Transitioning the Plug-In Industry from Legacy to UEFI: Real World Cases and Call to Action

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EFIS005

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Agenda

- Plug-Ins! Past, Present, and Future
- UEFI is Making BIOS Plug-Ins Possible!
- Real World Examples
- Taking Plug-Ins to the Next Level
- Call to Action

Plug-Ins: Added Value for PCs

Plug-Ins are added value for PCs installed by either:

- The OEM
- The End User

What plug-ins do we use today?

For MP3 players, it's earphones, power supplies, etc.

For PDAs/smart phones, it's app store software

For PCs, plug-ins extend functionality too

Plug-Ins: Added Value for PCs

- OEM Plug-Ins:
  - Likely to exist in source code form
  - Require technical integration into the BIOS in some way (source, adaptation, etc.)
  - Integrated as part of system test
- User Plug-Ins:
  - Need seamless binary installation
  - Lots of issues (security, storage, configuration, compatibility, etc.)
  - Must just work without any “system test” on the user’s part

Plug-Ins: Added Value for PCs

- In the early days, plug-ins made hardware operational– ROM BIOS extensions (OpROMs)
- Today's add value is less about new hardware options, and more about other things:
  - **Virus/Malware Protection**
  - **Enterprise Management**
  - **OS Installation**
  - **Geo-Fencing**
  - **Instant-On environments**
  - **Diagnostics**

Plug-Ins Past and Present

Today's computing is trending towards enclosed systems with limited hardware expansion

1981-1989

Expansion via hardware plug-ins (i.e. LAN, Modem, Graphics)

1990-1999

USB PCI SIG

Expansion via standards (USB, PCI)
Early Notebooks with limited expansion
Connectivity: Network, Internet

2000-2009

Accelerated Transition to Mobility (Notebooks, Netbooks, PDAs, etc.)
Limited Expansion: Closed Systems

Plug-Ins: Near Future

What forces are driving plug-ins now?

- 2010 : UEFI Notebooks: SW Door Opens
  - 2008-2009: Steady growth in UEFI adoption
  - 2010*: Broad adoption of UEFI: ~>50% notebooks shipped
- 2012** : Form Factor Mobile UEFI Adoption
  - i.e. PDAs, Mobile Phones, MP3 players, etc.

* Source, UEFI Forum
** Source, Phoenix Technologies

Plug-Ins: Longer-Term Future

What forces are driving plug-ins later?

- 2015*: The Cloud: Unlimited storage and services
- 2015*: The Grid: Unlimited computing power
- 2020*: Shift from “press this to cause the device to do that” to peer interaction with the device

* Source, Phoenix Technologies

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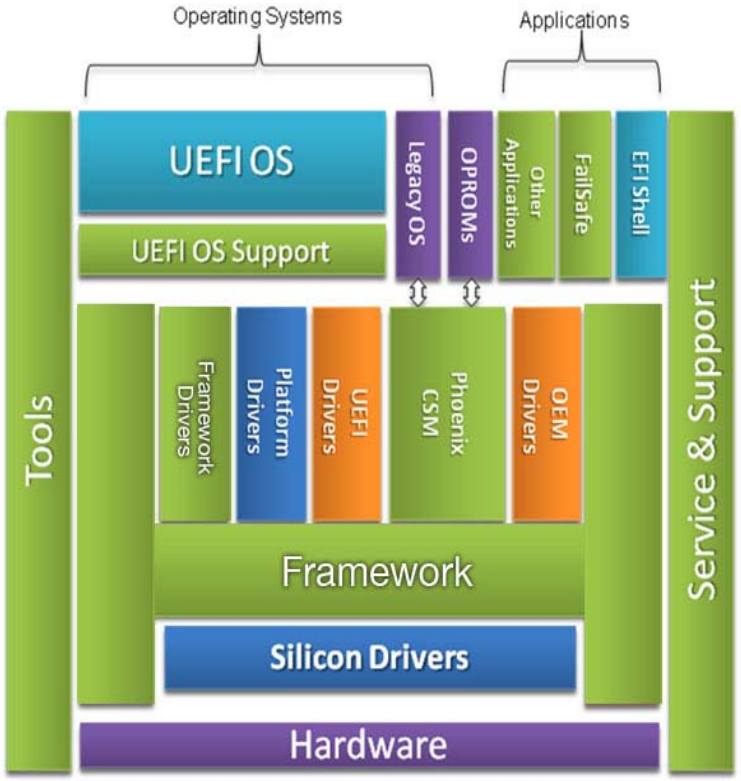
UEFI is Making Plug-Ins Possible!

