



Developers Conference 2007

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USB 3.0 Update

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Agenda

- USB 3.0 Promoter Group Announcement
- Market Overview
- USB 3.0 Architecture Overview
- Summary

USB 3.0 Promoter Group Announcement



INDUSTRY LEADERS DEVELOPING SUPERSPEED USB INTERCONNECT

Popular USB Computer Connection Technology Expands performance with Proposed USB 3.0 Specification

INTEL DEVELOPER FORUM, San Francisco, Sept. 18, 2007 – Intel Corporation and other industry leaders have formed the USB 3.0 Promoter Group to create a superspeed personal USB interconnect that can deliver over 10 times the speed of today's connection. The technology, also developed by HP, Microsoft Corporation, NEC Corporation, NXP Semiconductors and Texas Instruments Incorporated, will target fast sync-and-go transfer applications in the PC, consumer and mobile segments that are necessary as digital media become ubiquitous and file sizes increase up to and beyond 25 Gigabytes.

- Over 10x performance increase
- Fast Sync-N-Go
 - Minimizes User Wait-Time
 - Download 27 GB HD movie in 70 sec
- Optimized Power Efficiency
 - No device polling
 - Lower active & idle power requirements
- Backward compatible with USB 2.0





Background

- Hi-Speed USB (480 Mbps) is adequate for many products
- Emerging applications will benefit from higher performance
- Most other aspects of SuperSpeed USB will remain the same:
 - Backward compatibility with USB 2.0
 - Maintain the extensive device driver infrastructure
 - Preserve USB EoU usage expectations for users
- SuperSpeed USB will provide headroom for the next 5 years



Why Isn't USB 2.0 Fast Enough?

- USB 2.0 provides a maximum signaling rate of 480 Mbps
- Something faster is needed for large digital media files
- User wait time requirement is 1½ minutes to synchronize

	Song / Pic	256 Flash	USB Flash	SD-Movie	USB Flash	HD-Movie
	4 MB	256 MB	1 GB	6 GB	16 GB	25 GB
USB 1.0	5.3 sec	5.7 min	22 min	2.2 hr	5.9 hr	9.3 hr
USB 2.0	0.1 sec	8.5 sec	33 sec	3.3 min	8.9 min	13.9 min
USB 3.0	0.01 sec	0.8 sec	3.3 sec	20 sec	53.3 sec	70 sec

