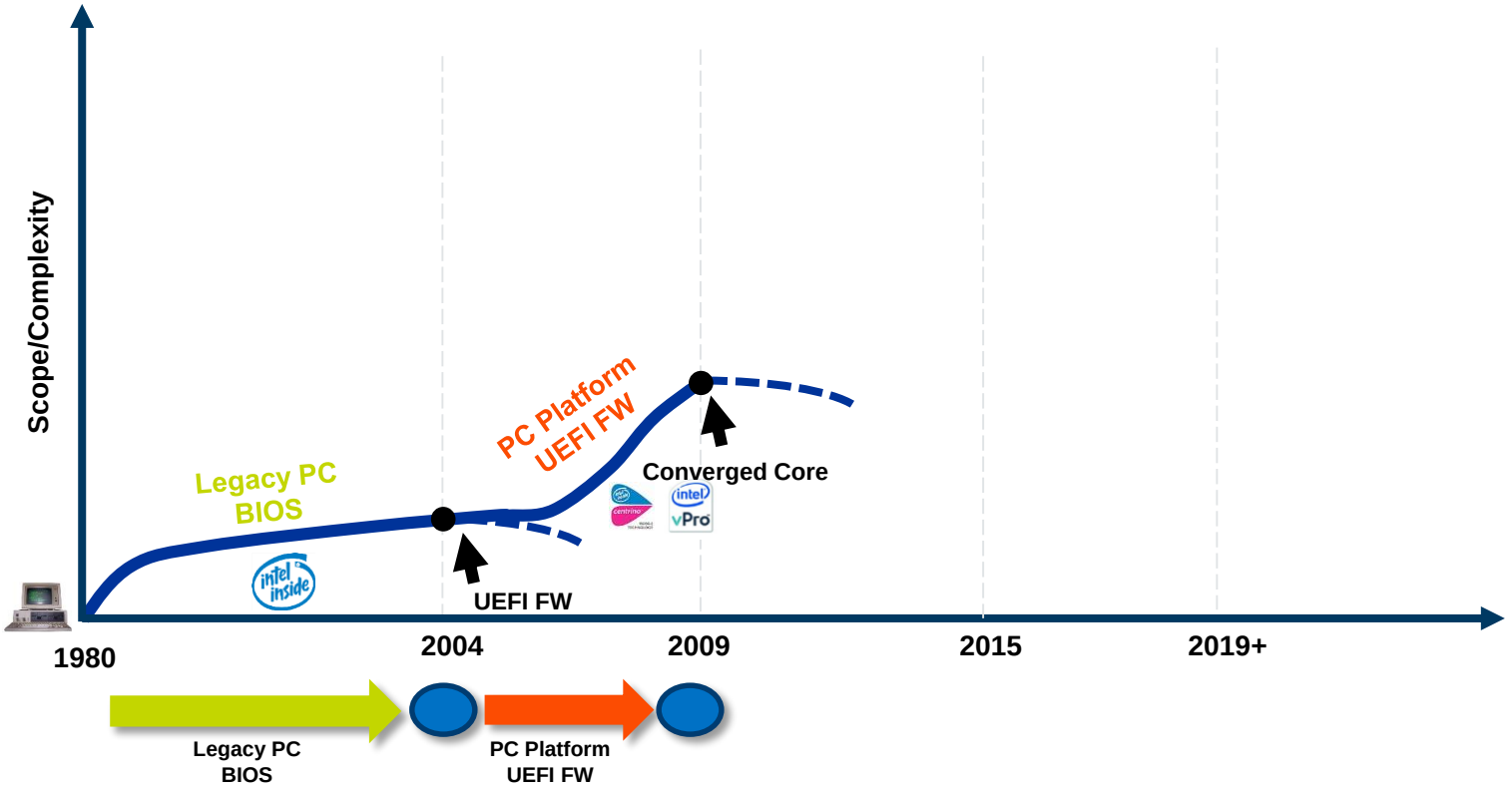
The platform code brings it all together

- Defines the firmware flash map
- Specifies the core and hardware drivers needed
- Calls into the silicon initialization API
- Provides board-specific settings like GPIO values, SPD settings, etc.

