USB ENGINEERING CHANGE NOTICE

Title: **USB 2.0 Phase-locked SOFs**

Applies to: **Universal Serial Bus Specification, Revision 2.0**

Summary of ECN

The current USB2.0 spec has no requirement that the SOFs sent before and after a selective suspend condition need to be phase-locked. Also the LPM ECN has no requirements on this when going in and out of level 1 power management. This ECN proposes to add a requirement in the spec that host controllers must guarantee that the SOFs sent before and after a selective suspend or L1 condition must be in phase-lock.

Reasons for ECN

The benefit of this ECN is that isochronous applications (like audio speakers) that use the SOFs to synchronize internal clocks, can now also do aggressive power management. If they provide enough buffering on the device side, it is possible that they transfer lots of data over the USB bus and then go into suspend or L1 while consuming the data on the application side.

Impact on Existing Peripherals and Systems:

As this ECN proposes to add something in the spec that was not explicitly mentioned before, it could be that existing systems today already support this, but it is not guaranteed. To make sure that isochronous devices can make optimal use of power savings on the USB, this requirement is being added to the USB specification.

Hardware Implications:

No changes to a host controller implementation are required as this ECN does not require host controllers to maintain phase-lock between SOF tokens across a global/system suspend.

Software Implications:

No changes to software are required.

Compliance Testing Implications:

The EHCI Test Suite must be eventually updated to add a test that checks that the SOFs on the bus are in phase-lock before and after a selective suspend.

Specification Changes

This ECN covers one addition to the USB2.0 spec to guarantee that isochronous USB devices can make optimal use of the power management features defined in the USB2.0 spec and the LPM ECN.

Section 7.1.7.7 describes the general behavior in case of suspend/resume. This section only states that a host must start sending traffic within 3ms after completion of the resume signaling to prevent the device from going back into suspend. It doesn't mention anything on the phase-lock of the SOF tokens that are sent.

Following text must be added at the end of paragraph 3 of section 7.1.7.7:
"The SOF tokens sent by a host after resuming a selective suspended port must be still phase-locked with respect to the SOF tokens that were sent before the suspend/resume signaling."

Section 10.2.3 describes the required behavior of a USB2 host controller for Frame and micro Frame generation. This section doesn't describe any requirements on the Frame or micro Frame generation when coming out of suspend.

Following text must be added at the end of section 10.2.3:
"When a downstream port of the host is put in selective suspend, the host must keep the frame timer running. A host is required to start sending SOF tokens after the suspend/resume signaling that are still in phase-lock with the SOF tokens that were sent before the suspend/resume. If the host controller is put in global suspend, it is not required to keep phase-lock between the SOF tokens sent before and after the global suspend."