Universal Serial Bus Revision 3.1

SuperSpeed Hub LVS Test Specification

Revision 1.15

Date: November 21, 2019

Revision: 1.15

Scope of this Revision

This document is meant to test Compliance for USB 3.1 Hubs and Compound Devices with exposed DS ports.

All defined tests are required. Small changes in these tests should be anticipated for several months as test equipment may root out issues in implementation and test definitions.

Revision History

Revision	Issue Date	Comments
0.1	4/6/2010	Revision 0.1 release.
0.7	3/8/2011	
0.72	4/19/2011	
0.75	11/28/2012	Revision for cert testing without U1/U2 tests
0.76	12/6/2012	Updated Document
0.77	2/6/2013	Timing section and a few test definition updates
0.78	5/2/2013	Test section defines methodology for tiered hubs and compound devices.
0.79	6/6/2013	
0.79.1	8/1/2013	TD 10.115 edited for tiered hubs
0.79.2	9/11/2013	TD 10.102 edited for USB 3.1 update and TD 10.120 edited for tiered hubs
0.79.3	10/3/2013	Added licensing information
0.79.4	10/24/2013	TD 10.117 and TD 10.120 edited for errors
0.79.5	11/1/2013	Update TD 10.120, delete TD 10.121, update ADP definition
0.9	2/5/2014	TD 10.113,117,119,120,126,127 edited to allow for timing implementations and update to tiered hub support
	4/3/2014	Updates to TD 10.102,120,127,119,124
	4/11/2014	Updates to TD 10.118,126,127
	5/29/2014	Updates to TD 10.117,120
	12/3/2014	Updates to TD 10.119,127
1.0	3/27/2015	Updates to TD 10.115, 126. Tests rolled out to ITLs a while ago.
	5/27/2015	Updates to TD 10.126 – deferred packet
	6/2/2015	Updates to TD 10.119 for tiered hubs
1.1	1/12/2018	Updates to TD 10.103,4,8-11 for USB Type-C Disabled state. Updates to Timing section for tRxDetectToSSDisabledTimeout
1.15	11/21/2019	Updates to TD 10.110-111 if Vbus is not present in DSPORT.Powered-off-reset Update to TD 10.115 to clear all change bits in the path Update to TD 10.127 to clarify DFP link Ux Exit

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1   Hub Testing Requirements

3.0 Hubs must pass all of the following:

- Chapter 10 Super Speed Hub Tests

- SS Hub Loopback Tests

- 2.0 Hub Tests (HS)

- 2.0 Hub Tests (FS)

- Chapter 9 Framework Tests (SS)

- Chapter 9 Framework Tests (HS)

- Chapter 9 Framework Tests (FS)

- Interoperability Test

- Backwards Compatibility Test

- Electrical Tests

- Link Tests

2   Test Assertions

Unless otherwise noted, subsection references are to the USB3.0 Specification.

An exhaustive reference to Ch 10 asserts can be found in the SS Hub Compliance Test Spec (for CV).

This table was taken from the SSHUB Compliance Test Spec (CV). It does not incorporate ECN 10 an appears to be incomplete in some subsections. Updates are anticipated.

Assertion #	Assertion Description	Test #
Chapter 10 Test Assertions:		
Subsection reference: 10.3 Hub Downstream Facing Port		
Subsection reference: 10.3.1 Hub Downstream Facing Port State Descriptions		
Subsection reference: 10.3.1.1 DSPORT.Powered-off		
10.3.1.1#1	The hub downstream port shall transition to DSPORT.Powered-off state from any state when local power is lost to the port.	TD 10.129
10.3.1.1#2	The hub downstream port shall transition to DSPORT.Powered-off state from any state when V_{BUS} is removed from the hub upstream port and the hub supports power switching on the DS ports.	TD 10.101 TD 10.102

Assertion #	Assertion Description	Test #
10.3.1.1#3	The hub downstream port shall transition to DSPORT.Powered-off state from any state if the Hub upstream port link transitions to the SS. Disabled state and UFP VBUS is on.	TD 10.107 TD 10.106
10.3.1.1#4	The hub downstream port shall transition to DSPORT.Powered-off state from any state when the hubs UFP link has attempted eight consecutive Rx.Detect events without detecting far-end receiver terminations.	TD 10.106
10.3.1.1#5	If a hub was configured while the local power supply was present and then if local power is lost, the hub shall place all ports in the Powered-off state if UFP VBus is on and bMaxPower > 0.	TD 10.129
10.3.1.1#6	A port transitions to DSPORT.Powered-off state from the DSPORT.Powered-off-detect state if UFP VBUS is off, no power switching, receiver detection failed on DFP and repowering is not met.	ECR removes assert
10.3.1.1#7	A port transitions to DSPORT.Powered-off state from the DSPORT.Powered-off-reset state if UFP VBUS is off, no power switching, receiver detection failed on DFP, repowering is not met and DSPORT.Powered-off-reset state has been maintained for treset.	ECR removes assert
10.3.1.1#8	A port shall remain in the DSPORT.Powered-off state until the hub's upstream port link has detected far-end reeiver termnations and the hub is bus-powered or the local power source is on	TD 10.101, TD 10.102 BC
10.3.1.1#9	In the DSPORT.Powered-off state, the port's link is in the SS.Disabled state	BC
Subsection reference: 10.3.1.2 DSPORT.Disconnected (Waiting for SS Connect)		
10.3.1.2#1	A port transitions to DSPORT.Disconnected state from SS.Inactive, Rx.Detect.Active, U1, U2 or U3 states when the port detects a disconnect.	TD 10.106 Partial Coverage
10.3.1.2#2	A port transitions to DSPORT.Disconnected state from the DSPORT.Resetting state when a port's link times out from Rx.Detect during a reset.	TD 10.112
10.3.1.2#3	A port transitions to DSPORT.Disconnected state from the DSPORT.Disabled state when a SetPortFeature(PORT_LINK_STATE) Rx.Detext request is received for the port.	TD 10.113
10.3.1.2#4	A port transitions to DSPORT.Disconnected state from the DSPORT.Resetting state if the port's link times out from any Polling substate during a reset.	TD 10.112
10.3.1.2#5	A port transitions to DSPORT.Disconnected state from the DSPORT.Training state if the port's link times out from any Polling substate.	TD 10.112

Assertion #	Assertion Description	Test #
10.3.1.2#6	A port transitions to DSPORT.Disconnected state from the DSPORT.Loopback state if the port's link performs a successful LFPS handshake in Loopback.Exit.	Not Tested
10.3.1.2#7	A port transitions to DSPORT.Disconnected state from the DSPORT.Powered-off-reset state if the conditions for repowering are met and DSPORT.Powered-off-reset state has been maintained for treset.	TD 10.103 TD 10.104 TD 10.108 – 109
10.3.1.2#8	A port transitions to DSPORT.Disconnected state from the DSPORT.Powered-off-detect state if the conditions for repowering are met.	TD 10.103 TD 10.104 TD 10.108 – 109
10.3.1.2#9	A port transitions to DSPORT.Disconnected state from the DSPORT.Powered-off or DSPORT.Disabled- state if the UFP receives a reset. The DFP shall issue a warm reset on the link if a far-end receiver is detected.	TD 10.108 TD 10.109
10.3.1.2#10	In DSPORT.Disconnected state, the port's link shall still perform connection detection normally from the Rx.Detect state if the hub upstream port's link is in U3.	TD 10.115
10.3.1.2#11	In the DSPORT.Disconnected state, the port's link shall be in the Rx.Detect state.	Implicit
Subsection reference: 10.3.1.3 DSPORT.Training		
10.3.1.3#1	In DSPORT.Training state, the port's link shall be in the Polling state.	Untestable / Implicit
Subsection reference: 10.3.1.4 DSPORT.Error		
10.3.1.4#1	A port shall transition to DSPORT.Error state only when a SuperSpeed capable device is present and a serious error condition occurred while attempting to operate the link.	Untestable
10.3.1.4#2	A port shall transition to DSPORT.Error state from the DSPORT.Enabled state if the link enters recovery and times out without recovering	Implicit Checked by Link State in TDs 10.108 – 10.111
10.3.1.4#3	A port shall transition to DSPORT.Error state from the DSPORT.Resetting state if U1 or U2 exit fails.	Implicit / Not Tested
10.3.1.4#4	A port shall transition to DSPORT.Error state from the DSPORT.Loopback state if the port is the loopback master and the LFPS handshake in Loopback.Exit fails.	Implicit / Not Tested
10.3.1.4#5	A port shall transition to DSPORT.Error state from DSPORT.Enabled if Port Configuration fails as described in Section 8.4.5.	Link Test TD 7.17
Subsection reference: 10.3.1.5 DSPORT.Enabled		
10.3.1.5#1	Port shall transition to DSPORT.Enabled state from the Training state when the port's link successfully enters U0.	Implicit
10.3.1.5#2	Port shall transition to DSPORT.Enabled state from the DSPORT.Resetting state when a reset completes successfully.	TDs 10.108 – 10.111

Assertion #	Assertion Description	Test #
10.3.1.5#3	A port in the DSPORT.Enabled state will propagate packets in both the upstream and the downstream direction.	BC
10.3.1.5#4	When the hub downstream port first transitions to the DSPORT.Enabled state after a power on or warm reset, it shall transmit a port configuration LMP as defined in Section 8.4.5.	BC
10.3.1.5#5	If the hub UFP is in U3 when the DFP enters DSPORT.Enabled and the hub is not enabled for remote wakeup, the DFP shall initiate a transition to U3 on its link within tDSPortEnabledToU3	TD 10.115
Subsection reference: 10.3.1.6 DSPORT.Resetting		
10.3.1.6#1	A downstream port shall transition to the DSPORT.Resetting state when the DFP receives SetPortFeature(PORT_RESET) unless the port is in the DSPORT.Powered-off, DSPORT.Powered-off-reset, DSPORT.powered-off-detect, or DSPORT.Disconnected state.	TD 10.110
10.3.1.6#2	A downstream port shall transition to the DSPORT.Resetting state when the DFP receives SetPortFeature(BH_PORT_RESET) unless the port is in the DSPORT.Powered-off, DSPORT.Powered-off-reset, DSPORT.powered-off-detect, or DSPORT.Disconnected state.	TD 10.111
10.3.1.6#3	IIf the downstream port is in the DSPORT.Powered-off, or DSPORT.Disconnected state and receives a SetPortFeature reset request, the request is ignored.	Powered-off Not Tested TD 10.110 TD 10.111
10.3.1.6#4	A downstream port shall transition to the DSPORT.Resetting if the port state is DSPORT.Enabled and the port's link is in any state other than U3 when a SetPortFeature(PORT_RESET) request is received. The port shall initiate a hot reset on the link.	TD 10.110
10.3.1.6#5	A downstream port shall transition to the DSPORT.Resetting if the port state is DSPORT.Enabled and the port's link is in any state, if the port receives a SetPortFeature(BH_PORT_RESET) request. The port shall initiate a warm reset on the link.	TD 10.111
10.3.1.6#6	If the port initiates a hot reset on the link and the hot reset TS1/TS2 handshake fails, a warm reset is automatically tried	Link Test TD 7.31
10.3.1.6#7	When the downstream port link enters Rx.Detect.Active during a warm reset, the hub shall start a timer to count the time it is in Rx.Detect.Active or Rx.Detect.Quiet. If this timer exceeds tTimeForResetError while the link remains in Rx.Detect, the port shall transition to the DSPORT.Disconnected state.	TD 10.112
10.3.1.6#8	A downstream port shall transition to the DSPORT.Resetting state when the UFP receives a hot reset unless the port is in the DSPORT.Powered-off, DSPORT.Powered-off-reset, DSPORT.powered-off-detect, DSPORT.Disabled or DSPORT.Disconnected state. The port shall transition before the UFP link reaches U0.	TD 10.108
10.3.1.6#9	A downstream port shall transition to the DSPORT.Resetting state when the UFP receives a warm reset unless the port is in the DSPORT.Powered-off, DSPORT.Powered-off-reset, DSPORT.powered-off-detect, DSPORT.Disabled, or DSPORT.Disconnected state. The port shall initiate a warm reset on the link before the UFP link reaches U0.	TD 10.109

Assertion #	Assertion Description	Test #
10.3.1.6#10	A downstream port shall not transition into the DSPORT.Powered-off state when the UFP receives a hot or warm reset when the port is in the DSPORT.Powered-off, DSPORT.Powered-off-reset, DSPORT.powered-off-detect, DSPORT.Disabled or DSPORT.Disconnected state.	TDs 10.108-109 Assert subject to removal – covered in 10.3.1.2
10.3.1.6#11	A downstream port shall transition to the DSPORT.Disconnected state when the UFP receives a hot or warm reset when the port is in the DSPORT.Powered-off, DSPORT.Powered-off-reset, DSPORT.powered-off-detect, DSPORT.Disabled or DSPORT.Disconnected state.	TDs 10.108-109 Assert subject to removal – covered in 10.3.1.2
10.3.1.6#12	A downstream port shall transition to the DSPORT.Resetting state if the port state is DSPORT.Enabled and the port's link is in U3 when a SetPortFeature(PORT_RESET) request is received. The port shall initiate a warm reset on the link.	TDs 10.108.109 Assert subject to removal
10.3.1.6#13	If a DS port transitioned to DSPORT.Resetting due to an UFP Hot Reset, and the DS port was initially in DSPORT.Training with port link at or before Polling.Active, or DSPORT.Enabled with PLS not in U3, the DS port initiates a Hot Reset on the link.	TDs 10.108-109 Assert subject to removal
10.3.1.6#14	If a DS port transitioned to DSPORT.Resetting due to an UFP Hot Reset, and the DS port was initially in DSPORT.Training or DSPORT.Enabled with PLS in U3, or any other DSPORT state excluding DSPORT.Powered-off, DSPORT.Powered-off-reset, DSPORT.powered-off-detect, DSPORT.Disabled or DSPORT.Disconnected, then the DS port initiates a Warm Reset on the link.	TDs 10.108-109 Assert subject to removal
10.3.1.6#15	If a DS port transitioned to DSPORT.Resetting due to a SetPortFeature(PORT_RESET), and the port did not transition from DSPORT.Enabled, the port shall initiate a Warm Reset on the link.	Untestable Assert subject to removal
Subsection reference: 10.3.1.7 DSPORT.Compliance		
10.3.1.7#1	A downstream port transitions to DSPORT.Compliance state when the link enters the Compliance Mode state.	Untestable / Implicit
Subsection reference: 10.3.1.8 DSPORT.Loopback		
10.3.1.8#1	A downstream port transitions to DSPORT.Loopback state from the DSPORT.Training state if the loopback bit is set in the received TS2 ordered sets.	Not Tested
10.3.1.8#2	In DSPORT.Loopback state, the port's link shall be in the Loopback state.	Implicit
Subsection reference: 10.3.1.9 DSPORT.Disabled		
10.3.1.9#1	A downstream port shall transition to DSPORT.Disabled state when the port receives a SetPortFeature(PORT_LINK_STATE) SS.Disable request.	TD 10.113
10.3.1.9#2	A downstream port's link state shall be SS.Disabled in the DSPORT.Disabled state.	Implicit
Subsection reference: 10.3.1.10 DSPORT.Powered-off-detect		

Assertion #	Assertion Description	Test #
10.3.1.10#1	A downstream port shall transition to the DSPORT.Powered-off-detect satte from the DSPORT.Powered-off-reset state when treset has been met and conditions for Repowering are not met.	TD 10.103 TD 10.104
10.3.1.10#2	When in DSPORT.Powered-off-detect state, the port shall perform far-end receiver detection with the link state in Rx.Detect until a far-end receiver termination is detected or the conditions for repowering a port are met or upstream VBUS is off and the hub does not support power switching and receiver detection has failed.	ECR change anticipated
10.3.1.10#3	In the DSPORT.Powered-off-detect state, SS terminations are maintained and far-end receiver detection is enabled	Implied
Subsection reference: 10.3.1.11 DSPORT.Powered-off-reset		
10.3.1.11#1	A downstream port shall transition to the DSPORT.Powered-off-reset state from any state if an overcurrent condition is detected on the hub (port or global), when there are receiver terminations on the UFP (or when the UFP VBUS was last on)	TD 10.121 ECR change anticipated
10.3.1.11#2	A downstream port shall transition to the DSPORT.Powered-off-reset state from any state if the UFP VBUS is off and the hub does not support power switching and the UFP receiver terminations were on when UFP VBUS was last on.	TD 10.101 – 102 ECR change anticipated
10.3.1.11#3	A downstream port shall transition to the DSPORT.Powered-off-reset state from any state if the hub receives a ClearPortFeature(PORT_POWER) for this port	TD 10.104
10.3.1.11#4	A downstream port shall transition to the DSPORT.Powered-off-reset state from any state if the hub receives a SetConfiguration(0) request.	TD 10.103
10.3.1.11#5	When in the DSPORT.Powered-off-reset state, a port shall drive warm reset and remain in link substate Rx.Detect.Reset for tReset duration.	TDs 10.103 – 104
10.3.1.11#6	When a downstream port transitions to the DSPORT.Powered-off-reset state from any state by receiving a ClearPortFeature(PORT_POWER) for this port and if the hub supports power switching, power is removed from the port only if it would not affect low, full or high-speed operation on any of the DS ports on the hub or SS operation on any DS port other than the target port.	TD 10.104
10.3.1.11#7	If a port entered DSPORT.Powered-off-reset because of a SetConfiguration(0), the port will stay in DSPORT.Powered-off-reset or transition between this state and DSPORT.Powered-off-detect state regardless of any other conditions until the hub is reset or the hub receives a non-zero SetConfiguration request.	TD 10.103

3   Timing Definitions

Timing definitions are taken from the USB 3.0 Link Test Specification.

Additionally, some hub tests require special timing parameters.

TDs 10.102 and 10.106 name a specific timing window during which a DFP should transition to SS.Disabled after an upstream product (host or hub) has removed far-end terms from the UFP. The timing was determined based on the following:

Given:
1)   After an upstream product removes terms, a UFP will try far-end receiver detection 8 times before transitioning to SS.Disabled (10.3.1.1#4, 7.5.3.6).
2)   When the UFP transitions to SS.Disabled, the DFPs should transition to SS.Disabled immediately.

From 1) and 2) we infer that if we can give a range of time for when the UFP transitions to SS.Disabled, the DFP must have transitioned to SS.Disabled in the same range of time.

For an upstream port receiver detection should occur every tRxDetectQuietTimeoutUFP (12-18ms). Eight of those will take 96-144ms. However, it's possible the first receiver detection occurred immediately on transitioning to Rx.Detect, before the first tRxDetectQuietTimeoutUFP. So the low end time should actually be 84ms instead of 96ms. Also, LVS solutions only guarantee accuracy with term removal within 2 detection cycles, so that an additional 24ms is required at the end of the test.

The additional timeout is called tRxDetectToSSDisabledTimeout and covers a range from 84ms to 168ms.

Several TDs require a timing calculation on the delay between a DS port initiating a U-state change and the US port of the hub initiating a U-State change (when applicable). The USB 3.1 spec defines tHubPort2PortExitLat in table 10-18 for this purpose.

If the Hub Under Test is a compound device or tiered hub, there may be multiple hub tiers between the DS port and US port of the HUT. For this reason we define a new timer that extrapolates tHubPort2PortExitLat for the tiered implementation.

TD 10.115 requires a timing calculation from when a DS port in U3 receives a SetPortFeature(PLS=U0) to when the wakeup signaling occurs on the DS link. We use tHubDriveResume for this purpose. This timer is defined in a USB 3.1 ECN as a change to Table 10-19 (hub parameters) with a more relaxed value than the previously used timer, tHubDriveRemoteWake.

