

Generic USB Device Testing Overview

The following is an overview of the testing involved with verifying proper operation of any specific USB Device, or more specifically the operation of a bus interface driver on a specific system to support the various function drivers.

In general, the verification of the correct operation of the bus interface (lowest) layer uses the following strategies:

- The upper two layers are previously validated, where possible, on other platforms, and usually on other major architectures as well.
- A wide variety of function drivers are used to test availability and proper operation of all USB features (where available, see below for list of features not present on all platforms).
- The device is tested with the USB Command Verifier from the USB Forum (visit www.usb.org on the WWW). The Command Verifier is created by Intel. This is also known as *UUT Chapter 9 Testing*.
- The network function (`network_fd`), is used for stress testing, for the following reasons
 - It has been widely tested already on many platforms
 - It creates the highest sustained data transfer rates of any function
 - Matching drivers are available for all major host platforms

Specific UDC capabilities and features may not be present on particular devices. This may in turn prevent certain tests from being used, or certain functions from operating. These include the following:

- software controllable pull-up resistor (soft-connect)
- cable event interrupt (attach and detach)
- set interface
- set interface with non-zero alternate
- one or more interrupt endpoint
- three or more BULK endpoints

In some devices there may be other limitations:

- no BUS RESET indication
- limit in size of configuration descriptor
- limit in size of bulk endpoints

In general, we support where possible the following functions.

Functions that require only two BULK endpoints:

- network BLAN
- network BASIC
- network SAFE
- msc
- mouse

Functions that require two BULK and a INTERRUPT endpoint:

- acm

Functions that require two BULK and a INTERRUPT endpoint and functioning SET INTERFACE with non-zero AltSetting:

- network CDC
- network BASIC2

1. Enumeration

- Verify that all function drivers listed below enumerate correctly with the appropriate host class drivers on the following platforms:
 - Windows ME, 2K, XP
 - Linux 2.4
 - Mac OSX
- verify delayed control reads operate correctly
- ep0 size test (test handling of descriptors whose length are a multiple of the control endpoint packet size).

2. UUT Chapter Nine Tests

Verify that the UUT Chapter Nine tests succeed without failure. This verifies that all of the "Chapter Nine" operations described in the USB 2.0 Specification work correctly (at least so far as tested by the UUT test program as distributed by the USB Forum).

- various conformance tests
- tests for specific functionality
- re-enumeration tests

3. network_fd - initial stress testing

Verify that the USB Device operates well under stress and for other specific problems:

- data upload
- data download
- ping flood
- ping sizes
- nfs root test

4. acm - verify NAK flow control

Verify that USB Device works well with acm driver under stress and for other specific conditions:

- data upload and download
- verify flow control (bus interface must NAK if no recv urb)

5. msc - verify NAK flow control

Verify that USB Device works well with the msc driver under stress and for other specific conditions:

- data transfer
- verify flow control (bus interface must NAK if no recv urb)

6. mouse - interrupt stress testing

Verify that USB Device works well with the mouse driver under stress and for other specific conditions:

- data transfer

7. Other tests

Verify switching and re-plugging.

- re-plugging test
- function switch test
- host suspend/resume test
- device suspend/resume test

The re-plugging test simply unplugs and re-plugs the device repeatedly on a short (5-10 second) interval, verifying that the function does continue to work.

The function switch test simply switches between two (or more) functions and verifies that the host re-enumerates correctly and the function works. This is similar to the re-plug test except that it switches between multiple functions.