

The top banner features a network of blue lines connecting various small portrait photos of people. The text 'IDF2011' is prominently displayed in large blue letters, with 'INTEL DEVELOPER FORUM' in smaller blue letters below it.

# IDF2011

INTEL DEVELOPER FORUM

## Rapid Development of Boot Loaders using Intel<sup>®</sup> Boot Loader Development Kit (Intel<sup>®</sup> BLDK) for Embedded Designs

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Technical Marketing Engineer

EMBS002

Sponsors of Tomorrow: 

# Agenda

- Intel® Boot Loader Development Kit (Intel® BLDK)
  - Product Overview
  - Code Base Architectural Overview
  - Features and Capabilities
- Intel BLDK Development Application
  - Rapid Development Environment
  - Building and Configuring Boot Loader Image
  - Debugging

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# Intel® Boot Loader Development Kit (Intel® BLDK)

Intel® Boot Loader Development Kit provides the mechanism for customers to develop their own boot loader solutions for embedded Intel® architecture designs

Intel BLDK is on <http://www.intel.com/go/bldk>

# Intel® Boot Loader Development Kit (Intel® BLDK)



## Documentation & Sample Reference Code

- Comprehensive instructional documents enable self-sufficiency and effective, scalable support



## CRB Example Image & Boot Code

- Sample CRB image and boot code provide baseline from which customers can modify their system firmware image



## Development Application with GUI Interface

- GUI Module Selection & Build Tool allows custom image creation without direct code changes
- Development Application facilitates easy navigation and modification of the code



**Customer's Own  
Boot Loader  
Solution**

# Intel® Boot Loader Development Kit (Intel® BLDK) Availability

- Intel® BLDK initially supports:
  - Intel® Atom™ Processor E6xx Series with Intel® Platform Controller Hub EG20T
  - Intel Atom Processor E65xC Series



- Alpha releases contains all features based on Intel® UEFI Development Kit 2010 (Intel® UDK2010)
- Gold releases includes feedback/issues from customers

**Gold releases will be available for download on  
<http://www.intel.com/go/bldk>**

# Intel® Boot Loader Development Kit (Intel® BLDK) Value Proposition

## Cost:

Reduced BOM cost potential  
with no royalties to Intel

## Features:

Rich set of boot  
time features and  
capabilities

## Flexibility:

Provides flexibility  
and control for  
customization

## Rapid

## Development:

Tools speed  
development by  
abstracting underlying code

## Performance:

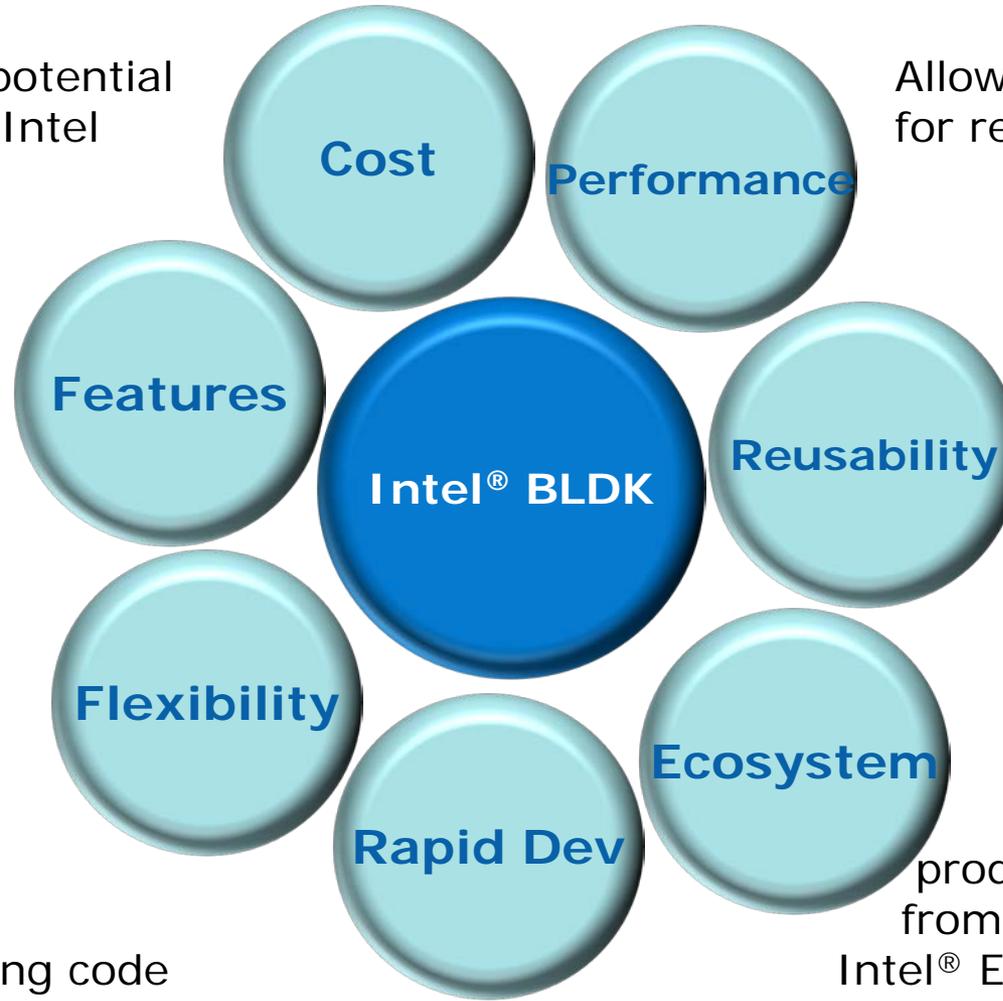
Allows for optimization  
for reduced boot times  
and firmware size

