UEFI Fast Boot for Microsoft* Windows* 7: Fast Boot Without Compromising your BIOS

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EFIS004

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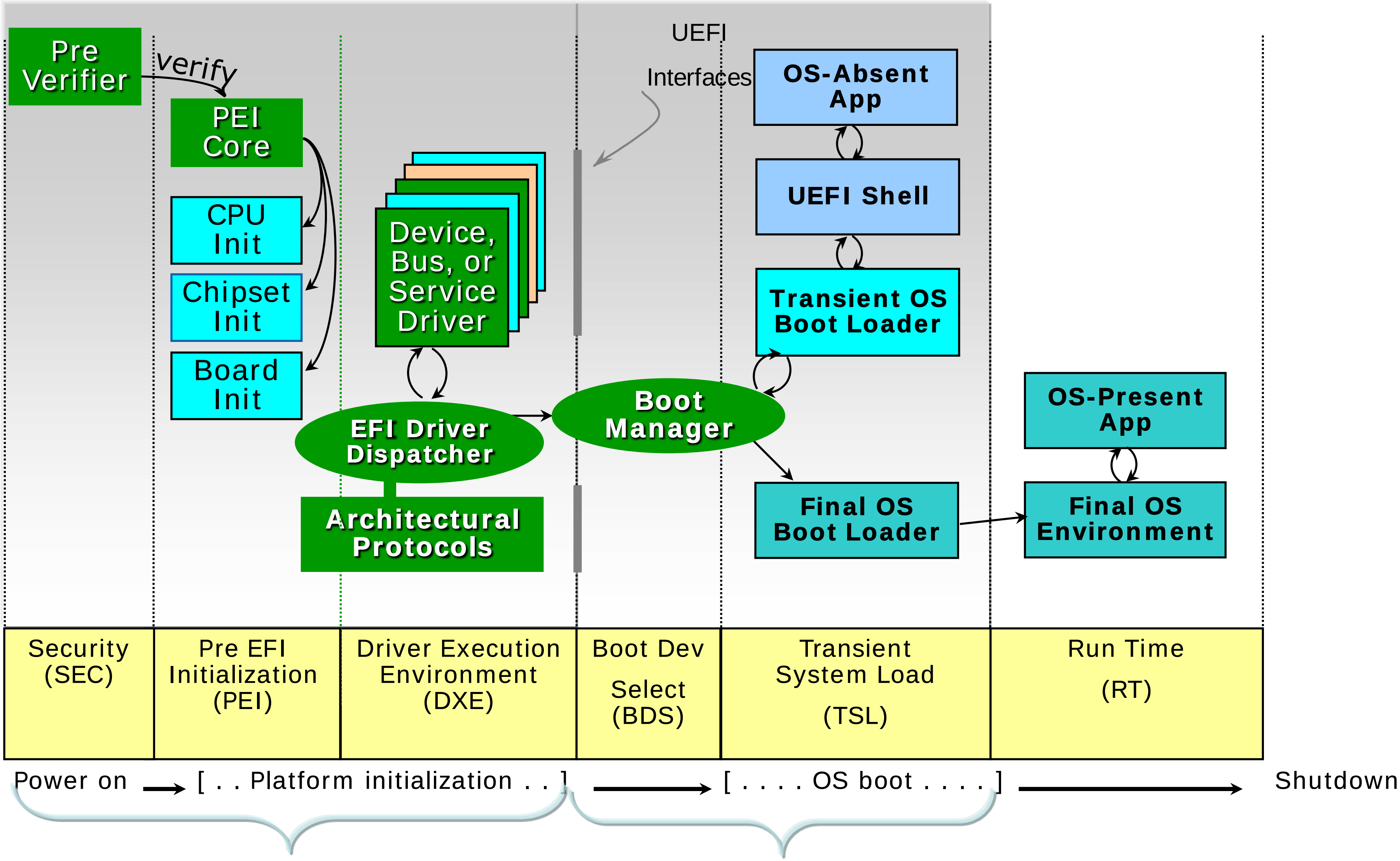
Agenda

