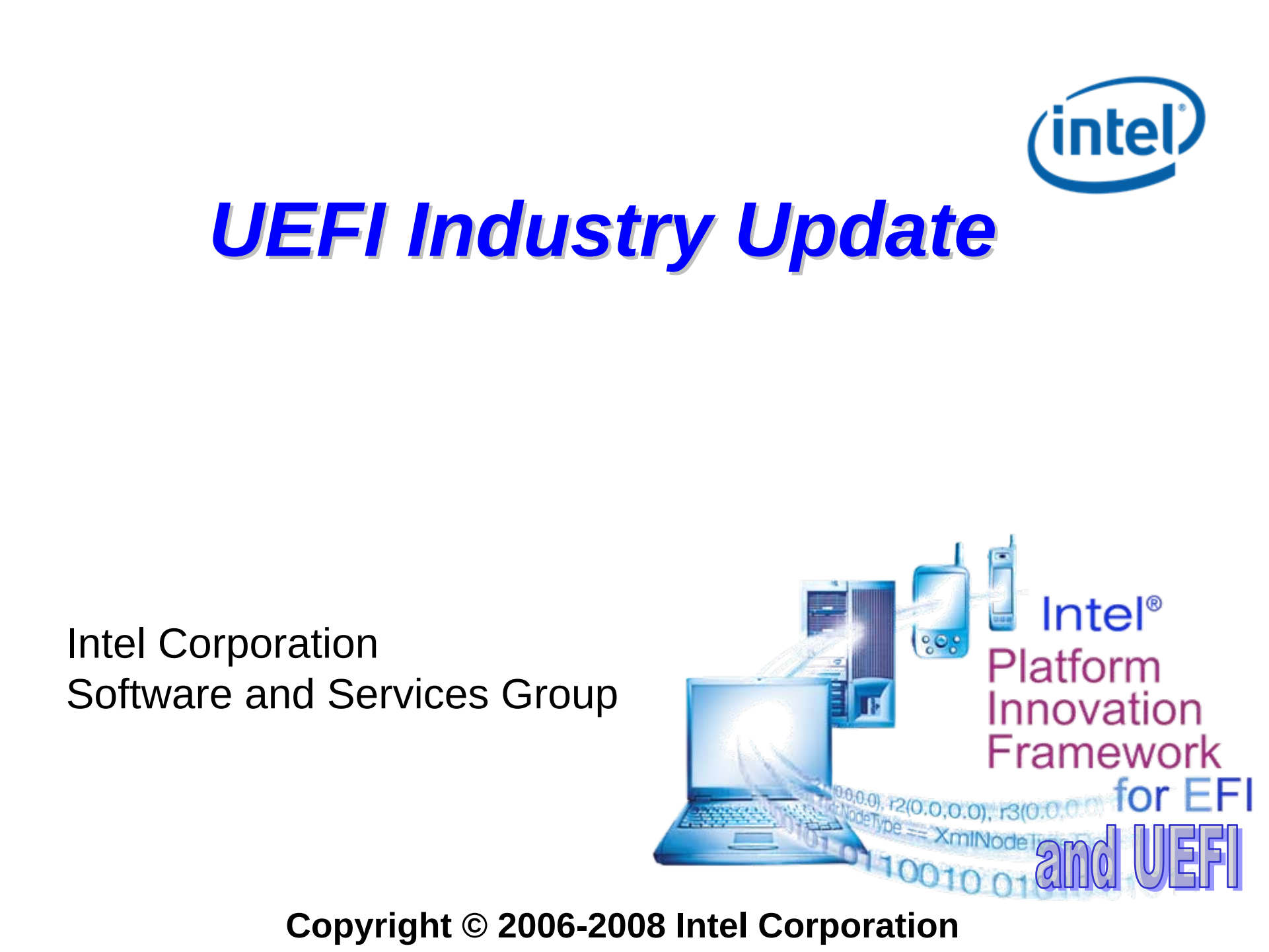

UEFI Industry Update

Intel Corporation
Software and Services Group

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Agenda

- Industry BIOS Transition
- Unified Extensible Firmware Interface (UEFI) Overview
- Some of UEFI Advantages
- UEFI Industry Adoption
- Operating Systems UEFI support status
- Community Resources
- Summary