Timer definition	Deadline (USB 3.0 specification defined low value)	Expiration (Calculated high value)
tRxDetectToSSDisabledTimeout	84ms	168ms[1]
tHubPort2PortExitLat	1us	
tHubPort2PortExitLatTiered	tHubPort2PortExitLat * (# of tiers in HUT between UFP and DFP)	
tHubDriveResume	400us	

Note 1: The tRxDetectToSSDisabledTimeout timer may be delayed if a Warm Reset is presently being sent on the link. In that case, the timeout expires 5 mS after the Warm Reset finishes transmitting.

Throughout the Test spec, the LVSh will be placing ports in U0, U1, U2, and U3 with the SetPortFeature(PLS=Ux) command. When the LVSh uses this command, it must give the target port 20ms before engaging with that port in a way that requires it to be in the commanded Ux state. The LVSh will also be adjusting the U1 and U2 timers with SetPortFeature(Ux_TIMEOUT=…). The LVSh must give the target port 20ms before checking that the timer is updated.

4 LVS Chapter 10 Test Descriptions

The following table lists terms used frequently in the test descriptions.

Term	Definition
HUT	Hub Under Test Note: For tiered hubs, any time a test step refers to the HUT, the step applies to all tiered hubs under test. For compound devices, the step applies to all tiered hubs in the compound device.
UFP	Upstream Facing Port on the HUT. Note: For tiered hubs and compound devices, this refers to the exposed upstream facing port at the top tier hub.
DFP	Downstream Facing PUT on the HUT. Note: This refers to an exposed downstream facing port.
LVSh	Host Port LVS (Host Emulator)
LVSd	Device Port LVS (Device Emulator)
ADP	Auxiliary Downstream Facing PUT on the HUT Note: This refers to an exposed downstream facing port. In the case of a tiered hub or compound device, this refers to an exposed downstream facing port on the same Hub Tier as the DFP.
PUT	Port Under Test
DUT	Device Under Test
PATH	For a tiered hub or compound device, the PATH is the direct route on the product from the UFP through the intermediate ports to the DFP. References to the PATH in tests by default exclude the UFP and DFP link.

The tests are defined with verification check points. If a verification check fails, the test fails. Example:

LVS verifies … == Test fails if conditions following this phrase are not verified

For testing each exposed downstream facing port on the HUT:
1) Connect the LVSh with the UFP
2) Connect the DFP with the LVSd

For a compound device, the LVS will determine which downstream ports are occupied with non-removable devices and will direct those ports to SS.Disabled for the duration of the tests.

For a tiered hub or compound device, for any DS port anywhere on the product tree outside of the PATH, the LVS will direct that DS port to SS.Disabled for the duration of the tests.

TD 10.101   Connect Upstream and Downstream Ports Test

A. This test verifies that detecting Terminations on the UFP will move the DFP to DSPORT.Disconnected state.
B. Assertions covered:
   1. 10.3.1.2#1
   2. 10.3.1.1#7
C. Procedure:
   1. LVSh presents VBUS.
   2. LVSh verifies that it does not receive any LFPS or SS signaling.
   3. LVSd presents terminations.
   4. LVSd verifies that DFP does not present terminations.
   5. LVSh presents terminations.
   6. LVSd verifies that DFP presents VBUS and terminations.
   7. LVSd verifies DFP link transitions to Polling.LFPS.
   8. LVSd and LVSh remove terminations and VBUS for 500ms.
   9. LVSh presents VBUS.
   10. LVSh verifies that the UFP does not send any LFPS or SS signaling.
   11. LVSh presents terminations..
   12. LVSh verifies

a. The UFP starts sending Polling.LFPS.
13. LVSd verifies:
    a. DFP terminations are turned on.
    b. The DFP does not send any LFPS or SS signaling.
14. LVSh brings the UFP link to U0.
15. LVSh enumerates and configures SS portion of the HUT.
16. LVSh issues GetPortStatus() for the DFP.
17. LVSh verifies:
    a. PLS = 5 (10.3.1.2#6)
    b. PP = 1 (10.14.2.6#16)
    c. CCS = 0 (10.14.2.6#2)
    d. PE = 0 (10.14.2.6#6)
    e. PR = 0 (10.14.2.6#12)
18. LVSd presents terminations to the DFP.
19. LVSd verifies the DFP starts sending Polling.LFPS within 18ms
20. LVSd brings the DFP link to U0.
21. LVSh issues GetPortStatus() to the DFP.
22. LVSh verifies:
    a. PP = 1 (10.14.2.6#12))
    b. CCS = 1 (10.14.2.6#1, 10.11.6#1)
    c. PE = 1 (10.14.2.6#5)
    d. PR = 0 (10.14.2.6#12)
    e. C_PORT_CONNECTION = 1
23. LVSh issues SetPortFeature(PORT_POWER) to the DFP (while the DFP is already powered).
24. LVSh issues GetPortStatus() to the DFP.
25. LVSh verifies that the DFP's status has not changed. (10.14.2.10#23)
26. LVSh issues ClearPortFeature(PORT_CONNECTION).
27. LVSh issues GetPortStatus() to the DFP.
28. LVSh verifies:
    a. PORT_CONNECTION bit as 1. (10.14.2.6#4)
    b. PORT_OVER_CURRENT bit is zero. (10.14.2.6#8)
29. LVSh issues SetPortFeature(PORT_OVER_CURRENT) and GetPortStatus
30. LVSh verifies:
    a. PORT_OVER_CURRENT bit is still zero. (10.14.2.6#9)

TD 10.102   Power Off Upstream Port Test

A. This test verifies that when the hub loses Vbus on its UFP, its DFP transitions correctly through DSPORT.Powered-off-reset to DSPORT.Powered-off. Conditions:
B. Assertions covered:
    1. 10.3.1.1#6
    2. 10.3.1.1#2
    3. 10.3.1.11#3
    4. 10.3.1.11#1
    5. 10.3.1.1#4
    6. 10.3.1.1#9
    7. 10.3.1.11#2
C. Procedure:
    1. LVSh presents Vbus and terms on upstream port
    2. LVSh brings UFP link to U0
    3. LVSh enumerates and configures UFP
    4. LVSh issues GetDescriptor(Configuration) and GetHubDescriptor() to the HUT.
    5. Skip remaining test if bit 6 in the bmAttributes field of the Hub's Configuration Descriptor is 0 (Hub is bus-powered).
    6. LVSh removes Vbus from UFP and starts timer.
    7. If bPwrOn2PwrGood > 0 (the hub supports power switching):

<ol type="a">
LVSd verifies terminations have been removed on the DFP.
LVSd presents terminations to the DFP.
LVSd verifies that there is no change on the DFP. (10.3.1.1#9)
LVSh removes terminations to the UFP.
LVSh presents Vbus to the UFP
LVSd verifies that DFP link state remains the same.

<ol start="8">
If bPwrOn2PwrGood = 0 (the hub does not support power switching):
<ol type="a">
When the timer > 200ms, the LVSd verifies that DFP terminations are present. (10.3.1.10#6)
LVSd present terminations to the DFP.
LVSd verifies that the DFP continually issues Warm Reset LFPS within tRxDetectQuietTimeoutDFP between cycles. (10.3.1.10#1, 10.3.1.11#2)
LVSh removes terminations to the UFP.
LVSh presents Vbus to the UFP.
LVSd verifies terminations have been removed on the DFP. (10.3.1.1#3)

LVSh presents terminations to the UFP.
LVSd verifies that DFP transitions to Rx.Detect
LVSd verifies that DFP transitions to Polling.LFPS
LVSh brings the UFP link to U0.
LVSd brings the DFP link to U0.
LVSh enumerates and configures the HUT.
LVSh issues GetPortStatus to each port to determine the DFP (PE = 1).
LVSh removes Vbus and terms on the UFP.
For each link state X = {U0, U1, U2, U3, SS.Disabled, Rx.Detect, SS.Inactive, Polling, Recovery, Hot Reset, Loopback}.
<ol type="a">
LVSh presents Vbus and terms on the UFP.
LVSd presents terms on DFP.
LVSh brings the UFP link to U0.
LVSd brings the DFP link to U0.
LVSh enumerates and configures the HUT.
Transition the DFP link to X:
<ol type="i">
If X == (U0 or U1 or U2 or U3 or SS.Disabled), then:

LVSh issues SetPortFeature(PORT_LINK_STATE)=X for the DFP.

If X == Rx.Detect, then:

LVSh issues ClearPortFeature(PORT_POWER=0) for the DFP.
Wait for tReset/2.

If X == SS.Inactive, then:

LVSd stops transmitting link traffic but keeps its terms on.
Wait for > tRecoveryActiveTimeout.

If X == Polling, then:

LVSh issues SetPortFeature(BH_PORT_RESET) to the HUT for the PUT.
LVSd waits for the DFP to transition to Polling.LFPS state, but doesn't respond with LFPS.
Steps g-i must be executed within tPollingLFPSTimeout of this step.

If X == Recovery, then:

LVSd stops transmitting link traffic but keeps its terms on.
Steps g-i must be executed within tRecoveryActiveTimeout of this step

If X == Hot Reset, then:

LVSh issues SetPortFeature(PORT_RESET) to the HUT for the PUT.
LVSd responds to the Hot Reset with TS2's with the Hot Reset bit set, but doesn't transition to sending TS2's with the Hot Reset bit not set.
Steps g-i must be executed within tHotResetActiveTimeout of this step

If X == Loopback, then:

LVSh issues SetPortFeature(BH_PORT_RESET) to the HUT for the PUT.
LVSd sets the Loopback bit in its TS2's during Polling.Configuration.
LVSd verifies that the DFP exits Polling.Idle and transitions to Loopback state.

LVSh issues a GetPortStatus request for the DFP.
LVSh verifies that PLS = X.
LVSh removes terminations and VBUS to the UFP.

    j.   If the bPwrOn2PwrGood field is non-zero (power-switching is supported), LSVd verifies that warm reset is NOT driven by the DFP and that the DFP's receiver terminations are disabled. (10.3.1.1#4)

    k.   If the bPwrOn2PwrGood field is zero (power-switching is not supported), LVSd verifies:

        i.   Warm Reset LFPS is driven by the DFP for tReset. (10.3.1.11#2)

        ii.   The DFP continuously issues Warm Reset LFPS within tRxDetectQuietTimeoutDFP between cycles.

TD 10.103   Toggle Upstream Configuration Test

A.   This test verifies that when an UFP receives a SetConfiguration(0) request, a DFP transitions between DSPORT.Powered-off-reset and DSPORT.Powered-off-detect until the UFP is reset or receives a non-zero SetConfiguration request. Conditions:

    1.   SS Device connected to DFP

    2.   No device connected to DFP

B.   Assertions covered:

    1.   10.3.1.2#3

    2.   10.3.1.2#4

    3.   10.3.1.2#12

    4.   10.3.1.10#1

    5.   10.3.1.10#2

    6.   10.3.1.10#3

    7.   10.3.1.11#1

    8.   10.3.1.11#5

C.   Procedure:

    1.   LVSh presents Vbus and terms on the UFP

        a.   SS Device connected to DFP

            i.   LVSd presents terms on the DFP

    2.   For each X = {configures the HUT, issues Hot Reset to the UFP, issues Warm Reset to the UFP}:

        a.   LVSh brings UFP link to U0, enumerates and configures the HUT.

            i.   SS Device connected to DFP

                1)   LVSd brings DFP link to U0

                2)   LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP (by which downstream port has Port Enabled)

                3)   LVSh verifies on the Enabled Port, that PLS = 0, PP = CCS = PE = 1, PR = 0.

            ii.   No Device connected to DFP

                1)   LVSh configures UFP and does a GetPortStatus request for each port.

                2)   LVSh verifies on all removable ports that PP = 1, CCS = PE = PR = 0

        b.   LVSh sends SetConfig(0) to UFP and starts timer.

            i.   SS Device connected to DFP.

                1)   If Vbus is present after tVbusOFF (650ms):

                    a)   LVSd confirms that DFP transitions to transmit Warm Reset LFP

                    b)   LVSd confirms that DFP transmits Eidle for up to tRxDetectQuietTimeoutDFP

                    c)   LVSd confirms that DFP cycles through steps **Error! Reference source not found.** and 2)

        c.   When timer > 700ms, LVSh [does] X.

        d.   LVSd confirms that DFP transitions to Rx.Detect

            i.   SS Device connected to DFP

                1)   LVSd confirms that DFP transitions to Polling.LFPS.

                2)   LVSd brings the DFP link to U0.

                3)   If X == Hot Reset or Warm Reset

                    a)   LVSh enumerates and configures the HUT.

                4)   LVSh issues a GetPortStatus request for the DFP and verifies that PLS = 0, PP = PE = CCS = 1, PR = 0 (10.3.1.2#12 and 10.3.1.10#2)

            ii.   No Device connected to DFP

                1)   If X == Hot Reset or Warm Reset

                    a)   LVSh enumerates and configures the HUT.

                2)   LVSh issues a GetPortStatus request for the DFP and verifies that PLS = 5, PP = 1, PR = PE = CCS = 0

TD 10.104   Toggle Port Power Test

A. This test verifies that when an UFP receives a ClearPortFeature(PORT_POWER) request for a DFP, the DFP link transitions between DSPORT.Powered-off-reset and DSPORT.Powered-off-detect until the UFP is reset or receives a SetPortFeature(PORT_POWER) request for the DFP. Conditions:
    1. SS Device connected to DFP
    2. No device connected to DFP
B. Assertions covered:
    1. 10.3.1.2#3
    2. 10.3.1.2#4
    3. 10.3.1.2#12
    4. 10.3.1.10#1
    5. 10.3.1.10#2
    6. 10.3.1.11#4
C. Procedure:
    1. LVSh presents Vbus and terms on the UFP
        a. SS Device connected to DFP
            i.   LVSd presents terms on the DFP
    2. LVSh brings UFP link to U0.
        a. SS Device connected to DFP
            i.   LVSd brings DFP link to U0
            ii.   LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP.
            iii. LVSh verifies for the DFP, that PLS = 0, PP = CCS = PE = 1, PR = 0.
        b. No Device connected to DFP
            i.   LVSh configures UFP and does a GetPortStatus request for each port.
            ii. LVSh verifies on all removable ports that PLS = 5, PP = 1, CCS = PE = PR = 0
        c. LVSh sends ClearPortFeature(PORT_POWER) for DFP and starts timer. Within min tReset (80ms) time, LVSh issues SetPortFeature(PORT_POWER) for DFP.
        d. After max tReset (120ms) time, LVSh issues a GetPortStatus request for the DFP and verifies that PP = 1.
        e. LVSh issues ClearPortFeature(PORT_POWER) to PUT.
        f. SS Device connected to DFP:
            i.   If Vbus is present after tVbusOFF (650ms).
                1) LVSd confirms that DFP transitions to transmit Warm Reset LFPS
                2) LVSd confirms that DFP transmits Eidle for up to tRxDetectQuietTimeoutDFP
                3) LVSd confirms that DFP cycles through steps (i) and (ii).
        g. LVSh issues a GetPortStatus request for the DFP.
        h. LVSh issues following requests for DFP:
            i.   ClearPortFeature (all valid Feature Selectors)
            ii. SetPortFeature (all valid Feature Selector without PORT_POWER and changed features)
            iii. GetPortErrorCount()
        i. LVSh verifies that the DFP's port status bits haven't changed since before sending any of the feature requests in the previous step. (10.14.2.2#12)
    3. When timer > 1s, LVS sends SetPortFeature(PORT_POWER) for DFP.
    4. LVSd confirms that DFP transitions to Rx.Detect
    5. SS Device connected to DFP
        a. LVSd confirms that DFP transitions to Polling.LFPS
        b. LVSd brings the DFP to U0
        c. LVSh issues a GetPortStatus request for the DFP and verifies that PLS = 0, PP = CCS = PE = 1, PR = 0.
    6. No Device connected to DFP
        a. LVSh issues a GetPortStatus request for the DFP and verifies that PLS = 5, PP = 1, CCS = PR = PE = 0 (10.3.1.2#12 and 10.3.1.10#2)

TD 10.105   Disconnect Device Test

A.   This test verifies that the DFP will transition to DSPORT.Disconnected when a disconnection is detected in U0, U1, U2 or U3.

B.   Assertions Covered
   1.   10.3.1.2#2

C.   Procedure
   1.   LVSh presents VBUS and terminations on the UFP.
   2.   LVSh brings UFP link to U0 then enumerates and configures the HUT.
   3.   For each link state X = {U0, U1, U2, U3}:
      a.   LVSd presents terminations on the DFP and brings DFP link to U0.
      b.   LVSh issues GetPortStatus for each port to determine the DFP
      c.   LVSh issues ClearPortFeature(C_PORT_CONNECTION).
      d.   LVSh issues SetPortFeature (PORT_LINK_STATE = X).
      e.   LVSh issues GetPortStatus and verifies that PLS = X, PP = CCS = PE = 1, PR = C_PORT_CONNECTION = 0.
      f.   LVSd disconnects link on DFP by removing terminations.
      g.   LVSh issues GetPortStatus and verifies that PLS = 5, PP = C_PORT_CONNECTION = 1, CCS = PR = PE = 0. (10.3.1.2#2)
      h.   LVSh issues ClearPortFeature (C_PORT_CONNECTION).

TD 10.106   Upstream Port Disconnected Test

A.   This test verifies that a DFP that is connected to a device transitions to DSPORT.Powered-off when an upstream port is disconnected. Conditions:
   1.   DFP is in DSPORT.Powered-off-reset
   2.   DFP is in DSPORT.Enabled

B.   Covered Assertions:
   1.   10.3.1.1#4

C.   Procedure
   1.   The LVSh presents Vbus and terms on the UFP, and LVSd presents terms on the DFP
   2.   LVSh brings UFP link to U0 and LVSd brings DFP link to U0
   3.   LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
   4.   LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1
      a.   DFP is in DSPORT.Powered-off-reset
         i.   LVSh transmits ClearPortFeature(PORT_POWER) for the DFP.
         ii.   Wait tVbusOFF
         iii.   If Vbus is present, LVSd verifies Warm Reset LFPS on DFP
   5.   LVSh removes terms from the UFP
   6.   LVSd verifies that the DFP transitions to SS.Disabled within tRxDetectToSSDisabledTimeout. Note: If the DUT is transmitting a Warm Reset when the timer expires, LVSd verifies that the DFP transitions to SS.Disabled when the Warm Reset transmission is concluded.

