Advanced UEFI Development Environment for Embedded Platforms

Jin Lei, Technical Marketing Engineer, Intel
Zhou Pengcheng, Development Manager, Byosoft*
Jiang Bo, Chief Technology Officer, SBS*

PTAS003
Agenda

- UEFI Development Environment for Embedded Platforms
- Byosoft* Embedded Development Best Known Method
- SBS* Embedded Application Experience Sharing
- Summary
UEFI Technology Overview

- Unified Extensible Firmware Interface (UEFI) specifies how firmware boots OS loader
- UEFI’s Platform Initialization Architecture (PI) specifies how UEFI firmware initializes Si and the platform
- UEFI and PI specifications are governed by UEFI forum (www.uefi.org)
- Intel® UDK2010 is a reference implementation of UEFI and PI specifications

Visit www.intel.com/udk for details
Intel® UDK2010 Standard Foundation for the Compute Continuum
## Firmware Difference Between PC and Embedded Market

<table>
<thead>
<tr>
<th>Metric</th>
<th>PC</th>
<th>Embedded</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS Support</td>
<td>Full range</td>
<td>Embedded Linux*, Android* &amp; Windows* Embedded</td>
</tr>
<tr>
<td>Distribution Model</td>
<td>Thru IBV</td>
<td>Direct to Customer</td>
</tr>
<tr>
<td>Boot Speed</td>
<td>PC Optimized (~&gt;2 seconds)</td>
<td>Optimized for CE and Handheld (~&lt; 1 second)</td>
</tr>
<tr>
<td>Footprint</td>
<td>PC Optimized (~&gt;1 MB)</td>
<td>Optimized for CE and Handheld (~&lt; 256 KB)</td>
</tr>
</tbody>
</table>

The Needs of Embedded Systems Developers are very different from PC
Meeting the Needs of Embedded Systems Developers

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
Stack Difference Between PC and Embedded

Embedded

- OS
- BSP + Tools
- Non IA

PC

- OS
- BIOS
- IA

Software

Firmware

Hardware

Intel® BLDK fills the firmware gap for Intel Architecture (IA) for embedded
Intel® BLDK Major Components

Intel® BLDK Development Application

Intel® BLDK Source Code

Configuration Files

Intel® BLDK Documentation

CPU & Chipset Initialization Binary Code

Intel® UDK2010

Binary Boot Loader

To Flash Memory

Build from GUI

Intel® BLDK Firmware
Spectrum of System Initialization
Firmware

- Memory
- Display
- ROM Update
- Power Management
- Network
- OS Services
- Legacy Compatibility
- System Management
- Storage
- Security
- Dynamic Setup
- Virtualization
- Reset
- Bus
- Simple I/O
- Peripheral Drivers
- Intel® BLDK Provides Flexibility to Scale System Initialization for Embedded Systems

Intel® BLDK

Intel® Boot Loader Development Kit (Intel® BLDK)
Intel® BLDK Fully Supported within the Embedded 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
Agenda

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• SBS* Embedded Application Experience Sharing
• Summary
Byosoft* Introduction

- Established in 2006
- Only one local PRC independent BIOS vendor
- Products have been involved Legacy PC, Embedded and Server
- Focus on Chinese Market

Cost Effective  Customer Oriented  Only One PRC IBV  Local PRC Support
## Byosoft* BIOS Roadmap

### Intel® 处理器

<table>
<thead>
<tr>
<th>2011</th>
<th>2012</th>
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<tbody>
<tr>
<td>Intel® Xeon® 处理器</td>
<td>Romley [Intel Xeon E Series]</td>
</tr>
<tr>
<td>Intel® Core™ 处理器</td>
<td>Chief River [Ivy Bridge]</td>
</tr>
<tr>
<td>Intel® Atom™ 处理器</td>
<td>Maho Bay [Ivy Bridge]</td>
</tr>
</tbody>
</table>