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Industry BIOS Transition

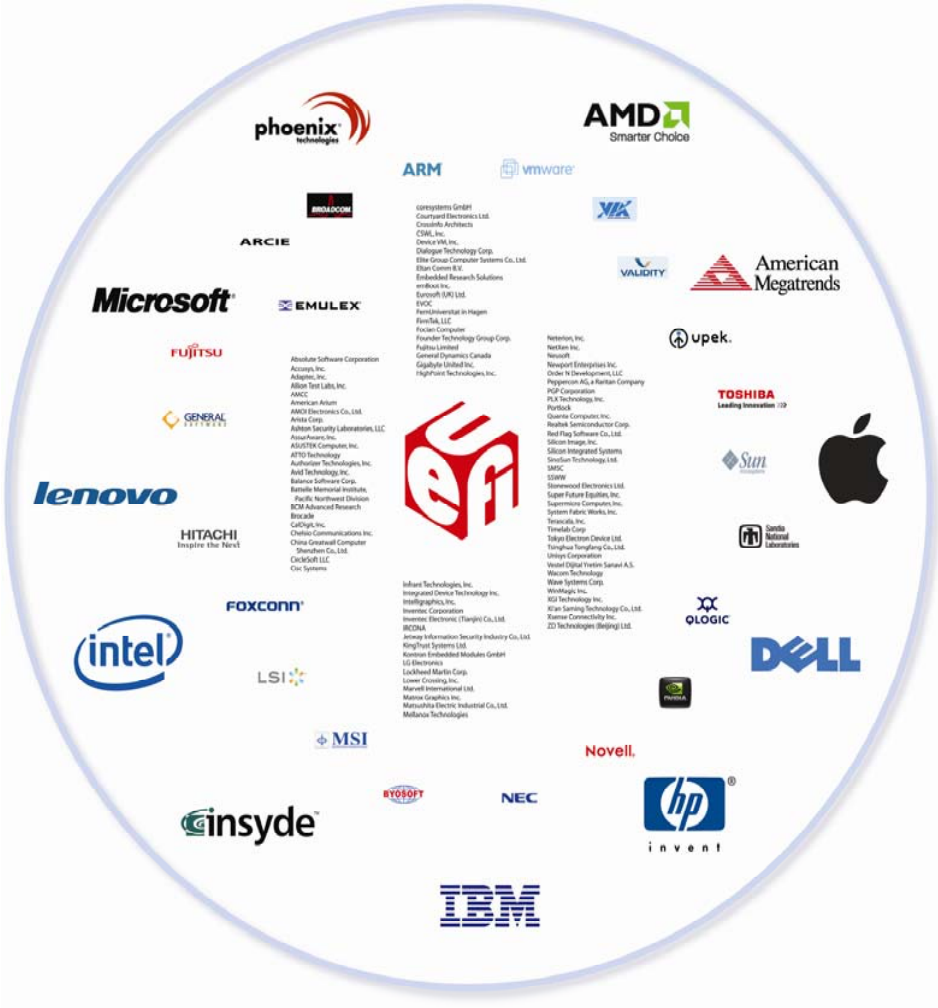
Pre-2000 — All Platforms BIOS were proprietary

2000 — Intel invented the Extensible Firmware Interface (EFI) and provided sample implementation under free BSD terms

2004 — **tianocore.org**, open source EFI community launched

2005 — **Unified EFI (UEFI)** Industry forum, with 15 members, was formed to standardize EFI

2008 — 127 members and growing! MNCs and Microsoft committed to integrate and support