- Overview of boot time
- Performance improvements for boot times
- Demo
- Why fast POST for Windows* 7
- Other considerations for Windows 7

Overall View of Boot Time Line



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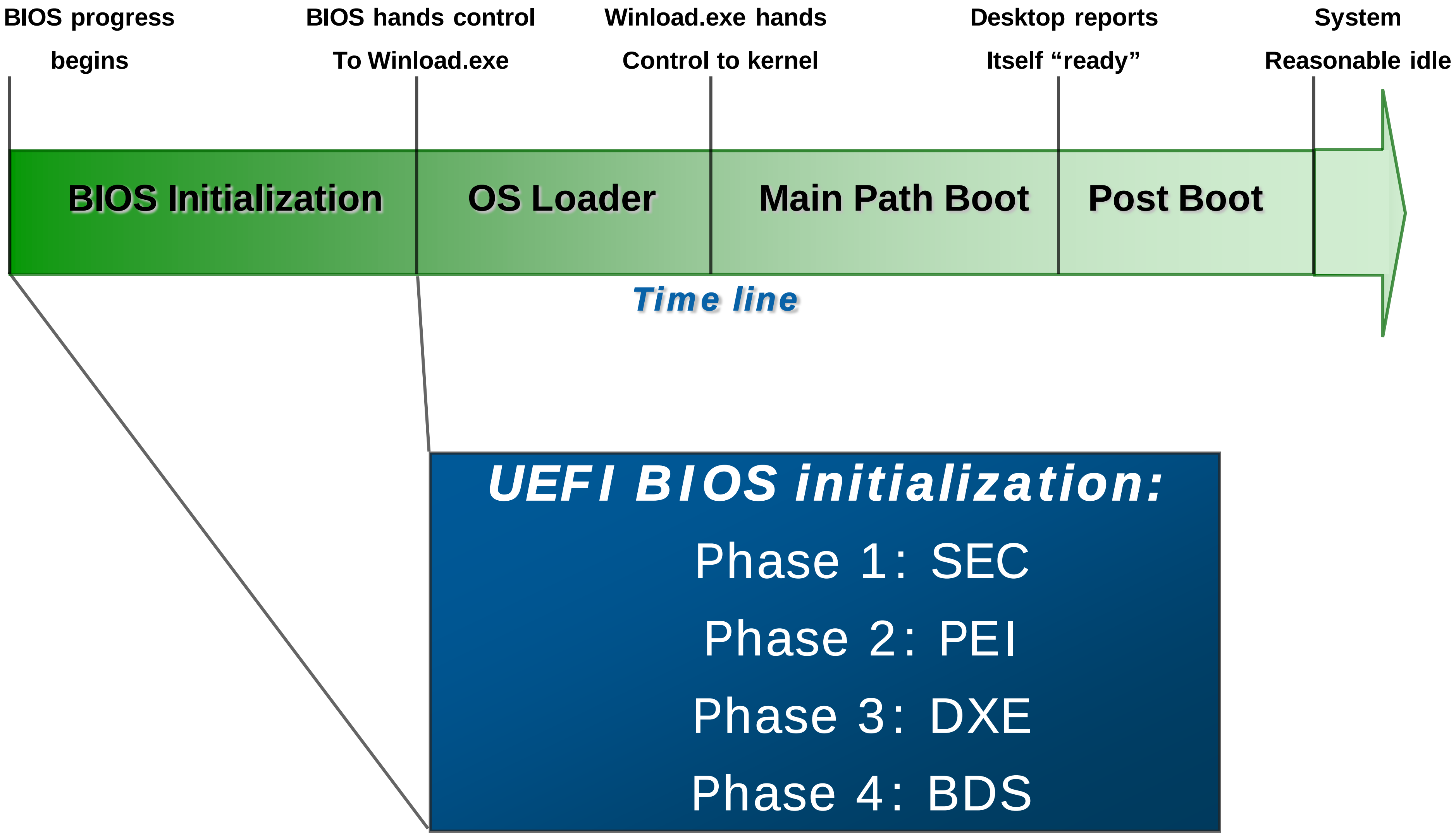
Overview of Boot Time