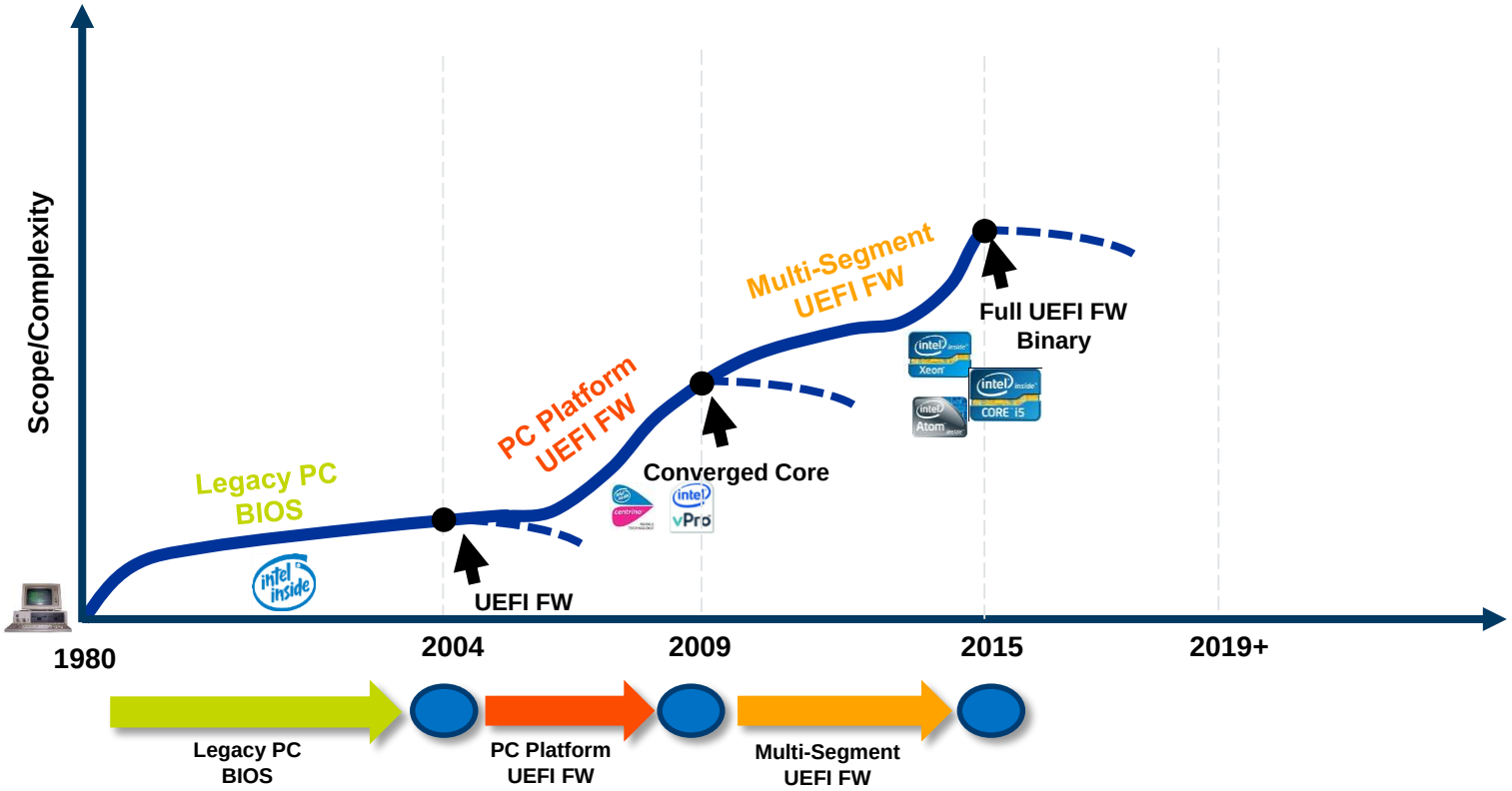
Intel® Legacy BIOS to UEFI



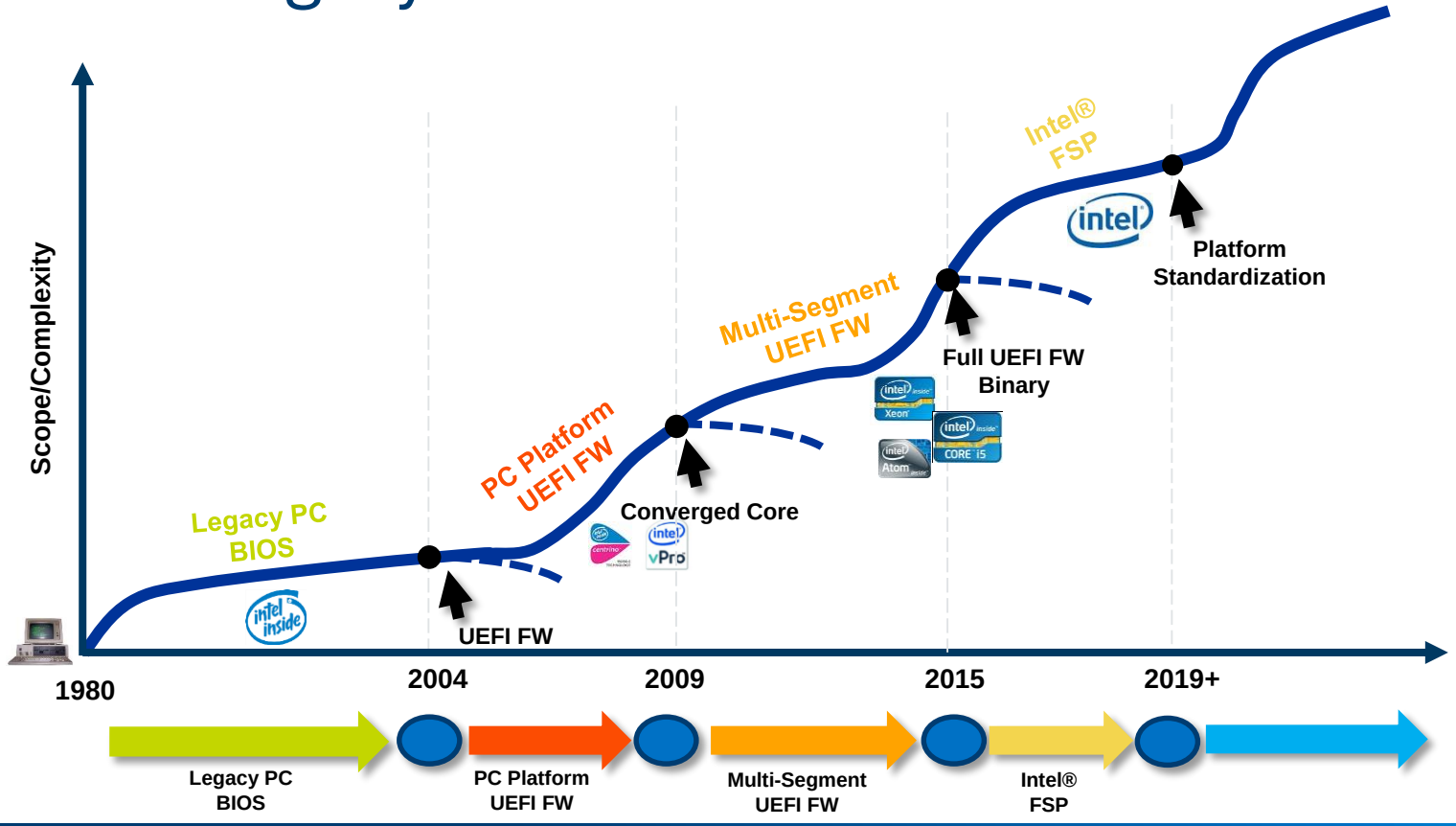
Intel® Legacy BIOS to UEFI



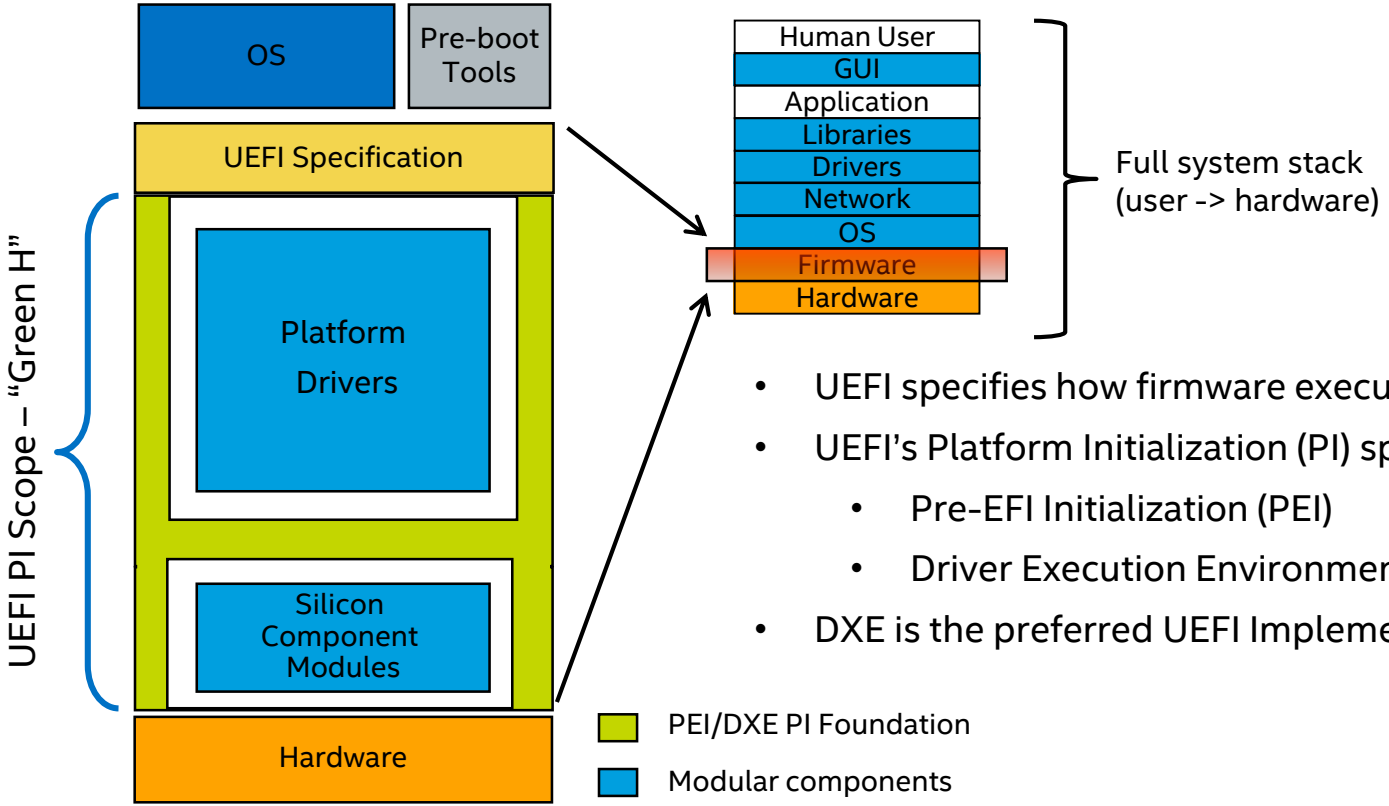
Intel® Legacy BIOS to UEFI



Intel® Legacy BIOS to UEFI



UEFI PI Overview



- UEFI specifies how firmware executes the OS loader.
- UEFI's Platform Initialization (PI) spec. defines:
  - Pre-EFI Initialization (PEI)
  - Driver Execution Environment (DXE)
- DXE is the preferred UEFI Implementation.

Silicon Initialization Overview

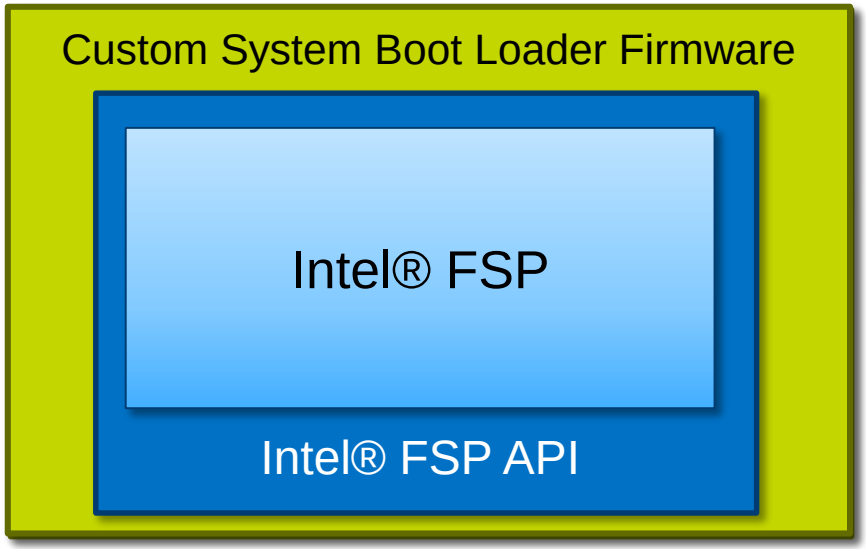
- Intel® FSP is a binary distribution of Intel's silicon initialization code.
  - The resources necessary to implement Intel silicon code are not publicly available.

- Intel's FSP Strategy:
  1. Distribute binaries of our proprietary silicon code to the public
  2. Enable this binary to plug into arbitrary firmware designs (coreboot, TianoCore, etc.)

  - Secondary goal is to abstract the complexity of silicon initialization.
  - Expose a limited number of well-defined interfaces.

Intel® FSP 2.0

- Intel® FSP is treated as a binary blob.