Products Requiring SuperSpeed USB

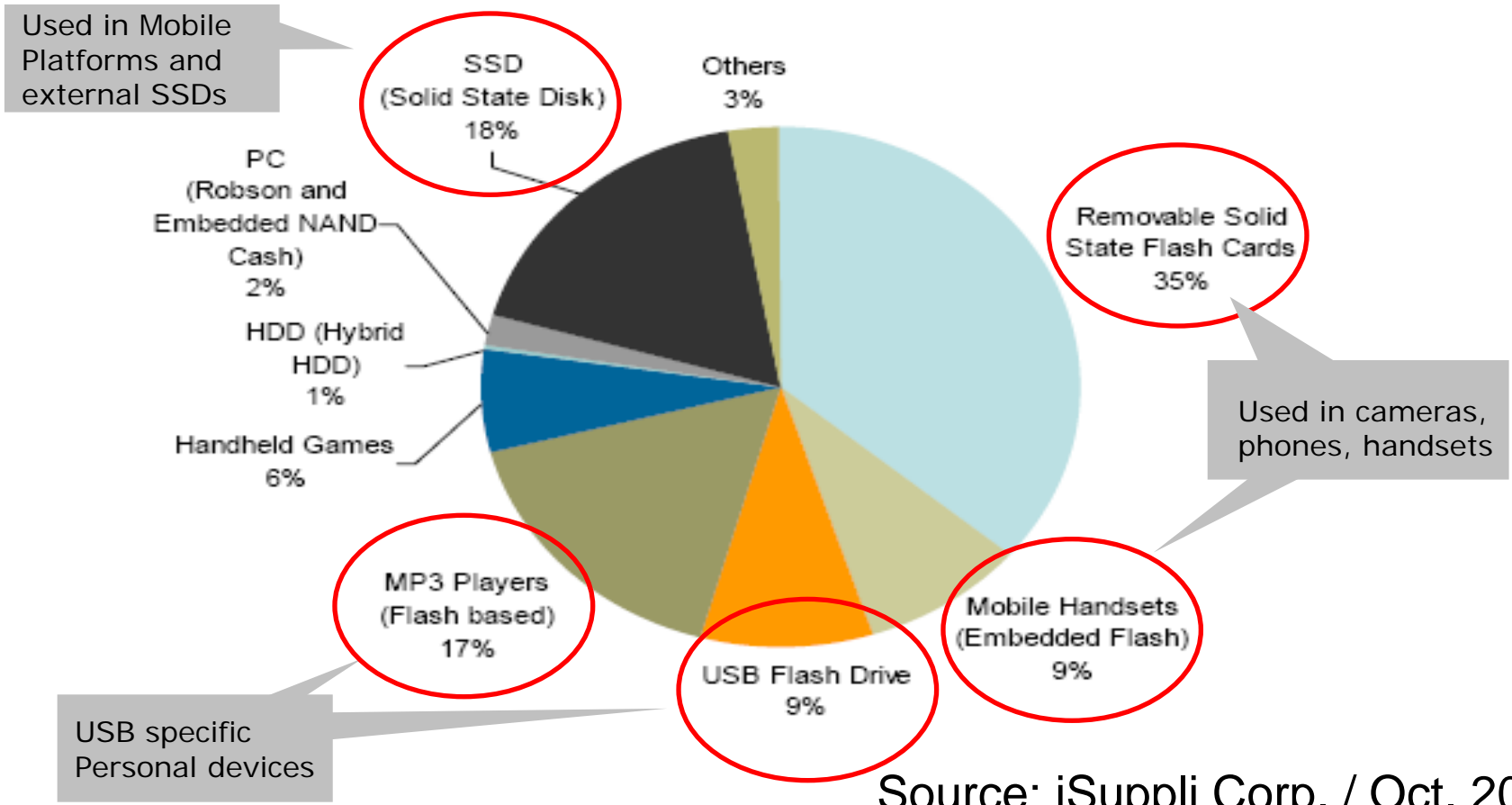


- Any Flash based peripheral is a candidate for higher data rates
 - Digital cameras and camcorders
 - Flash memory drives (USB thumb sticks, and cards)
 - Flash-based digital MP3 and video players
 - Mobile, Handheld PCs and smart phones (SSD's)
- Interface performance sets the requirement
 - Your connectivity is only as fast as your memory