TD 10.107   Upstream Port Disabled Test

This test is covered in TD 10.106

TD 10.108   Hot Reset Upstream Port Test

A.   This test verifies that a DFP that is connected to a device performs the correct reset when an upstream port is reset with a Port Reset. Conditions:
   1.   DFP is in DSPORT.Powered-off-reset

2. DFP is in DSPORT.Disconnected
3. DFP is in DSPORT.Enabled in U0
4. DFP is in DSPORT.Enabled in U1
5. DFP is in DSPORT.Enabled in U2
6. DFP is in DSPORT.Enabled in U3
7. DFP is in DSPORT.Error
8. DFP is in DSPORT.Disabled and device is connected
9. DFP is in DSPORT.Disabled and device is not connected
10. DFP is in DSPORT.Resetting

B. Covered Assertions:
1. 10.3.1.6#3
2. 10.3.1.2#3
3. 10.3.1.2#7
4. 10.3.1.2#8

C. Procedure:
1. LVSh presents Vbus and terms on the UFP, and LVSd presents terms on the DFP
2. LVSh brings UFP link to U0.
3. LVSh and LVSd take necessary steps to move to appropriate condition stated in A
   a. DFP is in DSPORT.Powered-off-reset
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1.
      iv. LVSh transmits ClearPortFeature(PORT_POWER) for the DFP.
      v. Wait tVbusOFF
      vi. If Vbus is present, LVSd verifies Warm Reset LFPS on DFP
   b. DFP is in DSPORT.Disconnected
      i. LVSd removes terms on the DFP link
   c. DFP is in DSPORT.Enabled in U0
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1.
   d. DFP is in DSPORT.Enabled in U1
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh transmits SetPortFeature(PORT_U1_TIMEOUT) = 1us and SetPortFeature(PORT_U2_TIMEOUT) = 0 for the DFP.
      iv. LVSd and DFP link enters U1, and LVSd sends Ping.LFPS every 200us to avoid U1 exit.
      v. LVSh verifies on the DFP, that PLS = 1, PR = 0, PP = CCS = PE = 1.
   e. DFP is in DSPORT.Enabled in U2
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh transmits SetPortFeature(PORT_U1_TIMEOUT) = 0 and SetPortFeature(PORT_U2_TIMEOUT) = 0x01 for the DFP.
      iv. LVSd and DFP link enters U2.
      v. LVSh verifies on the DFP, that PLS = 2, PR = 0, PP = CCS = PE = 1.
   f. DFP is in DSPORT.Enabled in U3
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh transmits SetPortFeature(PORT_LINK_STATE) = 3 for the DFP.
      iv. LVSd and DFP link enters U3
      v. LVSh verifies on the DFP, that PLS = 3, PR = 0, PP = CCS = PE = 1.
   g. DFP is in DSPORT.Error
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSd drops on LGOOD to the DFP to move the link to Recovery
      iv. LVSd transmits nothing in Recovery.Active
      v. LVSd verifies that between 12ms and 18ms later, the DFP tx is inactive.
      vi. LVSh transmits GetPortStatus for the DFP and verifies that PLS = 6, PR = PE = 0, PP = 1

    h. DFP is in DSPORT.Disabled and device is connected
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh transmits SetPortFeature(PORT_LINK_STATE) = 4 for the DFP
      iv. LVSd and DFP link enters SS.Disabled
      v. LVSh verifies on the DFP, that PLS = 4, PR = CCS = PE = 0, PP = 1
    i. DFP is in DSPORT.Disabled and device is not connected
      i. LVSd removes termination on the DFP.
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh transmits SetPortFeature(PORT_LINK_STATE) = 4 for the DFP.
      iv. LVSd and DFP link enters SS.Disabled
      v. LVSh verifies on the DFP, that PLS = 4, PR = CCS = PE = 0, PP = 1
    j. DFP is in DSPORT.Resetting
      i. LVSd brings DFP link to U0
      ii. LVSh transmits SetPortFeature(PORT_RESET) for DFP
      iii. LVSd verifies that DFP link transitions to Hot Reset

4. LVSh initiates a Hot Reset on the UFP link.
5. LVSd verifies that the correct Reset is initiated on the DFP link.
    a. DFP is in DSPORT.Powered-off-Reset
      i. If Vbus remained present, LVSd verifies a Warm Reset is transmitted on the DFP
      ii. LVSd verifies that the link transitions to Rx.Detect.
      iii. LVSd verifies that the link transitions to U0
    b. DFP is in DSPORT.Disconnected
      i. LVSd verifies that DFP continues to be in Rx.Detect
    c. DFP is in DSPORT.Enabled in U0
      i. LVSd verifies a Hot Reset is transmitted on the DFP
      ii. LVSd verifies the link transitions to U0
    d. DFP is in DSPORT.Enabled in U1
      i. LVSd verifies that the DFP exits U1 by performing a U1-exit LFPS handshake
      ii. LVSd verifies that the DFP initates Recovery
      iii. LVSd verifies a Hot Reset is completed on the DFP
      iv. LVSd verifies the link transitions to U0
    e. DFP is in DSPORT.Enabled in U2
      i. LVSd verifies that the DFP exits U2 by performing a U2-exit LFPS handshake
      ii. LVSd verifies that the DFP initates Recovery
      iii. LVSd verifies a Hot Reset is completed on the DFP
      iv. LVSd verifies the link transitions to U0
    f. DFP is in DSPORT.Enabled in U3
      i. LVSd verifies a Warm Reset is transmitted on the DFP
      ii. LVSd verifies the link transitions to Rx.Detect
    g. DFP is in DSPORT.Error
      i. LVSd verifies that a Warm Reset is transmitted on the DFP
      ii. LVSd verifies that the link transitions to Rx.Detect
    h. DFP is in DSPORT.Disabled and device is connected
      i. LVSd verifies a Warm Reset is transmitted on the DFP
      ii. LVSd verifies the DFP link transitions to Rx.Detect and sends Polling.LFPS.
    i. DFP is in DSPORT.Disabled and device is not connected
      i. LVSd verifies that DFP sends nothing.
    j. DFP is in DSPORT.Resetting
      i. LVSd verifies that link continues to transition through the original Hot Reset but does not send another Hot Reset.
6. LVSh and LVSd verifies that a Reset (if required) was in process on the DFP before the UFP transitioned back to U0

TD 10.109   Warm Reset Upstream Port Test

A. This test verifies that a DFP that is connected to a device performs the correct reset when an upstream port is reset with a Warm Reset. Conditions:
1. DFP is in DSPORT.Powered-off-reset
2. DFP is in DSPORT.Training
3. DFP is in DSPORT.Enabled in U0
4. DFP is in DSPORT.Enabled in U1
5. DFP is in DSPORT.Enabled in U2
6. DFP is in DSPORT.Enabled in U3
7. DFP is in DSPORT.Error
8. DFP is in DSPORT.Disabled and device is connected
9. DFP is in DSPORT.Disabled and device is not connected
10. DFP is in DSPORT.Resetting

B. Covered Assertions:
1. 10.3.1.6#3
2. 10.3.1.2#3
3. 10.3.1.2#7
4. 10.3.1.2#8

C. Procedure:
1. LVSh presents Vbus and terms on the UFP, and LVSd presents terms on the DFP
2. LVSh brings UFP link to U0.
3. LVSh and LVSd take necessary steps to move to appropriate condition stated in A
    a. DFP is in DSPORT.Powered-off-reset
        i. LVSd brings DFP link to U0
        ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
        iii. LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1.
        iv. LVSh transmits ClearPortFeature(PORT_POWER) for the DFP.
        v. Wait tVbusOFF
        vi. If Vbus is present, LVSd verifies Warm Reset LFPS on DFP
    b. DFP is in DSPORT.Training
        i. LVSd and DFP link transitions to Polling.LFPS
        ii. LVSd verifies Polling.LFPS bursts from DFP
    c. DFP is in DSPORT.Enabled in U0
        i. LVSd brings DFP link to U0
        ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
        iii. LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1.
    d. DFP is in DSPORT.Enabled in U1
        i. LVSd brings DFP link to U0
        ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
        iii. LVSh transmits SetPortFeature(PORT_U1_TIMEOUT) = 1us and SetPortFeature(PORT_U2_TIMEOUT) = 0 for the DFP.
        iv. LVSd and DFP link enters U1, and LVS sends Ping.LFPS every 200us to avoid U1 exit.
        v. LVSh verifies on the DFP, that PLS = 1, PR = 0, PP = CCS = PE = 1.
    e. DFP is in DSPORT.Enabled in U2
        i. LVSd brings DFP link to U0
        ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
        iii. LVSh transmits SetPortFeature(PORT_U1_TIMEOUT) = 0 and SetPortFeature(PORT_U2_TIMEOUT) = 0x01 to the DFP.
        iv. LVSd and DFP link enters U2.
        v. LVSh verifies on the DFP, that PLS = 2, PR = 0, PP = CCS = PE = 1.
    f. DFP is in DSPORT.Enabled in U3
        i. LVSd brings DFP link to U0
        ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
        iii. LVSh transmits SetPortFeature(PORT_LINK_STATE) = 3 for the DFP.
        iv. LVSd and DFP link enters U3
        v. LVSh verifies on the DFP, that PLS = 3, PR = 0, PP = CCS = PE = 1.
    g. DFP is in DSPORT.Error
        i. LVSd brings DFP link to U0

  ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
  iii. LVSd drops on LGOOD to the DFP to move the link to Recovery
  iv. LVSd transmits nothing in Recovery.Active
  v. LVSd verifies that between 12ms and 18ms later, the DFP tx is inactive.
  vi. LVSh transmits GetPortStatus for the DFP and verifies that PLS = 6, PR = PE = 0, PP = 1
 h. DFP is in DSPORT.Disabled and device is connected
  i. LVSd brings DFP link to U0
  ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
  iii. LVSh transmits SetPortFeature(PORT_LINK_STATE) = 4 for the DFP.
  iv. LVSd and DFP link enters SS.Disabled
  v. LVSh verifies on the DFP, that PLS = 4, PR = CCS = PE = 0, PP = 1
 i. DFP is in DSPORT.Disabled and device is not connected
  i. LVSd removes termination on the DFP.
  ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
  iii. LVSh transmits SetPortFeature(PORT_LINK_STATE) = 4 for the DFP.
  iv. LVSd and DFP link enters SS.Disabled
  v. LVSh verifies on the DFP, that PLS = 4, PR = CCS = PE = 0, PP = 1
 j. DFP is in DSPORT.Resetting
  i. LVSd brings DFP link to U0
  ii. LVSh transmits SetPortFeature(PORT_RESET) for DFP
  iii. LVS verifies that DFP link transitions to Recovery.Active
4. LVSh initiates a Warm Reset on the UFP link.
5. LVSd verifies that a Warm Reset begins transmission on the DFP before the UFP link transitions to U0
 a. DFP is in DSPORT.Powered-off-reset
  i. If Vbus remained present, LVSd verifies a Warm Reset is transmitted on the DFP.
  ii. LVS verifies that the DFP transitions to Rx.Detect.
 b. DFP is in DSPORT.Disabled and device is not connected
  i. LVSd verifies that DFP sends nothing.
6. LVS verifies that the DFP link transitions to U0

TD 10.110 Hot Reset Downstream Port Test

A. This test verifies that a DFP reacts correctly to a SetPortFeature(PORT_RESET). Conditions:
1. DFP is in DSPORT.Powered-off-reset
2. DFP is in DSPORT.Disconnected
3. DFP is in DSPORT.Enabled in U0
4. DFP is in DSPORT.Enabled in U1
5. DFP is in DSPORT.Enabled in U2
6. DFP is in DSPORT.Enabled in U3
7. DFP is in DSPORT.Error
8. DFP is in DSPORT.Disabled
9. DFP is in DSPORT.Resetting
B. Covered Assertions:
1. 10.3.1.2#3
2. 10.3.1.6#1
3. 10.3.1.6#4
4. 10.3.1.6#5
5. 10.3.1.6#6
6. 10.3.1.6#7
C. Procedure:
1. LVSh presents Vbus and terms on the UFP, and LVSd presents terms on the DFP
2. LVSh brings UFP link to U0 and enumerates and configures HUT
3. LVSh and LVSd take necessary steps to move to appropriate condition stated in A
 a. DFP is in DSPORT.Powered-off-reset
  i. LVSd brings DFP link to U0
  ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP

   iii. LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1.
   iv. LVSh transmits ClearPortFeature(PORT_POWER) for the DFP.
   v. Wait tVbusOFF
   vi. If Vbus is present, LVSd verifies Warm Reset LFPS on DFP
  b. DFP is in DSPORT.Disconnected
   i. LVSd removes terms on the DFP link
  c. DFP is in DSPORT.Enabled in U0
   i. LVSd brings DFP link to U0
   ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
   iii. LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1.
   iv. LVSh transmits a ClearPortFeature(C_Port_Connection) for the DFP
  d. DFP is in DSPORT.Enabled in U1
   i. LVSd brings DFP link to U0
   ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
   iii. LVSh transmits SetPortFeature(PORT_U1_TIMEOUT) = 1us and SetPortFeature(PORT_U2_TIMEOUT) = 0 to the DFP.
   iv. LVSd and DFP link enters U1, and LVS sends Ping.LFPS every 200us to avoid U1 exit.
   v. LVSh verifies on the DFP, that PLS = 1, PR = 0, PP = CCS = PE = 1.
   vi. LVSh transmits a ClearPortFeature(C_Port_Connection) for the DFP
  e. DFP is in DSPORT.Enabled in U2
   i. LVSd brings DFP link to U0
   ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
   iii. LVSh transmits SetPortFeature(PORT_U1_TIMEOUT) = 0 and SetPortFeature(PORT_U2_TIMEOUT) = 0x01 for the DFP.
   iv. LVSd and DFP link enters U2.
   v. LVSh verifies on the DFP, that PLS = 2, PR = 0, PP = CCS = PE = 1.
   vi. LVSh transmits a ClearPortFeature(C_Port_Connection) for the DFP
  f. DFP is in DSPORT.Enabled in U3
   i. LVSd brings DFP link to U0
   ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
   iii. LVSh transmits SetPortFeature(PORT_LINK_STATE) = 3 for the DFP.
   iv. LVSd and DFP link enters U3
   v. LVSh verifies on the DFP, that PLS = 3, PR = 0, PP = CCS = PE = 1.
   vi. LVSh transmits a ClearPortFeature(C_Port_Connection) for the DFP
  g. DFP is in DSPORT.Error
   i. LVSd brings DFP link to U0
   ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
   iii. LVSd drops on LGOOD to the DFP to move the link to Recovery
   iv. LVSd transmits nothing in Recovery.Active
   v. LVSd verifies that between 12ms and 18ms later, the DFP tx is inactive.
   vi. LVS transmits GetPortStatus for the DFP and verifies that PLS = 6, PR = PE = 0, PP = 1
  h. DFP is in DSPORT.Disabled
   i. LVSd brings DFP link to U0
   ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
   iii. LVSh transmits SetPortFeature(PORT_LINK_STATE) = 4 for the DFP.
   iv. LVSd and DFP link enters SS.Disabled
   v. LVSh verifies on the DFP, that PLS = 4, PR = CCS = PE = 0, PP = 1
  i. DFP is in DSPORT.Resetting
   i. LVSd brings DFP link to U0
   ii. LVSh transmits SetPortFeature(PORT_RESET) for DFP
   iii. LVSd verifies that DFP link transitions to Recovery.Active
 4. LVS initiates a SetPortFeature(PORT_RESET) on the DFP
 5. LVS verifies that the correct action is initiated on the DFP link.
  a. DFP is in DSPORT.Powered-off-Reset
   i. If Vbus remained present, LVSd verifies that the link continues to sending Warm Reset for the remainder of tReset
   ii. LVSd verifies that no transition occurs or DFP transitions to Rx.Detect
  b. DFP is in DSPORT.Disconnected

      i.   LVSd verifies that DFP continues to be in Rx.Detect
- c. DFP is in DSPORT.Enabled in U0
  - i.   LVSh immediately issues GetPortStatus() and verifies:
    1) PORT_CONNECTION bit is 1. (10.14.2.6#1, 10.14.2.6#23)
    2) PORT_RESET bit is 1.
    3) C_PORT_CONNECTION is 0. (10.14.2.6.2#1)
  - ii.   LVSd verifies a Hot Reset is completed on the DFP
  - iii. LVSd verifies the link transitions to U0
  - iv. Wait 200ms (max tTimeForResetError).
  - v.   LVSh issues GetPortStatus() and verifies:
    1) PORT_RESET bit is set to 0. (10.14.2.6#12)
    2) C_PORT_RESET is set to 1. (10.14.2.6#11, 10.14.2.6.2#8).
- d. DFP is in DSPORT.Enabled in U1
  - i.   LVSh immediately issues GetPortStatus() and verifies:
    1) PORT_CONNECTION bit is 1. (10.14.2.6#1, 10.14.2.6#23)
    2) PORT_RESET bit is 1.
    3) C_PORT_CONNECTION is 0. (10.14.2.6.2#1)
  - ii.   LVSd verifies that the DFP exits U1 by performing a U1-exit LFPS handshake
  - iii. LVSd verifies that the DFP initates Recovery
  - iv. LVSd verifies a Hot Reset is completed on the DFP
  - v.   LVSd verifies the link transitions to U0
  - vi. Wait 200ms (max tTimeForResetError).
  - vii. LVSh issues GetPortStatus() and verifies:
    1) PORT_RESET bit is set to 0. (10.14.2.6#12)
    2) C_PORT_RESET is set to 1. (10.14.2.6#11, 10.14.2.6.2#8).
- e. DFP is in DSPORT.Enabled in U2
  - i.   LVSh immediately issues GetPortStatus() verifies:
    1) PORT_CONNECTION bit is 1. (10.14.2.6#1, 10.14.2.6#23)
    2) PORT_RESET bit is 1.
    3) C_PORT_CONNECTION is 0. (10.14.2.6.2#1)
  - ii.   LVSd verifies that the DFP exits U2 by performing a U2-exit LFPS handshake
  - iii. LVSd verifies that the DFP initates Recovery
  - iv. LVSd verifies a Hot Reset is completed on the DFP
  - v.   LVSd verifies the link transitions to U0
- f. DFP is in DSPORT.Enabled in U3
  - i.   LVSh immediately issues GetPortStatus().
  - ii.   LVSh verifies:
    1) PORT_CONNECTION bit is 1. (10.14.2.6#1, 10.14.2.6#23)
    2) PORT_RESET bit is 1.
    3) C_PORT_CONNECTION is 0. (10.14.2.6.2#1)
  - iii. LVSd verifies a Warm Reset is transmitted on the DFP
  - iv. LVSd verifies the link transitions to Rx.Detect
  - v.   Wait 200ms (max tTimeForResetError).
  - vi. LVSh issues GetPortStatus() and verifies:
    1) PORT_RESET bit is set to 0. (10.14.2.6#12)
    2) C_PORT_RESET is set to 1. (10.14.2.6#11, 10.14.2.6.2#8).
- g. DFP is in DSPORT.Error
  - i.   LVSd verifies that a Warm Reset is transmitted on the DFP
  - ii.   LVSd verifies that the link transitions to Rx.Detect
- h. DFP is in DSPORT.Disabled
  - i.   LVSd verifies no transition occurs
- i. DFP is in DSPORT.Resetting
  - i.   LVSd verifies that link continues to transition through the original Hot Reset but does not send another Hot Reset.