- Intel® FSP header provides 32-bit entry points to APIs defined in the FSP specification.
- Intel® FSP specification defines data structures used for input and output from the API functions.



Intel® FSP 2.1

- **Primary objective:** Seamlessly integrate with UEFI PI firmware

Now we need an open source UEFI PI platform wrapper for Intel® FSP…

- **Non-UEFI PI Firmware: API mode**
  - Same “mode” provided with 2.0 using the same binary API
  - Uses UPDs for configuration
- **UEFI PI Firmware: Dispatch mode (* New)**
  - The FSP wrapper uses Intel® FSP the same as any other firmware file system partition
  - Directly uses UEFI PI architecture executables

Takeaway: Dispatch mode can improve efficiency if a UEFI PI wrapper is used.

Lack of Platform Code Consistency

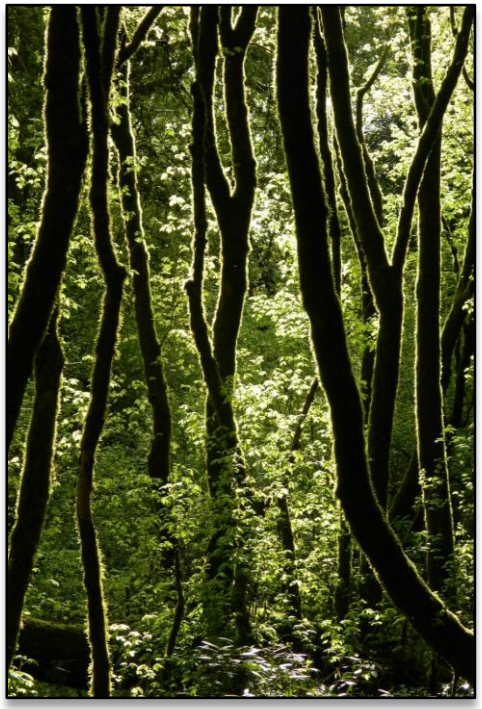
Platform code today needs work to encourage collaboration.

- It is designed with a specific device and segment in mind.
  - Lacks feature modularization
- It is difficult to understand and debug.
  - Boot flows vary arbitrarily between systems
- It is difficult to secure.
  - Same thing done different ways