BIOS progress begins

BIOS hands control To Winload.exe

Winload.exe hands Control to kernel

Desktop reports Itself “ready”

System Reasonable idle

BIOS Initialization

OS Loader

Main Path Boot

Post Boot

Time line

UEFI BIOS initialization:

Phase 1: SEC

Phase 2: PEI

Phase 3: DXE

Phase 4: BDS

Overview of Boot Time

- 4 UEFI BIOS Initialization phases:
  - **SEC** (Security) phase: Pre-RAM code handles CPU initialization to create temporary stack in CPU cache.
  - **PEI** (Pre-EFI initialization) phase: finishes CPU initialization, discovers the DRAM, and determines boot mode (cold boot, S3, S4)
  - **DXE** (Driver Execution Environment) phase. Loads drivers that initialize the rest of system hardware.
  - **BDS** (Boot Device Selection) phase. Finds boot devices, loads the OS, and passes control over to the OS.

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Overview of Fast Boot Solutions

BIOS POST time can be improved in three ways:

1. Remove drivers, or
2. Fine tune drivers, or
3. Hide drivers when not used

(Note: A software tool can be used to do the analysis the consumed time of your drivers)

Example of Analyzed Driver Time

SEC Phase Duration	:	317(ms)
PEI Phase Duration	:	148(ms)
DXE Phase Duration	:	387(ms)
BDS Phase Duration	:	775(ms)
Total Duratio	:	1627(ms)

Name	Duration time(ms)
HiiDatabase:	10
Crc32SectionExtract:	9
FwBlockService:	2
FtwLite:	2
Variable:	11
SetupUtility:	2
MiscSubclass:	8
MpCpu:	94
SmbiosMemory:	61
IsaBus:	1
LightPciBusPciBus:	20
SataController:	146
ConSplitter:	3
BiosVideo:	273
SmmBase:	30
PchInitDxe:	6

Name	*Duration time(ms)*
AcpiPlatform:	*2*
LegacyBios:	*38*
Ahci:	*66*
SmmRuntime:	*1*
SmmFwBlockService:	*1*
SmmFtw:	*49*
PowerManagement2:	*2*
SmmPlatform:	*2*
Ihisi:	*1*
OemInt15Callback:	*1*
	:
	:
	:
	:
	:
	:
	:

Manage Drivers After the Analysis

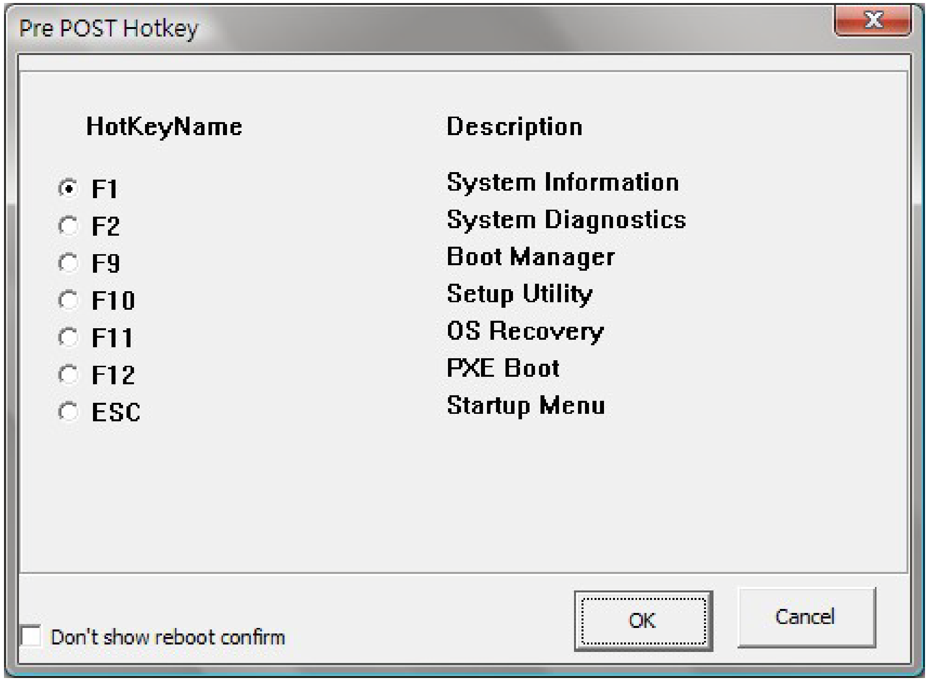
Module	Customer Decision
Module 1	Must have
Module 2	Removed
Module 3	Must have
Module 4	Removed
Module 5	Hidden
Module 6	Hidden
Module 7	Hidden
Module 8	Removed
Module 9	Must have
…	…