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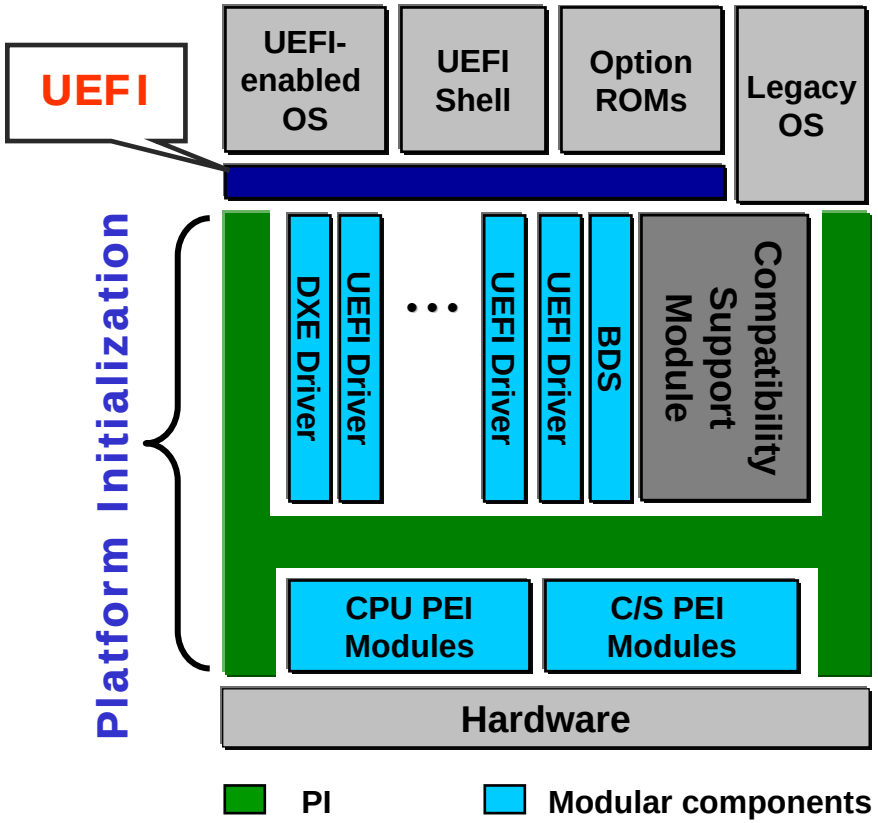
UEFI / Platform Initialization



- UEFI: Unified Extensible Firmware Interface
  - a new model for the interface between the OS and platform firmware
- PI: Platform Initialization
  - Standardization: key to interoperability across implementations
  - Modular components like silicon drivers (e.g. PCI) and value-add drivers (security)

UEFI is Architected for Dynamic Modularity

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Some of UEFI Advantages

- Specified standard for booting an operating system
  - Active industry standard working group with compliance tests support
- Engineering agility in pre-operating system space
  - Clean, architected interfaces
  - UEFI written in C and can be built with gmake and gcc
  - Cross architecture, Extensible and Modular
- Move beyond legacy BIOS
  - New authenticated boot scenarios
  - Support for new standard such as iPV6 (iPV6 network booting such as iSCSI, PXE)
  - Improve boot graphics (Safe Mode Video - GOP in UEFI)
  - Faster network boot performance
- Eliminate legacy restrictions for UEFI aware OS's.
  - Shortage of option ROM space
  - 32-bit protected mode as being a native mode of operation
  - 64-bit native code for x64 and Itanium
  - Support for > 2TB hard disk
- UEFI establishes a foundation on which many innovative features can be delivered.

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Industry speaking out

"Our use of UEFI Framework has allowed faster platform deployment, easier code sharing across projects, and has proven to be a robust development environment to build advanced firmware-based features."

Dan Forlenza,
VP and GM,
HP Business Notebooks
Taiwan IDF'07

"Windows Server 2008 and Windows Vista start the clock ticking for dropping BIOS backward compatibility"

Microsoft *US IDF'07*

"All New IBM Designed Platforms will be on UEFI"

IBM, *IRUM'08*

UEFI Time Line (Dell Business Client and Servers): Development starting in CY2009: UEFI support is a design requirement.

Dell, *IRUM'08*

"Apple has adopted EFI for its line of Intel-based Macs. MAC OS X v10.4 "Tiger" for Intel and Mac OS X v10.5 "Leopard" thoroughly support EFI."