## Reusability:

Modularity and  
UEFI standards  
ensure greater  
reusability across  
platforms

## Ecosystem:

Value-added  
products and services  
from companies in the  
Intel® Embedded Alliance



# Intel® Boot Loader Development Kit (Intel® BLDK) Ecosystem

## Operating System Vendors

**OSV**

A more integrated stack with firmware and OS

## Independent BIOS Vendors

**IBV**

Development tools, custom boot loader implementations and engineering services

## Independent Software Vendors

**ISV**

Engineering services for boot loader customization

## Embedded Board Manufacturers

**EBM**

COTS platforms with customized boot loaders and integrated Board Support Packages, ready for software development

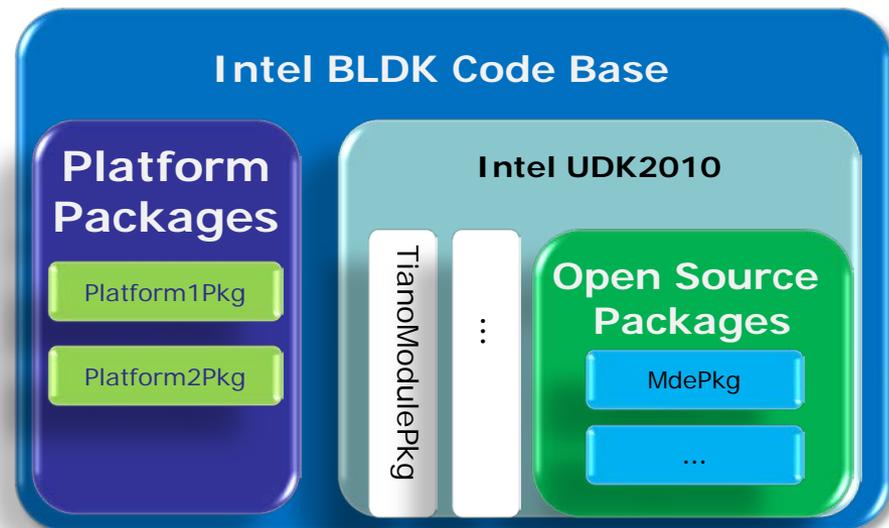
Intel is enabling many levels of 3<sup>rd</sup> party companies to develop a broad boot loader ecosystem supporting embedded designs

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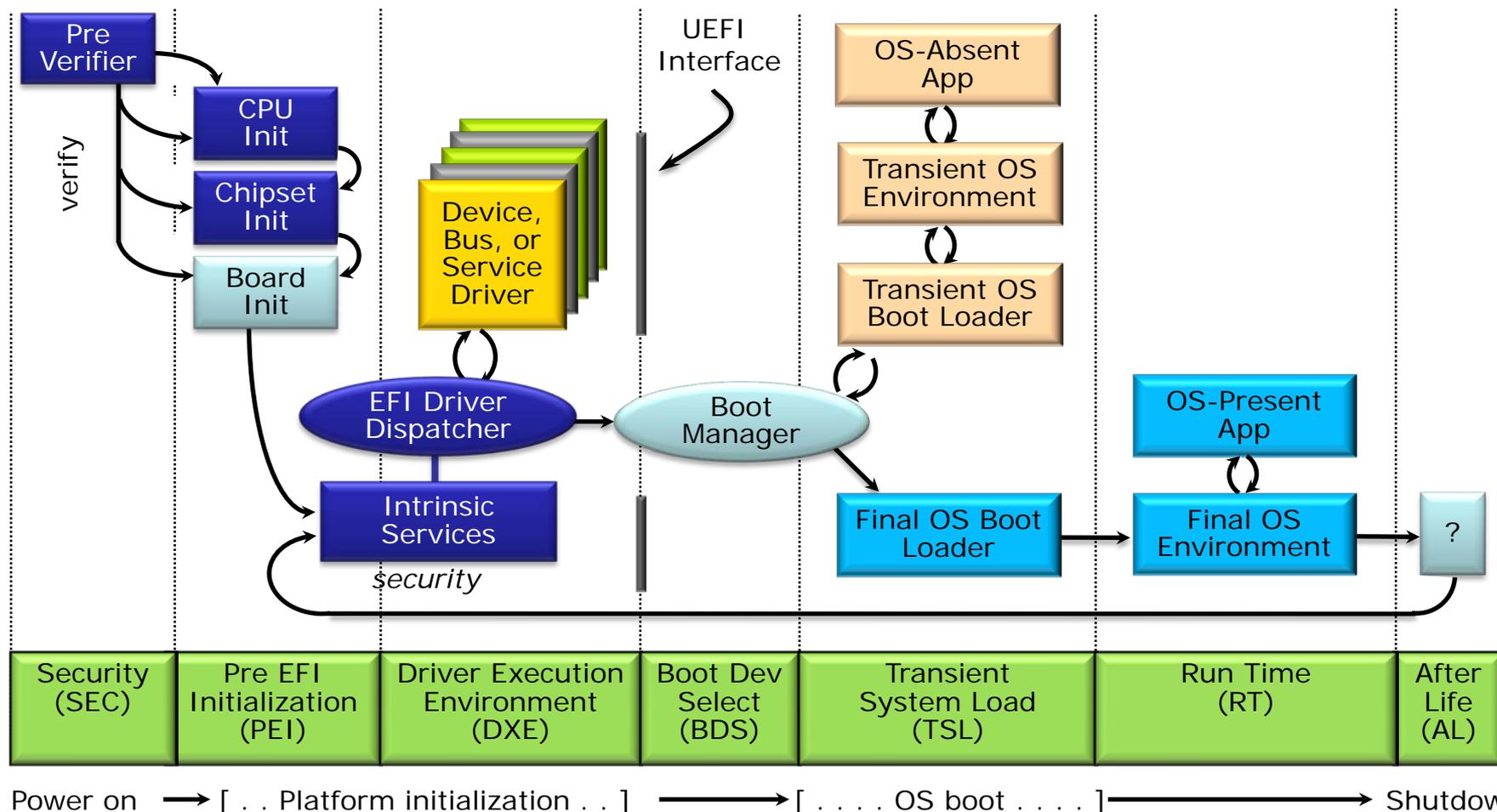
# Code Base Architectural Overview