TD 10.111   Warm Reset Downstream Port Test

A. This test verifies that a DFP reacts correctly to a SetPortFeature(BH_PORT_RESET). Conditions:
1. DFP is in DSPORT.Powered-off-reset
2. DFP is in DSPORT.Disconnected
3. DFP is in DSPORT.Training
4. DFP is in DSPORT.Enabled in U0
5. DFP is in DSPORT.Enabled in U1
6. DFP is in DSPORT.Enabled in U2
7. DFP is in DSPORT.Enabled in U3
8. DFP is in DSPORT.Error
9. DFP is in DSPORT.Disabled
10. DFP is in DSPORT.Resetting

B. Covered Assertions:
1. 10.3.1.2#3
2. 10.3.1.6#1
3. 10.3.1.6#2
4. 10.3.1.6#4
5. 10.3.1.6#5

C. Procedure:
1. LVSh presents Vbus and terms on the UFP, LVSd presents terms on the DFP
2. LVSh brings UFP link to U0.
3. LVSh and LVSd take necessary steps to move to appropriate condition stated in A
   a. DFP is in DSPORT.Powered-off-reset
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1.
      iv. LVSh transmits ClearPortFeature(PORT_POWER) for the DFP.
      v. Wait tVbusOFF
      vi. If Vbus is present, LVSd verifies Warm Reset LFPS on DFP
   b. DFP is in DSPORT.Disconnected
      i. LVSd removes terms on the DFP link
   c. DFP is in DSPORT.Training
      i. LVSd and DFP link transitions to Polling.LFPS
      ii. LVSd verifies Polling.LFPS bursts from DFP
   d. DFP is in DSPORT.Enabled in U0
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh verifies on the DFP, that PLS = PR = 0, PP = CCS = PE = 1.
      iv. LVSh transmits a ClearPortFeature(C_Port_Connection) for the DFP
   e. DFP is in DSPORT.Enabled in U1
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh transmits SetPortFeature(PORT_U1_TIMEOUT) = 1us and SetPortFeature(PORT_U2_TIMEOUT) = 0 for the DFP.
      iv. LVSd and DFP link enters U1, and LVS sends Ping.LFPS every 200us to avoid U1 exit.
      v. LVSh verifies on the DFP, that PLS = 1, PR = 0, PP = CCS = PE = 1.
      vi. LVSh transmits a ClearPortFeature(C_Port_Connection) for the DFP
   f. DFP is in DSPORT.Enabled in U2
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP
      iii. LVSh transmits SetPortFeature(PORT_U1_TIMEOUT) = 0 and SetPortFeature(PORT_U2_TIMEOUT) = 0x01 for the DFP.
      iv. LVSd and DFP link enters U1.
      v. LVSh verifies on the DFP, that PLS = 2, PR = 0, PP = CCS = PE = 1.
      vi. LVSh transmits a ClearPortFeature(C_Port_Connection) for the DFP
   g. DFP is in DSPORT.Enabled in U3
      i. LVSd brings DFP link to U0
      ii. LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP

       iii.   LVSh transmits SetPortFeature(PORT_LINK_STATE) = 3 for the DFP.

       iv.   LVSd and DFP link enters U3

       v.   LVSh verifies on the DFP, that PLS = 3, PR = 0, PP = CCS = PE = 1.

       vi.   LVSh transmits a ClearPortFeature(C_Port_Connection) for the DFP

   h.   DFP is in DSPORT.Error

       i.   LVSd brings DFP link to U0

       ii.   LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP

       iii.   LVSd drops on LGOOD to the DFP to move the link to Recovery

       iv.   LVSd transmits nothing in Recovery.Active

       v.   LVSd verifies that between 12ms and 18ms later, the DFP tx is inactive.

       vi.   LVSh transmits GetPortStatus for the DFP and verifies that PLS = 6, PR = PE = 0, PP = 1

   i.   DFP is in DSPORT.Disabled

       i.   LVSd brings DFP link to U0

       ii.   LVSh configures UFP and does a GetPortStatus request for each port to determine the DFP

       iii.   LVSh transmits SetPortFeature(PORT_LINK_STATE) = 4 for the DFP.

       iv.   LVSd and DFP link enters SS.Disabled

       v.   LVSh verifies on the DFP, that PLS = 4, PR = CCS = PE = 0, PP = 1

   j.   DFP is in DSPORT.Resetting

       i.   LVSd brings DFP link to U0

       ii.   LVSh transmits SetPortFeature(PORT_RESET) for DFP

       iii.   LVSh verifies that DFP link transitions to Recovery.Active

4.   LVS initiates a SetPortFeature(BH_PORT_RESET) on the DFP

5.   LVS verifies that the correct action is initiated on the DFP link.

   a.   DFP is in DSPORT.Powered-off-Reset

       i.   If Vbus remained present, LVSd verifies that the link sends Warm Reset for the remainder of tReset

       ii.   LVSd verifies that no transition occurs or DFP transitions to Rx.Detect

   b.   DFP is in DSPORT.Disconnected

       i.   LVSd verifies that no transition occurs

   c.   DFP is in DSPORT.Training

       i.   LVSd verifies a Warm Reset is transmitted on the DFP

       ii.   LVSd verifies that the link transitions to Rx.Detect

   d.   DFP is in DSPORT.Enabled in U0

       i.   LVSh immediately issues GetPortStatus() and verifies:

          1)   PORT_CONNECTION bit is 1. (10.14.2.6#1, 10.14.2.6#23)

          2)   PORT_RESET bit is 1.

          3)   C_PORT_CONNECTION is 0. (10.14.2.6.2#1)

       ii.   LVSd verifies a Warm Reset is completed on the DFP

       iii.   LVSd verifies the link transitions to Rx.Detect

       iv.   Wait 200ms (max tTimeForResetError).

       v.   LVSh issues GetPortStatus() and verifies:

          1)   PORT_RESET bit is set to 0. (10.14.2.6#12)

          2)   C_PORT_RESET is set to 1. (10.14.2.6#11, 10.14.2.6.2#8).

          3)   C_BH_PORT_RESET is set to 1.

   e.   DFP is in DSPORT.Enabled in U1

       i.   LVSh immediately issues GetPortStatus() and verifies:

          1)   PORT_CONNECTION bit is 1. (10.14.2.6#1, 10.14.2.6#23)

          2)   PORT_RESET bit is 1.

          3)   C_PORT_CONNECTION is 0. (10.14.2.6.2#1)

       ii.   LVSd verifies a Warm Reset is completed on the DFP

       iii.   LVSd verifies the link transitions to Rx.Detect

       iv.   Wait 200ms (max tTimeForResetError).

       v.   LVSh issues GetPortStatus() and verifies:

          1)   PORT_RESET bit is set to 0. (10.14.2.6#12)

          2)   C_PORT_RESET is set to 1. (10.14.2.6#11, 10.14.2.6.2#8).

   f.   DFP is in DSPORT.Enabled in U2

       i.   LVSh immediately issues GetPortStatus() and verifies:

          1)   PORT_CONNECTION bit is 1. (10.14.2.6#1, 10.14.2.6#23)

          2)   PORT_RESET bit is 1.

3) C_PORT_CONNECTION is 0. (10.14.2.6.2#1)
  ii. LVSd verifies a Warm Reset is completed on the DFP
  iii. LVS verifies the link transitions to U0
  iv. Wait 200ms (max tTimeForResetError).
  v. LVSh issues GetPortStatus() and verifies:
    1) PORT_RESET bit is set to 0. (10.14.2.6#12)
    2) C_PORT_RESET is set to 1. (10.14.2.6#11, 10.14.2.6.2#8).
g. DFP is in DSPORT.Enabled in U3
  i. LVSh immediately issues GetPortStatus() and verifies:
    1) PORT_CONNECTION bit is 1. (10.14.2.6#1, 10.14.2.6#23)
    2) PORT_RESET bit is 1.
    3) C_PORT_CONNECTION is 0. (10.14.2.6.2#1)
  ii. LVS verifies a Warm Reset is transmitted on the DFP
  iii. LVS verifies the link transitions to Rx.Detect
  iv. Wait 200ms (max tTimeForResetError).
  v. LVSh issues GetPortStatus() and verifies:
    1) PORT_RESET bit is set to 0. (10.14.2.6#12)
    2) C_PORT_RESET is set to 1. (10.14.2.6#11, 10.14.2.6.2#8).
h. DFP is in DSPORT.Error
  i. LVS verifies that a Warm Reset is transmitted on the DFP
  ii. LVS verifies that the link transitions to Rx.Detct
i. DFP is in DSPORT.Disabled
  i. LVS verifies no transition occurs
j. DFP is in DSPORT.Resetting
  i. LVS verifies that a Warm Reset is transmitted on the DFP
  ii. LVS verifies that the link transitions to Rx.Detect

TD 10.112   Transition to DSPORT.Disconnected Test

A. This test verifies that an error during DSPORT.Resetting or DSPORT.Training will transition the link to DSPORT.Disconnected. Conditions:
  1. DFP is in DSPORT.Resetting (tTimeForResetError timeout)
  2. DFP is in DSPORT.Resetting (Polling timeout)
  3. DFP is in DSPORT.Training (Polling timeout)
B. Covered Assertions
  1. 10.3.1.2#5
  2. 10.3.1.2#9
  3. 10.3.1.2#10
  4. 10.3.1.6#9
C. Procedure
  1. LVSh presents Vbus and terms on the UFP, LVSd presents terms on the DFP
  2. LVSh brings UFP link to U0.
  3. LVSh and LVSd take necessary steps to move to appropriate condition stated in A
    a. DFP is in DSPORT.Resetting (tTimeForResetError timeout)
      i. LVSd brings DFP link to U0
      ii. LVSh transmits SetPortFeature(BH_PORT_RESET) for DFP
      iii. LVSd verifies that DFP transmits Warm Reset LFPS
      iv. LVSd removes terms before Warm Reset LFPS completes
      v. Wait for tTimeForResetError after Warm Reset LFPS completes
    b. DFP is in DSPORT.Resetting (Polling timeout)
      i. LVSd brings DFP link to U0
      ii. LVSh transmits SetPortFeature(BH_PORT_RESET) for DFP
      iii. LVSd verifies that DFP transmits Warm Reset LFPS
      iv. LVSd and DFP transition through Polling.LFPS to Polling.Active
      v. LVSd does not transmit any packet or Ordered Sets and removes terms.
      vi. Wait for 18ms.

       c.   DFP is in DSPORT.Training
           i.   LVSd and DFP link transitions to Polling.LFPS
           ii.   LVSd and DFP transition through Polling.LFPS and Polling.Active to Polling.Configuration
           iii.   LVSd does not transmit any packets or Ordered Sets and removes terms.
           iv.   Wait for 18ms.
   4.   LVSh issues GetPortStatus for DFP and verifies that PLS = 5, PP = 1, PR = CCS = PE = 0

TD 10.113   DSPORT.Disabled Test

A. This test verifies the HUT responses of some SetPortFeature requests when the DFP is in DSPORT.Disabled.
B. Assertions Covered
   1.   10.3.1.2#5
   2.   10.3.1.9#1
C. Procedure
   1.   LVSh presents VBUS and terminations to the UFP.
   2.   LVSd presents terminations to the DFP.
   3.   LVSh enumerates and configures the HUT.
   4.   LVSh issues a GetPortStatus() to each port to determine the DFP
   5.   LVSh issues a SetPortFeature(PORT_LINK_STATE = SS.Disabled) for the DFP.
   6.   LVSh issues a GetPortStatus request for the DFP and verifies:
       a.   PLS = 4 (10.3.1.9#1, 10.3.1.9#2)
       b.   PP = 1 (10.14.2.6#16)
       c.   CCS = 0 (10.14.2.6#2)
       d.   PR = 0 (10.14.2.6#12)
       e.   PE = 0 (10.14.6.2.6#6)
   7.   LVSh issues a GetStatus() to the LVSd.
   8.   LVSd verifies if the HUT does not propagate the packets downstream. (10.1.3.1#5).
   9.   LVSd removes terminations from the DFP.
   10. LVSh issues a SetPortFeature(PORT_LINK_STATE=U3) for the DFP.
   11. LVSd verfies if the DFP does not go to link state U3.(10.14.2.10#22)
   12. LVSh issues SetPortFeature(PORT_LINK_STATE = Rx.Detect) for the DFP.
   13. LVSd verifies that the link transitions to Rx.Detect
   14. LVSd presents terminations on DFP.
   15. For each value of link state X = {U0, U1, U2, U3}
       a.   LVSh issues a SetPortFeature(PORT_LINK_STATE = X) for the DFP.
       b.   LVSh issues a GetPortStatus request and verifies that PLS = X, PP = CCS = PE = 1 and PR = 0.
       c.   LVSh issues a SetPortFeature(PORT_LINK_STATE = SS.Disabled) for the DFP.
       d.   LVSh issues a GetPortStatus request to the PUT and verifies that PLS = 4, PP = 1, CCS = PR = PE = 0. (10.3.1.9#1)
       e.   LVSh issues a SetPortFeature(PORT_LINK_STATE = 5 (Rx.Detect)) for the DFP.
       f.   Wait for 600ms.

TD 10.114   Remove power during DSPORT.Powered-off-detect Test

This test is covered in TD 10.102.

TD 10.115   Hub Suspend/Resume Test

A. This test verifies suspend/resume functionality.
B. Assertions Covered

10.1.4#1, 10.1.4#2, 10.1.4#3, 10.2.1#1, 10.3.1.2#5, 10.3.1.5#1, 10.3.1.5#6, 10.3.1.9#1, 10.8#2, 10.8#3, 10.8#4, 10.8#5, 10.8#6, 10.8#7, 10.8#8, 10.8#9, 10.14.2.10#10, 10.14.2.10#11, 10.6.2.6#2

C. Procedure
1. LVSh presents Vbus and terms.
2. LVSh brings UFP link to U0.
3. LVSh enumerates and configures the HUT.
4. LVSd presents terms to the DFP.
5. LVSd brings DFP link to U0.
6. LVSh issues GetPortStatus to each port to determine the DFP (PE = 1)

Testing DFP suspend from U1 to U3

7. LVSh issues a SetPortFeature(PORT_LINK_STATE = 1) for the DFP.
8. LVSh issues GetPortStatus for the DFP and verifies the PLS = 1. (10.4.2.2#1)
9. LVSh issues a SetPortFeature(PORT_LINK_STATE = 3) for the DFP.
10. LVSh and LVSd verify that, after receiving the SetPortFeature(PORT_LINK_STATE = 3) on the UFP, the DFP initiated a transition to U0 and then to U3. (10.14.2.10#9)
11. LVSh issues a SetPortFeature(PORT_LINK_STATE = 0) for the DFP. (10.14.2.10#5, 10.4.2.1#13)

Testing DFP suspend from U2 to U3

12. LVSh issues a SetPortFeature(PORT_LINK_STATE = 2) for the DFP
13. LVSh issues GetPortStatus for the DFP and verifies the PLS = 2. (10.4.2.3#1)
14. LVSh issues a SetPortFeature(PORT_LINK_STATE = 3) for the DFP.
15. LVSh and LVSd verify that, after receiving the SetPortFeature(PORT_LINK_STATE = 3) on the UFP, the DFP initiated a transition to U0 and then to U3. (10.14.2.10#9)
16. LVSh issues a SetPortFeature(PORT_LINK_STATE = 0) for the DFP. (10.14.2.10#5, 10.4.2.1#13).

Testing no global suspend / resume

17. Connect a SS device to the HUT on an auxiliary downstream port.
18. LVSh enumerates and configures the auxiliary SS device.
19. LVSh issues SetPortFeature(PORT_LINK_STATE=U3) for the auxiliary downstream port
20. LVSh suspends the DFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3) for every port on the link path from DFP to UFP. (10.14.2.10#8)
21. LVSh suspends the UFP to U3.
22. Wait 1sec (tDSPortEnabledToU3).
23. LVSh resumes the UFP to U0 by initiating U3 exit sequence.
24. LVSh verifies UFP resumes to U0 (10.6.2.1#29)
25. LVSh resumes every intermediary port on the link path from the UFP to and excluding the DFP to U0.
26. LVSh verifies that both of the DFPs in low power states do not resume to U0 (10.8#2, 10.8#6)

27. LVSh resumes the DFP link to U0 by issuing a SetPortFeature(PORT_LINK_STATE=U0) for the DFP.
28. LVSd verifies the DFP drives wakeup signaling within tHubDriveResume Downstream. (10.14.2.10#5, 10.8#7)
29. LVSh verifies that the auxiliary port does not resume to U0. (10.8#2, 10.8#8)

Testing Remote wakeup initiated by device

30. LVSh disables Remote wake on the HUT by issuing SetFeature (FUNCTION_SUSPEND, LowPower=1, FunctionRemoteWake=0) request.
31. For each populated downstream port, starting at the last tier hub:
    a. If the port is connected to another hub, the LVSh makes sure to clear all port status change bits for each DS port of the hub
    b. LVSh suspends the port to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3)
32. LVSh clears all port status change bits for all downstream ports on the HUT
33. LVSh suspends UFP to U3. (10.6.2.6#1)
34. LVSd initiates Remote Wake to the DFP.
35. LVSh verifies that:
    a. The UFP resumes back to U0. (10.6.2.1#29, 10.8#4)
    b. The UFP drives wake up signaling within tHubPropRemoteWakeUpstream of receiving remote wake signaling on the DFP. (10.8#4)

c. The auxiliary downstream port does not resume back to U0. (10.8#6)
d. The DFP does not send an LFPS to LVSd before LVSh transmits U3 exit LFPS (10.8#5)
36. LVSd issues Remote Wake Device Notification packet.
37. LVSh verifies that the Notification packet is forwarded on the UFP. (10.1.3.1#1)
38. LVSh suspends the DFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3). (10.14.2.10#8)
39. LVSh clears all port status change bits for all downstream ports on the HUT and on any hubs connected downstream.
40. LVSd initiates Remote Wake Signaling and U3 exit sequence to the DFP
41. LVSd verifies that:
a. The DFP resumes back to U0 (10.8#3).
b. The HUT drives wake signaling on the DFP. (10.8#3)
42. LVSd issues Remote Wake Device Notification packet.
43. LVSh verifies that the Notification packet is forwarded on the UFP. (10.1.3.1#1)
44. LVSh enables Remote wake on the HUT by issuing SetFeature (FUNCTION_SUSPEND, LowPower=1, FunctionRemoteWake=1).
45. For each downstream port in the path from DFP to UFP, excluding the UFP and starting at the DFP:
a. If the port is connected to another hub, the LVSh clears all port status change bits for each DS port of the hub
b. LVSh suspends the port to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3) (10.14.2.10#8 for the DFP)
46. LVSh suspends the DFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3). (10.14.2.10#8)
47. LVSh clears all port status change bits for all downstream ports on the HUT.
48. LVSh suspends the UFP to U3.
49. LVSd initiates Remote Wake Signaling and U3 exit sequence to the DFP.
50. LVSh verifies that the UFP resumes to U0.

Testing DFP autonomous transition to U3

51. LVSh issues SetPortFeature(PORT_REMOTE_WAKE_MASK) with the all mask bits cleared (MSB of wIndex = 0) for the DFP.
52. LVSd removes terms from the DFP.
53. LVSh suspends every port on the path from DFP to UFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3).
54. LVSh suspends UFP to U3. (10.6.2.6#1)
55. LVSd presents terms to the DFP.
56. LVSd brings the DFP link to U0.
57. LVSd verifies that the DFP transitions to U3 within tDSPortEnabledToU3 (1 second) after entering U0 (10.3.1.5#6)

Not propagate packet to DFP in link U3 test

58. LVSh resumes UFP to U0. (10.6.2.1#29)
59. LVSh sends a GetStatus() request to LVSd.
60. LVSd verifies the DFP remains in U3.(10.4.2.6#3).
61. LVSh verifies that the UFP performs a link level Acknowledgement (LGOOD) of the GetStatus() Header packet (10.4.2.6#4)

Testing Remote wakeup initiated by HUT

62. LVSh enables Remote wake on the HUT by Set Feature (FUNCTION_SUSPEND, LowPower=1, FunctionRemoteWake=1).

Conn_RWEnable mask test

63. LVSd removes terms from the DFP.
64. LVSh clears all port status change bits for all downstream ports on the HUT and on any hubs connected downstream
65. LVSh issues SetPortFeature(PORT_REMOTE_WAKE_MASK) with Conn_RWEnable mask bit set to 1 for the DFP.
66. LVSh suspends every port on the path from DFP to UFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3).
67. LVSh suspends the UFP to U3. (10.6.2.6#1)
68. LVSd presents terms to the DFP.

69. LVSd brings the DFP link to U0.
70. LVSh verifies if the UFP sends Remote Wake Device Notification packet.
71. LVSh verifies if the UFP link successfully transitions to U0. (10.6.2.1#30, 10.8#11, 10.14.2.10#13).
72. LVSh issues GetStatus for the LVSd.
73. LVSh verifies that GetStatus completes successfully.
74. LVSd removes terms from the DFP.
75. LVSh clears all port status change bits for all downstream ports on the HUT and on any hubs connected downstream.
76. LVSh issues SetPortFeature(PORT_REMOTE_WAKE_MASK) with Conn_RWEnable mask bit cleared for the DFP.
77. LVSh suspends every port on the path from DFP to UFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3).
78. LVSh suspends UFP to U3. (10.6.2.6#1)
79. LVSd presents terms to the DFP.
80. LVSd brings the DFP link to U0.
81. LVSd verifies that the DFP link transitions to U0.
82. LVSh verifies that the UFP link does not transition to U0. (10.14.2.10#12)
83. LVSd verifies that the DFP link transitions to U3 within tDSPortEnabledToU3 (1 second) after entering U0 (10.3.1.5#6)
84. LVSh resumes UFP to U0. (10.6.2.1#29)
85. LVSh resumes every port on the path from UFP to DFP to U0.
86. Clear all port status change bits for all downstream ports on the HUT and on any hub connected downstream.

