USB 2.0
and Windows XP

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Overview

- Introduction
- Microsoft and USB Support
- Status of USB 2.0
- Future Projects
- Action Items and Summary
The World Is Changing

USB support reaches new height with Windows XP
  – Great USB 1.1 functionality
  – Windows Update makes USB 2.0 a reality

USB 2.0 enables numerous scenarios previously unimaginable

USB 2.0 has received numerous industry awards.
  USB 2.0 Hardware support progressing well
    – Multiple EHCI controllers already in market
    – Over 100 peripheral devices available today
    – Multiple Microsoft Operating Systems support USB 2.0
USB2: The Trilogy

- USB EHCI Controller
- Microsoft’s EHCI Miniport driver
- “Hi-Speed” USB 2.0 Device

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USB2: New Scenarios

Build on existing scenarios
- USB Hard Drives
- CD-RWs!!
- Networking Solutions
- Conference Cameras

New Scenarios
- Docking Solutions
- Debugging

Innovate /Consolidate ports
- PS/2 (2)
- Serial (2)
- Game
- Parallel

Storage Performance ...

<table>
<thead>
<tr>
<th>Connection</th>
<th>Read (MB/s)</th>
<th>Write (MB/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB 2.0</td>
<td>28.0</td>
<td>17.6</td>
</tr>
<tr>
<td>USB 1.1</td>
<td>0.92</td>
<td>0.86</td>
</tr>
<tr>
<td>IDE</td>
<td>29.3</td>
<td>19.1</td>
</tr>
</tbody>
</table>

Average values measured with HD Tach 2.61, 75 GB IBM DTLA-307075 drive, 1.7 Ghz Pentium® 4 processor, 128 MB RAM, Windows XP Professional
USB2: Release Mechanisms

For OEMs
- USB 2.0 software support can be installed via OPK
- Future service packs contain support
  - Windows 2000: SP4 is scheduled to support USB 2.0
  - Windows XP: SP1 supports USB 2.0

For End Users
- USB 2.0 drivers available on Windows Update today
- Keep an eye on future service packs

For IHVs
- Point customers to Windows Update
Windows XP USB Changes

- Host Controller Drivers
  - UHCD.SYS & OPENHCL.SYS: Gone
  - New port/miniport architecture
    - UHCI, OHCI & EHCI
- USB 2.0 support available
- USB DDI unchanged
- New and greatly improved DDK documentation and samples
Windows XP and USB Power Management

- Selective Suspend supported in XP
  - Over 10% improvement in battery life
  - Initially supported on the following:
    - Host Controller
    - Hub (including Root Hub)
    - HID Drivers (Specific Devices)
    - ...more in the future
  - Cooperation with client drivers is essential for SS to succeed

- Future OS releases will provide more class drivers with Selective Suspend enabled by default
## Evolution of USB in Windows

<table>
<thead>
<tr>
<th>Feature</th>
<th>Windows 98</th>
<th>Windows Me</th>
<th>Windows XP</th>
<th>Windows Vista</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio Class</td>
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<td>Class</td>
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<tr>
<td>HID Class</td>
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<tr>
<td>RNDIS Class</td>
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<tr>
<td>Storage Class</td>
<td>-</td>
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<tr>
<td>Printing Class</td>
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<td>Scanning Class</td>
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<td>Video Conf IHV</td>
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<td>Content Protection</td>
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<tr>
<td>64-bit support YES</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>YES</td>
</tr>
</tbody>
</table>
Windows Ongoing Projects

- Windows .NET Server
  - RC1 coming out shortly
  - 64-Bit and 32-Bit Versions
  - Server/Advanced Server/Data Center
  - Contain USB 2.0 (test with RC1 when released)

- Windows XP - SP1
  - Will contain USB 2.0
  - BETAs available soon to Windows Beta Testers

- Windows XP Embedded

- Windows CE
Windows CE and USB History

- **WinCE 1.0**
  - USB Host Stack
  - OHCI driver
  - USB Mouse driver

- **WinCE 2.0**
  - USB Host Stack
  - OHCI driver
  - USB Mouse driver

- **WinCE 2.11**
  - USB Host Stack
  - OHCI driver

- **WinCE 2.12**
  - USB Host Stack
  - OHCI driver
  - HID class

- **WinCE 3.0 (Pocket PC)**
  - USB Host Stack
  - OHCI driver
  - HID class
  - UHCI driver
  - USB Function

