Firmware Implementation Techniques to Achieve Windows® 8 Fast Boot

UEFI Summer Summit – July 16-20, 2012
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Insyde Software
Agenda

• Introduction and Goals
• Cost of Early USB Enumeration
• Firmware Menu Entry Solution
• What if a Keyboard is Needed?
• Other Elements
• Q & A
Introduction and Goals
What Were Our Goals?

• Faster Boot – better turn-on experience
• Streamline boot of installed OS from disk
• Allow other boot targets when needed
• Allow user access to firmware menus when needed
Firmware/OS Cooperation

• Example of system improvement only possible due to cooperation facilitated by UEFI
  – Available to all firmware vendors
  – Available to all OS vendors
  – Available in Win 8 public Beta
  – Full function in Insyde current versions
Cost of Early USB Enumeration
Impact of USB Enumeration on Firmware Boot Times

• When the Firmware enumerates the USB bus and searches for keyboard system time-to-boot is increased
• USB bus has certain architected delays
• If multiple devices are attached, the total delay increases
Firmware Portion of System Boot from Shutdown (SSD Disk)
Skipping USB Enumeration

• Skipping USB enumeration pays immediate benefits in faster boot
Firmware Boot Time when skipping USB Enumeration
Improvement when Skipping USB Enumeration
Boot Time Penalty for Connected USB Devices
Firmware Menu Entry Solution
How to Reach Firmware Menus?

• Skipping USB enumeration removes USB keyboard as tool for user interrupting boot to go to firmware menus

• NOTE – PS/2 style keyboard on NB embedded controller is still available
  – But boot speed is so fast it may be hard for user to hit correct key quickly enough!
New OsIndications Variables

• User can use OS menus to signal need for firmware menu
• OS signals to firmware via new variables
  – Added UEFI Spec Update 2.3.1C
# New UEFI Variables for F/W <-> OS Signaling

<table>
<thead>
<tr>
<th>New UEFI Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OsIndicationsSupported</td>
<td>Allows the firmware to indicate supported features and actions to the OS.</td>
</tr>
<tr>
<td>OsIndications</td>
<td>Allows the OS to request the firmware to enable certain features and to take certain actions.</td>
</tr>
<tr>
<td><strong>Defined Indicator Bit</strong></td>
<td></td>
</tr>
<tr>
<td>EFI_OS_INDICATIONS_BOOT_TO_FW_UI</td>
<td>0x0000000000000001</td>
</tr>
</tbody>
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Windows® 8 Menu Navigation to Request Firmware On Reboot

Settings | Change PC Settings |
General | Advanced Startup [Restart] |
Troubleshoot | Advanced Options |
UEFI Firmware Settings | [Restart]
What if a Keyboard is Needed by OS Bootloader?
Scenarios that Require Firmware Keyboard Initialization

1. Bootloader needs keyboard
2. Non-Standard Boot Target
3. Default Boot Fails
Bootloader Requests Keyboard Wakeup

• Example Scenarios:
  – Bitlocker Pin
  – GRUB or other Bootloader Options

• When OS bootloader performs first EFI_SIMPLE_TEXT_INPUT_EX_PROTOCOL. `ReadKeyStrokeEx()` the deferred USB Enumeration is performed
Win 8 Menu for Alt. Device Boot

• Windows® 8 provides BootNext select

Settings | Change PC Settings
General | Advanced Startup [Restart]
Troubleshoot |
Use A Device | [Boot-Device]
Automatic Enumeration

• USB is enumerated if primary boot target (BootNext or top of BootOrder) is not hard disk
  – Example – USB boot is top of BootOrder list

• USB is enumerated if primary boot target fails to boot
  – Facilitate recovery scenarios
Opt-in or Opt-out

• Skipping USB Enumeration allows faster boot
  – But will it confuse users?
• OEM has decision
  – Should new behavior be Factory Default?

Consider:
1. System Type
2. OS Vendor Recommendations
Streamlined Boot Priority

• This technology is built on earlier improvements including:
  – Skip media checks for removable media
  – Pre-set OS boot variables are always top priority

• Streamlined procedure departs from Legacy BIOS tradition
Questions and Answers
Thanks for attending the UEFI Summer Summit 2012

For more information on the Unified EFI Forum and UEFI Specifications, visit http://www.uefi.org

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