Apple, *UEFI Forum Media Advisory May'08*

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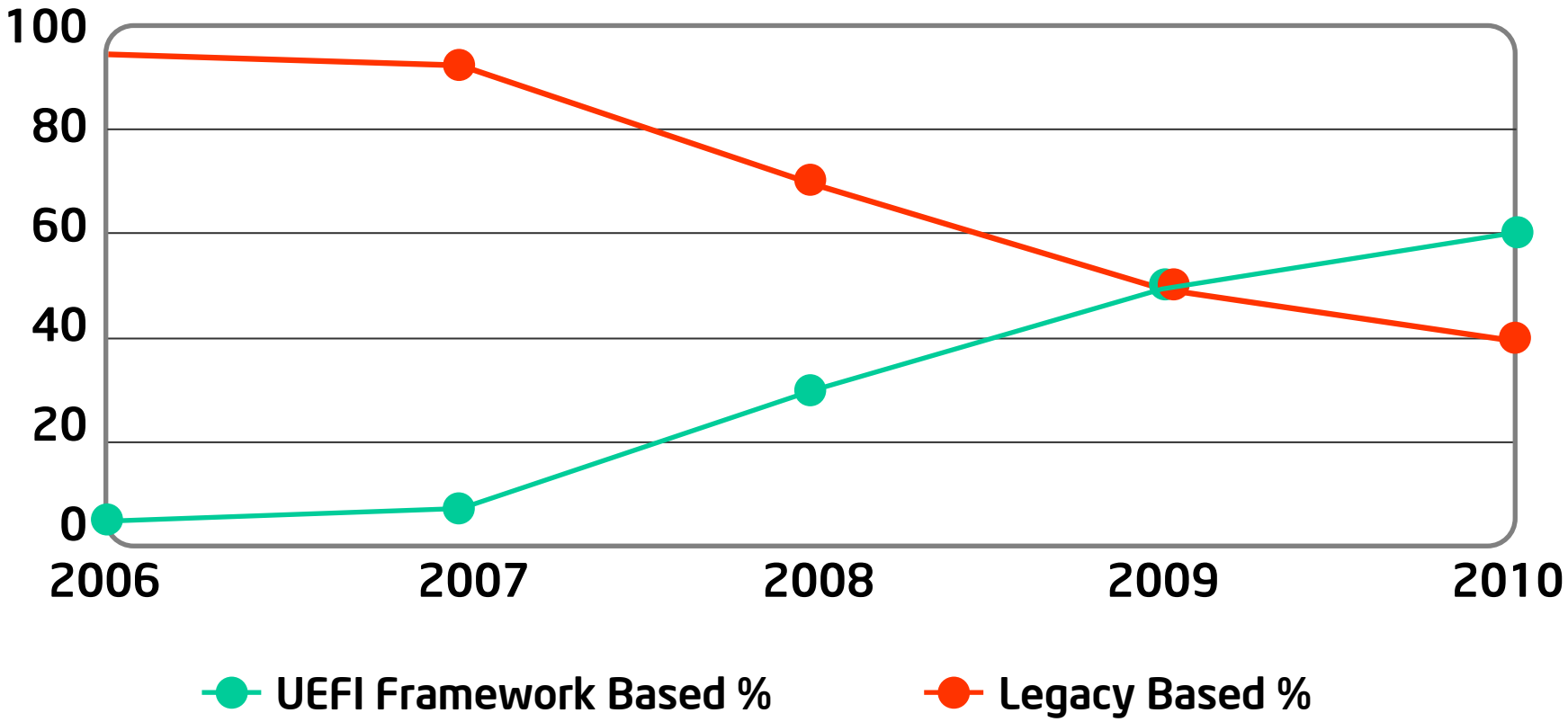
UEFI Firmware Based Deployments….