- Intel® Boot Loader Development Kit (Intel® BLDK) code base provides a reference firmware implementation of the boot loader for the specific Customer Reference Boards (CRBs), based on Intel® UEFI Development Kit 2010 (Intel® UDK2010).
- Intel BLDK code base
  - Over 80% is source code
  - Modular code base
  - Reuse source code for different platforms



# Code Base Architectural Overview

The primary purpose of the Intel® Boot Loader Development Kit (Intel® BLDK) is to initialize a platform and boot to a shell application or an operating system.



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# Features and Capabilities of Intel® Boot Loader Development Kit (Intel® BLDK)

## Supported

- CPU, Memory, Basic IO Init
- Boot from ATA, CF, SD, USB, PXE, FWH, SPI
- Feature configuration
- Linux\* OSes, Embedded OSes, UEFI shell 2.0
- Windows\* Tool Chain
- UEFI Specification
- Fast Boot < 3s
- TCP/IP File Transfer
- ACPI 3.0
- Intel® UEFI Development Kit Debugger Tool

## Not Supported

- Windows\* OSes
- Legacy USB
- Virtualization
- Intel® Active Management Technology
- Intel® Trusted Execution Technology
- Plug and Play Systems (Hardware Detection)
- Intel® vPro™ Technology
- Custom Remote Access Services
- Compatibility Support Module

**Intel® BLDK boot loader does not replace BIOS, instead it performs basic initialization**

# Features and Capabilities of Intel® Boot Loader Development Kit (Intel® BLDK)

## Supported

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- **Intel® UEFI Development Kit Debugger Tool**

**Configurability**  
means flexibility for developers

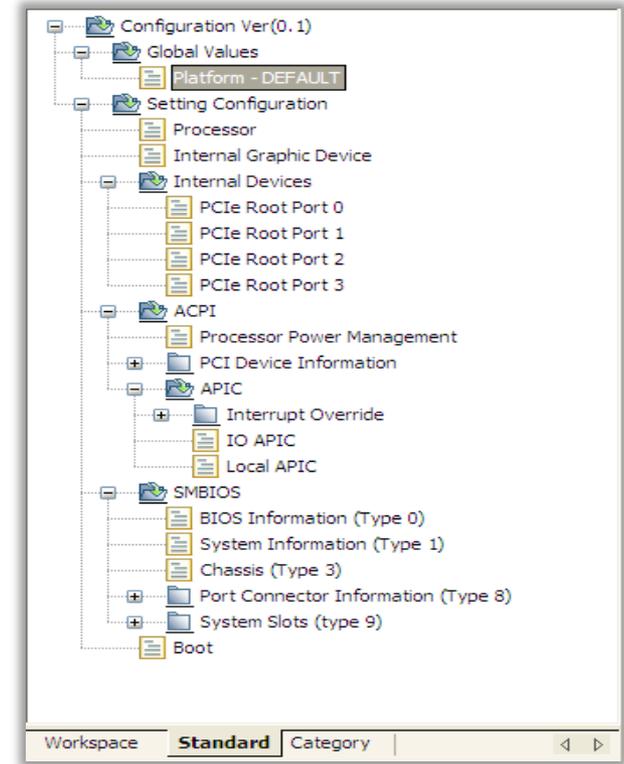
**Boot Performance** is everything for some embedded designs

**Good Debugging**  
Tool can reduce time to market

**Intel® BLDK delivers key features for developing firmware images quickly**

# Intel® Boot Loader Development Kit (Intel® BLDK) - Configurability

- Intel® BLDK offers a way to configure firmware settings by patching binary without rebuilding
- Intel BLDK has hundreds of feature setting options
- Intel BLDK Development Application makes the patching process easy