Disconn_RWEnable mask test

87. LVSh issues SetPortFeature(PORT_REMOTE_WAKE_MASK) with Disconn_RWEnable mask bit set to 1 for the DFP.
88. LVSh suspends the DFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3). (10.14.2.10#8)
89. LVSh suspends every port on the path from the DFP to UFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3).
90. LVSh suspends UFP to U3. (10.6.2.6#1)
91. LVSd removes terms from the DFP.
92. LVSh verifies that
    a. The UFP signals a Remote Wake. (10.14.2.10#15, 10.8#12)
    b. The UFP resumes to U0. (10.6.2.1#30)
    c. The UFP sends Remote Wake Device Notification packet.
93. LVSd presents terms to the DFP.
94. LVSd brings the DFP link to U0.LVSh enumerates and configures LVSd.
95. LVSd verifies that it is configured successfully.
96. LVSh clears all port status change bits for all downstream ports on the HUT and on any hub connected downstream.
97. LVSh issues SetPortFeature(PORT_REMOTE_WAKE_MASK) with Disconn_RWEnable mask bit cleared for the DFP.
98. LVSh suspends every port on the path from the DFP to UFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3). (10.14.2.10#8)
99. LVSh suspends the UFP to U3. (10.6.2.6#1)
100. LVSd removes terms from the DFP.
101. LVSh verifies that the UFP does not resume to U0. (10.6.2.1#30)
102. LVSh resumes every port on the path from UFP to DFP to U0.

NOTE: OC_RWEnable mask is tested in TD 10.23 because overcurrent fixture required.

Wake on Local Power Status Change test

103. If HUT's configuration descriptor reported bMaxPower>0 and bmAttributes.SelfPower=1 (Both Power modes supported) :
    a. NOTE : This state is USB 3.0 spec, Table10-3, Row 6
    b. Prompt user to remove the external power source of the HUT.
    c. NOTE : This state is USB 3.0 spec, Table10-3, Row 5
    d. LVSh verifies the UFP initiates U3 exit sequence. (10.6.2.1#30)

  e. LVSh disables Remote wake on hub by SetFeature (FUNCTION_SUSPEND, LowPower=1, FunctionRemoteWake=0).

  f. LVSh suspends UFP to U3. (10.6.2.6#1)

  g. Prompt user to attach the external power source of the HUT.

  h. LVSh verifies the UFP initiates a U3 exit sequence. (10.6.2.1#30)

  i. LVSh resumes UFP to U0.

  j. LVSh verifies if the UFP sends Remote Wake Device Notification.

Testing UFP suspend after remote wakeup

104. LVSh resumes UFP and all intermediary links from UFP to the DFP to U0.
105. LVSh clears all port status change bits for all downstream ports on the HUT and on any hub connected downstream.
106. LVSh suspends all ports on the path from the DFP to and excluding the UFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3).
107. LVSd initates U3 wakeup LFPS.
108. LVSd verifies that it receives U3 wakeup LFPS from DFP.
109. LVSh suspends the UFP to U3 immediately after verification.
110. LVSh verifies that the UFP drives U3 wakeup LFPS within tHubPropRemoteWakeUpstream. (10.8#9)

Global Suspend/ Resume Testing (corner case):

111. LVSh resumes the links from DFP to the UFP inclusive to U0 if these are not in U0.
112. LVSd removes and presents terms to the DFP.
113. LVSh immediately suspends the UFP or the port directly upstream from the DFP to U3.
114. Allow 5ms idle time.
115. LVSd verifies that the DFP link is in U3 (10.6.2.6#2).

TD 10.116 Hub DS Ports Initiating U1/U2 Test

A. This test verifies correct U1/U2 behavior.

B. Assertions Covered

10.2.1#1, 10.2.2#1, 10.2.2#2, 10.2.2#3, 10.2.2#4, 10.2.2#10, 10.2.2#11, 10.4.2.1#3, 10.4.2.1#4, 10.4.2.1#7, 10.4.2.1#8, 10.4.2.1#10, 10.4.2.1#11, 10.4.2.1#12, 10.4.2.1#13, 10.4.2.2#2, 10.4.2.3#2, 10.14.2.10#3.

C. Procedure

1. LVSh presents Vbus and terms on.
2. LVSh brings UFP link to U0.
3. LVSh enumerates and configures the HUT.
4. LVSd presents terminations.
5. LVSd brings the DFP link to U0.

Initiate U0 to U1, U0 to U2 test.

6. LVSh issues SetPortFeature(PORT_U1_TIMEOUT >0 and not 0xFF) and SetPortFeature(PORT_U2_TIMEOUT = 0) for the DFP.
7. Wait 1ms.
8. The LVSd verifies that it received an LGO_U1 from the DFP and the link successfully went to U1. (10.2.2#1, 10.4.2.1#4)
9. LVSd configures itself to reject LGO_U1.
10. LVSh issues SetPortFeature(PORT_LINK_STATE =U0) and SetPortFeature(PORT_U1_TIMEOUT=0) and SetPortFeature(PORT_U2_TIMEOUT >0 and not 0xFF) for the DFP.
11. Wait 70ms.
12. The LVSd verifies:
  a. The DFP sent an LMP to LVSd with the specified timeout value (PORT_U2_TIMEOUT). (10.14.2.10#3)
  b. The DFP initiated U2 transition by sending an LGO_U2. (10.2.2#1 and 10.4.2.1#8)

U1/U2 timeout value reset test

13. LVSd configures itself to reject both LGO_U1 and LGO_U2.
14. LVSh issues SetPortFeature(PORT_LINK_STATE =U0) and
    SetPortFeature(PORT_U1_TIMEOUT = 0x7E) and
    SetPortFeature(PORT_U2_TIMEOUT = 0x0) for the DFP.
15. Wait 128us.
16. LVSd verifies that:
    a.   The DFP sends LGO_U1.
    b.   The DFP link stays in U0. (10.4.2.2#4)
17. LVSh issues SetPortFeature(PORT_RESET) for the DFP.
18. Wait 128us after the link returns to U0.
19. The LVSd verifies that the DFP does not send any LGO_U1. (9.4.14#1)
20. LVSh issues SetPortFeature(PORT_U1_TIMEOUT = 0x0) and
    SetPortFeature(PORT_U2_TIMEOUT = 0xFE) for the DFP.
21. Wait 70ms.
22. LVSd verifies that:
    a.   The DFP sends LGO_U2.
    b.   The DFP link stays in U0. (10.4.2.3#4)
23. LVSh issues hot reset to the UFP.
24. Wait 70ms after the DFP link returns to U0.
25. LVSd verifies that the DFP does not send any LGO_U2. (10.2.2#4, 9.4.14#3)
26. LVSh enumerates and configures the HUT.
27. LVSh issues SetPortFeature(PORT_U1_TIMEOUT = 0x0) and SetPortFeature(PORT_U2_TIMEOUT = 0xFE) for
    the DFP.
28. Wait 70ms.
29. LVSd verifies that:
    a.   The DFP sends LGO_U2.
    b.   The link stays in U0. (10.4.2.3#4)
30. LVSh issues SetPortFeature(PORT_RESET) for the DFP.
31. Wait 70ms after the DFP link returns to U0.
32. The LVSd verifies that the DFP does not send any LGO_U2. (9.4.14#2)
33. LVSh issues SetPortFeature(PORT_U1_TIMEOUT = 0x7E) and SetPortFeature(PORT_U2_TIMEOUT = 0x0) for
    the DFP.
34. Wait 128us.
35. LVSd verifies that:
    a.   The DFP sends LGO_U1.
    b.   The link stays in U0. (10.4.2.2#4)
36. LVSh issues hot reset to the UFP.
37. Wait 128us after the DFP link returns to U0.
38. The LVSd verifies that the DFP does not send any LGO_U1. (10.2.2#4, 9.4.14#3)

Initiate U1/U2 Combination Test

39. U1 timeout =0xFF, U2 timeout = 0x0
    a.   LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0xFF) and SetPortFeature(PORT_U2_TIMEOUT=0x0) for
         the DFP.
    b.   Wait 80ms.
    c.   LVSd verifies that the DFP does not send any LGO_U1 or LGO_U2. (10.4.2.1#3, 10.4.2.1#27)
40. U1 timeout =0x0, U2 timeout = 0xFF
    a.   LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x0) and SetPortFeature(PORT_U2_TIMEOUT=0xFF) for
         the DFP.
    b.   Wait 80ms.
    c.   LVSd verifies that the DFP does not send any LGO_U1 or LGO_U2. (10.4.2.1#26, 10.4.2.1#7)
41. U1 timeout = 0x FF, U2 timeout =0xFE
    a.   LVSd configures itself to reject LGO_U1 and LGO_U2
    b.   LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0xFF) and SetPortFeature(PORT_U2_TIMEOUT=0xFE) for
         the DFP.
    c.   Wait 80ms.
    d.   LVSd verifies:

      i.   The DFP does not send LGO_U1. (10.4.2.1#10)

      ii.   DFP sends LGO_U2. (10.4.2.1#25)

42. U1 timeout =0x7E, U2 timeout= 0xFF
    a.   LVSd configures itself to respond properly to LGO_U1 and LGO_U2
    b.   LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x7E) and SetPortFeature(PORT_U2_TIMEOUT=0xFF) for the DFP.
    c.   Wait 127us.
    d.   LVSd verifies that DFP initiates transition to U1 by sending LGO_U1. (10.4.2.1#4)
    e.   Wait for 80ms after the DFP enters U1.
    f.   LVSh issues GetPortStatus() for the DFP and verifies that PLS=1. (10.4.2.1#7)

43. U1 timeout =0x7F, U2 timeout =0xFE)
    a.   LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x7F) and SetPortFeature(PORT_U2_TIMEOUT=0xFE) for the DFP.
    b.   LVSh issues SetPortFeature(PORT_LINK_STATE = U0) for the DFP.
    c.   LVSd verifies that the DFP link transitions to U0 (10.4.2.1#13)
    d.   Wait 128us after DFP link enters U0.
    e.   LVSd verifies that the DFP sends LGO_U1 and the link successfully transitions to U1. (10.4.2.1#4)
    f.   Wait 70ms.
    g.   LVSh issues GetPortStatus() for the DFP.
    h.   LVSh verifies that PLS = 2. (10.4.2.4#3)
    i.   LVSh sends SetPortFeature(PORT_LINK_STATE = U0) for the DFP.
    j.   LVSd verifies that the DFP link transitions to U0. (10.4.2.1#13)

U1/U2 timeout value reset by hub UFP power cycle test

44. LVSh removes VBUS and terms. LVSd removes terms.
45. LVS prompts user to cycle power to the HUT.
46. LVSh presents Vbus, LVSh and LVSd present terminations and bring the links to U0.
47. Wait 80ms.
48. LVSd verifies no LGO_U1 or LGO_U2 were received. (10.2.2#10, 10.4.2.1#26 and 10.4.2.1#27)

Testing U0->U1->U0 transition:

49. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x0) and SetPortFeature(PORT_U2_TIMEOUT=0x0) for the DFP.
50. LVSh issues SetPortFeature(PORT_LINK_STATE = U1) for the DFP.
51. LVSd verifies that:
    a.   The DFP sends an LGO_U1
    b.   The link successfully transitions to U1. (10.4.2.2#1, 10.14.2.10#6)
52. LVSh issues SetPortFeature(PORT_LINK_STATE = U0) for the DFP.
53. LVSd verifies that the DFP initiates a transition back to U0. (10.4.2.1#13, 10.14.2.10#5)

Testing U0->U2->U0 transition:

54. LVSh issues SetPortFeature(PORT_LINK_STATE = U2) for the DFP.
55. LVSd veifies that:
    a.   The DFP sends an LGO_U2
    b.   The link successfully transitions to U2. (10.4.2.3#1)
56. LVSh issues SetPortFeature(PORT_LINK_STATE = U0) for the DFP.
57. LVSd verifies that the DFP initiates a transition back to U0. (10.4.2.1#13 and 10.14.2.10#5)

Testing Timeout Reset due to Port Power Off

58. LVSh issues SetPortFeature (PORT_U1_TIMEOUT=0x0) and SetPortFeature(PORT_U2_TIMEOUT = 0xFE (65 ms)) for the DFP.
59. LVSh issues ClearPortFeature(PORT_POWER) for the DFP.
60. LVSh issues SetPortFeature(PORT_POWER) for the DFP.
61. LVSd verifies that its link transitions back to U0.
62. Wait 80 ms.
63. LVSd verifies that the DFP does not send an LGO_U2. (9.4.14#2)

64. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x7F) and SetPortFeature(PORT_U2_TIMEOUT = 0x0) for the DFP.
65. LVSh issues ClearPortFeature(PORT_POWER) for the DFP.
66. LVSh issues SetPortFeature(PORT_POWER) for the DFP.
67. LVSd verifies that its link transitions back to U0.
68. Wait 80 ms.
69. LVSd verifies that the DFP did not send an LGO_U1. (9.4.14#1)

TD 10.117   Hub DS Inactivity Timers Reset Test

A. This test verifies U1/U2 Timers reset, U1/U2 Timeouts reset, and U1/U2 Timers accuracy.
B. Assertions Covered

9.4.14#1, 9.4.14#2, 10.2.2#9, 10.4.1#1, 10.4.1#2, 10.4.1#4, 10.14.2.10#1, 10.14.2.10#2, 10.14.2.10#3

C. Procedure
1. LVSh presents Vbus and terms on.
2. LVSh brings UFP link to U0.
3. LVSh enumerates and configures the Hub.
4. LVSd presents terminations.
5. LVSd brings the DFP link to U0.
6. LVSd configures itself to reject LGO_U1 and LGO_U2.
7. U1/U2 Timers accuracy test:
   a. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x1) and SetPortFeature(PORT_U2_TIMEOUT=0) for the DFP.
   b. Wait 10ms.
   c. LVSh sends SETUP TP to the LVSd.
   d. LVSd verifies that the DFP starts sending LGO_U1 between 1us and 2us after the LVSd receives the SETUP TP. (10.4.1#4, 10.4.1#2, 10.14.2.10#3)
   e. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x40) and SetPortFeature(PORT_U2_TIMEOUT=0) for the DFP.
   f. Wait 10ms.
   g. LVSh sends SETUP TP to the LVSd.
   h. LVSd verifies that the DFP starts sending LGO_U1 between 64us and 65us after the LVSd receives the SETUP TP. (10.4.1#4, 10.4.1#2, 10.14.2.10#3)
   i. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x7F) and SetPortFeature(PORT_U2_TIMEOUT=0x00) for the DFP.
   j. Wait 10ms.
   k. LVSh sends SETUP TP to the LVSd.
   l. LVSd verifies that the DFP starts sending LGO_U1 between 127us and 128us after the LVSd receives the SETUP TP. (10.4.1#4, 10.4.1#2, 10.14.2.10#3)
   m. LVSh issues SetPortFeature(PORT_U1_TIMEOUT= 0x0) and SetPortFeature(PORT_U2_TIMEOUT=0x1) for the DFP.
   n. Wait 10ms.
   o. LVSh sends SETUP TP to the LVSd.
   p. LVSd verifies that the DFP starts sending LGO_U2 between 256us and 756us after the LVSd receives the SETUP TP. (10.4.1#4, 10.4.1#2, 10.14.2.10#3)
   q. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x0) and SetPortFeature(PORT_U2_TIMEOUT=0x80) for the DFP.
   r. Wait 10ms.
   s. LVSh sends SETUP TP to the LVSd.
   t. LVSd verifies that the DFP starts sending LGO_U2 between 32.768ms and 33.268ms after the LVSd receives the SETUP TP. (10.4.1#4, 10.4.1#2, 10.14.2.10#3)
   u. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0) and SetPortFeature(PORT_U2_TIMEOUT=0xFE) for the DFP.

    v.   Wait 10ms.

    w.   LVSh sends SETUP TP to the LVSd.

    x.   LVSd verifies that the DFP starts sending LGO_U2 between 65.024ms and 65.524ms after the LVSd receives the SETUP TP. (10.4.1#4, 10.4.1#2, 10.14.2.10#3)

8. U1 Timer/Timeout reset test
   a. LVSh issues SetPortFeature(PORT_U1_TIMEOUT = 0x7E), SetPortFeature(PORT_U2_TIMEOUT=0x0) for the DFP.
   b. LVSh sends a SETUP DP to the LVSd when the LVSh receives the ACK TP for the STATUS stage of the last SetPortFeature() in step a.
   c. Wait 20us.
   d. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x7F) for the DFP.
   e. LVSd verifies that the DFP does not send LGO_U1 for 128us after the LVSd received the SETUP DP. (10.4.1#1)
   f. LVSd removes and presents terminations.
   g. LVSd brings the DFP link to U0.
   h. Wait 128us.
   i. LVSd verifies that the DFP does not send LGO_U1. (9.4.14#1).

9. U2 Timer/Timeout reset test
   a. LVSh issues SetPortFeature (PORT_U1_TIMEOUT=0x0) and SetPortFeature(PORT_U2_TIMEOUT= 0x14) for the DFP.
   b. LVSh sendis a SETUP DP to the LVSd when the LVSh receives the ACK TP for the STATUS stage of the last SetPortFeature() in step a.
   c. Wait 1ms.
   d. LVSh issues SetPortFeature(PORT_U2_TIMEOUT=0x15) for the DFP.
   e. LVSd verifies that the DFP does not start sending LGO_U2 for 5.88ms after the LVSd receives the SETUP DP. (10.4.1#1, 10.4.1#2, 10.14.2.10#3)
   f. LVSd removes and presents terminations.
   g. LVSd brings the PUT link to U0.
   h. Wait 5.5ms.
   i. LVSd verifies that the DFP does not send LGO_U2. (9.4.14#2)

10. Hub Downstream Inactivity Timers not reset by ITP test
   a. LVSh issues SetPortFeature (PORT_U1_TIMEOUT=0x0) and SetPortFeature(PORT_U2_TIMEOUT = 0x4) (1024us) for the DFP.
   b. Wait 20ms.
   c. LVSh sends a SETUP TP to the LVSd.
   d. LVSh waits 700us.
   e. LVSh sends ITP
   f. LVSd verifies that:
      i. The DFP forwards the ITP. (10.1.3.1#3)
      ii. The DFP starts sending LGO_U2s between 1024us and 1524us after the LVSd receives the SETUP TP. (10.2.2#9)
   g. LVSh issues SetPortFeature(PORT_U2_TIMEOUT = 0) for the DFP.
   h. LVSh issues SetPortFeature(PORT_U1_TIMEOUT = 0x7F) for the DFP.
   i. Wait 20ms.
   j. LVSh sends a SETUP TP to the LVSd.
   k. LVSh waits 50us.
   l. LVSh sends ITP.
   m. LVSd verifies that:
      i. The DFP forwards the ITP. (10.1.3.1#3)
      ii. The DFP starts sending LGO_U1s between 127us and 128us after the LVSd receives the SETUP TP. (10.2.2#9)

11. Hub Downstream Inactivity Timers reset by non-ITP packet test
   a. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0) and SetPortFeature(PORT_U2_TIMEOUT=0) for the DFP.
   b. LVSh issues SetPortFeature(PORT_U2_TIMEOUT = 0xFE (65 ms)) for the DFP.
   c. Wait 5ms.
   d. LVSh sends a SETUP TP to the LVSd.
   e. Wait 60.5ms.

f. LVSd verifies that the DFP did not send an LGO_U2. (10.4.1#2)

g. LVSh issues SetPortFeature(PORT_U2_TIMEOUT = 0) and SetPortFeature(PORT_U1_TIMEOUT = 0x7F) for the DFP.

h. Wait 50us.

i. LVSh sends a SETUP TP to the LVSd.

j. Wait 78us.

k. LVSd verifies that the DFP did not send an LGO_U1. (10.4.1#2)

TD 10.118   Hub DS Ports accepting U1/U2 Test

A. This test verifies Hub DFP U1/U2 behavior.

B. Assertions Covered

10.2.2#5, 10.2.2#8, 10.4.2.1#1, 10.4.2.1#2, 10.4.2.1#5, 10.4.2.1#6, 10.4.2.1#9, 10.4.2.1#10, 10.4.2.1#12, 10.4.2.2#1, 10.4.2.2#3, 10.4.2.3#1.