SuperSpeed USB delivers bandwidth and headroom for Flash-based products



Products Requiring SuperSpeed USB

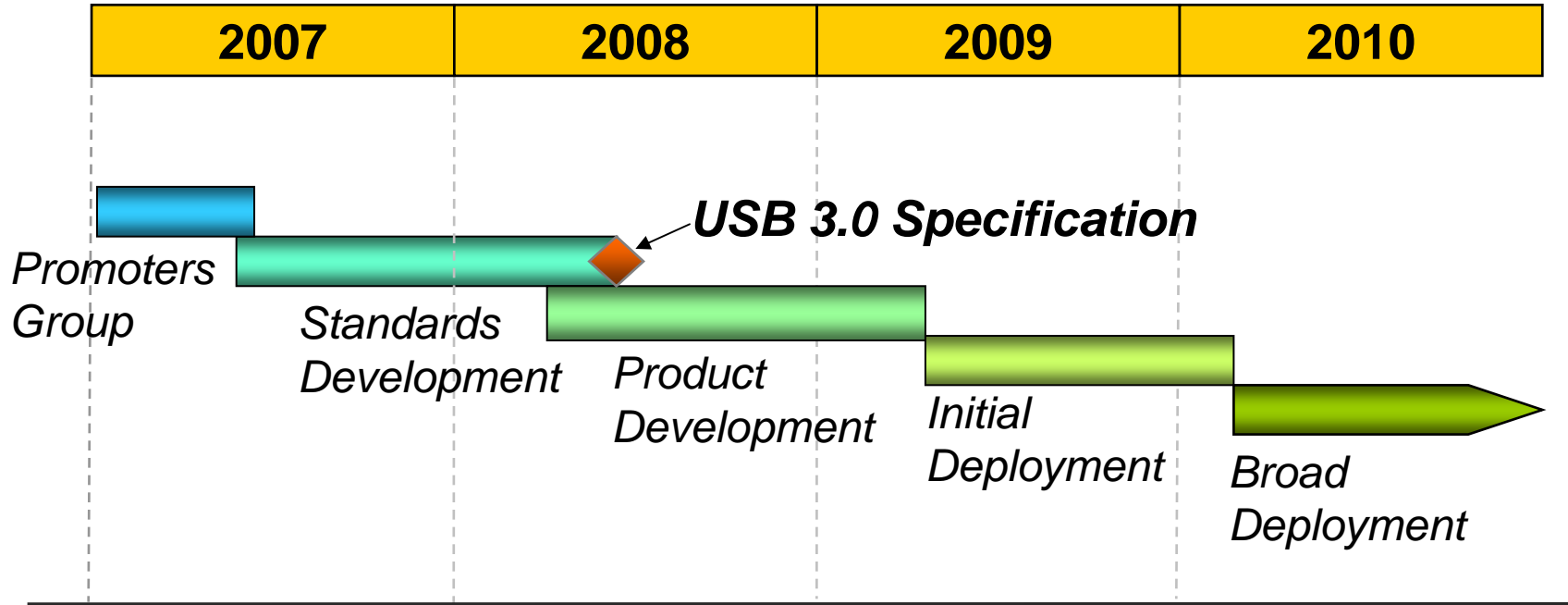


Source: iSuppli Corp. / Oct. 2006

Flash Application Demand 2010



Industry Timeline for SuperSpeed USB



Intel is leading the USB 3.0 Promoter Group to deliver the Next Generation SuperSpeed USB specification



Market Requirements Summary

- SuperSpeed USB – Over 10x performance increase
- Deliver excellent power efficiency for all platforms
- Connector & cable backward compatible with USB 2.0
- Same programming and device models as USB 2.0
- Support virtualization for devices



USB 3.0 Architecture Overview



Key Technical Benefits of USB 3.0

- USB 3.0 preserves USB Value and maintains backward compatibility with USB 2.0
- USB 3.0 delivers performance to meet application requirements for the next 5 years
- USB 3.0 protocol delivers the power & transfer efficiency required for all platforms, particularly with Mobile platforms