- Focus on Mobile Devices
- All new systems shipping with some form of UEFI
- Phoenix creating UEFI solutions for all new silicon solutions
- Green H: Formal packaging of executable entities, run-order, flow control
  - Does away with hooking and patching



Green H/UEFI Transforms Plug-Ins

	Legacy	UEFI
Memory Allocation	☹ BDA Editing ☹ INT 15h	✓ Allocate Pages ✓ Allocate Memory
I/O to Screen	☹ INT 10h/INT 16h ☹ Painting video memory	✓ ConIn/ConOut handles
Hotkeys	☹ Hook INT 09h, INT 08h, INT 1ch	✓ Hotkey protocols
Security	☹ None	✓ Well Defined Protocols
Configuration	☹ ^S to enter special setup program in ROM	✓ Human Interface (HII) Protocols
Packaging	☹ ROM extension on PC card	✓ UEFI DXE Driver ✓ UEFI Application

UEFI offers Standard services & Interfaces vs. ad-hoc legacy implementation

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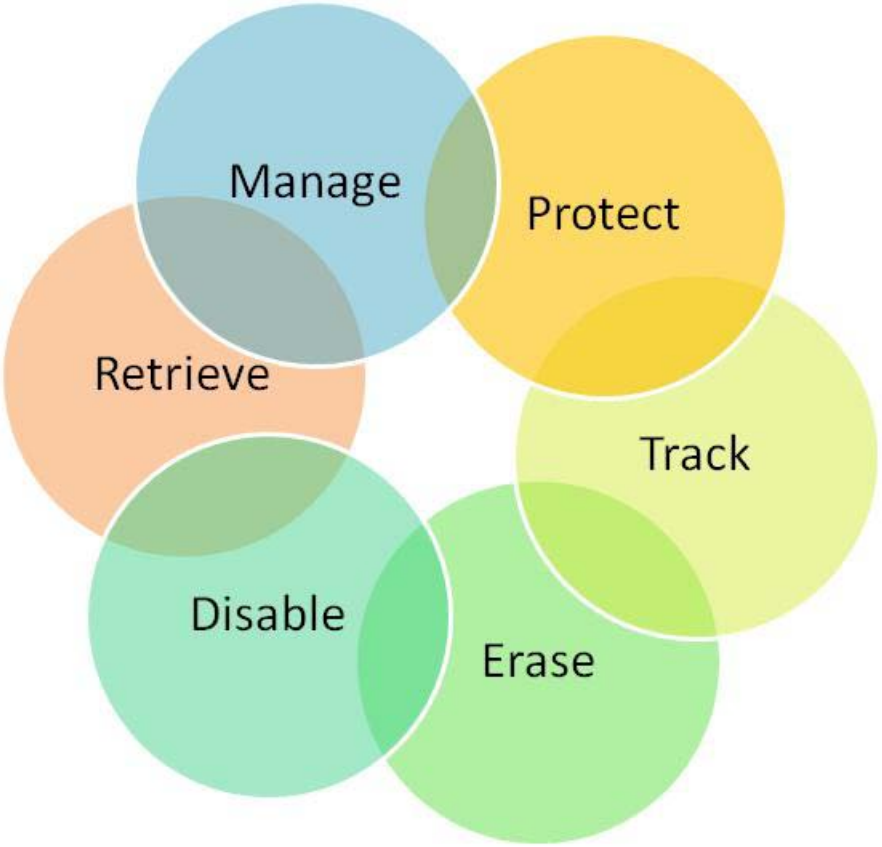
Real World Example-Phoenix FailSafe™

- Deployed on legacy BIOS and UEFI systems
- Deployed on Phoenix SecureCore™ /Legacy
- Deployed on Phoenix SecureCore Tiano™
- Deployed on other IBV offerings!

Case Study #1: FailSafe™ – What is it?