…expected to cross 50% of worldwide IA units by 2010



Source: Various – UEFI Forum Media Advisory For Spring'08; IDC Sep'07 worldwide vendor market share; Industry platform adoption projection

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Operating System and UEFI Support

- Microsoft supports UEFI
  - Native UEFI 2.0 Boot released in Windows Vista SP1 (client) and Windows Server 2008. *Microsoft indicated that new pre-OS feature development will be on UEFI first!...and they want to move beyond legacy BIOS.*
  - Link to Microsoft UEFI Support and Requirements:

    http://www.microsoft.com/whdc/system/platform/firmware/uefireg.mspx
- Linux O/S loaders (x64 UEFI GRUB and ELILO) are available as well as UEFI x64 Kernel 2.6.25 with boot and runtime services support. Inclusion within various distributions is Work In Progress.
  - Novell plans to support booting from UEFI in x64 platforms in addition to Itanium in SUSE Linux Enterprise 11 (SLE11)
    - Novell would like OEMs to get involved in SLE11 beta test process – OEMs should contact their Novell representative regarding SLE11 status and plan
  - Red Hat engineers have joined the Open Source Community and Intel in the development of UEFI. Please see Fedora project for more details:
    - https://fedoraproject.org/wiki/Releases/9/ReleaseSummary#What.27s_New_in_Fedora_9.3F
  - Red Hat needs strong OEM participation in order to define a plan to include UEFI in a future release of RHEL. Access to OEM UEFI hardware is critical to success of this effort.

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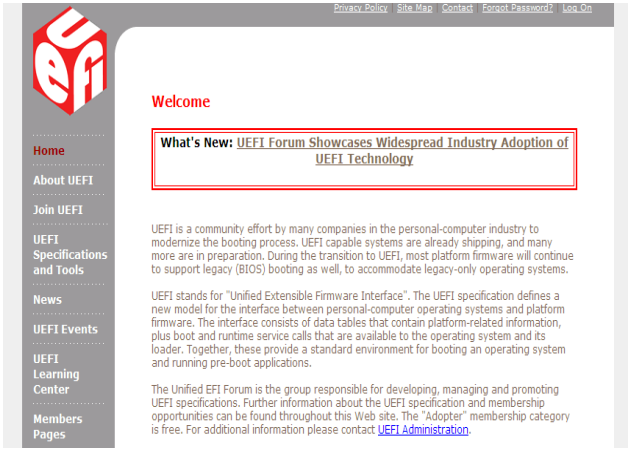
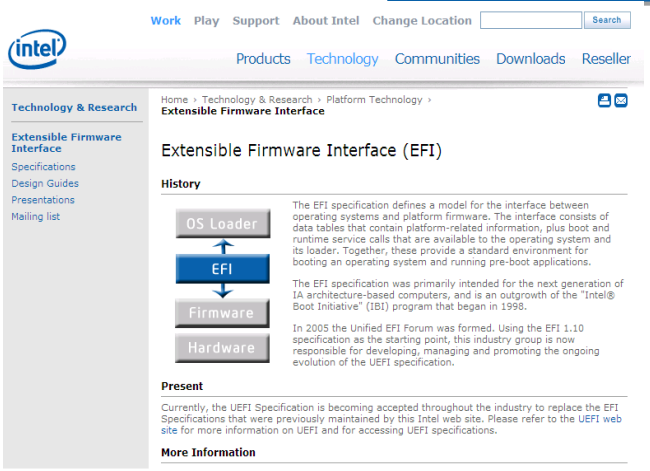
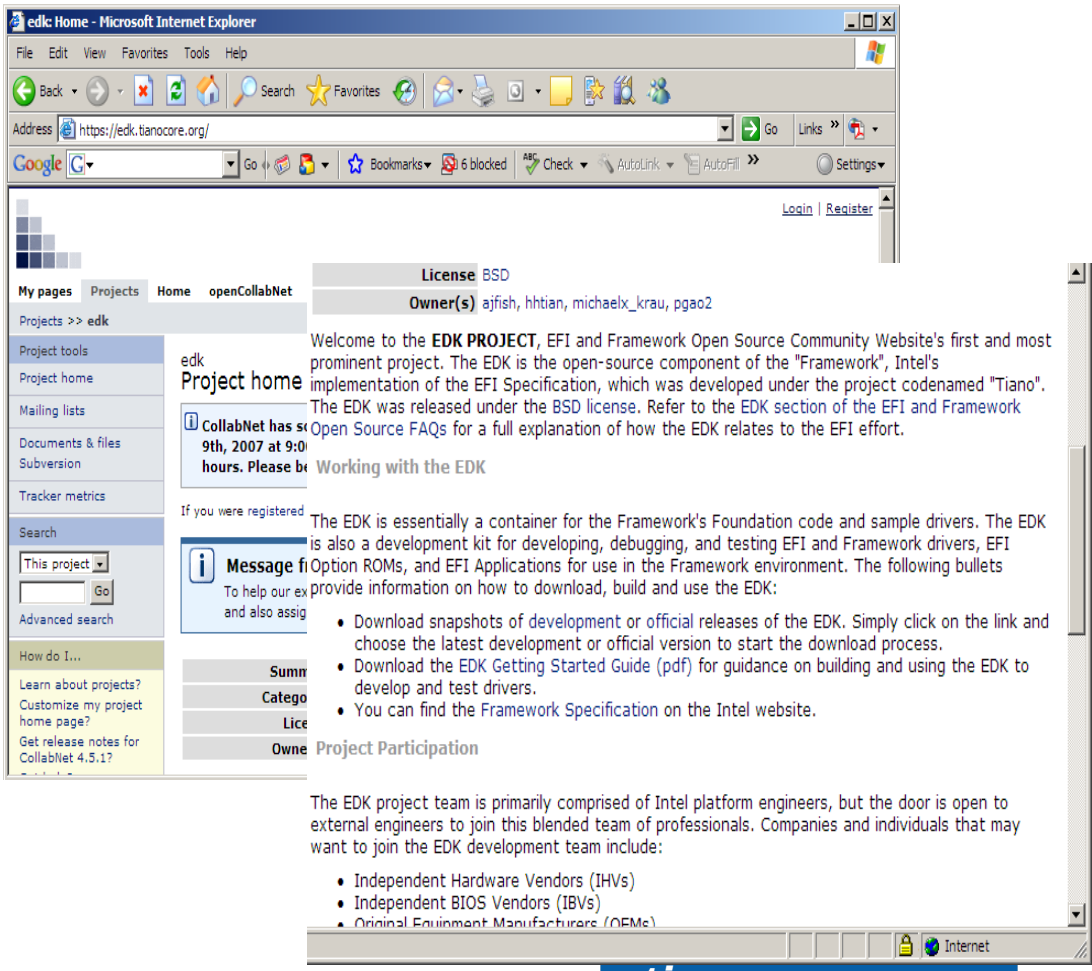
Community resource centers for UEFI