- Analyze the list of modules for customers to decide whether the features should be kept, removed, or hidden.
- The "Hidden" items don't run unless:
  - First boot after configuration changed
  - Previous boot fails
  - Pre-Post hotkeys pressed
  - Triggered by windows application

Trigger for Special Purpose

- EC Support
  - EC codes to be defined for users to go to the user interface in POST
  - While pressing Power button, if a hotkey is also pressed (e.g. F10), BIOS will boot to SCU or the defined page.

- Windows application
  - *The user can select where to reboot to.*


Pre POST Hotkey

HotKeyName	Description
● F1	System Information
○ F2	System Diagnostics
○ F9	Boot Manager
○ F10	Setup Utility
○ F11	OS Recovery
○ F12	PXE Boot
○ ESC	Startup Menu

□ Don't show reboot confirm

Performance Improvement

Disk Type	SSD		HDD	
Blink Boot (Seamless AHCI + Smart Boot)	On	Off	On	Off
IRU	1.692	3.021	1.912	3.314
BIOS POST (Volecity)	2.75	4.11	3.63	5.06

Performance Improvements on Actual OEM platform

(more “must have” items stay here)

Disk Type	SSD		HDD	
Smart Boot	On	Off	On	Off
IRU	2.068	3.021	2.313	3.314
BIOS POST (Velocity)	3.25	4.11	4.16	5.06

Agenda

✓ Overview of boot time

✓ Performance improvements

- Demo
- Why fast POST for Windows* 7
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- ✓ Sample results
- ✓ Demo
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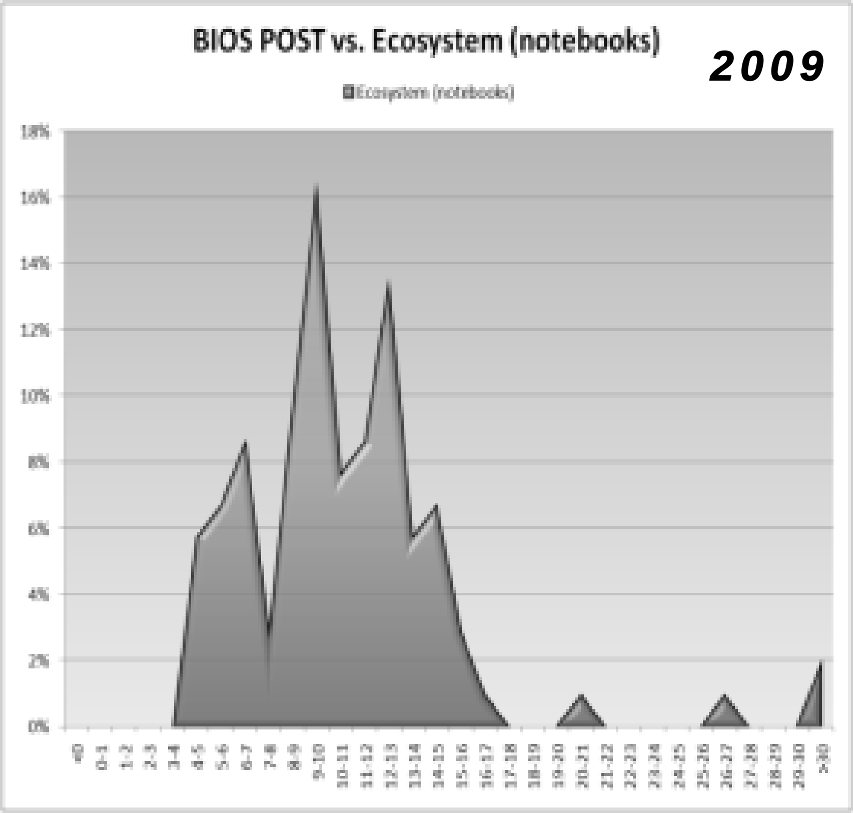
Why fast POST for Windows® 7