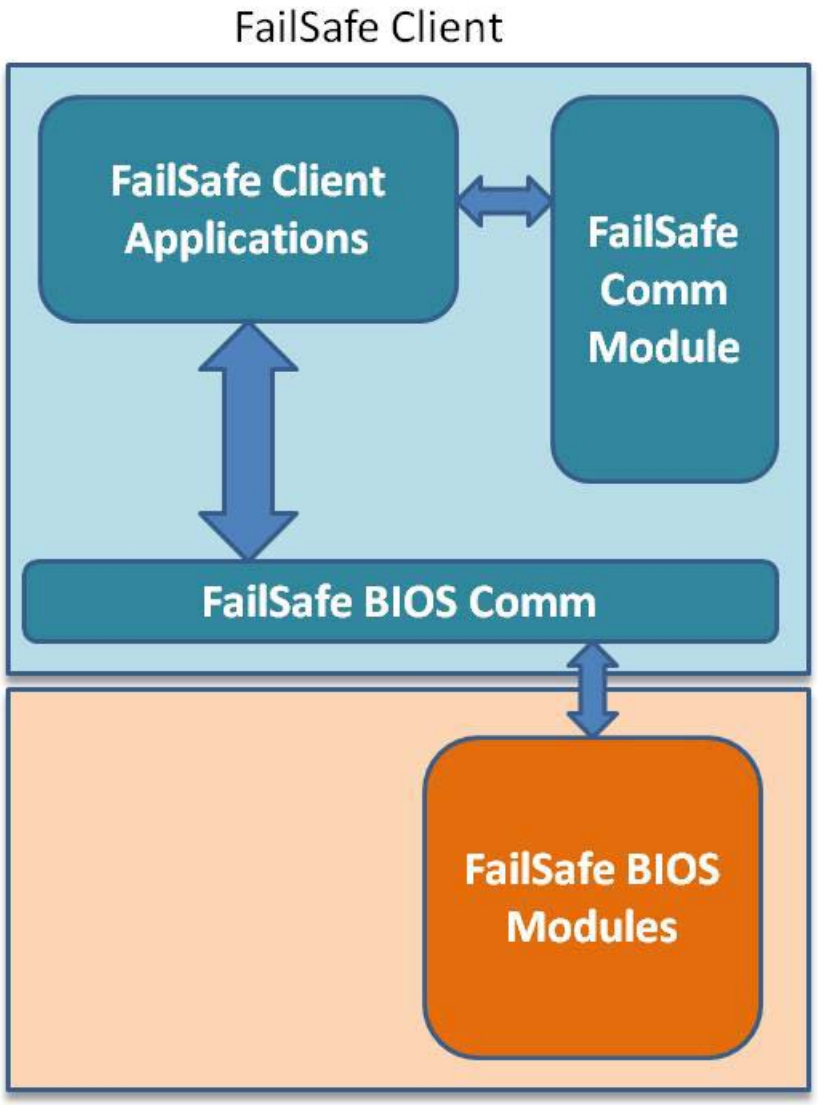
A SaaS offering from Phoenix Technologies that provides the ability to protect, track and remotely manage lost or stolen notebook or netbook



FailSafe
Secure your laptop

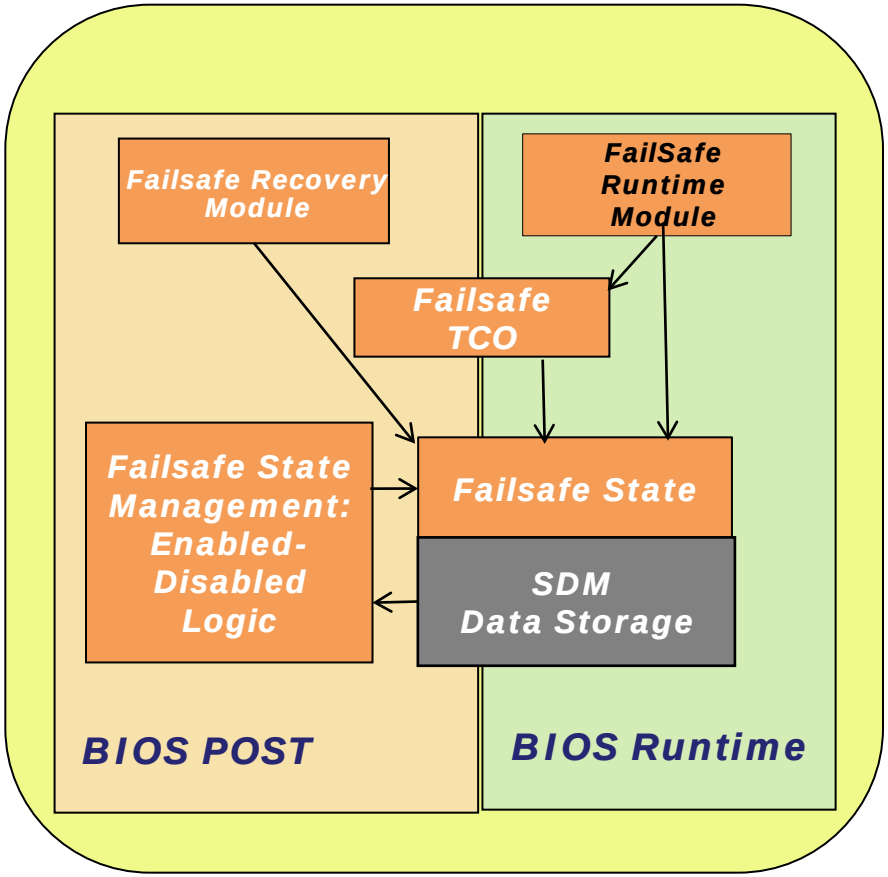
Case Study #1: FailSafe™ – What is it?