SuperSpeed USB delivers Performance & Power Efficiency

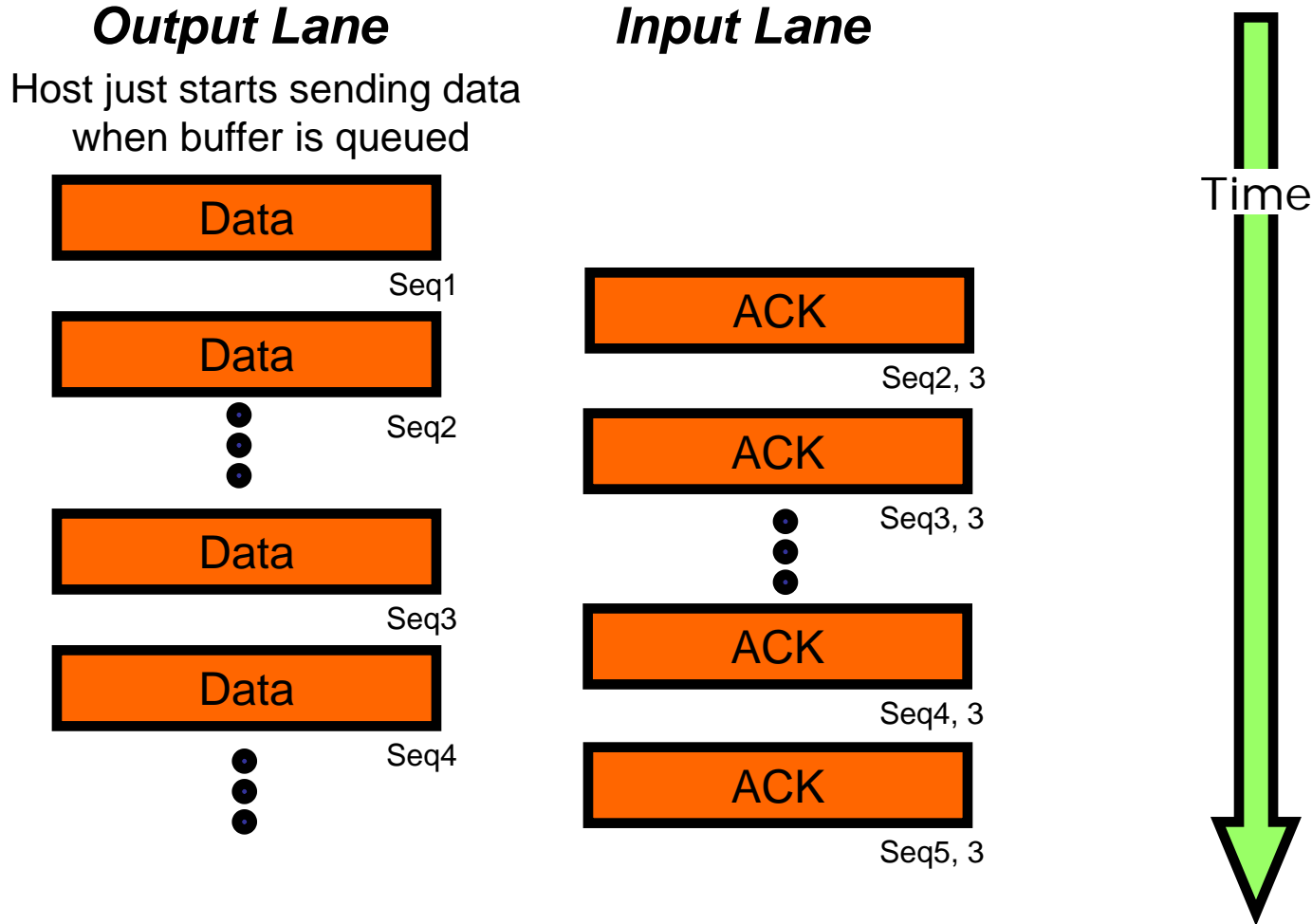


USB 3.0: Enhancements Over USB 2.0

- Link Layer
 - Dedicated IN and OUT lanes, not multiplexed
 - Aggressive power management; Links go to low power states when idle
- Protocol Layer
 - Host schedules all transactions
 - There is no polling in USB 3.0
 - Devices transmit only when they have data
 - Hosts transmit only when they have data
 - Unlimited bursting