uefi.org



www.intel.com/technology/efi/



tianocore.org

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Summary

- UEFI is becoming an Industry Requirement
- OEMs are making UEFI based platforms available to vendors to accelerate UEFI development
- Leverage the UEFI community resources available to assist you with your UEFI development/ deployment
- Move beyond legacy BIOS
- Join UEFI forum and contribute
- Join us at UEFI plugfests and events

Visit uefi.org and tianocore.org

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Q & A

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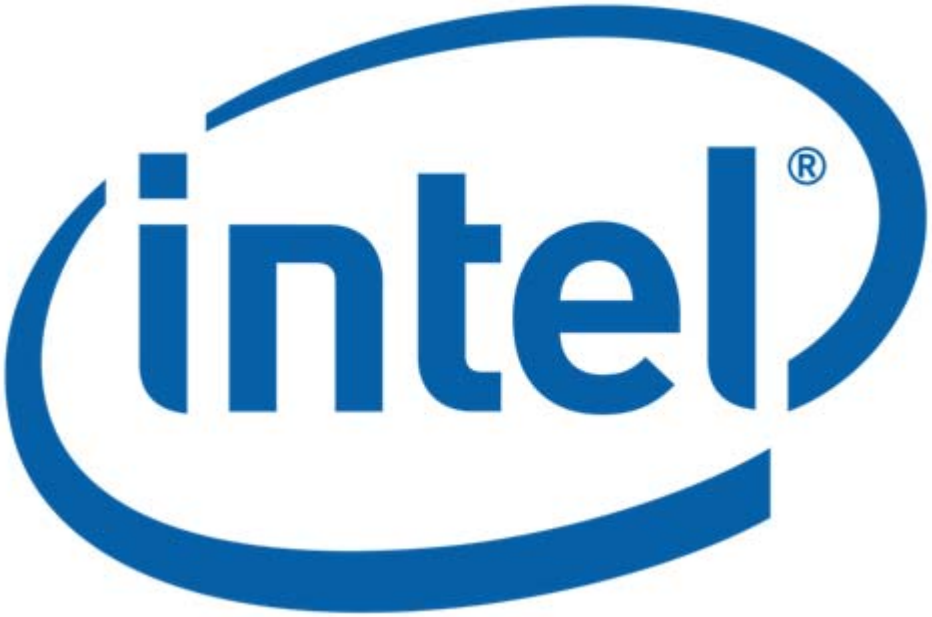