- Lock laptop at the BIOS level
- BIOS stores critical information
- Cryptography modules in BIOS responsible for authenticating callers
- Uses UEFI SMM architecture to perform all runtime operations



FailSafe Legacy Implementation

- Created as a Phoenix SecureCore feature
- Tightly coupled with SecureCore features
  - Secure BIOS-to-OS communication (CryptOSD)
  - Encrypted data storage (SDM)
  - Cryptographic features (StrongROM)
  - Additional features
    - Hard-disk password support
    - User password collection routines



FailSafe™ – Legacy Porting Challenges

- Option ROM concept dismissed
  - Cannot use platform setup screen
  - No conflict-free mechanism for CMOS access
  - Prone to malware attacks

- Tight integration with 3rd party BIOS
  - Little knowledge of the architecture
  - Need to integrate key SecureCore features/services
  - OS compatibility with SecureCore™
  - SDK for ease of implementation – difficult to generalize

FailSafe™ SDK (Legacy)– Binaries

- SDK created as a proprietary binary solution
- Additional effort required by 3rd party BIOS teams:
  - Six binary modules in flash
  - Memory allocation
    - i.e. E000/F000 and SMM
  - Placement of SDK binaries in specific regions
  - Population of binary headers with environment information

FailSafe™ SDK (Legacy)– Challenges

- SDK solution had large code size driven by:
  - Time to market urgency
  - Lack of familiarity with the code
  - Lack of common services
- Unexpected environment differences:
  - SDK assumed SMM code address at TSEG vs. a flat address
- Conflicting behaviors:
  - FailSafe hard-disk password implementation compatibility with 3rd party BIOS solution

Failsafe™ – UEFI Implementation

- EDK framework as a starting base
- Greater modularity and portability through UEFI services and protocols
  - Boot Services and Runtime Services
    - **Readytoboot**
    - **LegacyBoot,**
    - **Exitbootservices**
  - User Interface
    - **Conin()**
    - **Conout()**
  - Wide array of UEFI protocols
    - **EFI_CPU_IO_PROTOCOL**
    - **EFI_SMM_CPU_PROTOCOL**
    - **EFI_ACPI_SUPPORT_PROTOCOL**
    - **EFI_LEGACY_BIOS_PROTOCOL**
    - **Etc.**

UEFI significantly improves portability across multiple code bases

Failsafe: UEFI Challenges

- Not all BIOS codebases are compliant with the latest spec
  - Some protocols not yet adopted by everyone
    - EFI_SMM_COMMUNICATION_PROTOCOL
    - EFI_SMM_CPU_PROTOCOL
- Build environments are different, require additional integration effort
  - SDK is released for a EDK style build environment
    - Adding new binaries to build requires ".inf" and ".dxs" files
  - Lack of standardization on global settings/environment variables

➢ *Need a standard build environment or means for binary inclusion*
➢ *Compliance checking and plugfests are a must*

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Taking Plug-Ins to the Next Level

- Preparation for transition from OEM “Push” to End User “Pull” in the market

- Solve User-Level problems, not OEM problems

Taking Plug-Ins to the Next Level

- Make Mobile Systems Plug-In Friendly (OEM/ODMs)
  - Need to create concept vehicles

- Make Tools that are Plug-In Friendly (IBVs)
  - Create SDKs for ODMs and OEMs

  Also
  - Create SDKs for Plug-In Makers
  - Development environment that abstracts the complexities of BIOS from the Plug-In makers

i.e., You don't need Windows 7* source code to create a Windows application.

Taking Plug-Ins to the Next Level

- IBVs to collaborate with UEFI forum and define a path to move to binary distribution (i.e. app store level)

- All IBVs will have their own ideas

- Phoenix is working on:
  - **Installation** – Installer
  - **Discovery** – Defining firmware volume assignments for plug-In storage
  - **Compatibility** – UI form and function
  - **Storage** – Read/Write firmware volume assignments and QoS for data storage
  - **Isolation** – Adding protection around apps for security and reliability
  - **Performance** – One second POST
  - **Power Management** – Best practices for maximizing battery life
  - **Configuration** – Best practices to simplify user experience

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Call To Action

- Plug-Ins are going to take off, as the role of the BIOS/Pre-Boot is standardized and stabilized
- Importance of Plug-Ins will increase
  - Allows for differentiation and expandability in otherwise closed systems
- IBVs, ODMs, OEMs, and SVs will pave the way for plug-In manufacturers to add value:
  - First at the source code level as they sell to OEMs
  - Finally at the binary level as end users install their own plug-ins

Active participation in the UEFI Forum is key to the success of plug-ins

Additional resources on UEFI:

- Visit UEFI Booth #136
- More web based info:
  - Specifications and Implementation sites: www.tianocore.org, www.uefi.org, www.intel.com/technology/efi
- Technical book from Intel Press: "Beyond BIOS: Implementing the Unified Extensible Firmware Interface with Intel's Framework" www.intel.com/intelpress

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Q&A

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