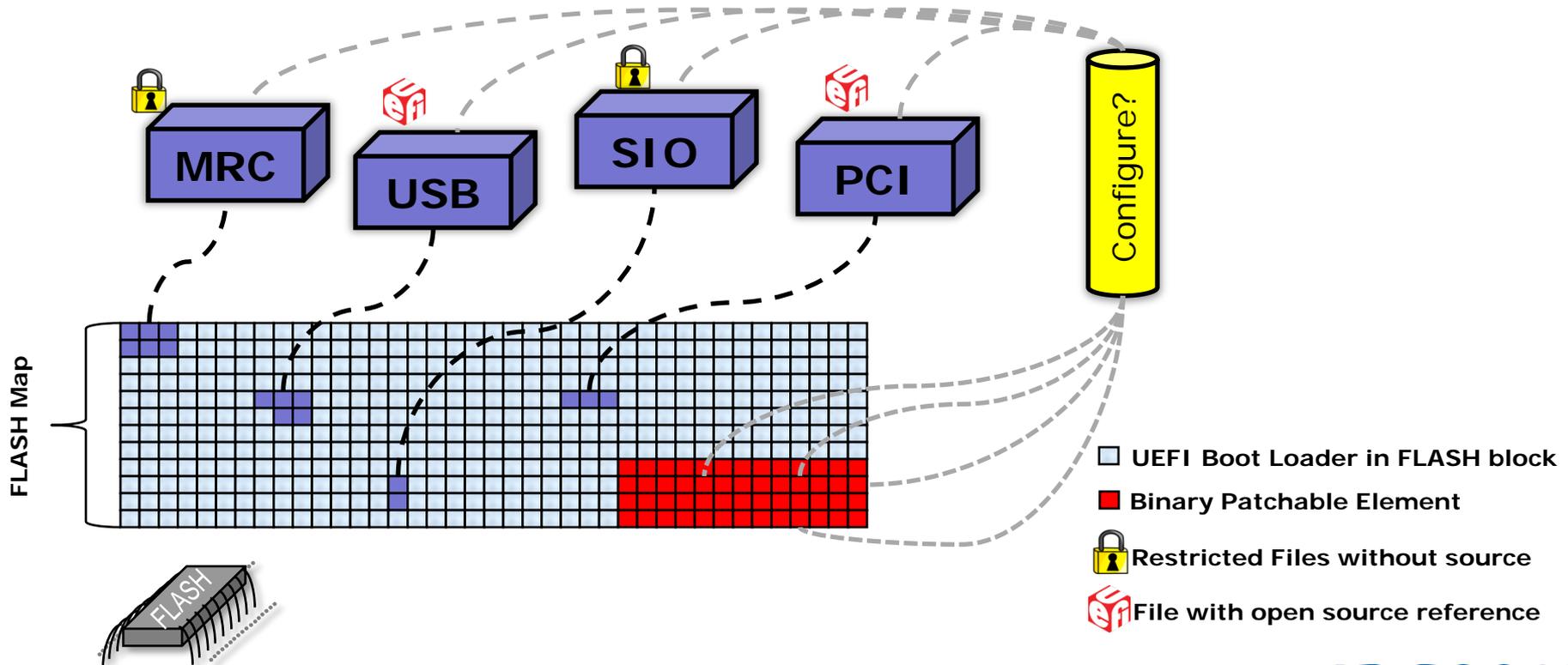


**Intel® BLDK provides an easy-to-use configuration solution without rebuilding**

# Intel® Boot Loader Development Kit (Intel® BLDK) - Configurability

The Intel® BLDK firmware configuration feature is based on the Intel® UEFI Development Kit 2010 (Intel® UDK2010).

## The mechanism of Intel BLDK firmware configuration features



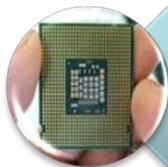
# Intel® Boot Loader Development Kit (Intel® BLDK) – Boot Performance

Intel® BLDK	Fast Boot Path	Full Boot Path
<b>Difference</b>	Only initialize the required devices	Initialize all devices
<b>Usage Model</b>	Statically configured	Used when the hardware configuration is changed
<b>Time elapsed from power on to Boot Loader enabled</b>	< 3s	> 5s
<b>Test Platform</b>	CPU: Intel® Atom™ Processor E600 Series PCH: Intel® Platform Controller Hub EG20T Memory: DDR3 1Gb	

**Intel® BLDK accelerates boot performance**

# Intel® Boot Loader Development Kit (Intel® BLDK) – Boot Performance

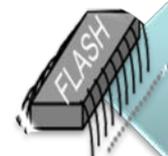
How to maximize performance in the Intel® BLDK?



Make good use of system cache



Avoid initializing unnecessary devices



Organize the FLASH layout effectively



Use saved data during boot time

More details in a whitepaper "**Reducing Platform Boot Time**" which is located at:  
<http://edc.intel.com/Link.aspx?id=4603>

# Intel® Boot Loader Development Kit (Intel® BLDK) - Debugging

Intel® BLDK has a software-only debugger solution

Allows target debugging without need for exposed JTAG

Leverages various debug ports (e.g. USB, Serial)

Supports WinDbg as a front-end

Few differences between this solution and a high-end hardware-based debugger

- To break into target, SEC startup code must have established a stack
  - Typically a few dozen instructions from the reset vector
  - This is also true of first few dozen instructions in SMI entry
- Some CPU mode transitions are difficult to debug

**Intel® UEFI Development Kit Debugger Tool speeds development**

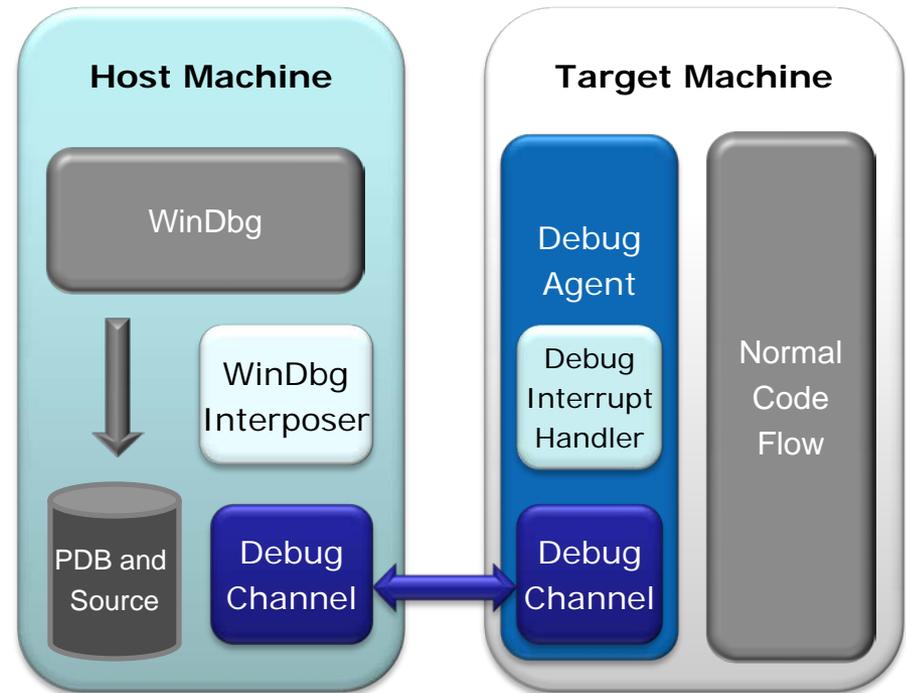
# Intel® Boot Loader Development Kit (Intel® BLDK) - Debugging