### Intel® 平台

- **服务器平台**
  - Intel® Xeon® 处理器
  - Romley [Intel Xeon E Series]
- **移动平台**
  - Intel® Core™ 处理器
  - Huron River [Sandy Bridge]
  - Chief River [Ivy Bridge]
- **台式机平台**
  - Intel® Core™ 处理器
  - Sugar Bay [Sandy Bridge]
  - Maho Bay [Ivy Bridge]
- **嵌入式平台**
  - Intel® Atom™ 处理器
  - Crown Bay [Intel Atom E6xx]
  - Cedar Trail [Intel Atom D/N2000]

### 基于 Intel® UDK2010**

- Intel® Boot Loader Development Kit (Intel® BLDK)
- Intel® UEFI Development Kit 2010 (Intel® UDK2010)
Support Customer with Intel® BLDK

Intel® Boot Loader Development Kit
Reference Implementation

Byosoft*
Value-add

Byosoft*
CSM

CPU and Chipset Initialization Code

Product-level Service from Byosoft*

Embedded Product

Customer

*文中涉及的其它名称及商标属于各自所有者资产。
Byosoft* Comprehensive Boot Loader Features and Support

**Features**

- Legacy OS Support
- Legacy USB Support
- Security Support
- Compatibility Support
- Remote Network Management
- Graphic UI
- Authentication
- Fast Boot

**Support Model based on Intel® BLDK**

- Full Source Provider
- Customer Board Porting
- Features Customization
- Technical Consultation and Training
Intel® BLDK Usages BKM

• Platform Porting
• Firmware Customization
• Performance Optimization
• Legacy OS Support
• Network Support
Platform Porting

If you want to port a new platform, you need to replace the below directory:

- **Chipset Directory**
  - CedarViewPkg
  - Nm10Pkg
  - Npce791Pkg
- **Platform Directory**
  - CedarRockPlatformPkg
Firmware Customization

- Development Application provides the ability to customize firmware
- Hundreds of firmware options are configurable through the Development Application
- No source modification is required
Performance Optimization

• Intel® BLDK boot sequence can be configured for fast boot via the Development Application

• Only drivers required for system boot are dispatched

• Faster boot times can be achieved by optimizing Intel BLDK for a specific target configuration
Legacy OS Support

- Embedded System need Multiple OS Support
- CSM is a key module to support Legacy OS

If you want to add CSM support, you need add below driver.

```markdown
# Legacy Modules

#

PcAtChipsetPkg/8259InterruptControllerDxe/8259.inf
TianoModulePkg/Csm/LegacyBiosDxe/LegacyBiosDxe.inf
TianoModulePkg/Csm/BiosThunk/VideoDxe/VideoDxe.inf
TianoModulePkg/Csm/BiosThunk/BlockIoDxe/BlockIoDxe.inf
TCPlatformPkg/LegacyBiosPlatformDxe/LegacyBiosPlatformDxe.inf
ByoModulePkg/Csm/LegacyUsb/LegacyUsb.inf
```
Network Support

- Support Remote Network Management
- Support PXE Function

If you want to add Network support, you need add below driver.

```plaintext
# Network Modules

TianoModulePkg/Network\Ip4ConfigDxe\Ip4ConfigDxe.inf
TianoModulePkg/Network\Ip4Dxe\Ip4Dxe.inf
TianoModulePkg/Network\Tcp4Dxe\Tcp4Dxe.inf
```
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SBS* Introduction

• Founded in 1992, SBS Science & Technology Co., Ltd.

• The first member of PC/104 Consortium, PICMG Organization and Intel® Embedded Alliance.

• The leading provider of embedded computing solutions in Chinese market.