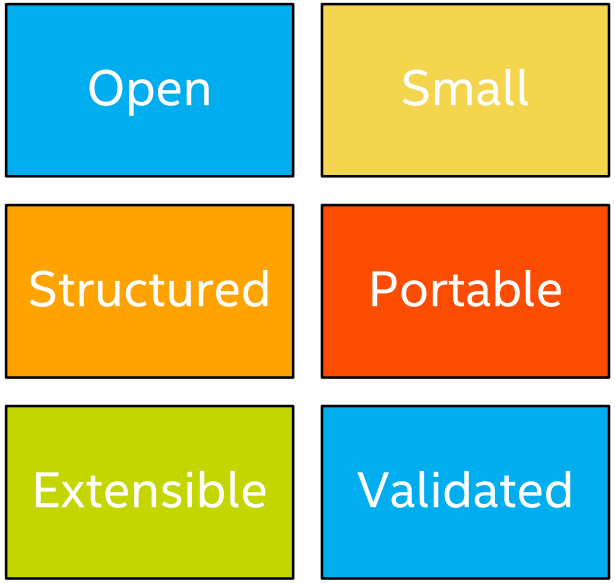
Server

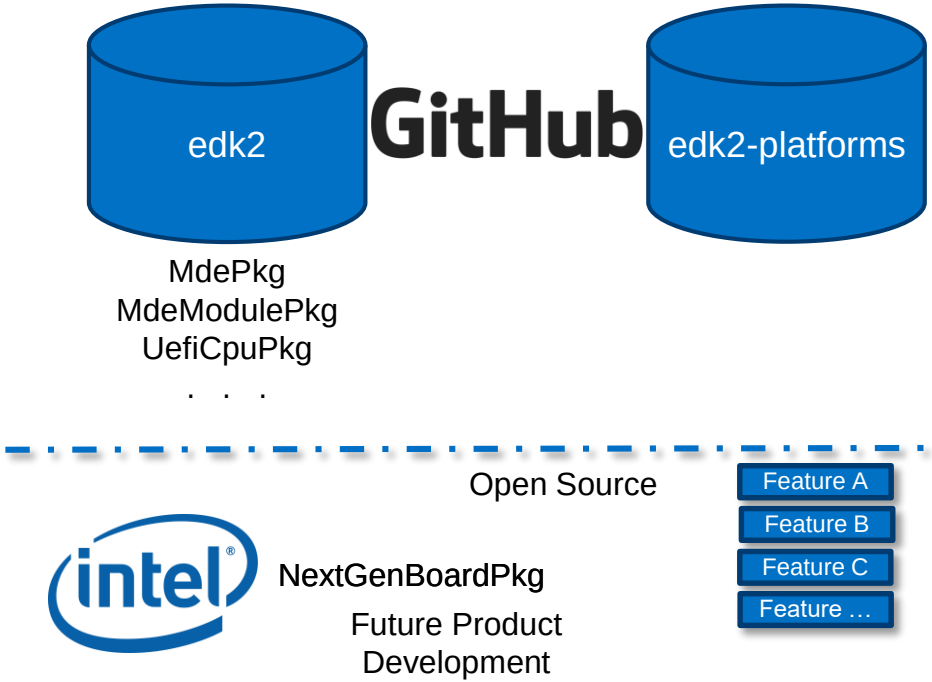
Client

Ultra Mobile



Evolving Intel Open Source Platform Firmware





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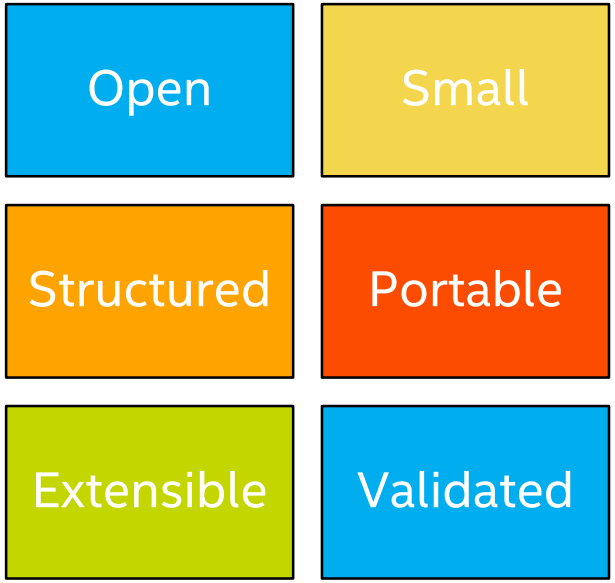

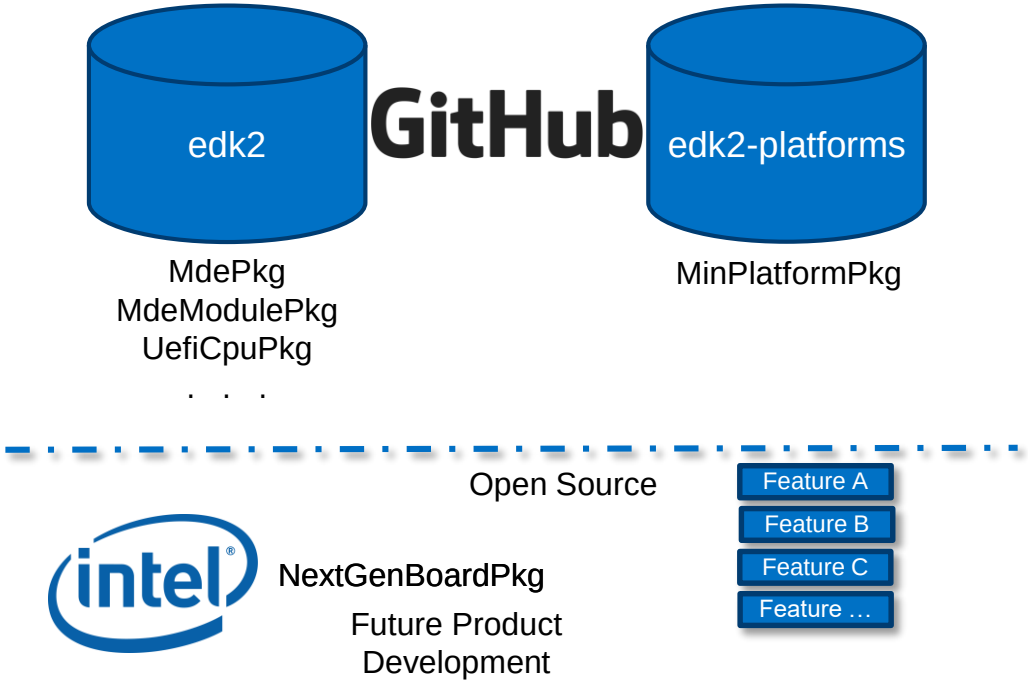

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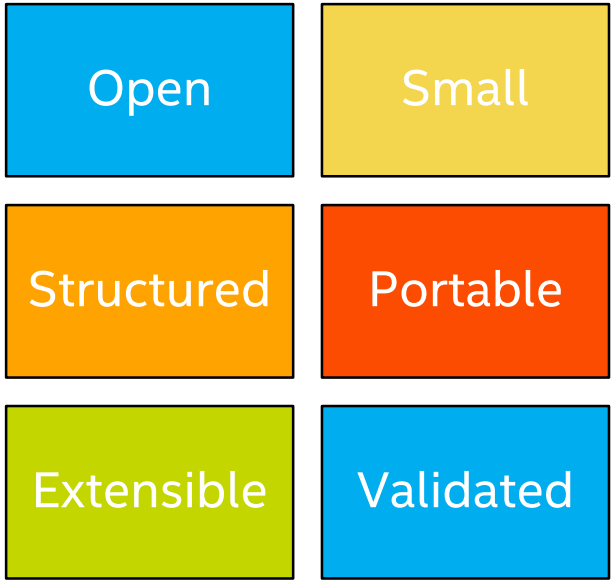

