



SuperSpeed USB Developers Conference

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Compliance & Interoperability

Rahman Ismail

Chair - USB-IF Compliance
Intel Corporation



Agenda

- Compliance Program Goals
- Compliance Process
- Test Categories
 - Framework Tests
 - Cable and Connector Tests
 - Electrical Tests
 - Host and Hub Tests
 - Compliance Devices
 - Interoperability
- Summary

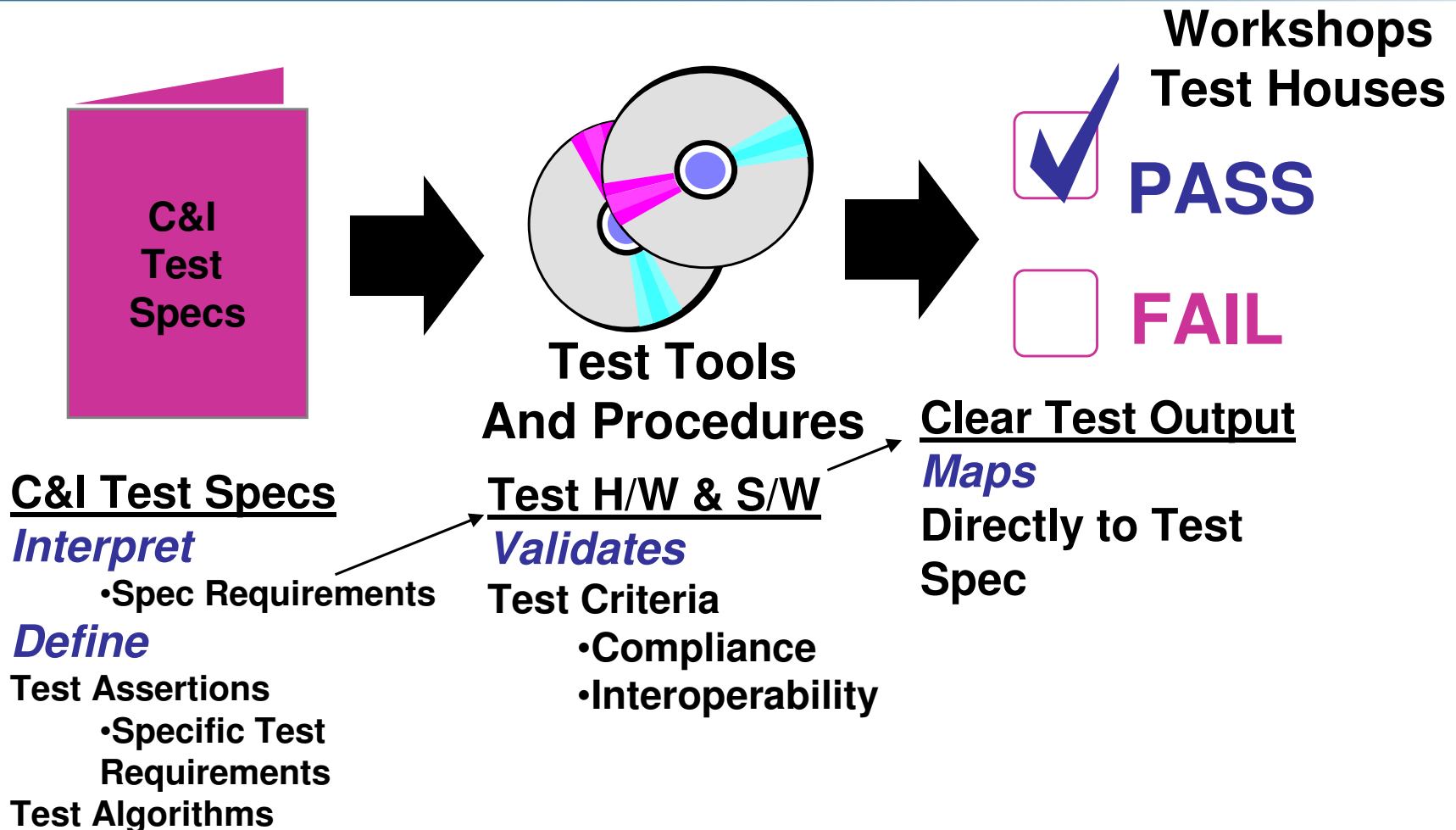


Compliance Program Goals

- High Quality Certified SuperSpeed USB Products
- Stable, Repeatable, Well Documented Tests
 - Documented Test Procedures
 - Documented Test Assertions and Descriptions
- Instantly Available Testing (Qualified Test Houses)
- Reuse USB 2.0 Compliance Program Infrastructure
 - Extend and Reuse USBCV
 - Reuse Existing Compliance Devices
 - Testing of USB 2.0 capabilities of Hosts and Hubs
 - Extend Compliance Device Infrastructure
 - Testing of USB 3.0 capabilities of Hosts and Hubs
 - Extend and Reuse Test Services Infrastructure
- Minimize Test Equipment Costs
 - Avoid Expensive Equipment As Possible
- End goal is to provide Full End Product Test Coverage at Workshops

Repeat Success Of USB 2.0 Compliance Program

Compliance Process



Predictable Path To Compliance
Same Model as USB 2.0 Compliance Program

SuperSpeed USB Logo



SUPERSPEED

CERTIFIED

USB

TM

Passing Compliance Enables Use Of Logo



Test Spec – Test Assertions

- Test assertions provide specific test requirements with spec references
- Simple set of ‘yes/no’ questions
- Test specs will be available on the USB-IF website

9.6.1#2	A device must report a value of 0300H in the <i>bcdUSB</i> field of its Device Descriptor	
9.6.1#5	A device must report a value of 09H in the <i>bMaxPacketSize0</i> field of its Device Descriptor	