What we said at IDF in September 2009

- *In a recent audit of Windows 7 notebooks, 34% booted in 35 sec or less*
- *Not including post times*
- *Since Windows 7 boot times are faster than Windows Vista SP1 on any HW, long POST times are more noticeable and undesirable for end users*

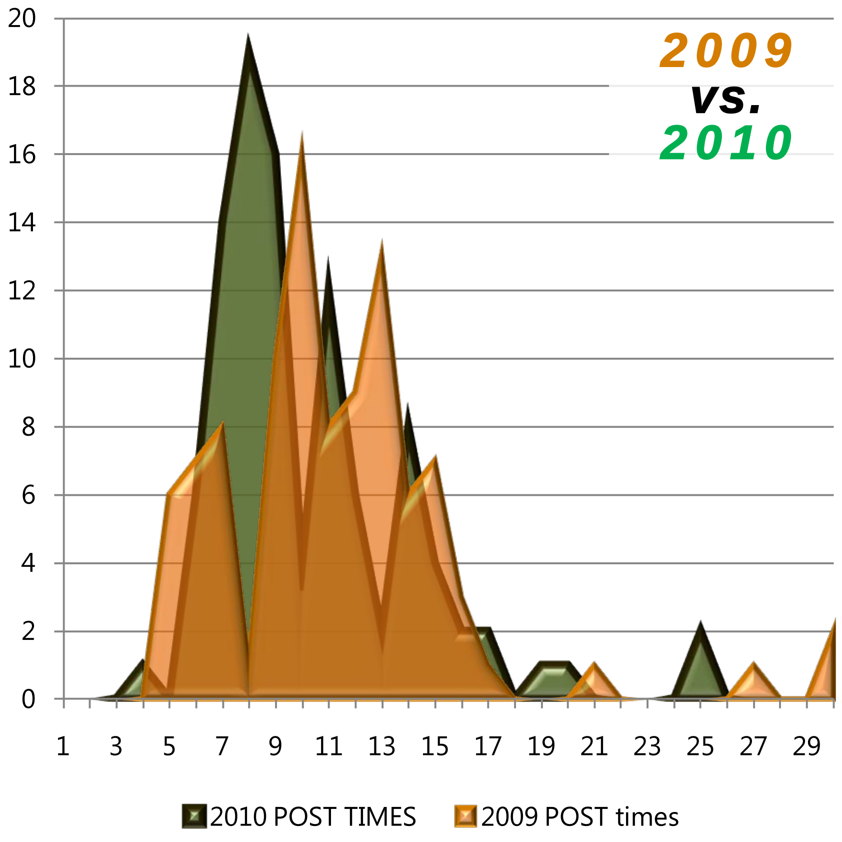


2009

“Source: Microsoft Windows OEM Engineering Services”

Why fast POST for Windows® 7: Update

- Fast POST is becoming mainstream for Windows 7 machines
  - Median POST time 3 sec faster than Windows Vista (11 sec → 8 sec)
- But some very slow POST still remain



“Source: Microsoft Windows Ecosystem Engineering”

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Other Windows® 7 Considerations

- Baseline to prevent regressions
  - Use Velocity Tools or Windows Logo Kit to baseline firmware times during power transitions
  - Especially important if you did not have aggressive targets for Windows® Vista®
  - Verify that you do not have dependencies on undocumented Windows behavior
    - Example: restoring MTRRs for each CPU after S3 resume
      - Adds ~400 milliseconds
      - Also impacts time to synchronize the processor TSCs (new for Windows® 7)