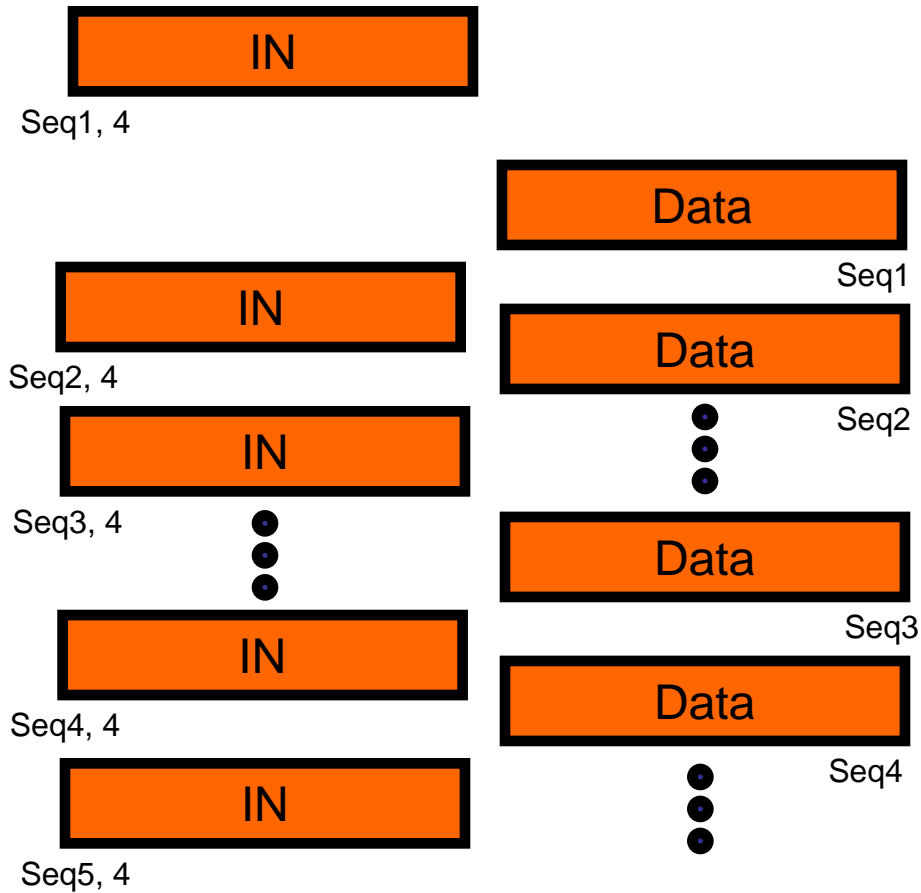
Basic OUT Transfer



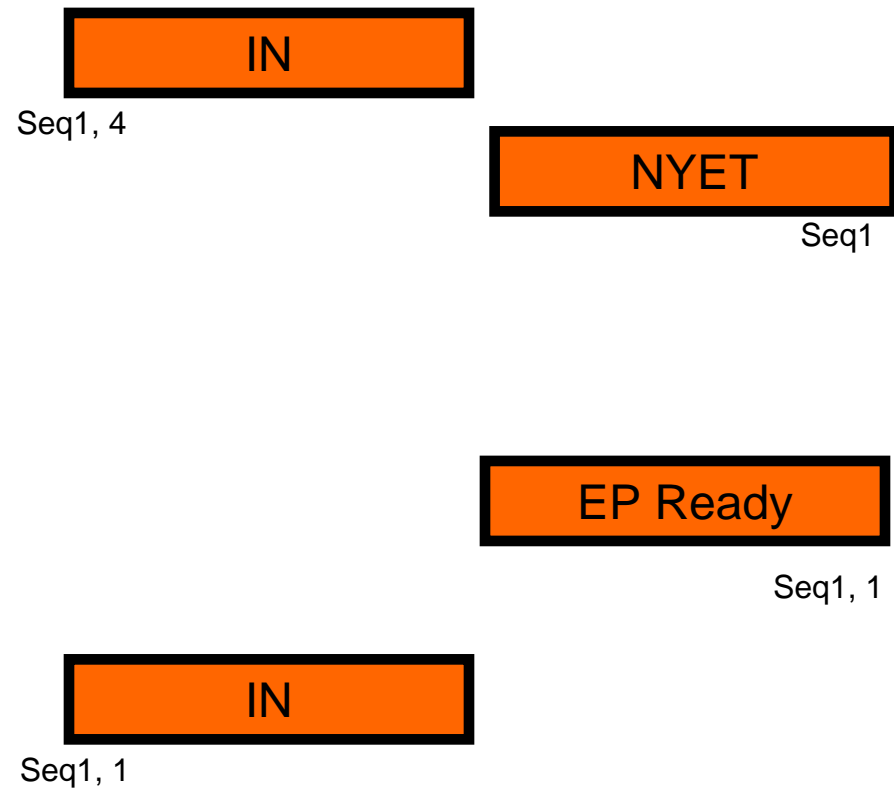


Basic IN Transfer

When host has a buffer to receive data



When no data is available



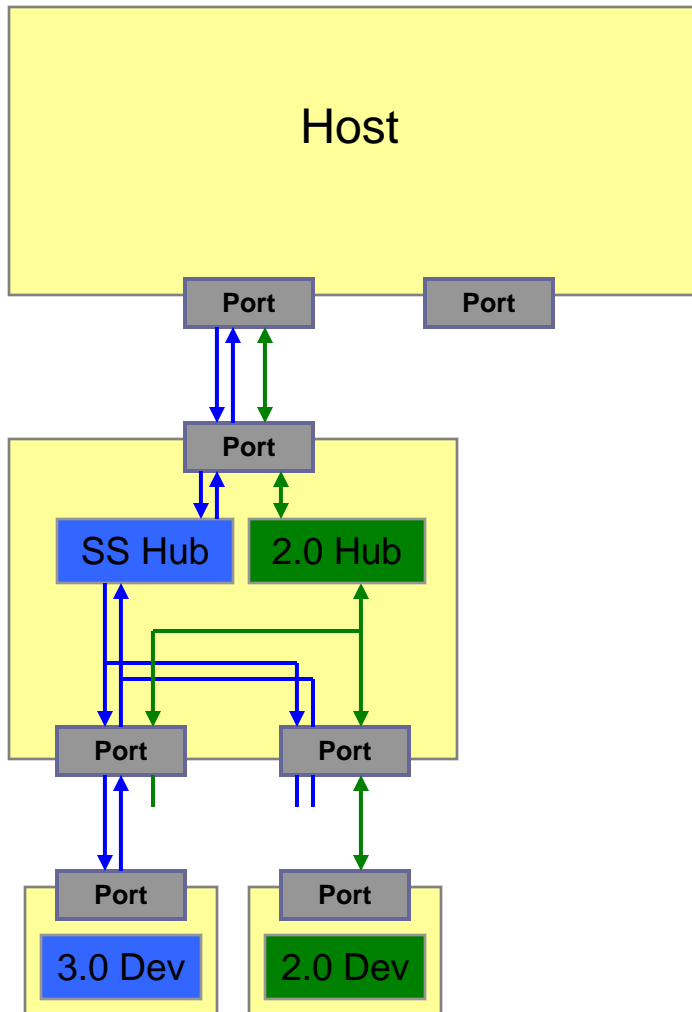


Flows

- A new concept to give more flexibility to devices
- An endpoint can have multiple flows, that are unique and handled separately by H/W
 - Very close to being just another endpoint
- Usage case: USB Mass Storage
 - Driver can make multiple requests, with each request being a separate flow
 - Drive prioritizes requests and returns data in appropriate flow
 - Host HW deposits data in appropriate buffer



Hubs



- Provide fan out for USB 3.0 connectivity
- Downstream ports support USB 2.0 devices
 - Embed a USB 2.0 hub
- USB 3.0 is not a broadcast bus
 - Uses RouteString field in the packet header to route packets
- Requires buffering



USB Device Virtualization

- USB device virtualization lets a VM interact directly with USB device with no SW intervention
 - Classic example is storage device that has a partition for each VM
- Host support for device virtualization
 - For devices that don't support virtualization natively



USB Storage Class

- Current USB Mass Storage averages about 32MB/s
- Need an effort to fix/extend/change Storage Class
 - MSC driver updated to improve protocol efficiency
 - Add support for command queuing
- Outside of scope of USB 3.0 spec development
 - Engage with DWG – Mass Storage Class
 - Do what it takes to make USB Storage deliver excellent performance

Call to Action!



- Look for announcement inviting Contributors to participate in USB 3.0 Spec development
- Benefits of becoming a USB 3.0 Contributor
 - Invited to USB 3.0 Industry Update Forums
 - Early access to Specification and Updates
 - Feedback mechanism to present contributions
- USB 3.0 Industry Update being planned for November in San Jose, CA (USA)
 - Two day overview of specification at version 0.75

Summary



- *SuperSpeed USB delivers bandwidth headroom for Flash based products*
- *Intel is leading the USB 3.0 Promoter Group to deliver the USB 3.0 specification*
- *USB 3.0 specification delivers Performance and Power Efficiency*

USB 3.0 specification completed 1H'08



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