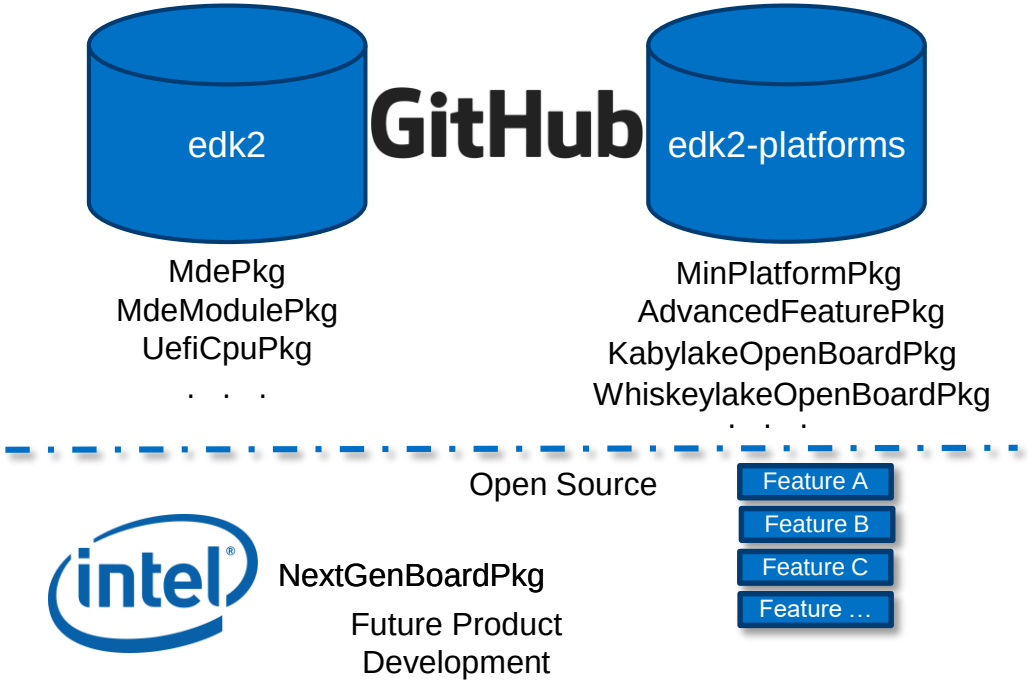

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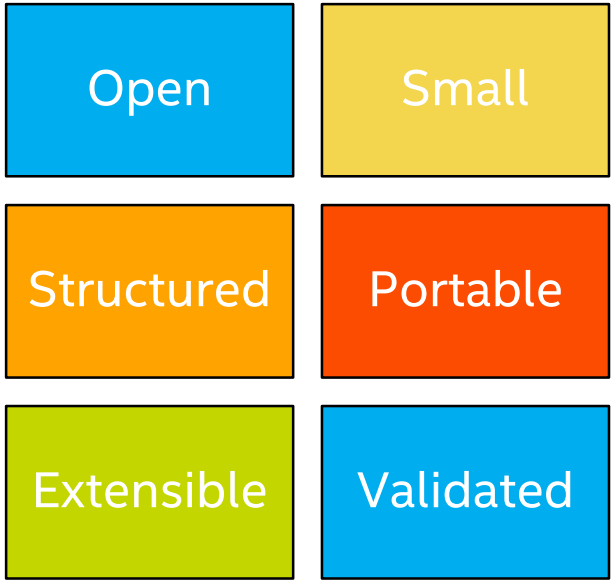

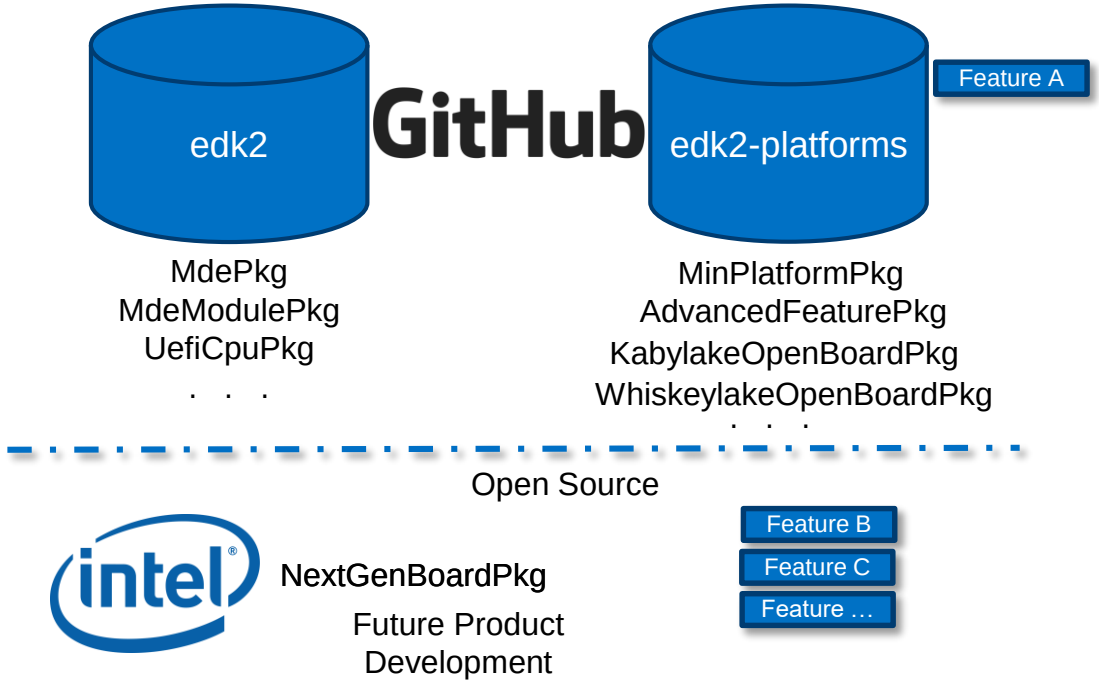

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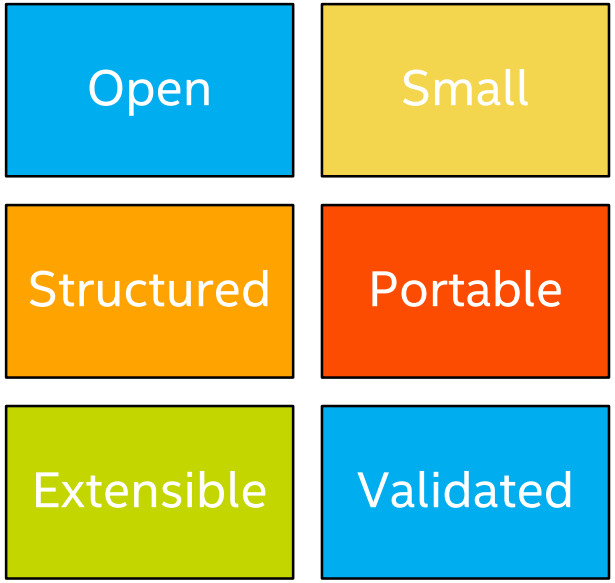