Other Windows® 7 Considerations

- Keep BIOS CSM compatibility layer small
  - Windows 7 does not require Int13 support for storage
    - Use UEFI interface instead
  - Int10 still required
  - Usually possible to initialize the video BIOS without the CSM
    - Int10 still required, but not during POST
    - The video BIOS must be in the C0000 segment and a real-mode IDT at physical address 0x0

Other Windows® 7 Considerations

- 64-bit OS & 4 GB
  - 4 GB RAM machines became common in Windows Vista® SP1 timeframe
  - 64-bit OS required to support 4 GB RAM
  - Verify that there are no issues accessing 64-bit ISOs from CD-ROM or DVD
- Solid State Drive (SSD) compatibility
  - SSDs now becoming popular for both high-end and low-end machines with Windows 7
  - Verify that there are no race conditions or other compatibility problems
  - Verify both boot and hibernate use cases

Other Windows® 7 Considerations

- ACPI runtime firmware accessing memory from an AcpiReclaimMemory memory region
  - ACPI defines AcpiReclaimMemory as memory that can be reclaimed by OS after it copies memory out of it
    - Typically used by the platform for ACPI tables
  - Windows 7 does not currently reclaim this memory and does not currently verify that ACPI firmware does not attempt to access this memory

Other Windows® 7 Considerations

- Wrong device paths in EDD
  - Legacy BIOS provides a mechanism to know the physical path to a HDD
    - e.g., PCI Express* Bus/Device/Function, IDE controller, master
  - Windows 7 does not depend on this behavior
    - majority of Legacy BIOS implementations populated this information incorrectly.

Summary

- Since Windows® 7 boot times are much faster, Faster firmware POST times are required
- Faster POST improvements are achieved by Selecting the best performing hardware and reducing the POST time features
- Beware of other Windows 7 considerations
- UEFI by design can help improve on boot time performance

Next Steps

- Work with your BIOS teams to push for POST improvements
- Specify POST times to your ODMs
- Specify minimum hardware performance standards to your ODMs
- Make use of the latest UEFI and PI Specifications to help your design make improvements in boot times
- Download the Microsoft White paper: http://www.microsoft.com/whdc/system/platform/firmware/FirmwareEnhance_Win7.mspx.

Microsoft

Additional resources on UEFI:

- Other UEFI Sessions – Next slide
- More web based info:
  - Specifications and Implementation sites: www.tianocore.org, www.uefi.org, www.intel.com/technology/efi
  - Link to Microsoft UEFI Support and Requirements: http://www.microsoft.com/whdc/system/platform/firmware/uefireg.mspx
- Technical book from Intel Press: "Beyond BIOS: Implementing the Unified Extensible Firmware Interface with Intel's Framework" www.intel.com/intelpress
- UEFI Plugfest Event at Intel in Dupont Washington, June 22-25, 2010 www.uefi.org or email: laurie.jarlstrom@intel.com

IDF 2010 UEFI Spring Sessions April 14

EFI#	Company	Description	Time	RM
S001 ✓	Intel, IBM, HP	Using the Latest EFI Development Kit (EDK II) for UEFI Advanced Development and Innovation	11:10	302AB
S002 ✓	Intel, HP, Byosoft	Notebook Advancements for Unified Extensible Firmware Interface (UEFI) for Pre-boot Productivity	13:00	302AB
S003 ✓	Intel, Byosoft	Unified Extensible Firmware Interface (UEFI): Best Platform Security Practices	14:00	302AB
S004 ✓	Intel, Microsoft, Insyde	UEFI Fast Boot for Microsoft* Windows* 7 : Fast Boot Without Compromising your BIOS	15:00	302AB
S005	Intel, Inspur, Insyde	UEFI Firmware Solutions for Enterprise Servers: A Case Study in 8-way Processor Support	16:00	302AB

✓ **DONE**

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