Test Spec – Test Descriptions

- Test descriptions provide detailed descriptions of how test suites test specific test assertions
- EXAMPLE:
- Device Descriptor Test
 - Place device in desired starting state
 - Send a Control Transfer Request
 - bRequest set to GetDescriptor
 - wValue set to the Device Descriptor
 - wLength set to 12H
 - Verify Descriptor Type set to DEVICE Descriptor
 -
 -



Sample Test Output

InitializeTestSuite

```
INFO Microsoft Windows XP (Build 2600)
INFO Service Pack 2.0
INFO USBCommandVerifier.dll ver 1.3.3.0
INFO TestServices.dll ver 1.3.3.0
INFO StackSwitcher.dll ver 1.3.3.0
INFO Super Speed Device
```

BOSDescriptorTest_DeviceAddressed

Passed

```
INFO Now Starting Test:BOS Descriptor Test (Configuration Index 0)
INFO BOS descriptor bLength : 0x5
INFO BOS descriptor bDescriptorType : 0xf
INFO BOS descriptor bTotalLength : 0x25
INFO BOS descriptor bNumDeviceCaps : 0x2
INFO Descriptor Type : 0xf
INFO Number of Device Capability Descriptors found : 0x2
INFO This is a Super Speed device. Checking Super Speed Device Capability
INFO Checking BOS Super Speed Descriptor
INFO Device Supports 5Gbs
INFO Device Supports High Speed
INFO BOS Super Speed Capability Descriptor wSpeedsSupported reports High as lowest supported speed
INFO BOS Super Speed Capability Descriptor bFunctionality Support = High
INFO BOS Super Speed Capability Descriptor LTM Capable = 0
INFO BOS Super Speed Capability Descriptor bU1DevExitLat = 10
INFO BOS Super Speed Capability Descriptor wU2DevExitLat = 2047
INFO Checking BOS USB 2.0 Extension Descriptor
INFO LPM Capable = 1
INFO Stopping Test [ BOS Descriptor Test (Configuration Index 0):
  Number of: Fails (0); Aborts (0); Warnings (0) ]
```