Intel® UEFI Development Kit Debugger Tool (Intel® UDK Debugger Tool) Architecture:

WinDbg Interposer interprets the commands from WinDbg

Debug Channels are in charge of communication between Host Machine and Target Machine

Debug Interrupt Handler handles the commands from Debug channel



**Intel® BLDK includes UEFI-based open source debugger**

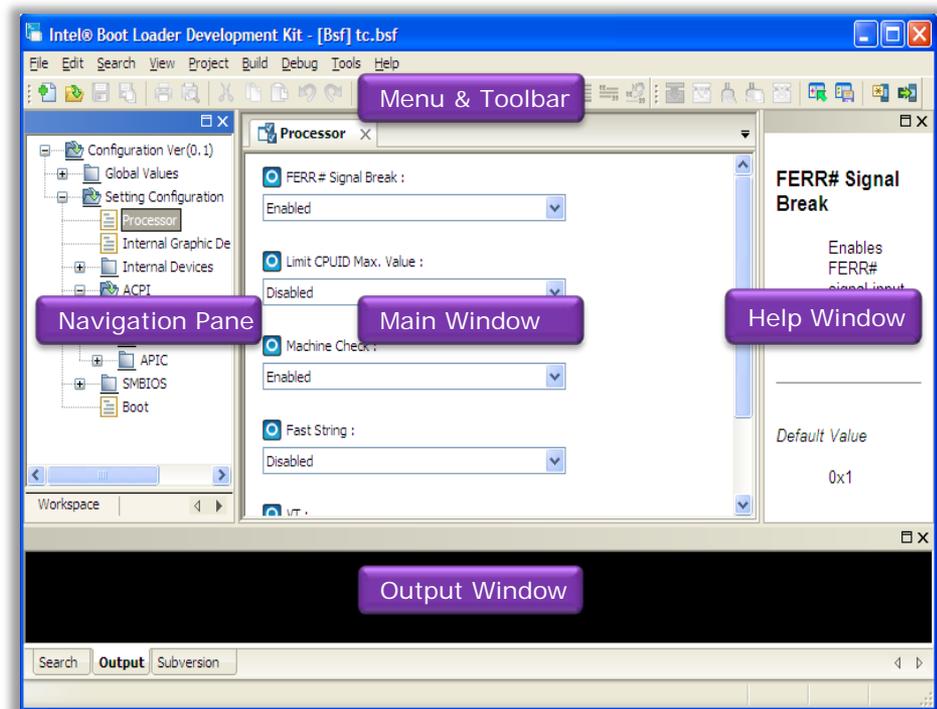
For more details about the Intel UDK Debugger tool, please refer to:  
<http://sourceforge.net/apps/mediawiki/tianocore/index.php?title=EDK2>

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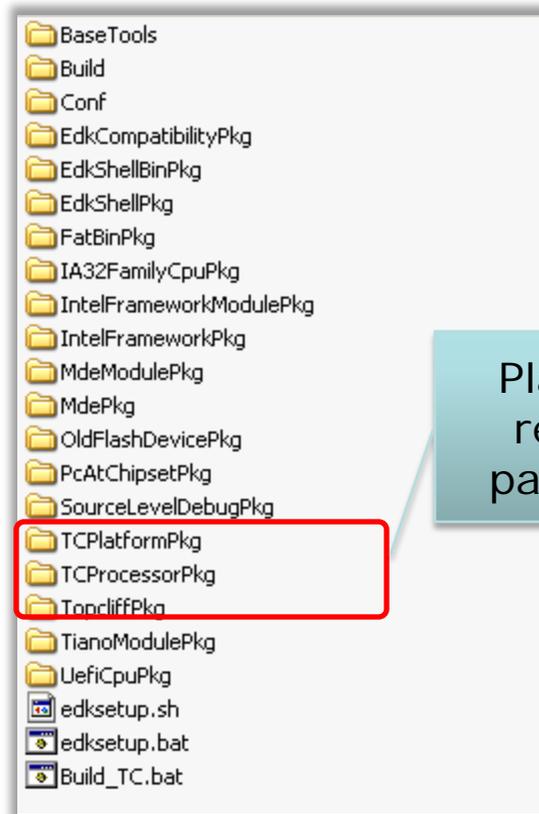
# Intel® Boot Loader Development Kit (Intel® BLDK) Development Application

- Intel® BLDK Development Application is used to build and customize target Boot Loader Images
- Main Features
  - Graphical User Interface (GUI)
  - Project Driven
  - Build Environment
  - Binary Configuration
    - Enable/Disable FW Features
    - Configure Feature Settings
  - Source Code Editor with Syntax Highlighting



# Development Environment & Build Tree

- Code Base Build Tree
  - Package concept for each directory
  - Platform is contained in a package
- Operating System
  - Build machine runs Microsoft\* Windows\*
- Compiler Tool Chains
  - iASL
  - Microsoft Visual Studio\* .NET 2005 Team Suite Edition
  - Microsoft Windows Server 2003\* DDK version 3790.1830