- **WinCE 4.0**
  - USB Host Stack
  - OHCI driver
  - HID class
  - UHCI driver
  - USB Function

Timeline:
- Aug-96
- Dec-96
- Apr-97
- Aug-97
- Dec-97
- Apr-98
- Aug-98
- Dec-98
- Apr-99
- Aug-99
- Dec-99
- Apr-00
- Aug-00
- Dec-00
- Apr-01
- Aug-01
- Dec-01

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USB Support in Windows CE .net

- Windows CE .net = Windows CE 4.0 = “Talisker”
- Many new USB drivers added to the Windows CE .NET release
  - USB mass storage class driver
  - USB printer class driver
  - USB rNDIS driver for USB ethernet adapters
  - USB Function drivers (Netchip NET2890 based)
- All drivers ship with source code
HCT 10 vs. HCT 11

- Device and host controller tests for USB 2.0 available today (HCT 10 + QFE 4 and onwards)
- HCT 11 adds much more testing support:
  - Hub TT tests added
  - Latest USB-IF Compliance Test Tools rolled in
  - USBCV replaces USBCheck
  - Latest driver verifier and INF checking enabled
- Start beta testing HCT 11.
  HCT 11 – Release Candidate coming soon!!!
- Start monitoring Online Crash Analysis (OCA) database and fix driver bugs
Evaluating Support For Following USB Projects

announcing...
Disclaimer

Planning efforts for future OS releases are not yet complete. The information that follows should not be construed as a commitment to development or as a feature list. This advance information is intended to represent current thinking on future directions. Plans are subject to and likely to change
Smart Card Readers
Class Driver

- Planned support for USB CCID compliant smartcard readers on Windows 2000 and Windows XP
- CCID specification (V1.0) available since April 2001. CCID hardware is finally under development
- Smartcard readers can be external or embedded in PC
- Proposed future OS Logo requirements will mandate that USB CCID readers be compatible with usbccid.sys
- Detailed whitepaper and beta drivers are available (see Action Items slide)
Generic USB Driver

- Control USB device from USER mode. Microsoft provides the kernel driver

- Advantages:
  - Reduces IHV’s software development time
  - Reduces risk of BSOD

- Disadvantages:
  - This model is not suitable for all devices. Scenarios that can’t use this approach include:
    - Isoc devices
    - Devices that need to install a kernel stack – e.g., usb to serial dongle
  - Possible latencies in processing data
  - This model will not be available on Windows 9x
Debugging Over USB 2.0

Great solution for:
- Low cost, legacy reduced machines
- Sub-notebooks and PCs without 1394 or serial ports

Features needed to support USB2 debugging
- Needs special cable to connect both PCs
- Cable must be connected to specific port on target machine
- Software support current under investigation at Microsoft

Implementation details are provided in:
- EHCI Specification (optional Appendix C of V1.0)
- USB 2.0 Specification (Chapter 9 Extensions)
- USB2 Debug Device – A Functional Device Specification (V0.7)

Review “USB 2.0 Debug Port” Presentation for technical details
Action Items

- Review the USB CCID Whitepaper on

- Latest news on USB and USB 2.0 is available on

- Review Windows Logo Requirements for Windows XP and future operating systems at

- Review latest Windows Hardware Quality Labs website at
  [http://www.microsoft.com/hwtest/](http://www.microsoft.com/hwtest/) and test with
  HCT 10 + QFE 6.
Summary

- USB 2.0 drivers are available for Windows 2000 and Windows XP TODAY!!
- Windows Family provides great support for USB. Future operating systems will provide additional support.
- Updated HCT kits available for Windows XP on http://www.microsoft.com/hwtest/
- Windows USB team working on new features. Please provide your thoughts and prioritize these projects.
Backup Slides
USB 2.0 Vs. USB 1.1

**What changed**
- New descriptors added
- New Hi-Speed signaling
- New features in USB 2.0 hubs

**What didn’t change**
- Host/device model
- Basic protocol
- Software API interface
- Power distribution policies
- Cables and connectors
- Topology management
Windows XP: Core USB Stack

USB DDI: IRP-Based Interface

IRP-Based Interface

HCDI: Function-Based Interface