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Back up

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IBM Plans/Requirements for: Unified Extensible Firmware Interface (UEFI)

IBM Systems and Technology Group

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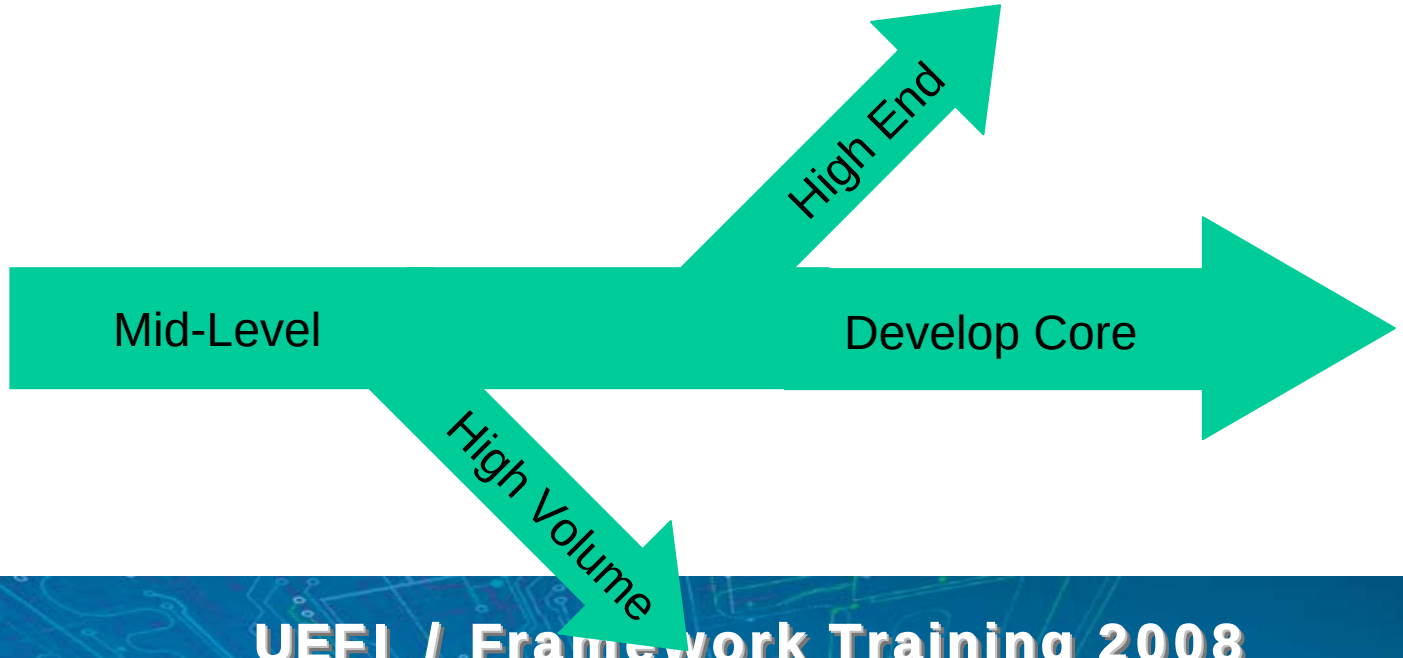
IBM's Pre-boot Roadmap