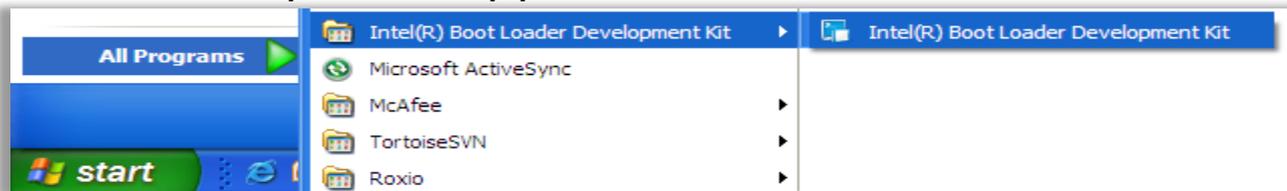


# Agenda

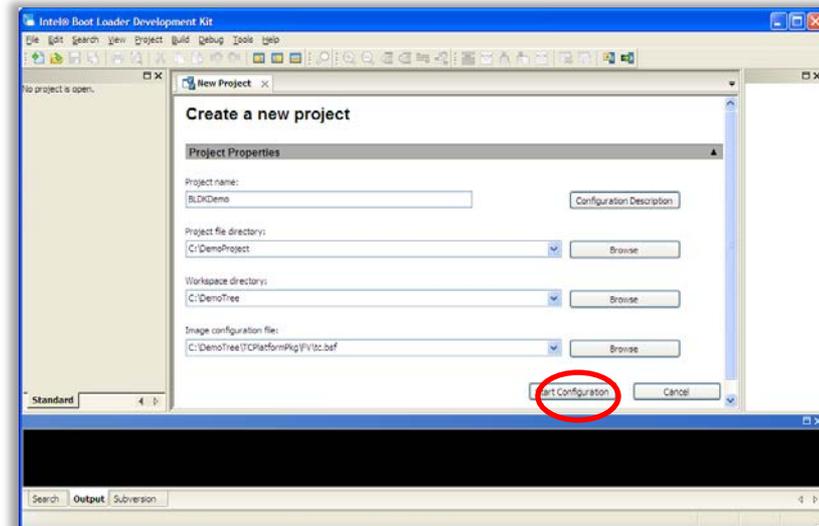
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# Create a Project & Build the Image

- What is the project in the Intel® Boot Loader Development Kit (Intel® BLDK)?
  - The project is the starting point for developing, configuring and building a boot loader. It acts as a container that manages the source code and configuration.
- Run the development application

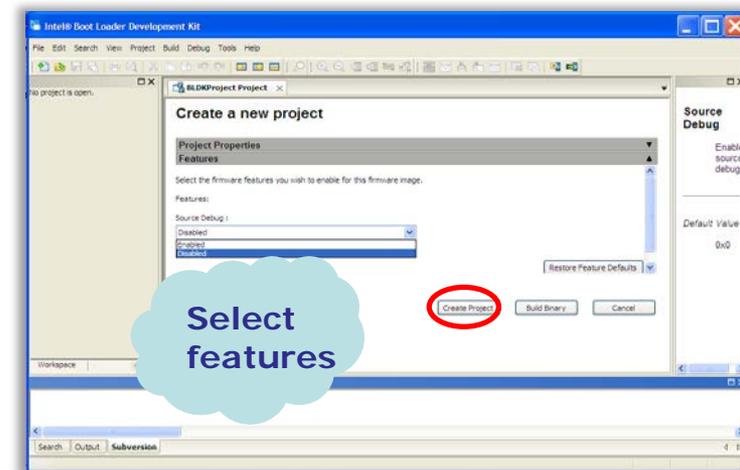


- Follow these steps to Create a Project
  - Click Project → New Project
  - Enter Project Name & Directory
  - Enter Workspace Directory & Configuration File (\*.bsf)
  - Click Start Configuration



# Create a Project & Build the Image

- Select Build Features & Build Binary
  - Select the features enabled or disabled in the build
  - Select Build Binary to start the build process
  - The final image is in:  
C:\DemoTree\Build\TCPlatform\RELEASE\_MYTOOLS\FV\TUNNELCREEK.fd
  - Also, a copy of the final image is in:  
C:\DemoTree\TCPlatformPkg\FV\TUNNELCREEK.bin