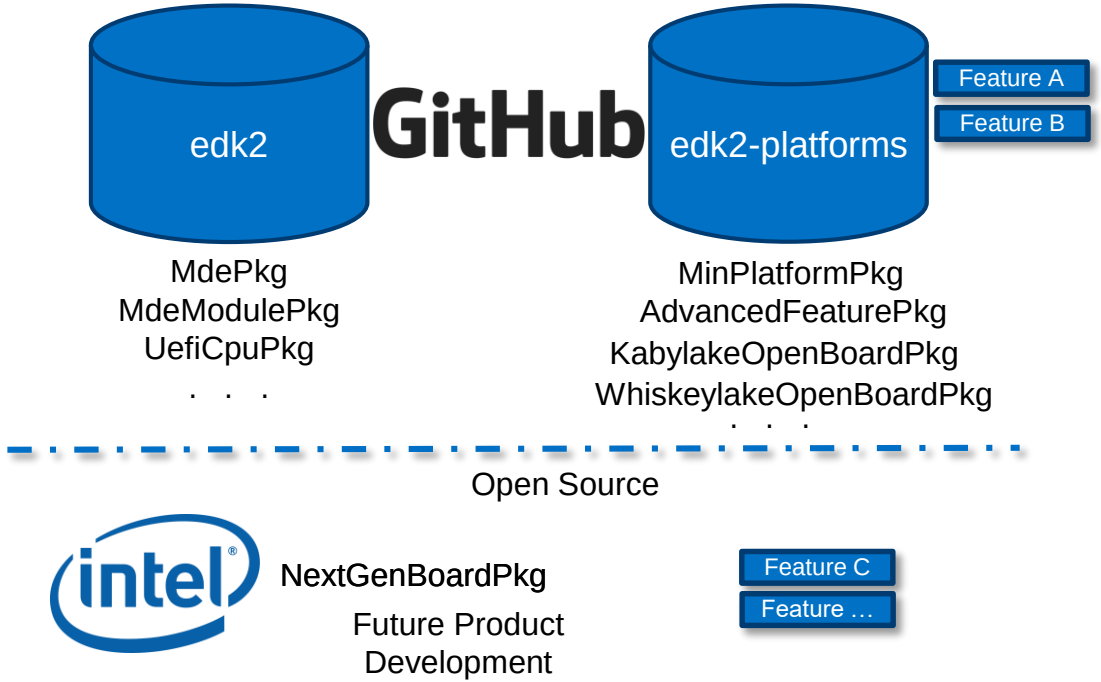

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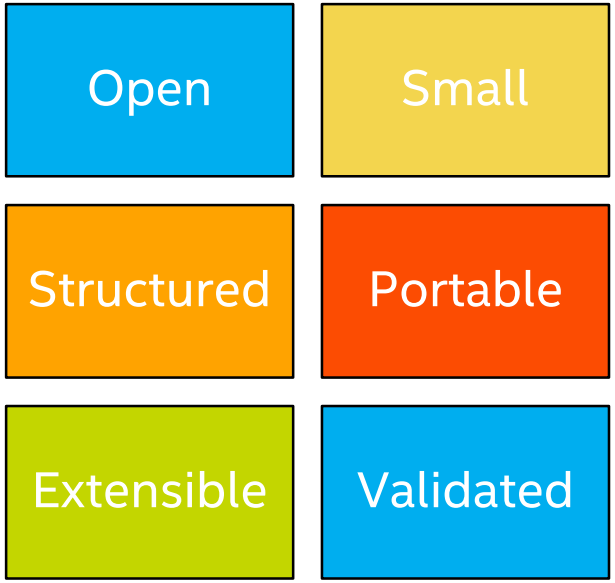

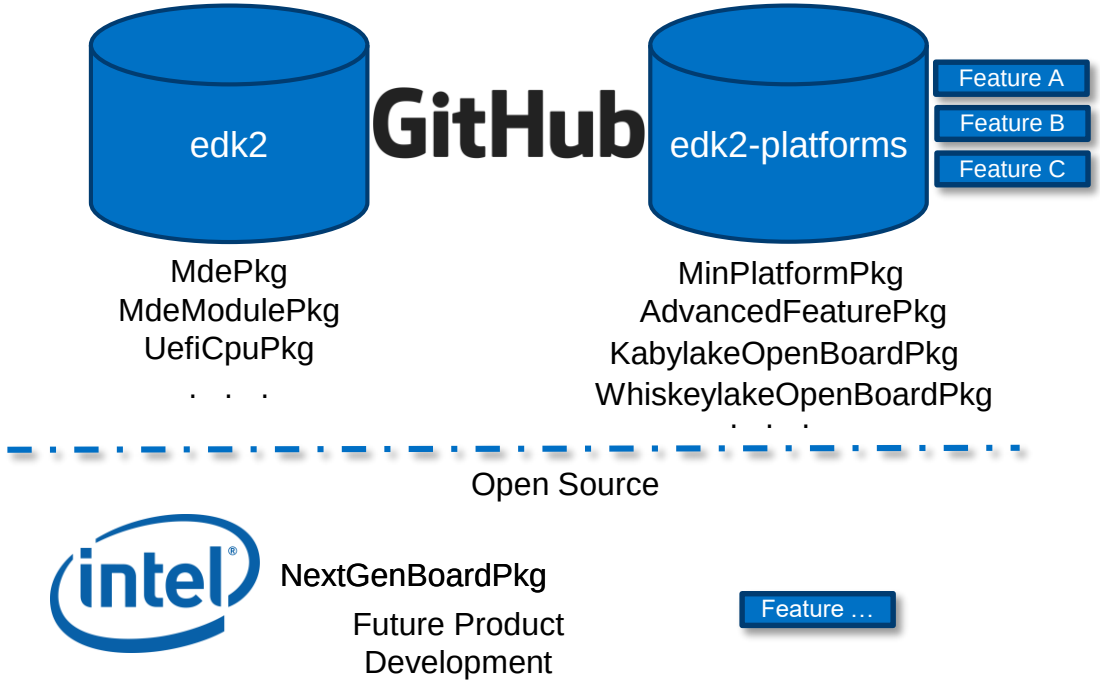

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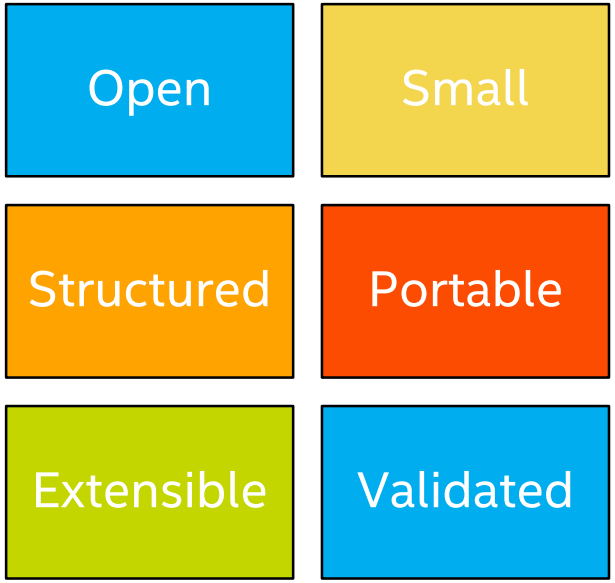