- IBM is making a big investment in UEFI on our next generation platforms
- IBM System x3450 was our first IA-based server to ship UEFI (GA 2Q 2008)
- Expect future UEFI based platforms to start shipping in 2009
- All New IBM Designed Platforms will be on UEFI



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Why IBM sees UEFI as an Important Technology

- Improve Configuration and Setup from console and remote access.
- Eliminate legacy restrictions for UEFI aware OS's.
  Example: Shortage of option ROM space. (1801 Errors).
- Allow for better designs with hooks for test and manufacturing.
- Deliver a consistent experience across our entire portfolio.
- Open the door to innovation in the pre-boot area.
  Active Energy Manager
  BladeCenter Open Fabric Manager

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IBM Requirements for Vendors

1. UEFI 2.1 or later compliance required where applicable.

2. PI 1.0 or later compliance required where applicable.

3. Vendor deliverables must pass Self Certification Test (SCT).

4. Setup Plug-In

- **a.** EFI Driver Configuration Protocol required for configurable devices.
- **b.** Human Interface Infrastructure (HII) support may be required.

5. Device Types

- **a.** Note: All devices must include a basic PI/UEFI abstraction in support of detection, diagnostics, etc. even if not a console or boot device.
- **b.** Plug In Options - An x64 UEFI driver is preferred.
- **c.** Core Chipset Devices - A PI deliverable is required
- **d.** I/O Components and Integrated Devices

For All New Development, UEFI is a Design Requirement

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Dell UEFI Plans and Requirements

IDF IRUM August 2008

Dell Server BIOS Group

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Dell's UEFI Support

- Dell will support UEFI across many platforms in CY2009.
- UEFI transition powered by adding value along multiple vectors.
  - UEFI delivers end user visible value
    - UEFI establishes a foundation on which many innovative features can be delivered.
  - UEFI enables new development models for BIOS
    - Huge benefit when industry mindshare is focused on a single firmware architecture.
    - Components can be mix-and-match.
    - Market for innovative firmware components is already starting to develop.

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Dell Message to Partners

- Support latest spec versions:
  - UEFI 2.1 – HII is required
  - PI 1.1 – SMM CIS / SMBIOS Protocol
- Partner Messages
  - ODMs: Must have in house skill set required to deliver a full UEFI based BIOS with industry standard feature set.
  - IHVs: UEFI driver support required for integrated devices as well as bootable expansion devices.
  - IBVs: Support for firmware component based ecosystem.
- Time Line (Business Client and Servers)
  - Development underway today: Vendors supporting UEFI/PI are advantaged.
  - Development starting in CY2009: UEFI support is a design requirement.

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HP UEFI Status

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HP UEFI Support Status

- HP Integrity Business Critical Servers
  - Support EFI/UEFI as the only boot method
  - HP-UX, Windows, Linux, OpenVMS, HP Integrity Virtual Machine operating environments use EFI/UEFI
  - **UEFI Support is a Design Requirement for HP Integrity Servers**
- HP Notebooks and Tablet PCs
  - Starting in 2008, all new designs leverage UEFI Framework technology. – ***Shipping!***
  - HP innovating based on the UEFI technology: e.g., Quick Look
- Workstations and Business Desktops will adopt a common UEFI code base and are collaborating with Business Notebooks on HP features that provide enhanced manageability, security, and ease of use.
- Multi-function printers from HP have started using UEFI Framework technology.
- UEFI/PI framework has enabled code sharing opportunities among business entities and with partners/vendors.

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Benefits and Actions

- Why UEFI/Framework
  - Modern architecture
    - Easier to support,
    - Easier to differentiate
  - Modular architecture
    - Build/buy/share/reuse modules independently
    - Focus internal work where it's most valuable
  - Fully specified
    - Compliance tests ensure higher quality
    - Reduces integration headaches
- Customer Benefits
  - Future OS enhancements
  - Keep all useful existing HP value-add
  - Faster implementation of future enhancements
- Re-enables pre-OS ecosystem

- Call to Actions
  - Industry partners to
    - Support UEFI 2.1 Specification
      - UEFI Drivers to support the HII related Protocols
    - Support PI 1.1 Specification
    - Make use of the UEFI and PI SCTs

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