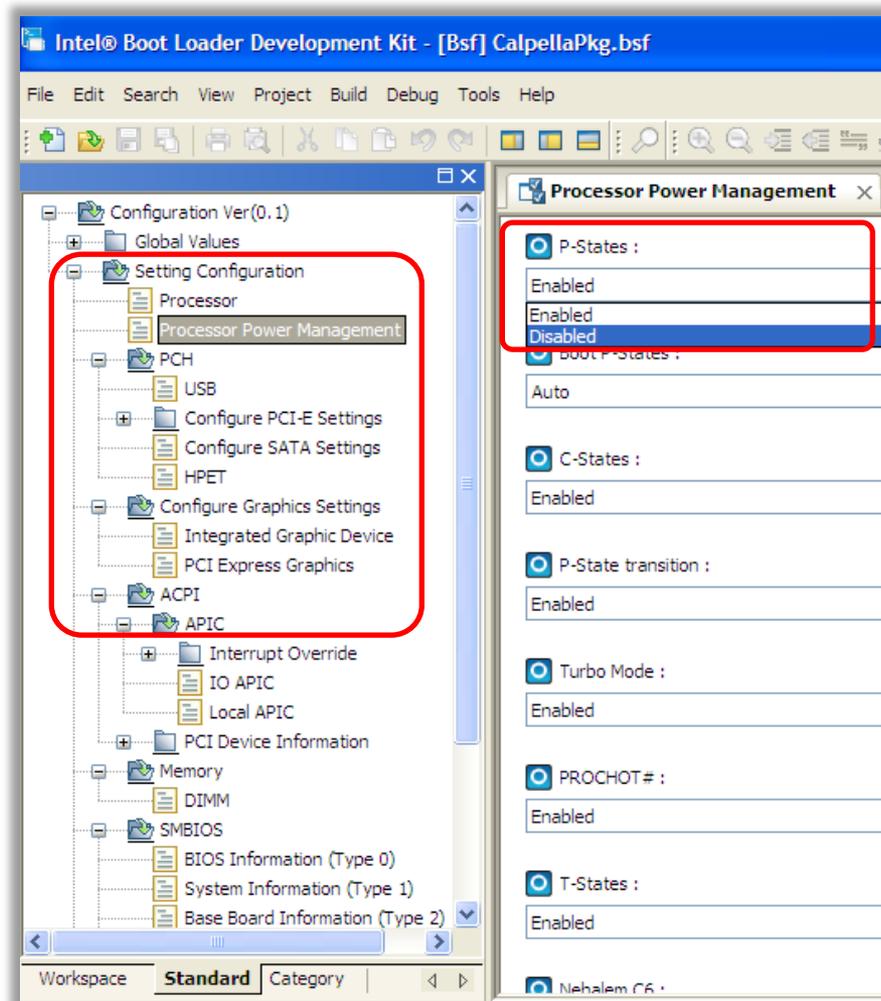


- Alternatively, build the image from the command line as follows:
  - > EdkSetup
  - > build -p TCPlatformPkg\TCPlatformPkg.dsc -a IA32

```
Build ... done.
C:\DemoTree\Build\TCPlatform\RELEASE_MYTOOLS\FV\FVMAIN.Fv
C:\DemoTree\Build\TCPlatform\RELEASE_MYTOOLS\FV\FVMAIN_COMPACT.Fv
C:\DemoTree\Build\TCPlatform\RELEASE_MYTOOLS\FV\FVRECOVERY.Fv
C:\DemoTree\Build\TCPlatform\RELEASE_MYTOOLS\FV\FVRECOVERY_COMPONENTS.Fv
5 file(s) copied.
copy /y /b C:\DemoTree\Build\TCPlatform\RELEASE_MYTOOLS\FV\*.fd C:
C:\DemoTree\Build\TCPlatform\RELEASE_MYTOOLS\FV\TUNNELCREEK.fd
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```

# Configuring Settings in Binary Image

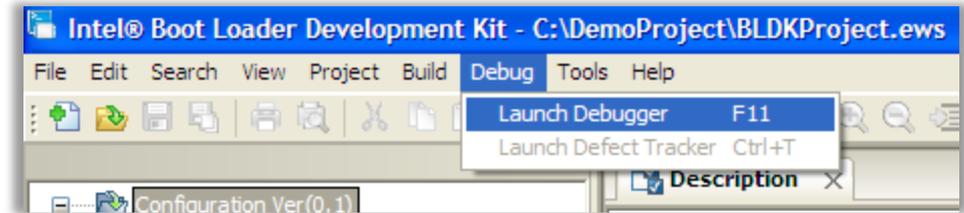
- Provides board customization and porting without rebuilding image
- Post-build firmware configurations are accessed through development application
  - Expand Post-Build Firmware Configuration in tree-view
  - Modify all parameters according to the Target Board Configuration
  - Save Configuration: Select Project → Save Configuration from the menu
  - Create binary file: Select Build → Create Final Firmware Image from the menu



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# Start Software Debugger from Intel® Boot Loader Development Kit (Intel® BLDK)



- Launch

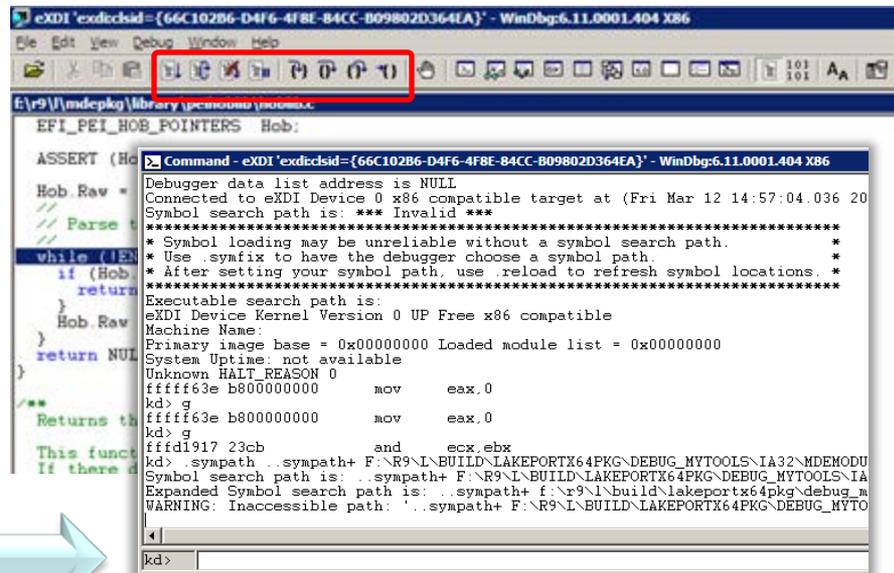
1. Launch Intel® UEFI Development Kit Debugger Tool (Intel® UDK Debugger Tool)
2. Start up the target system using the Intel UDK Debugger Tool based firmware with the debug feature enabled (within 30 seconds after step 1)
3. Wait two or three seconds, until WinDbg is connected and is ready to accept commands



# Using the Software Debugger

- Bottom window allows commands to be entered
  - .reboot
  - g - Go
  - Q - quit
  - ? – Command list
- Launch debug commands from the toolbar

-  Go – "G", "F5"
-  Halt – Control Break
-  Step Into "F8"
-  Step Over "F10"
-  Step Out "Shift F11"
-  Run to Cursor



**Similar user interface as other debuggers**

# Intel® Boot Loader Development Kit (Intel® BLDK) Demo

- **Demo:** How to use Intel® BLDK Development Application
- Procedure:
  - **Create a project**
  - **Enable Fast boot feature setting**
    - (a) Expand "Boot"
      - Select "Enabled" under the "Fast Boot" option and the "Silent Mode" option
      - Select "Yes" under the "Enforce Boot Order" option
      - Set "Hard Disk" as the first boot option
      - Fill "OEM Boot Option Path"
    - (c) Save the configuration
    - (d) Click "Start build process" button to build the binary image if the binary has not been built out
    - (e) Click "Create final firmware image" button to patch the final image
  - **Debugging using software debugger tool**

Fast Boot feature setting

<input checked="" type="checkbox"/> <b>Fast Boot :</b> Enabled	<input checked="" type="checkbox"/> <b>Enforce Boot Order :</b> Yes
<input checked="" type="checkbox"/> <b>Silent Mode :</b> Enabled	<input checked="" type="checkbox"/> <b>Internal Shell :</b> 1
<input type="checkbox"/> <b>Banner :</b> Intel (R) Crown Bay Platform	<input checked="" type="checkbox"/> <b>Hard Disk :</b> 0
<input type="checkbox"/> <b>Product Tip Version :</b> Tip-2010-12	<input type="checkbox"/> <b>OEM Boot Option Name :</b> Oem Boot Option
	<input type="checkbox"/> <b>OEM Boot Option Path :</b> \\efi\\oem\\OemBootOption.efi



# Summary

- Currently Intel® Boot Loader Development Kit (Intel® BLDK) is targeted for Intel® Atom™ Processor-based embedded designs
- Intel BLDK helps developers to develop their own boot loader rapidly
- Intel BLDK helps customers to win Intel® Architecture embedded market

# Additional sources of information on this topic:

- Other Sessions and Q&A:
  - EFIS004 Intel® UEFI Development Kit 2010 (Intel® UDK2010) and Intel® Boot Loader Development Kit (Intel® BLDK): Foundations for Advanced Embedded Development for detailed technical information – 16:10 in room 306A
  - SPCQ001 Hot Topic Q&A: Intel BLDK – 17:00 in room 306A
- Demos in the showcase – Intel BLDK Booth in IDF Embedded Zone
- More web based info: <http://edc.intel.com/>

# Technical Sessions the EMB Track

	Description	Time	RM
✓ EMBS001	Intel® In-vehicle Infotainment Platform	11:10	311B
✓ EMBS002	Rapid Development of Boot Loaders using Intel® Boot Loader Development Kit (Intel® BLDK) for Embedded Designs	14:05	311B
EMBS003	Intelligent HD Digital Security Surveillance Solution Based on Intel® Architecture	15:10	311B