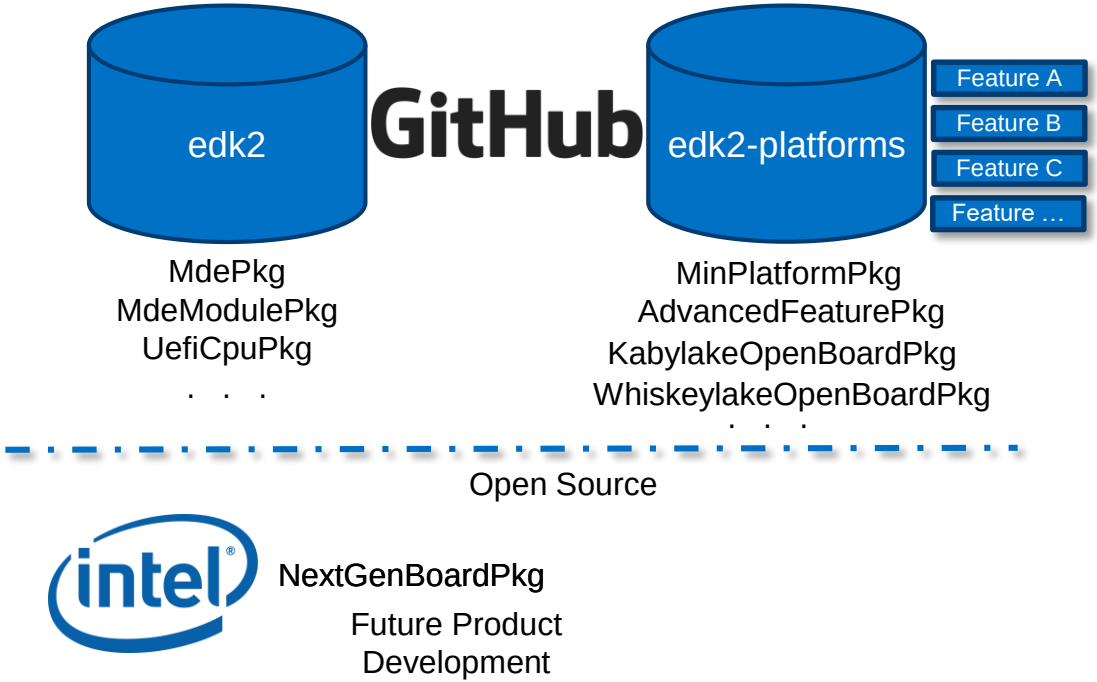

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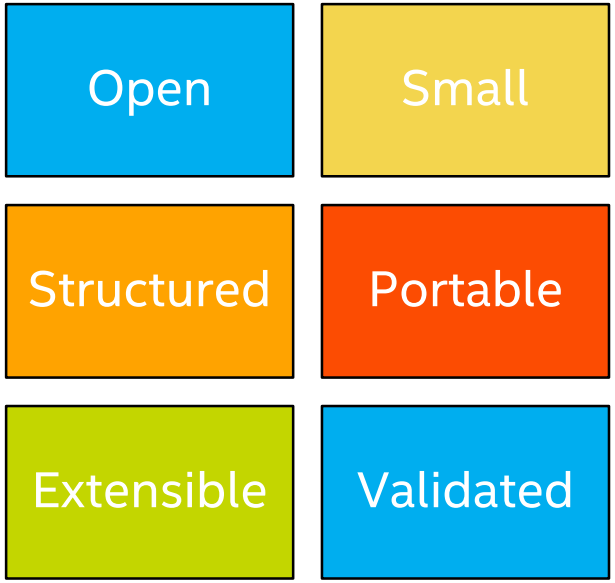
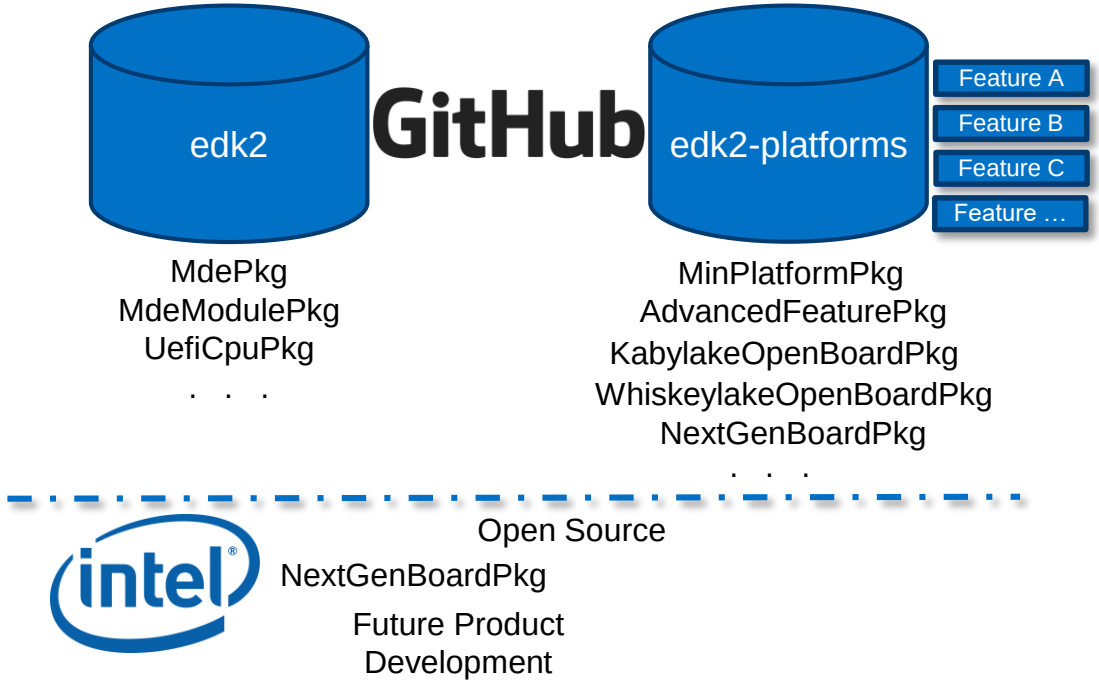
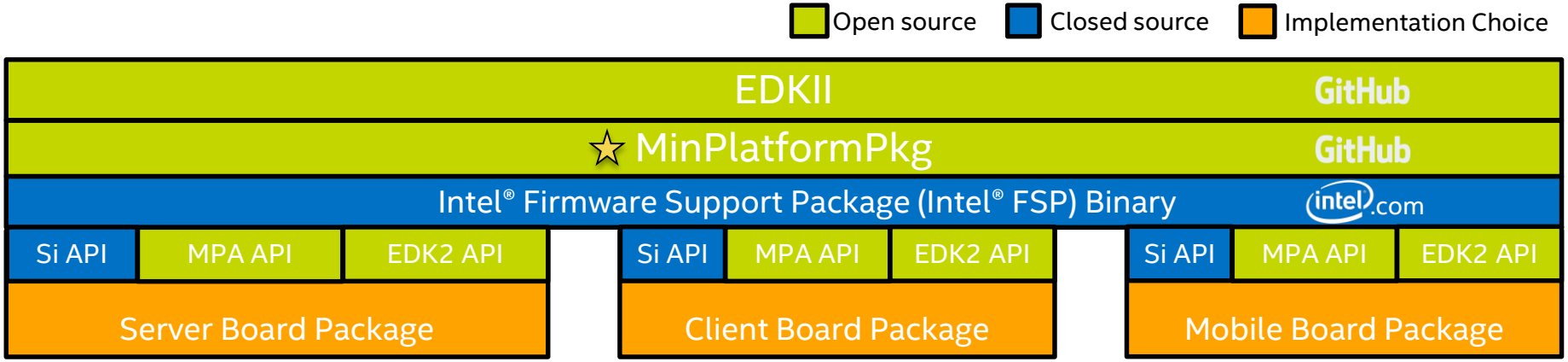