C. Procedure

Cannot test all the valid timeout values.

Cannot generate the case where traffic is pending.

This test is explicitly setting the Timeouts to 0.

1. LVSh presents Vbus and terms on.
2. LVSh enumerates and configures the HUT.
3. LVSd presents terminations.
4. LVSh enumerates and configures LVSd.
5. Device U1 enable = 1, U2 enable = 0; DFP U1 timeout = 0, U2 timeout = 0.
   a. LVSh sets LVSd U1 enable = 1, U2 enable = 0. (SetFeature(U1_ENABLE), ClearFeature(U2_ENABLE))
   b. LVSh sets the DFP U1 timeout = 0, U2 timeout = 0. (SetPortFeature(PORT_U1_TIMEOUT=0), SetPortFeature(PORT_U2_TIMEOUT=0))
   c. LVSd sends LGO_U1 after 1ms.
   d. LVSd verifies that the DFP rejects U1 entry. (10.4.2.1#5)
6. Device U1 enable = 0, U2 enable = 1; DFP U1 timeout = 0, U2 timeout = 0.
   a. LVSh sets LVSd U1 enable = 0, U2 enable = 1.
   b. LVSh sets the DFP U1 timeout = 0, U2 timeout = 0.
   c. LVSd sends LGO_U2 after 1ms.
   d. LVSd verifies that the DFP rejects U2 entry. (10.4.2.1#5)
7. Device U1 enable = 1, U2 enable = 0; DFP U1 timeout = 0, U2 timeout = 0xFE.
   a. LVSh sets LVSd U1 enable = 1, U2 enable = 0.
   b. LVSh sets the DFP U1 timeout = 0, U2 timeout = 0xFE.
   c. LVSd sends LGO_U1 after it receives the U2_Inactivity_Timeout LMP.
   d. LVSd verifies that the DFP rejects U1 entry. (10.4.2.1#5)
8. Device U1 enable = 0, U2 enable = 1; DFP U1 timeout = 0, U2 timeout = 0xFE.
   a. LVSh sets the DFP U1 timeout = 0x00, U2 timeout = 0x00.
   b. LVSh sets LVSd U1 enable = 0, U2 enable = 1.
   c. LVSh sets the DFP U1 timeout = 0, U2 timeout = 0xFE.
   d. LVSd verifies that after it receives the U2_Inactivity_Timeout LMP and the U2_Timeout timer expires, the DFP accepts U2 entry. (10.4.2.1#6)
9. Device U1 enable = 1, U2 enable = 0; DFP U1 timeout = 0x7F, U2 timeout = 0.
   a. LVSh sets LVSd U1 enable = 1, U2 enable = 0. The DFP link resumes from U2 to U0. (10.4.2.1#18)
   b. LVSh sets the DFP U1 timeout = 0x7F, U2 timeout = 0 (Set U2 timeout first).
   c. LVSd verifies that the DFP accepts U1 entry. (10.4.2.1#2)
10. Device U1 enable = 0, U2 enable = 1; DFP U1 timeout = 0x7F, U2 timeout = 0.
   a. LVSh sets LVSd U1 enable = 0, U2 enable = 1. The DFP link resumes from U1 to U0. (10.4.2.1#17)
   b. LVSh sets the DFP U1 timeout = 0x7F, U2 timeout = 0.
   c. LVSd sends LGO_U2 after 1ms.
   d. LVSd verifies that the DFP rejects U2 entry. (10.4.2.1#1)
11. Device U1 enable = 1, U2 enable = 0; DFP U1 timeout =0xFF, U2 timeout = 0x0

a. LVSh sets the DFP U1 timeout =0xFF, U2 timeout = 0x0.
b. LVSh sets LVSd U1 enable = 1 and U2 enable = 0 (Set U2 Enable first).
c. LVSd verifies that the DFP accepts U1 entry. (10.4.2.1#3)

12. Device U1 enable = 0, U2 enable = 1; DFP U1 timeout =0x0, U2 timeout = 0xFF
    a. LVSh sets LVSd U1 enable = 0, U2 enable = 1. The DFP Link resumes from U1 to U0. (10.4.2.1#17)
    b. LVSd verifies that the DFP rejects U2 entry.
    c. LVSh sets the DFP U1 timeout =0x0, U2 timeout = 0xFF.
    d. LVSd verifies that the DFP accepts U2 entry. (10.4.2.1#7)

13. Device U1 enable = 1, U2 enable = 0; DFP U1 timeout >0 (0x7F), U2 timeout >0 (0xFE)
    a. LVSh sets LVSd U1 enable = 1, U2 enable = 0. The DFP Link resumes from U2 to U0. (10.4.2.1#18).
    b. LVSd verifies that the DFP rejects U1 entry.
    c. LVSh sets the DFP U1 timeout = 0x7F, U2 timeout = 0xFE (Set U2 timeout first).
    d. LVSd verifies that the DFP accepts U1 entry. (10.4.2.1#2)

14. Device U1 enable = 0, U2 enable = 1; DFP U1 timeout >0 (0x7F), U2 timeout >0 (0xFE)
    a. LVSh sets the DFP U1 timeout = 0x00, U2 timeout = 0x00.
    b. LVSh sets LVSd U1 enable = 0, U2 enable = 1. The DFP Link resumes from U2 to U0 (10.4.2.1#18).
    c. LVSd verifies that the DFP rejects U2 entry.
    d. LVSh sets the DFP U1 timeout = 0x7F, U2 timeout = 0xFE.
    e. LVSd verifies that the DFP accepts U2 entry. 10.4.2.1#6)

15. Device U1 enable = 1, U2 enable = 0; DFP U1 timeout = 0xFF, U2 timeout >0 (0xFE)
    a. DFP U1 timeout = 0x00, U2 timeout = 0x00. The DFP Link resumes from U2 to U0. (10.4.2.1#18)
    b. LVSh sets LVSd U1 enable = 1, U2 enable = 0 (Set U2 Enable first).
    c. LVSd verifies that the DFP rejects U1 entry.
    d. LVSh sets the DFP U1 timeout = 0xFF, U2 timeout = 0xFE (Set U2 timeout first).
    e. LVSd verifies that the DFP accepts U1 entry. (10.4.2.1#3)

16. Device U1 enable = 0, U2 enable = 1; DFP U1 timeout = 0xFF, U2 timeout >0 (0xFE).
    a. LVSh sets the PUT U1 timeout = 0x00, U2 timeout = 0x00.
    b. LVSh sets LVSd U1 enable = 0, U2 enable = 1. The DFP Link resumes from U2 to U0. (10.4.2.1#18)
    c. LVSd verifies that the DFP rejects U2 entry.
    d. LVSh sets the DFP U1 timeout = 0xFF, U2 timeout = 0xFE.
    e. LVSd verifies that the DFP accepts U2 entry. (10.4.2.1#6)

17. Device U1 enable = 1, U2 enable = 0; DFP U1 timeout >0 (0x7F), U2 timeout = 0xFF.
    a. LVSh sets the DFP U1 timeout = 0x00, U2 timeout = 0x00. The DFP Link resumes from U2 to U0. (10.4.2.1#18)
    b. LVSh sets LVSd U1 enable = 1, U2 enable = 0.
    c. LVSd verifies that the DFP rejects U1 entry.
    d. LVSh sets the DFP U1 timeout = 0x7F, U2 timeout = 0xFF (Set U2 timeout first).
    e. LVSd verifies that the DFP accepts U1 entry. (10.4.2.1#2)

18. Device U1 enable = 0, U2 enable = 1; DFP U1 timeout >0 (0x7F), U2 timeout = 0xFF.
    a. LVSh sets the DFP U1 timeout = 0x00, U2 timeout = 0x00. The DFP Link resumes from U1 to U0. (10.4.2.1#17)
    b. LVSh sets LVSd U1 enable = 0, U2 enable = 1.
    c. LVSd verifies that the DFP rejects U2 entry.
    d. LVSh sets the DFP U1 timeout = 0x7F, U2 timeout = 0xFF.
    e. LVSd verifies that the DFP accepts U2 entry.(10.4.2.1#7)

19. Device U1 enable = 1, U2 enable = 0; DFP U1 timeout = 0xFF, U2 timeout = 0xFF.
    a. LVSh sets DFP U1 timeout = 0x00, U2 timeout = 0x00. The DFP Link resumes from U2 to U0. (10.4.2.1#18)
    b. LVSh sets LVSd U1 enable = 1, U2 enable = 0.
    c. LVSd verifies that the DFP rejects U1 entry.
    d. LVSh sets the PUT U1 timeout = 0xFF, U2 timeout = 0xFF (Set U2 timeout first).
    e. LVSd verifies that the DFP accepts U1 entry. (10.4.2.1#3)

20. Device U1 enable = 0, U2 enable = 1; DFP U1 timeout = 0xFF, U2 timeout = 0xFF.
    a. LVSh sets the DFP U1 timeout = 0x00, U2 timeout = 0x00. The DFP Link resumes from U1 to U0. (10.4.2.1#17)
    b. LVSh sets LVSd U1 enable = 0, U2 enable = 1.
    c. LVSd verifies that the DFP rejects U2 entry.
    d. LVSh sets the PUT U1 timeout = 0xFF, U2 timeout = 0xFF.
    e. LVSd verifies that the DFP accepts U2 entry. (10.4.2.1#7)

TD 10.119 Hub USPort Initiating U1/U2 Test

A. This test verifies the UFP automatic transition to low power state when all downstream ports are in a low power state.

B. Assertions Covered:
1. 10.1.4#1
2. 10.1.4#2
3. 10.2.3#1
4. 10.2.3#3
5. 10.2.3#5
6. 10.2.3#7
7. 10.4.2.4#1
8. 10.4.2.5#1
9. 10.4.2.5#2
10. 10.4.2.6#1
11. 10.4.2.6#2
12. 10.6.2.1#18
13. 10.6.2.1#23
14. 10.6.2.1#24
15. 10.6.2.1#30
16. 10.6.2.1#8
17. 10.6.2.1#10
18. 10.6.2.1#11
19. 10.6.2.1#12
20. 10.9#1
21. 10.9#2
22. 10.14.2.10#5
23. 10.14.2.10#8

C. Procedure:
1. LVSh presents Vbus and terms, LVSd presents terms.
2. LVSh brings UFP link to U0.
3. LVSd brings DFP link to U0.
4. LVSh enumerates and configures HUT and LVSd (LVSd behaves as wake up capable device).
5. Connect a SS KGD to one auxiliary downstream port. This port will be referred to as the ADP (Auxiliary Downstream Port in Test).
6. LVSh enumerates and configures the ADP.

Propagation of link power state test - UFP with both U1 and U2 enabled.

7. LVSh is programmed not to initiate or accept U1 and/or U2 state transition.
8. LVSh sends SetFeature(U1_ENABLE) and SetFeature(U2_ENABLE) for the HUT and PATH US ports.
9. LVSh sends SetPortFeature(U1_TIMEOUT = 0xFF) and SetPortFeature(U2_TIMEOUT = 0xFF) for the PATH DS ports.
10. Take the following steps to put DFP link in different states.

ADP = U2, DFP = U1, Expect UFP to initiate transition from U0 to U1:

a. LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the ADP.
b. LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.
c. LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#18)

ADP = U2, DFP = U2, Expect UFP to initiate transition from U0 to U2:

d. LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) for the DFP .
e. LVSd wakes DFP link to U0.
f. LVSh issues GetPortStatus() for the ADP.
g. LVSh verifies that PLS=2 for the ADP.
h. LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP.

       i.   LVS verifies that the UFP sends LGO_U2 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.6.2.1#11, 10.4.2.5#1)

ADP = U2, DFP = U3, Expect UFP to initiate transition from U0 to U2:

    j.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.
    k.   LVSh issues GetPortStatus() for the ADP.
    l.   LVSh verifies that PLS=2 for the ADP.
    m.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.
    n.   LVS verifies that the UFP sends LGO_U2 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#11)

ADP = U1, DFP = U1, Expect UFP to initiate transition from U0 to U1:

    o.   LVSh sends SetPortFeature(PORT_LINK_STATE = U0) for the DFP. (10.14.2.10#5)
    p.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0F) and SetPortFeature(PORT_LINK_STATE =U0) on ADP.
    q.   LVSh issues GetPortStatus() for ADP.
    r.   LVSh verifies that PLS=1 for the ADP.
    s.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.
    t.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.2.3#1, 10.6.2.1#18)

ADP = U1, DFP = U2, Expect UFP to initiate transition from U0 to U1:

    u.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.
    v.   LVSh issues GetPortStatus() for the ADP.
    w.   LVSh verifies that PLS=1 for the ADP.
    x.   LVSh sends SetPortFeature(U2_TIMEOUT=0x01) for the DFP.
    y.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#18)

ADP = U1, DFP = U3, Expect UFP to initiate transition from U0 to U1:

    z.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.
    aa.   LVSh issues GetPortStatus() for the ADP.
    bb.   LVSh verifies that PLS=1 for the ADP.
    cc.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.
    dd.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#18)

ADP = U3, DFP = U1, Expect UFP to initiate transition from U0 to U1:

    ee.   LVSh sends SetPortFeature(PORT_LINK_STATE = U0) for the DFP. (10.14.2.10#5)
    ff.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) for the ADP.
    gg.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the ADP. (10.14.2.10#8)
    hh.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.
    ii.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#18)

ADP = U3, DFP = U2, Expect UFP to initiate transition from U0 to U2:

    jj.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.
    kk.   LVSh issues GetPortStatus() for the ADP.
    ll.   LVSh verifies that PLS=3 for the ADP.
    mm.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP.
    nn.   LVS verifies that the UFP sends LGO_U2 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#18)

ADP = U3, DFP = U3, Expect UFP to initiate transition from U0 to U2:

    oo. LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.
    pp. LVSh issues GetPortStatus() for the ADP.
    qq. LVSh verifies that PLS=3 for the ADP.
    rr. LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.
    ss. LVS verifies that the UFP sends LGO_U2 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#18)

Propagation of link power state test - UFP with U1 enabled and U2 disabled.

11. LVSh removes and presents Vbus and terms.
12. LVSh enumerates and configures HUT, LVSd and ADP (LVSd is wakeup capable)
13. LVSh is programmed not to initiate or accept U1 and/or U2 state transition.
14. LVSh sends SetFeature(U1_ENABLE) and ClearFeature(U2_ENABLE) for the HUT and PATH US ports
15. LVSh sends SetPortFeature(U1_TIMEOUT=0xFF) and SetPortFeature(U2_TIMEOUT=0xFF) for the PATH DS ports.
16. LVSh sends SetFeature(U1_ENABLE) and SetFeature(U2_ENABLE) for the LVSd and ADP device.

ADP = U2, DFP = U1, Expect UFP to initiate transition from U0 to U1:

    a. LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the ADP.
    b. LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.
    c. LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.2.3#1, 10.6.2.1#18)

ADP = U2, DFP = U2, Expect UFP to initiate transition from U0 to U1:

    d. LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.
    e. LVSh issues GetPortStatus() for the ADP.
    f. LVSh verifies that PLS=2 for the ADP.

    g. LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP.
    h. LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.5#1, 10.6.2.1#6, 10.6.2.1#18)

ADP = U2, DFP = U3, Expect UFP to initiate transition from U0 to U1:

    i. LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.
    j. LVSh issues GetPortStatus() for the ADP.
    k. LVSh verifies that PLS=2 for the ADP.
    l. LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.
    m. LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.6#1, 10.4.2.6#2, 10.6.2.1#6, 10.6.2.1#18)

ADP = U1, DFP = U1, Expect UFP to initiate transition from U0 to U1:

    n. LVSh sends SetPortFeature(PORT_LINK_STATE = U0) for the DFP. (10.14.2.10#5)
    o. LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0F) and SetPortFeature(PORT_LINK_STATE =U0) for the ADP.
    p. LVSh sends SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.
    q. LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#18)

ADP = U1, DFP = U2, Expect UFP to initiate transition from U0 to U1:

      r.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.

      s.   LVSh issues GetPortStatus() for the ADP.

      t.   LVSh verifies that PLS=1 for the ADP.

      u.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP.

      v.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.5#2, 10.6.2.1#18)

ADP = U1, DFP = U3, Expect UFP to initiate transition from U0 to U1:

      w.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.

      x.   LVSh sends GetPortStatus() for the ADP.

      y.   LVSh verifies that PLS=1 for the ADP.

      z.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.

      aa.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.6#2, 10.6.2.1#18)

ADP = U3, DFP = U1, Expect UFP to initiate transition from U0 to U1:

      bb.   LVSh sends SetPortFeature(PORT_LINK_STATE = U0) for the DFP. (10.14.2.10#5)

      cc.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) for the ADP.

      dd.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the ADP. (10.14.2.10#8)

      ee.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.

      ff.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.4#1, 10.6.2.1#18)

ADP = U3, = U2, Expect UFP to initiate transition from U0 to U1:

      gg.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.

      hh.   LVSh issues GetPortStatus() for the ADP.

      ii.   LVSh verifies that PLS=3 for the ADP.

      jj.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP.

      kk.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.5#1, 10.6.2.1#6, 10.6.2.1#18)

ADP = U3, DFP = U3, Expect UFP to initiate transition from U0 to U1:

      ll.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.

      mm. LVSh issues GetPortStatus() for the ADP.

      nn.   LVS verifies that PLS=3 for the ADP.

      oo.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.

      pp.   LVS verifies that the UFP sends LGO_U1 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.6#1, 10.4.2.6#2, 10.2.3#5, 10.6.2.1#6, 10.6.2.1#18)

Propagation of link power state test - UFP with U1 disabled and U2 enabled.