Summary

```
INFO Summary Log Counts [ Fails (0); Aborts (0); Warnings (0) ]
```



SuperSpeed C & I Elements

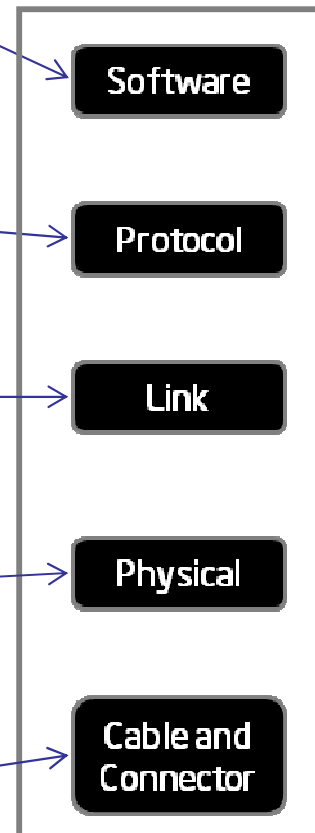
- Framework and Interoperability testing

- Protocol testing

- Link testing

- Electrical testing

- Cable and Connector testing





Test Categories

- SuperSpeed USB Device Tests
 - Link Level Tests
 - Electrical tests – including all USB 2.0 tests
 - USBCV – Device tests that can be performed with a standard host
 - UASP Test
 - Interoperability
- SuperSpeed USB Hubs
 - All Device tests
 - Hub descriptor tests – Tests of SuperSpeed specific descriptor features (part of USBCV)
 - Hub functional tests – Tests that use a SuperSpeed USB Compliance Test Device to exercise various protocol boundary conditions. Most tests will be silicon only
 - Interoperability



Test Categories

- SuperSpeed USB Hosts
 - Perform all Device and Hub tests (Using known good hubs and devices)
 - Host functional tests – Tests that use a Compliance Test Device to verify SuperSpeed USB specific functionality. Most tests will be silicon only
 - Electrical, Link and Interoperability
 - xHCI compliance tests
 - Verify operation with Compliance and Prototype test stack
 - USB 2.0 Compatibility Test Suite
- Compliance Devices
 - Link Test Device
 - USB 3.0 Compliance Test Device
 - USB 2.0 Compliance Test Devices



Test Coverage

- Compliance is not a replacement for validation
- Tests attempt to approximate variations that could occur across all hosts
 - Full coverage not possible with standard host
- For example - It is unlikely we will design a test to check that a device accepts all possible permutations of ACKs with varying NumP and Sequence numbers

Interop Lab



- Provides early debug and interop help
 - Access to tools, other products, and experts
- Available to early developers
 - By appointment
 - For multiple days, if needed
- Hosted at Intel in Oregon
 - <http://www.usb.org/developers/ssusb/testing>