EMBS004	Remote Manageability of Digital Signage Systems with Intel® Active Management Technology (Intel® AMT)	16:10	311B
SPCQ001	Hot Topic Q&A: Intel® Boot Loader Development Kit (Intel® BLDK)	17:00	306A

✓ = DONE

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# Risk Factors

The above statements and any others in this document that refer to plans and expectations for the first quarter, the year and the future are forward-looking statements that involve a number of risks and uncertainties. Many factors could affect Intel's actual results, and variances from Intel's current expectations regarding such factors could cause actual results to differ materially from those expressed in these forward-looking statements. Intel presently considers the following to be the important factors that could cause actual results to differ materially from the corporation's expectations. Demand could be different from Intel's expectations due to factors including changes in business and economic conditions; customer acceptance of Intel's and competitors' products; changes in customer order patterns including order cancellations; and changes in the level of inventory at customers. Intel operates in intensely competitive industries that are characterized by a high percentage of costs that are fixed or difficult to reduce in the short term and product demand that is highly variable and difficult to forecast. Revenue and the gross margin percentage are affected by the timing of Intel product introductions and the demand for and market acceptance of Intel's products; actions taken by Intel's competitors, including product offerings and introductions, marketing programs and pricing pressures and Intel's response to such actions; and Intel's ability to respond quickly to technological developments and to incorporate new features into its products. The gross margin percentage could vary significantly from expectations based on capacity utilization; variations in inventory valuation, including variations related to the timing of qualifying products for sale; changes in revenue levels; product mix and pricing; the timing and execution of the manufacturing ramp and associated costs; start-up costs; excess or obsolete inventory; changes in unit costs; defects or disruptions in the supply of materials or resources; product manufacturing quality/yields; and impairments of long-lived assets, including manufacturing, assembly/test and intangible assets. Expenses, particularly certain marketing and compensation expenses, as well as restructuring and asset impairment charges, vary depending on the level of demand for Intel's products and the level of revenue and profits. The majority of Intel's non-marketable equity investment portfolio balance is concentrated in companies in the flash memory market segment, and declines in this market segment or changes in management's plans with respect to Intel's investments in this market segment could result in significant impairment charges, impacting restructuring charges as well as gains/losses on equity investments and interest and other. Intel's results could be impacted by adverse economic, social, political and physical/infrastructure conditions in countries where Intel, its customers or its suppliers operate, including military conflict and other security risks, natural disasters, infrastructure disruptions, health concerns and fluctuations in currency exchange rates. Intel's results could be affected by the timing of closing of acquisitions and divestitures. Intel's results could be affected by adverse effects associated with product defects and errata (deviations from published specifications), and by litigation or regulatory matters involving intellectual property, stockholder, consumer, antitrust and other issues, such as the litigation and regulatory matters described in Intel's SEC reports. An unfavorable ruling could include monetary damages or an injunction prohibiting us from manufacturing or selling one or more products, precluding particular business practices, impacting Intel's ability to design its products, or requiring other remedies such as compulsory licensing of intellectual property. A detailed discussion of these and other factors that could affect Intel's results is included in Intel's SEC filings, including the report on Form 10-Q for the quarter ended September 25, 2010.

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