17. LVSh removes and presents Vbus and terms.

18. LVSh enumerates and configures HUT, LVSd and ADP (LVSd is wakeup capable).

19. LVSh is programmed not to initiate or accept U1 and/or U2 state transition.

20. LVSh sends ClearFeature(U1_ENABLE) and SetFeature(U2_ENABLE) for the HUT and PATH US ports.

21. LVSh sends SetPortFeature(U1_TIMEOUT=0xFF) and SetPortFeature(U2_TIMEOUT=0xFF) for the PATH DS ports.

22. LVSh sends SetFeature(U1_ENABLE) and SetFeature(U2_ENABLE) for the DFP and ADP.

ADP = U2, DFP = U1, Expect UFP to stay in U0:

      a.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the ADP.

      b.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.

      c.   LVSh verifies that the UFP does not send any LGO_Ux for 5us after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.6.2.1#5)

ADP = U2, DFP = U2, Expect UFP to initiate transition from U0 to U2:

    d.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.

    e.   LVSh issues GetPortStatus() for the ADP.

    f.   LVSh verifies that PLS=2 for the ADP.

    g.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP.

    h.   LVS verifies that the UFP sends LGO_U2 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.5#1, 10.6.2.1#11)

ADP = U2, DFP = U3, Expect UFP to initiate transition from U0 to U2:

    i.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.

    j.   LVSh issues GetPortStatus() for the ADP.

    k.   LVSh verifies that PLS=2 for the ADP.

    l.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.

    m.   LVS verifies that the UFP sends LGO_U2 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.6#1, 10.6.2.1#11)

ADP = U1, DFP = U1, Expect UFP to stay in U0:

    n.   LVSh sends SetPortFeature(PORT_LINK_STATE = U0) for the DFP.(10.14.2.10#5)

    o.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0F) and SetPortFeature(PORT_LINK_STATE =U0) for the ADP.

    p.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.

    q.   LVSh verifies that the UFP does not send any LGO_Ux for 5us after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.6.2.1#5)

ADP = U1, DFP = U2, Expect UFP to stay in U0:

    r.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.

    s.   LVSh issues GetPortStatus() for the ADP.

    t.   LVSh verifies that PLS=1 for the ADP.

    u.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP.

    v.   LVSh verifies that the UFP does not send any LGO_Ux for 5us after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.6.2.1#5)

ADP = U1, DFP = U3, Expect UFP to stay in U0:

    w.   LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.

    x.   LVSh issues GetPortStatus() for the ADP.

    y.   LVSh verifies that PLS=1 for the ADP.

    z.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.

    aa.   LVSh verifies that the UFP does not send any LGO_Ux for 5us after DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.6.2.1#5)

ADP = U3, DFP = U1, Expect UFP to stay in U0:

    bb.   LVSh sends SetPortFeature(PORT_LINK_STATE = U0) for the DFP. (10.14.2.10#5)

    cc.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) for the ADP.

    dd.   LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the ADP. (10.14.2.10#8)

    ee.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.

    ff.   LVSh verifies that the UFP does not send any LGO_Ux for 5us after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.6.2.1#5)

ADP = U3, DFP = U2, Expect UFP to initiate transition from U0 to U2:

    gg.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.

    hh.   LVSh issues GetPortStatus() for the ADP.

    ii.   LVSh verifies that PLS=3 for the ADP.

    jj.   LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP.

kk. LVS verifies that the UFP sends LGO_U2 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.5#1, 10.6.2.1#11)

ADP = U3, DFP = U3, Expect UFP to initiate transition from U0 to U2:

ll. LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(U1_TIMEOUT = 0x0) for the DFP.
mm. LVSh issues GetPortStatus() for the ADP.
nn. LVSh verifies that PLS=3 for the ADP.
oo. LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.
pp. LVS verifies that the UFP sends LGO_U2 within tHubPort2PortExitLatTiered after the DFP transmitted LPMA on the DFP link or the SetPortFeature() is completed on the UFP link. (10.4.2.6#1, 10.6.2.1#11)

Propagation of link power state test - UFP with both U1 and U2 disabled.

23. LVSh removes and presents Vbus and terms.
24. LVSh enumerates and configures the HUT, LVSd and ADP. (LVSd is wakeup capable)
25. LVSh is programmed not to initiate or accept U1 and/or U2 state transition.
26. LVSh sends ClearFeature(U1_ENABLE) and ClearFeature(U2_ENABLE) on UFP and PATH US ports.
27. LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the ADP. (10.14.2.10#8)
28. LVSh sends SetPortFeature(U1_TIMEOUT=0xFF) and SetPortFeature(U2_TIMEOUT=0xFF) for the PATH DS ports.
29. LVSh sends SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP.
30. Wait 500ms.
31. LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x01) and SetPortFeature(PORT_LINK_STATE =U0) for the DFP.
32. Wait 500ms.
33. LVSh sends SetPortFeature(U2_TIMEOUT = 0x0) and SetPortFeature(PORT_LINK_STATE = U3) for the DFP. (10.14.2.10#8)
34. Wait 500ms.
35. LVSh verifies that the UFP did not send any LGO_Ux starting at step 18. (10.2.3#3, 10.2.3#5))
36. Test: warm reset on UFP link when all links are in U3.
    a. LVSh sends SetPortFearure(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) for the ADP.
    b. LVSh sends SetPortFeature(U1_TIMEOUT = 0x0) and SetPortFeature(U2_TIMEOUT = 0x0) for the DFP.
    c. LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the ADP.
    d. LVSh sends SetPortFeature(PORT_LINK_STATE = U3) for the DFP.
    e. LVSh sends LGO_U3 on UFP and the link transitions to U3.
    f. LVSh generates a warm reset LFPS on UFP link.
    g. LVS verifies that both UFP and DFP links transition back to U0. (10.9#1, 10.9#2)

TD 10.120   Hub US Port Accepting U1/U2 Test

A. This test verifies U states of the Upstream hub port.
B. Assertions Covered:
    1. 10.6.2.1#1
    2. 10.6.1#2
    3. 10.6.2.1#3
    4. 10.6.2.1#4
    5. 10.6.2.1#5
    6. 10.6.2.1#6
    7. 10.6.2.1#7
    8. 10.6.2.1#8
    9. 10.6.2.1#10
    10. 10.6.2.1#11
    11. 10.6.2.1#12
    12. 10.6.2.1#13
    13. 10.6.2.1#16
    14. 10.6.2.1#17

15. 10.6.2.3#1
16. 10.6.2.3#3
17. 10.6.2.4#1
18. 10.6.2.4#2
19. 10.6.2.4#3
20. 10.6.2.5#1
21. 10.6.2.5#2
22. 10.6.2.1#15
23. 10.6.2.1#18
24. 10.6.2.1#19

C. Procedure:

NOTE: LVSd and ADP used in this TD must not exit from U1/U2 unless intended by the test.

1. LVSh presents Vbus and terms. LVSd presents terms.
2. LVSh brings UFP link to U0.
3. LVSd brings DFP link to U0.
4. Plug in SS KGD on ADP (Auxiliary Downstream Facing Port).
5. LVSh enumerates and configures HUT.
6. LVSh sends SetLinkFunction LMP with Force_LinkPM_Accept bit asserted to the UFP.
7. LVSh initiates U1 entry with LGO_U1.
8. LVSh verifies that the UFP accepts U1 entry with LAU. (10.6.2.1#1)
9. LVSh brings UFP link to U0.
10. LVSh initiates U2 Entry with LGO_U2.
11. LVSh verifies that the UFP accepts U2 entry with LAU. (10.6.2.1#1)

U1_ENABLE=0, U2_ENABLE=0

12. LVSh is programmed not to initiate or accept U1 and/or U2 state transition unless directed by test steps.
13. LVSh issues Warm reset on UFP.
14. LVSh enumerates and configures the HUT, LVSd and ADP.
15. LVSh clears all port status change bits for all downstream ports of the HUT by sending ClearPortFeature().

Accepting U1:

16. LVSh issues SetPortFeature(PORT_LINK_STATE=1) for the DFP and for the ADP.
17. LVSh issues SetPortFeature(PORT_LINk_STATE=1) for any tiered hub DS port in the HUT on the path from the UFP to the DFP, excluding the DFP.
18. LVSh sends LGO_U1.
19. LVSh verifies that the UFP responds with LAU and UFP link transitions successfully to U1. (10.6.2.1#3, 10.6.2.4#1)

Resume from U1 to U0 by downstream port:

20. LVSd initiates U1 exit.
21. LVSh verifies that the UFP initiates U1 exit and the link successfully transitions back to U0. (10.6.2.1#25)

Accepting U2:

22. LVSh issues SetPortFeature(PORT_LINK_STATE=0) for the ADP.
23. LVSh issues SetPortFeature(PORT_LINK_STATE=2) for the DFP and for the ADP.
24. LVSh issues SetPortFeature(PORT_LINK_STATE=2) for any tiered hub DS port in the HUT on the path from the UFP to the DFP, excluding the DFP.
25. LVSh sends LGO_U2.
26. LVSh verifies that the UFP responds with LAU and UFP link transitions successfully to U2. (10.6.2.1#4, 10.6.2.5#1)

Resume from U2 to U0 by downstream port:

27. LVSd initiates U2 exit.
28. LVSh verifies that the UFP initiates U2 exit and the link successfully transitions back to U0. (10.6.2.1#26)

No Accepting U2:

29. LVSh initiates the U2 Entry by sending LGO_U2.
30. LVSh verifies that the UFP responds with LXU (Because DFP link in U0). (10.6.2.1#17)

No Accepting U1:

31. LVSh initiates U1 Entry by sending LGO_U1.
32. LVSh verifies hat the UFP responds with LXU (Because DFP link in U0). (10.6.2.1#16)

U1_ENABLE = 1, U2_ENABLE=0

33. LVSh is programmed not to initiate or accept U1 and/or U2 state transition unless stated in test steps.
34. LVSh issues Warm Reset on UFP.
35. LVSh enumerates and configures the HUT, LVSd and ADP.
36. LVSh clears all port status change bits for all downstream ports of the HUT by sending ClearPortFeature() .
37. LVSh issues SetFeature(U1_ENABLE) request for the HUT.
38. LVSh issues SetPortFeature(PORT_LINK_STATE=2) for the DFP and for the ADP.
39. LVSh issues SetPortFeature(PORT_LINK_STATE=2) for any tiered hub DS port in the HUT on the path from the UFP to the DFP, excluding the DFP.

Accepting U2:

40. LVSh sends an LGO_U2.
41. LVSh verifies that
    a. the UFP responds with LAU. (10.6.2.1#4)
    b. the US link transitions to U2. (10.6.2.5#1)

Accepting U1:

42. LVSh brings the UFP link to U0.
43. LVSh issues SetPortFeature(PORT_LINK_STATE=0) for the DFP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
44. LVSh sends SetPortFeature(U2_TIMEOUT = 0x00) and SetPortFeature(U1_TIMEOUT = 0x7F) for the DFP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
45. Wait for 10ms.
46. LVSh sends a SETUP packet to the LVSd.
47. Wait for 135us after LVSd receives SETUP packet.
48. LVSh sends LGO_U1.
49. LVSh verifies that
    a. The UFP responds with LAU. (10.6.2.1#3)
    b. The UFP link transitions to U1. (10.6.2.4#1)

No Accepting U2:

50. LVSh brings the UFP link to U0.
51. LVSh initiates U2 entry by sending LGO_U2.
52. LVSh verifies that UFP responds with LXU for LGO_U2 (Because DFP link in U1). (10.6.2.1#17)

No Accepting U1:

53. LVSh issues SetPortFeature(U1_TIMEOUT=0x0) and SetPortFeature(PORT_LINK_STATE=0) for the DFP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
54. LVSh initiates U1 Entry by sending LGO_U1.
55. LSVh verifies that UFP responds with LXU for LGO_U1 (Because DFP link in U0). (10.6.2.1#16)

U1_ENABLE=0, U2_ENABLE=1

56. LVSh is programmed not to initiate or accept U1 and/or U2 state transition unless stated in test steps.
57. LVSh issues Warm Reset.

58. LVSh enumerates and configures the HUT, LVSd and ADP.
59. LVSh clear all port status change bits for all downstream ports of the HUT by sending ClearPortFeatrure().
60. LVSh issues SetFeature(U2_Enable) for the HUT.

Accepting U2:

61. LVSh sends SetPortFeature(U1_TIMEOUT = 0x00) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP and for the ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
62. Wait 757us.
63. LVSh sends LGO_U2 to UFP.
64. LVSh verifies that:
    a.   The UFP responds with LAU. (10.6.2.1#4)
    b.   The UFP link successfully transitions to U2. (10.6.2.5#1)

Accepting U1:

65. LVSh brings the UFP link back to U0.
66. LVSh issues SetPortFeature(PORT_LINK_STATE=0) for the DFP and for the ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
67. LVSh sends SetPortFeatrure(U2_TIMEOUT = 0x00) and SetPortFeatrure(U1_TIMEOUT = 0x7F) for the DFP and for the ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
68. Wait for 10ms.
69. LVSh sends a SETUP packet to the LVSd.
70. Wait for 135us after LVSd receives SETUP packet.
71. LVSh initiates U1 Entry by sending LGO_U1.
72. LVSh verifies that:
    a.   The UFP responds with LAU. (10.6.2.1#3)
    b.   The UFP successfully transitions to U1. (10.6.2.4#1)

No Accepting U1:

73. LVSh initiates U0 entry.
74. LVSh sends SetPortFeatrure(U1_TIMEOUT = 0x00) and SetPortFeature(PORT_LINK_STATE=0) for the DFP and for the ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
75. LVSh sends LGO_U1.
76. LVSh verifies that the UFP responds with LXU for LGO_U1 (Because DFP link in U0). (10.6.2.1#16)

No Accepting U2:

77. LVSh initiates U2 entry by sending LGO_U2.
78. LVSh verifies that UFP responds with LXU for LGO_U2 (Because DFP link in U0). (10.6.2.1#17)

U1_ENABLE=1, U2_ENABLE=1

79. LVSh is programmed not to initiate or accept U1 and/or U2 state transition unless stated by test steps.
80. LVSh issues Warm Reset.
81. LVSh enumerates and configures the HUT, LVSd and ADP.
82. LVSh clears all port status change bits for all downstream ports of the HUT by sending ClearPortFeature().

Accept U1 or U2:

83. LVSh sends SetFeature (U1_ENABLE) and SetFeature (U2_ENABLE) requests to the HUT.
84. LVSh sends SetPortFeature(U1_TIMEOUT = 0x7F) and SetPortFeatrure(U2_TIMEOUT = 0x00) for the DFP and for the ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP. (10.6.2.1#18, 10.6.2.1#27)

No Accepting U2:

85. Wait 135us.
86. LVSh initiates U2 entry by sending LGO_U2.
87. LVSh verifies that the UFP responds with LXU for LGO_U2. (10.6.2.1#17)

Accepting U1:

88. LVSh sends LGO_U1 to UFP.
89. LVSh verifies that
    a. The UFP responds with LAU. (10.6.2.1#3)
    b. The UFP link successfully transitions to U1. (10.6.2.4#1)
90. LVSh brings the UFP link to U0.
91. LVSh issues SetPortFeature(U1_TIMEOUT=0) for the DFP and for the ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP. (10.6.2.1#21).
92. LVSh issues SetPortFeature(PORT_LINK_STATE=0) for the ADP and DFP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.

Accepting U2:

93. LVSh sends SetPortFeature(U2_TIMEOUT = 0x01) for the DFP and for the ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP. (10.6.2.1#11, 10.6.2.1#28, 10.6.2.3#4)
94. Wait 757us.
95. LVSh sends LGO_U2 to UFP.
96. LVSh verifies that
    a. The UFP responds with LAU. (10.6.2.1#4)
    b. The UFP link successfully transitions to U2. (10.6.2.5#1)

No Accepting U1:

97. LVSh brings the UFP link to U0.
98. LVSh issues SetPortFeature(U2_TIMEOUT=0) and SetPortFeature(PORT_LINK_STATE=0) for the DFP and ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP. (10.6.2.1#22).
99. LVSh initiates U1 entry by sending LGO_U1.
100. LVSh verifies that UFP responds with LXU for LGO_U1. (10.6.2.1#16)

Testing U0->U1->U2 silent transition

101. LVSh sends ClearPortFeature(U1_ENABLE) and ClearPortFeature(U2_ENABLE) to the UFP.
102. LVSh sends SetPortFeature(U1_TIMEOUT = 0x00) and SetPortFeature(U2_TIMEOUT = 0x01) for the DFP and ADP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
103. LVSh sends U2 Inactivity Timeout LMP with U2 Inactivity Timeout value = 0xFE.
104. Wait 10ms.
105. LVSh verifies that the UFP does not send any LGO_U1 or LGO_U2.
106. LVSh sends LGO_U1.
107. LVSh verifies that the link successfully transitions to U1.
108. LVSh verifies that the UFP stops sending Ping.LFPS between 65.024ms and 65.524ms after the link enters U1.
109. LVSh brings UFP link to U0.

Automatic transition U0->U1->U0->U2, without UFP PM Timer

110. LVSh sends SetPortFeature(U2_TIMEOUT=0) and SetPortFeature(PORT_LINK_STATE=0) for the DFP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP. (Keep ADP in U2.)
111. LVSh sends U2 Inactivity Timeout LMP with U2 Inactivity Timeout value = 0xFF.
112. LVSh sends SetFeature(U1_ENABLE) and SetFeature(U2_ENABLE) to the HUT.
113. LVSh sends SetPortFeature(U2_TIMEOUT = 0xFE) and (U1_TIMEOUT = 0x7F) for the DFP and for any tiered hub DS port in the HUT on the path from the UFP to the DFP.
114. Wait 129us after LVSd receives U2_Inactivity_Timeout LMP.
115. LVSh verifies that the UFP sends LGO_U1 and the link successfully transitions to U1. (10.6.2.1#18)
116. Wait 65.4ms.
117. LVSh verifies that
    a. The UFP initiate a successful transition to U0. (10.6.2.1#31)
    b. The UFP immediately sends LGO_U2 and the link successfully transitions to U2. (10.6.2.1#11)

TD 10.121   Overcurrent Test

A.   This test has been deleted because we don't have an OC fixture that will work for most products.

TD 10.122   Status Change Endpoint Test

A.   This test verifies that the HUT returns status change notification when port status change occurs.

B.   Assertions Covered
1.   10.1.3.2#3
2.   10.11.1#2
3.   10.11.1#3
4.   10.11.1#5
5.   10.11.2#1
6.   10.11.2#2
7.   10.11.2#5
8.   10.11.3#1
9.   10.11.4#1
10.   10.11.4#2
11.   10.11.4#4
12.   10.11.4#8
13.   10.14.2.6.2#1
14.   10.14.2.6.2#3
15.   10.14.2.6.2#8
16.   10.14.2.6.2#9

C.   Procedure
1.   LVSh presents VBUS and terminations on UFP.
2.   LVSh enumerates and configures the HUT.
3.   LVSh clears all the change bits by ClearPortFeature for each downstream port on the HUT.
4.   LVSh issues an INTR IN.
5.   LVSh verifies that the HUT returns an NRDY. (10.11.1#2)
6.   LVSd presents terminations on DFP.
7.   LVSh verifies that an ERDY is received from the status change endpoint. (10.11.1#3)
8.   LVSh issues an INTR IN.
9.   LVSh verifies that:
   a.   Hub/Port Status Change Bitmap is returned from the status change endpoint. (10.11.1#5)
   b.   The route string is set to zero in the INTR IN packet. (10.1.3.2#3)
   c.   Returned Hub/Port Status Change Bitmap is 1 or 2 bytes. (10.11.4#8)
   d.   Corresponding bit with DFP is set to one in the Hub/Port Status Change Bitmap. (10.11.4#2)
   e.   Bit (bNbrPorts + 1) to bit 15 are set to zero in the Hub/Port Status Change Bitmap. (10.11.4#1)
10.   LVSh issues SetPortFeature(PORT_RESET) request for the DFP.
11.   Wait 200ms (max tTimeForResetError).
12.   LVSh sends an INTR IN.
13.   LVSh veriries that:
   a.   Hub/Port Status Change Bitmap is received from the status change endpoint. (10.11.1#5)
   b.   The route string is set to zero in the INTR IN packet. (10.1.3.2#3)
   c.   Returned Hub/Port Status Change Bitmap is 2-byte. (10.11.4#8)
   d.   Corresponding bit with DFP is set to one in the Hub/Port Status Change Bitmap. (10.11.4#2)
   e.   Bit (bNbrPorts + 1) to bit 15 are set to zero in the Hub/Port Status Change Bitmap. (10.11.4#1)
14.   LVSh issues GetPortStatus request for DFP.
15.   LVSh verifies that:
   a.   The route string is set to zero in the data stage packet. (10.1.3.2#3)
   b.   At least one change bit is set to one. (10.11.4#4)
   c.   C_PORT_CONNECTION = 1. (10.14.2.6.2#1).
   d.   C_PORT_RESET bit = 1. (10.14.2.6.2#8).
16.   LVSh issues another INTR IN.
17.   LVSh verifies that the same Port Status Change bitmap as the previous one is received. (10.11.2#5)