Interop Lab

Learnings



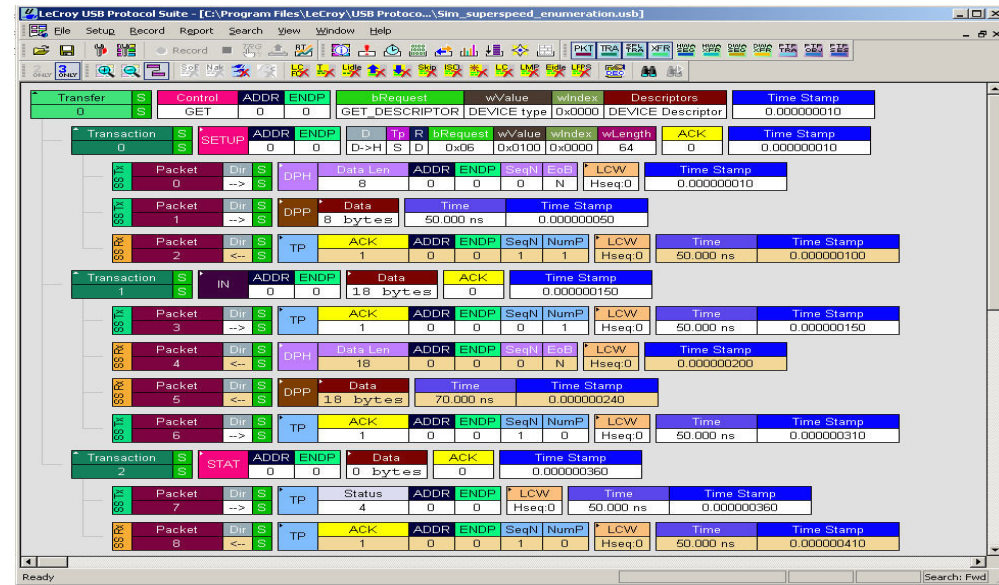
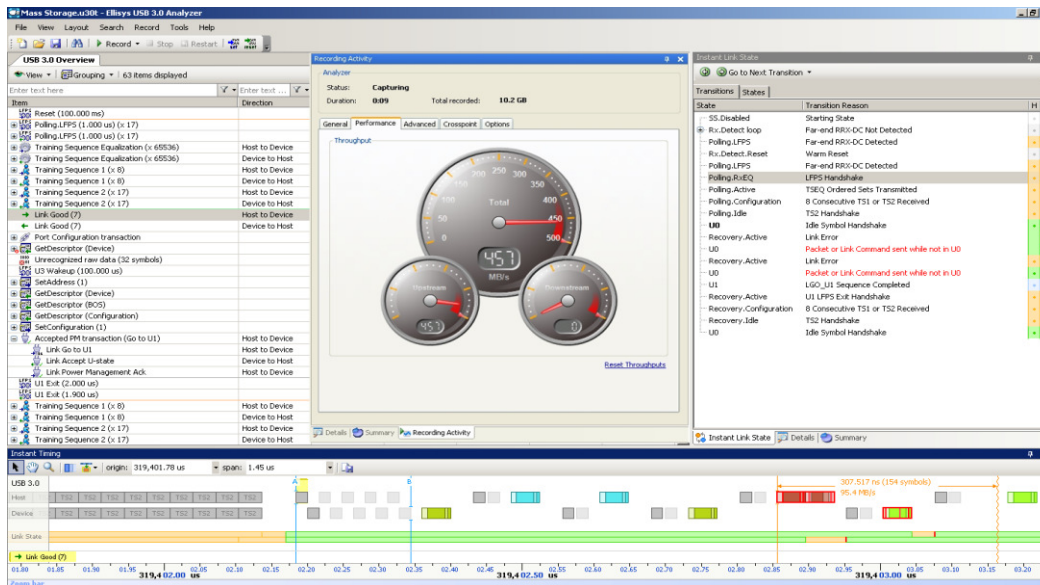
- Host Control transfer NRDY processing
- ITP handling
 - Always acknowledge the packet at the link level even if you don't use the packet
- Sending extra ERDYs
 - Devices shouldn't do this
 - Host should be able to handle it
- ERDY with NumP set to zero
- Buffer Credit Advertisement
- Host handling of EOB in short packets

Peripheral Developers Kit (PDK)



- Provides a host controller and SW solution to enable early peripheral development
 - PCIe add-in card
 - Prototype software stacks from Microsoft and Intel
 - Compliance software stack from Intel
- Will be available for purchase through the USB-IF e-Store
 - June/July 2009

Debugging Tools



- SuperSpeed USB protocol analyzers
 - Ellisys
 - LeCroy
- Physical layer analysis tools
 - Agilent
 - LeCroy
 - Tektronix



Summary and Call to Action

- SuperSpeed Compliance Program will follow USB 2.0 model
 - Trademarked Logo For Compliance
 - High level of testing with initial product rollout
 - Repeatable tests and procedures
- USB-IF will provide all required testing at USB-IF workshops
- Review test specs when available and provide feedback
 - Currently on track for end of Q2 2009
- Review Interoperability Procedures
 - Perform in your own lab