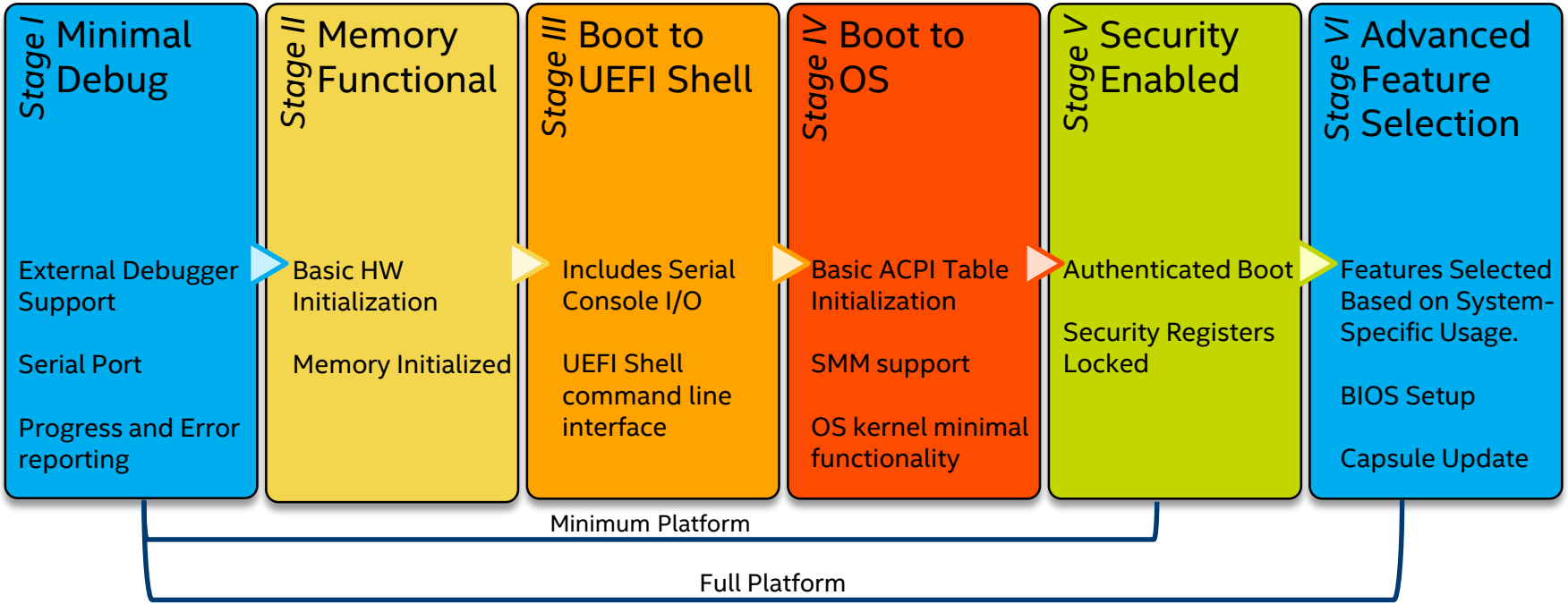


Intel Open Platform Firmware Stack

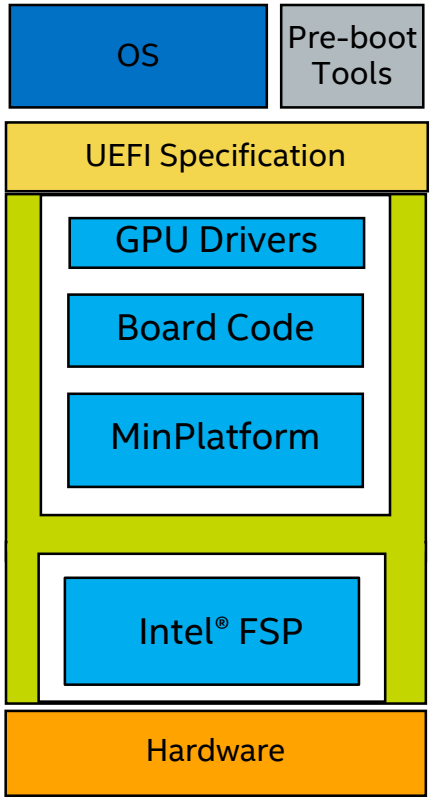


Consistent boot flows and interfaces
Approachable across the ecosystem
Scalable from pre-silicon to derivatives

The Staged Platform Approach



Intel Open Platform – Minimum Platform + Intel® FSP

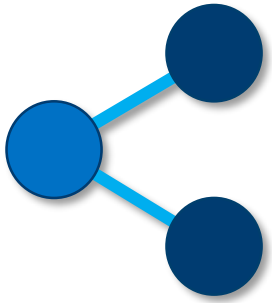


- UEFI is built with the PC supply chain in mind.
  - Open and closed modules can co-exist in a system.
  - Minimum Platform seeks to increase the overall share of open source UEFI firmware code available.
- UEFI's component based design gives OEM's choices:
  - Wide array of choice in ICs:
    - CPU
    - GPU
    - I/O Controllers (USB, Disk, etc.)
- Silicon vendors can provide pluggable UEFI components that adhere to specifications.

Call to Action

Contributions welcome!

Create and modify Intel system firmware



Share platform features

- Embedded system development
- Simple sample code for porting to other firmware

Create new board packages:

1. Start with a sample OpenBoard package.
2. Update the board-specific data such as GPIOs.
3. Get a simple stage 4 boot to OS boot functional and add advanced board features.
4. Customize the Intel FSP configuration settings for your needs.

Current Status & Upcoming Plans

Platforms Currently Supported:

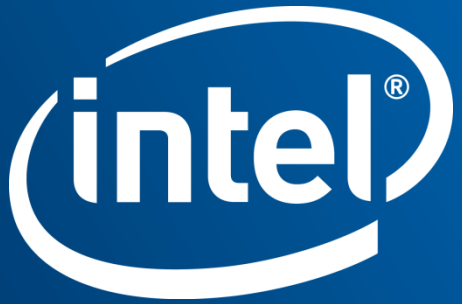
7th Generation Intel® Core™ i7 Processors (products formerly Kaby Lake)	Intel® Xeon® Scalable Processors with Intel® C620 Series Chipsets (products formerly Purley)	8th Generation Intel® Core™ i7 Processors (products formerly Whiskey Lake)
Kaby Lake U DDR3 RVP	Mt. Olympus	Whiskey Lake U DDR4 RVP
System76* Galago Pro 3		

Note: Sky Lake U DDR3 RVP works with KabylakeOpenBoardPkg.

EDK II Minimum Platform draft specification published.

Upcoming Plans:

1. Continue to roll out more Intel open source platform code.
2. Expand advance feature code and quality.
3. Support open source community continuous integration for minimum platforms.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Glossary

- **edk2**: The tianocore.org git source code repository.
- **edk2-platforms**: The tianocore.org platforms git source code repository.
- **EDK II**: Cross-platform firmware development environment for the UEFI and PI specifications.
- **Intel® FSP**: Intel® Firmware Support Package. A binary distribution model for Intel silicon component code.
- **Green H**: Allowed components to build portable UEFI & PI arch components. APIs, standards, and libraries.
- **GPIO:** General Purpose Input/Output
- **Minimum Platform**: EDK II compatible minimum and cross-platform code with a well-defined control flow.
- **MPA:** Minimum Platform Architecture.
- **SPD:** Serial Presence Detect
- **Tiano**: A UEFI implementation combining TianoCore with Intel's closed source platform and silicon modules.
- **TianoCore:** An open source project that creates the most widely used UEFI implementation: **EDK II**.
- **UEFI:** Unified Extensible Firmware Interface.
- **UEFI.org / UEFI Forum**: Industry standards body.
- **UEFI PI Arch specs**: Platform Initialization. Firmware construction specifications. Defines: SEC, PEI, DXE, BDS.
- **UEFI Specification**: A firmware to OS interface specification.