18. LVSh issue GetPortStatus.
19. LVSh verifies that C_PORT_CONNECTION = C_PORT_RESET =1. (10.11.2#1 and 10.11.2#2).
20. Prompt tester to plug in SS Device on Auxiliary Downstream Port (ADP).
21. LVSh issues INTR IN.
22. LVSh verifies that bits corresponding with both DFP and ADP are set to one in the Hub/Port Status Change Bitmap. (10.11.4#2)
23. LVSh issues GetPortStatus for the ADP.
24. LVSh verifies that C_PORT_CONNECTION = 1. (10.14.2.6.2#1)
25. LVSh issues GetPortStatus for the DFP.
26. LVSh verifies that C_PORT_CONNECTION = C_PORT_RESET = 1. (10.11.2#1 and 10.11.2#2)
27. LVSh clears C_PORT_CONNECTION and C_PORT_RESET for the DFP by ClearPortFeature.
28. LVSh issues another INTR IN.
29. LVSh verifies that:
    a. Corresponding bit with the DFP is 0 in the port status change bit map. (10.11.3#1)
    b. Corresponding bit with the ADP is 1 in the port status change bit map. (10.11.4#2)
30. LVSh issues GetPortStatus for the ADP.
31. LVSh verifies that C_PORT_CONNECTION = 1. (10.11.2#1 and 10.11.2#2)
32. LVSh issues GetPortStatus for the DFP.
33. LVSh verifies that:
    a. C_PORT_CONNECTION = 0. (10.14.2.6.2#3)
    b. C_PORT_RESET = 0. (10.14.2.6.2#9)
34. LVSh clears the C_PORT_CONNECTION for the ADP by ClearPortFeature.
35. LVSh issues INTR IN.
36. LVSh verifies that an NRDY is returned. (10.11.1#2)
37. LVSh issue GetPortStatus for the ADP.
38. LVSh verifies that C_PORT_CONNECTION = 0. (10.14.2.6.2#3)
39. Prompt the user to disconnect the SS Device from the ADP.
40. LVSh verifies that port status change bitmap is returned from status change endpoint. (10.11.1#5)

TD 10.123   ITP Packet Signaling and Connectivity Test

A. This test has been deleted because it requires 3 generaters.

TD 10.124   Hub Control Transfer Latency Test

A. This test verifies bus traffic timing constraints for hub.
B. Assertions Covered
   1. 10.14.1#1
   2. 10.14.1#2
   3. 10.14.1#5
C. Procedure
   1. LVSh presents VBUS and terminations on the UFP.
   2. LVSh enumerates and configures the HUT.
   3. LVSh issues ClearFeature(ENDPOINT_HALT).
   4. LVSh verifies that request completes within 50ms. (10.14.1#1)
   5. LVSh issues GetDescriptor(Configuration).
   6. LVSh verifies that the data stage completes within 50ms after completion of the setup stage. (10.14.1#2)
   7. LVSh verifies that the status stage completes within 50ms after completion of the data stage. (10.14.1#5)

TD 10.125   Hub LMP Test

A. This test verifies that the hub correctly sends LMP packets.
B. Assertions Covered
   1. 8.4.2#2

2. 10.3.1.5#4
3. 10.14.2.2#8
4. 10.14.2.10#24
C. Procedure
1. LVSh presents VBUS and terminations on UFP.
2. LVSh enumerates and configures the HUT.
3. LVSd presents terminations on DFP and brings the link to U0.

SetLinkFunction LMP Test

4. LVSh issues SetPortFeature(FORCE_LINKPM_ACCEPT).
5. LVSd verifies that Set Link Function LMP is received with Force_LinkPM_Accept bit set to one. (8.4.2#2)
6. LVSh issues ClearPortFeature(FORCE_LINKPM_ACCEPT).
7. LVSd verifies that Set Link Function LMP is received with Force_LinkPM_Accept bit set to zero. (10.14.2.2#8)

Port Configuration LMP test

8. LVSh issues SetPortFeature(PORT_RESET).
9. LVSd verifies that no Port Capabilities LMP, Port Configuration LMP or Port Configuration Response LMP is received. (10.3.1.5#4)
10. LVSh issue SetPortFeature(BH_PORT_RESET).
11. LVSd verifies that Port Capabilities LMP and Port Configuration LMP are received. (10.3.1.5#4)

TD 10.126   Packet Deferring Test

A. This test verifies that deferred packets are used correctly.
B. Assertions Covered
1. 10.4.2.1#17
2. 10.7.8.4#11
3. C.1.2.2#1
4. C.1.2.2#2
C. Procedure
1. LVSh presents VBUS and terminations on UFP.
2. LVSh enumerates and configures the HUT.
3. LVSd presents terminations to the DFP.
4. LVSh enumerates and configures the LVSd.
5. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x7F) and SetPortFeature(PORT_U2_TIMEOUT=0) for the DFP.
6. Wait until DFP link goes to U1.
7. LVSh issues GetStatus to LVSd.
8. LVSh verifies that a deferred packet is received. (C.1.2.2#1).
9. LVSh verifies that the header packet with the deferred bit set does not contain payload. (10.7.8.4#11)
10. LVSd verifies that DFP link resumes to U0. (10.4.2.1#17)
11. LVSd verifies that a deferred packet is received after DFP link resumes to U0. (C.1.2.2#2).
12. LVSd verifies that the header packet with the deferred bit set does not contain payload. (10.7.8.4#11)
13. Wait until DFP link goes to U1.
14. LVSh issues ClearFeature(U1_ENABLE) and GetStatus() to the LVSd, with 2 Idle ordered sets between the packets.
15. LVSh verifies that 2 deferred backets are received.
16. LVSd verifies that the DFP link resumes to U0.
17. LVSd verifies that 2 deferred packets are received after DFP link resumes to U0.
18. LVSh issues SetPortFeature(PORT_U1_TIMEOUT=0x0) and SetPortFeature(PORT_U2_TIMEOUT=0xFE) for the DFP.
19. Wait until DFP link goes to U2.
20. LVSh issues GetStatus to LVSd.
21. LVSh verifies that a deferred packet is received (C.1.2.2#1).
22. LVSh verifies that the packet with the deferred bit set does not contain payload. (10.7.8.4#11)
23. LVSd verifies that DFP link resumes to U0. (10.4.2.1#17)
24. LVSd verifies that a deferred packet is received after DFP link resumes to U0. (C.1.2.2#2).

25. LVSd verifies that the header packet with the deferred bit set does not contain payload. (10.7.8.4#11)
26. Wait until DFP link goes to U2.
27. LVSh issues ClearFeature(U2_ENABLE) and GetStatus() to the LVSd, with 2 Idle ordered sets between the packets.
28. LVSh verifies that 2 deferred packets are received.
29. LVSd verifies that the DFP link resumes to U0.
30. LVSd verifies that 2 deferred packets are received after DFP link resumes to U0.
31. LVSh sends a DPH (reporting a DPP with length=8) without the DPP to the LVSd and sets the deferred bit.
32. LVSd verifies that the HUT forwards the DPH.
33. LVSh sends ACK TP with the deferred bit set to the status change EP of the HUT.
34. LVSh verifies the HUT does not send an ERDY TP.
35. LVSh sends ACK TP with the deferred bit cleared to the status change EP of the HUT.
36. LVSh verifies the HUT sends NRDY TP.
37. LVSd removes termination on the PUT.
38. LVSh verifies the HUT sends ERDY TP.
39. LVSh sends ACK with the deferred bit set to the status change EP of the HUT.
40. LVSh verifies the HUT sends ERDY TP.
41. LVSh sends ACK with the deferred bit cleared to the status change EP of the HUT.
42. LVSh verifies the HUT sends status change bitmap.

TD 10.127 Hub Timing Parameters Test

A. This test verifies the HUT forwards packets or decodes packet headers within the time specified in the Hub Descriptor.
B. Assertions Covered
   1. 10.3.1.6.4
   2. 10.3.1.6#5
   3. 10.4.2.4#1
   4. 10.4.2.4#4
   5. 10.4.2.5#1
   6. 10.4.2.5#2
   7. 10.4.2.5#3
   8. 10.4.2.5#5
   9. 10.13.2.1#16
   10. 10.13.2.1#18
   11. 10.17#2
C. Procedure
   1. LVSh presents VBUS and terminations on UFP.
   2. LVSh enumerates and configures the HUT.
   3. LVSh clears all change bits.
   4. LVSd presents terminations on DFP.
   5. LVSh reads hub descriptor by GetHubDescriptor.

wHubDelay Test

   6. LVSh issues 10 GetStatus requests to LVSd.
   7. LVSh and LVSd verify that the maximum delay of IN packets is less than wHubDelay. (10.13.2.1#18)
   8. LVSh and LVSd verify that the maximum delay of OUT packets is less than wHubDelay. (10.13.2.1#18)

bHubHdrDecLat Test

   9. For each link state X = {U1, U2}:
      a. LVSh issues SetPortFeature(PORT_LINK_STATE=X) for the DFP.
      b. LVSh issues a GetStatus request to LVSd.
      c. LVSh and LVSd verifies that time between last symbol of header packet of GetStatus request to LFPS wake signal is less than bHubHdrDecLat. (10.13.2.1#16)
   10. LVSh places the DFP link to U0 by SetPortFeature(PORT_LINK_STATE=U0).

UFP U2 Test

11. LVSh enables U2 transition on UFP and DFP by SetFeature(U2_ENABLE) and SetPortFeature(PORT_U2_TIMEOUT=0xFE) for each DS port on the path from UFP to and including DFP.
12. LVSh and LVSd verify that UFP transmits an LGO_U2 within tHubPort2PortExitLatTiered after DFP transmits LPMA. (10.4.2.5#1)
13. LVSd initiates transition to U0.
14. LVSh verifies that the UFP transmits a U2 Exit LFPS within tHubPort2PortExitLatTiered after DFP link initiates a U2 Exit LFPS (10.4.2.5#3).
15. LVSh disables U2 transition on DFP and UFP by ClearFeature(U2_Enable) and SetPortFeature(PORT_U2_TIMEOUT=0) for each DS port on the path from UFP to and including DFP.

UFP U1 Test

16. LVSh enables U1 transition on UFP and DFP by SetFeature(U1_ENABLE) and SetPortFeature(PORT_U1_TIMEOUT=0x7F) for each DS port on the path from UFP to and including DFP.
17. LVSh and LVSd verify that UFP transmits LGO_U1 within tHubPort2PortExitLatTiered after DFP transmits LPMA. (10.4.2.4#1)
18. LVSd initiates transition to U0.
19. LVSh verifies that the UFP transmits a U1 Exit LFPS within tHubPort2PortExitLatTiered after DFP link initiates a U1 Exit LFPS. (10.4.2.4#4)
20. LVSh disables U1 transition on DFP and UFP by ClearFeature(U1_Enable) and SetPortFeature(PORT_U1_TIMEOUT=0) for each DS port on the path from UFP to and including DFP.

UFP U1 and DFP U2 Test

21. LVSh enables U1 transition on UFP by SetFeature(U1_ENABLE).
22. LVSh enables U2 transition on DFP by SetPortFeature(PORT_U2_TIMEOUT=0x7F) for each DS port on the path from UFP to and including DFP.
23. LVSh and LVSd verify that UFP transmits LGO_U1 within tHubPort2PortExitLatTiered after DFP transmits LPMA. (10.4.2.5#2)
24. LVSd initiates transition to U0.
25. LVSh verifies that UFP transmits U1 Exit LFPS within tHubPort2PortExitLatTiered + wU2DevExitLat – bU1DevExitLat after the DFP link initiates a U1 Exit LFPS. (10.4.2.5#5)
26. LVSh disables U1/U2 transition on UFP and DFP.

TD 10.128 Hub Initial State Test

A. This test verifies that resets are handled correctly by the hub.
B. Assertions Covered
   1. 10.9#3
   2. 10.9#4
C. Procedure
   1. LVSh presents VBUS and terminations on UFP.
   2. LVSh enumerates and configures the HUT.
   3. LVSd presents terminations on DFP.
   4. For each reset_type Y = {Hot Reset, Warm Reset}:
      a. LVSh issues SetFeature(FUNCTION_SUSPEND) with Function Remote Wake Enabled = 1 to the HUT
      b. LVSh issues SetFeature(U1_ENABLE) to the HUT.
      c. LVSh issues SetFeature(U2_ENABLE) to the HUT.
      d. LVSh issues SetFeature(LTM_ENABLE) to the HUT.
      e. LVSh issues SetFeature(ENDPOINT_HALT) to the HUT for status change endpoint.
      f. LVSh sends a Set Link Function LMP to the HUT with the Force_LinkPM_Assert bit = 1.
      g. LVSh issues reset_type Y on the UFP.
      h. Wait 500ms.
      i. LVSh issues GetDescriptor(Device) to address 0 and LVSh verifies that the request succeeds. (10.9#4, 10.9#3)
      j. LVSh assigns an address to the HUT and issues a SetAddress request.
      k. LVSh issues a GetConfiguration request to the HUT and verifies that the returned configuration value = 0. (10.9#4, 10.9#3)
      l. LVSh enumerates and configures the HUT.

m. LVSh issues a GetStatus(recipient=endpoint) to the HUT and verifies that the endpoint is not halted. (10.9#4, 10.9#3)
n. LVSh issues a GetStatus(recipient=device) to the HUT and verifies that:
   i. Remote Wakeup status bit = 0. (10.9#4, 10.9#3)
   ii. U1_ENABLE = 0. (10.9#4, 10.9#3)
   iii. U2_ENABLE = 0. (10.9#4, 10.9#3)
   iv. LTM_ENABLE = 0. (10.9#4, 10.9#3)
o. LVSh issues GetPortStatus for each downstream port to determine the DFP.
p. LVSh enumerates and configures LVSd.

Port inactivity timers reset test

q. For each link state X = {U1, U2}:
   i. LVSh issues a SetPortFeature(PORT_X_TIMEOUT = 0x11) for the DFP..
   ii. Wait for 100ms.
   iii. LVSh issues a GetPortStatus() for the DFP and verifies that PLS = X.
   iv. LVSh issues reset_type Y on the UFP.
   v. LVSh enumerates and configures the HUT and the LVSd.
   vi. Wait for 100ms.
   vii. LVSh issues a GetPortStatus for the DFPand verifies that PLS = 0. (10.9#4, 10.9#3)
   viii. LVSh issues a SetFeature(X_ENABLE) to the LVSd.
   ix. LVSh issues a GetPortStatus for the DFP and verifies that PLS = 0. (10.9#4, 10.9#3)

Testing status change bits cleared by hub reset and port power:

5. For each reset_type Y = {Hot Reset, Warm Reset, Port_Power}:
   a. LVSd removes and presents terminations to the DFP
   b. LVSd brings the DFP link to U0.
   c. LVSh issues GetPortStatus().
   d. LVSh verifies if GetPortStatus() reports that the C_PORT_CONNECTION bit is set to 1.
   e. LVSh issues SetPortFeature(BH_PORT_RESET) for the DFP.
   f. Wait 200ms (max tTimeForResetError).
   g. LVSh issues GetPortStatus() for the DFP.
   h. LVSh verifies:
      i. PORT_RESET bit is set to 0. (10.14.2.6#12)
      ii. C_PORT_RESET is set to 1. (10.14.2.6#11).
      iii. C_BH_PORT_RESET is 1. (10.14.2.6.2#11, 10.14.2.10#20)
      iv. C_PORT_CONNECTION is 1.
      v. PORT_CONNECTION is 1.
   i. LVSh suspends the DFP to U3 by issuing SetPortFeature(PORT_LINK_STATE=U3).
   j. After the link transitions to U3, LVSh issues SetPortFeature(PORT_LINK_STATE=U0).
   k. Wait for 50ms. Need to allow some time for the link to get back to U0.
   l. LVSh issues GetPortStatus() for the DFP.
   m. LVSh verifies:
      i. C_PORT_LINK_STATE is 1. (10.14.2.6.2#15).
      ii. C_PORT_CONNECTION is 1.
   n. LVSd removes terms.
   o. LVSh issues reset_type Y:
      i. If Y = Hot Reset or Warm Reset
         1) LVSh issues Y to the UFP
         2) LVSh enumerates and configures the HUT. (Do not issue ClearPortFeature() request at this enumeration.)
      ii. If Y = Port Power
         1) LVSh issues ClearPortFeature(PORT_POWER) for the DFP
         2) LVSh issues GetPortStatus() for the DFP.
         3) LVSh verifies that the DFP's status is as follows:
            a) PORT_CONNECTION = 0
            b) PORT_ENABLE = 0
            c) PORT_RESET = 0
            d) PORT_LINK_STATE = 5

e) PORT_POWER = 0
f) C_PORT_CONNECTION = 0
g) C_PORT_RESET = 0
h) C_BH_PORT_RESET = 0
i) C_PORT_LINK_STATE = 0
j) C_PORT_CONFIG_ERROR = 0
4) LVSh issues SetPortFeature(PORT_POWER) for the DFP.
p. LVSh issues GetPortStatus() for the DFP.
q. LVSh checks that the DFP's status is as follows:

i.	PORT_CONNECTION	0
ii.	PORT_ENABLE	0
iii.	PORT_RESET	0
iv.	PORT_LINK_STATE	5
v.	PORT_POWER	1
vi.	PORT_SPEED	X
vii.	C_PORT_CONNECTION	0 (10.14.2.6.2#26).
viii.	C_PORT_RESET	0 (10.14.2.6.2#26).
ix.	C_BH_PORT_RESET	0 (10.14.2.6.2#26).
x.	C_PORT_LINK_STATE	0 (10.14.2.6.2#26).
xi.	C_PORT_CONFIG_ERROR	0

TD 10.129   Removing Local Power Test

A. This test verifies that all ports enter the DSPORT.Powered-off state when local power is lost.
B. Assertions Covered
1. 10.3.1.1#7
2. 10.3.1.6#3
3. 10.14.2.4#1
4. 10.14.2.4#2
5. 10.14.2.4#3
6. 10.10#3
7. 10.10#4
C. Procedure
1. Prompt user to attach power supply to the HUT.
2. LVSh presents VBUS and terminations on UFP.
3. LVSh enumerates and configures HUT.
4. Skip this test if bit 6 in the bmAttributes field of the Hub's Configuration Descriptor is 0 (Hub is bus-powered).
5. LVSh issues a GetHubStatus request to the HUT and verifies that bit 0 of the Hub Status field = 0 (Local Power Source on). (10.14.2.4#1)
6. Skip this test if the MaxPower field in the Hub's Configuration Descriptor is 0.
7. LVSd presents terminations on DFP.
8. Prompt user to remove power supply from HUT.
9. LVSh issues a GetHubStatus request to the HUT.
10. Skip this test if the GetHubStatus request fails.
11. LVSh verifies that:
a. bit 0 of the Hub Status field (Local Power Source status) = 1 (Local Power is off). (10.14.2.4#2)
b. bit 1 of the Hub Status Change field (Local Power Source status change) = 1. (10.14.2.4#3)
12. LVSh issues GetPortStatus requests for each downstream port on the HUT.
13. LVSh verifies that PLS = 4, PP = CCS = PR = PE = 0. (10.3.1.1#7)
14. LVSh issues a SetPortFeature(PORT_POWER) request for the DFP.
15. Wait 1 second.
16. LVSh issues a GetPortStatus request for the DFP.
17. LVSh verifies that PLS = 4, P = CCS = PR = PE = 0. (10.10#3).
18. LVSh isues a SetPortFeature(PORT_RESET) request for the DFP.
19. Wait 1s.
20. Send a GetPortStatus request for the DFP.

21. LVSh verifies that PLS =4, PP = CCS = PR = PE = 0. (10.3.1.6#3)
22. LVS issues a SetPortFeature(BH_PORT_RESET) request for the DFP.
23. Wait 1s.
24. LVSh issues a GetPortStatus request for the DFP.
25. LVSh verifies that PLS =4, PP = CCS = PR = PE = 0. (10.3.1.6#3)

TD 10.130   DSPORT.Powered-off-reset Test

This test is covered in TD 10.103 and TD 10.104.