• Headquartered in Shenzhen, with a number of branch offices in Beijing, Shanghai, Xi’an, Nanjing, Jinan, Shenyang, Chengdu, Wuhan, Guangzhou, etc.
SBS* Embedded Market Focus

Healthcare Devices
Retail Kiosks
Digital Signage
IVI System

Electric Power System
Train Monitoring System
Intelligent Transport System
Metro AFC System
Embedded Software Requirements

• Modularity, easy for customization
• Fast boot is key for embedded
• Real-time, quick response
• Comprehensive test
• Product differentiation
SBS* Embedded System

- High Reliability
- Low Power Consumption
- Long Product Life
- Upgradeable
- Small Size

SBS board-level driver
SBS customized firmware
OS: SBS Linux
SBS algorithm
Application software
Intel® BLDK Meets SBS* Embedded Requirements

- Get rid of legacy BIOS
- Customized and Professional
- Easy for Differentiation
- Fast Boot
- IP Protection
Application Example Based on Intel® BLDK

- Fast boot
  - Power to OS < 2s (BLDK < 1s)
- Easy to Customize Hardware
- Able to Support Multiple Boot Path

Using Intel® Atom™ E6xx platform and Intel® BLDK, SBS* was able to deliver the competitive In-vehicle infotainment (IVI) product
SBS* Product Samples Based on Intel® BLDK

Intel® Atom™ Processor E6xx Series
COMe9440 (55mm X 84mm)

Intel® Atom™ Processor E6xx Series
SCM-9200 (96mmX96mm)

Intel® Atom™ Processor N/D 2000 Series
STM9040 (70mm X 84mm)

Intel® Atom™ Processor N/D 2000 Series
STM9060 (62mm X 68mm)
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Summary

- Intel® BLDK is a royalty-free solution for fixed-function embedded devices
- Intel BLDK is a complete solution that includes source, binaries, debug tools and documentation
- Intel BLDK reference implementations available now for:
  - Intel® Atom™ Processor E6xx Series
  - Intel Atom Processor E6x5C Series
  - Coming Soon:
    Intel Atom Processor N2000 and D2000 Series

Fast · Simple · Flexible
Call to Action

• Download Intel® BLDK and related whitepapers and documentation ([http://intel.com/go/bldk](http://intel.com/go/bldk))

• Experiment with Intel® BLDK on your Intel reference platform

• Identify 3rd parties that can assist with development efforts ([http://intel.com/go/eca](http://intel.com/go/eca))

• Visit the online community support forum ([http://edc.intel.com/community](http://edc.intel.com/community))
# Related Sessions

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<thead>
<tr>
<th>Session ID</th>
<th>Title</th>
<th>Day</th>
<th>Time</th>
<th>Room</th>
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<tr>
<td>PTAC001</td>
<td>Poster Chat: UEFI Application Development using Standard Libraries and Python*</td>
<td>Wed</td>
<td>14:00</td>
<td>Station 7</td>
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<td>16:25</td>
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<tr>
<td>PTAC002</td>
<td>Poster Chat: Power and Thermal Analysis using Intel® Platform Profiling Tool</td>
<td>Wed</td>
<td>14:00</td>
<td>Station 8</td>
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<tr>
<td>PTAS001</td>
<td>System Behavior and Performance Prediction using System Modeling and Simulation Tools</td>
<td>Wed</td>
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<td>PTAS002</td>
<td>Shift Left! Leverage Full System Simulation to Reduce Your Time To Market</td>
<td>Wed</td>
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<td>PTAS003</td>
<td>Advanced UEFI Development Environment for Embedded Platforms</td>
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<td>Platform Technologies and Analysis Q&amp;A</td>
<td>Wed</td>
<td>17:15</td>
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<td>PTAS004</td>
<td>Implementing Platform Security with UEFI</td>
<td>Thurs</td>
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<tr>
<td>PTAS005</td>
<td>Platform Optimization Using Open Computing Language (OpenCL*) Tool</td>
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<td></td>
<td>Software and Services Group Pavilion - Platform Technologies: UEFI, Analysis Tools, and Simulation Booth Number 16</td>
<td>Wed - Thurs</td>
<td>Show Case</td>
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Q&A
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