USB Type-C ENGINEERING CHANGE NOTICE

Title: Add Example USB-C Mode Entry Flow Section
Applied to: USB Type-C Specification Release 2.1, May 2022

Brief description of the functional changes proposed:
No functional changes.

Benefits as a result of the proposed changes:
Provides context to readers about how the alternate modes described in the specification relate to one another, and demonstrates how the user can be notified of different types of mode entry failure.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
No impact.

An analysis of the hardware implications:
None.

An analysis of the software implications:
None.

An analysis of the compliance testing implications:
None.

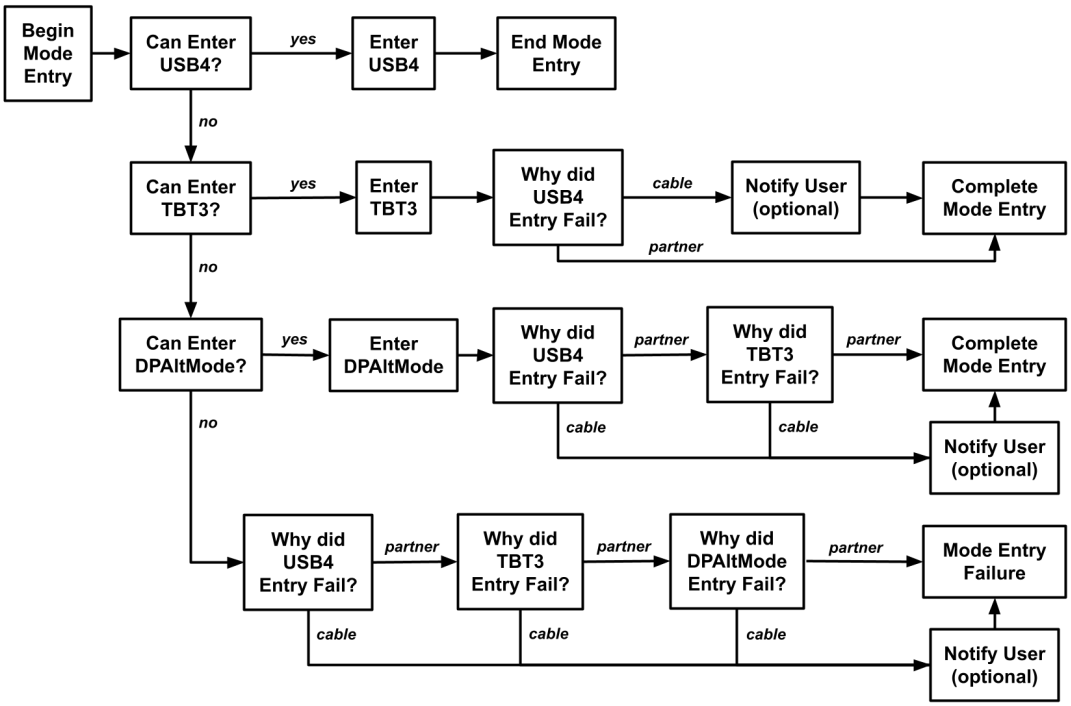
Actual Change Requested

(a). Addition: Section E.5

E.5 Example Alternate Mode Entry Flow with Cable Warnings

A single USB Type-C port may support multiple alternate modes if it is acting as a DFP. Which alternate mode the port enters depends on two factors. First, what the port, partner and cable can support. Second, how the DFP's alternate modes are prioritized. Figure E-6 gives an example of how an alternate mode entry flow may work for a DFP USB4 port with notifications to warn the user when a cable is preventing alternate mode entry.

Figure E-6 USB4 DFP Mode Entry Flow Example



The port in this system supports USB4, Thunderbolt 3 and DisplayPort alternate mode. These alternate modes are mutually exclusive because they use pin reassignment as detailed in Section E.2.1. The port will prioritize entering USB4, followed by Thunderbolt 3, and then DisplayPort alternate mode. It will only attempt Thunderbolt 3 discovery if USB4 discovery fails. It will only attempt DisplayPort alternate mode discovery if both USB4 discovery and Thunderbolt 3 discovery fail.

E.5.1 Operational Summary

This subsection describes how the DFP USB4 port in this example attempts alternate mode discovery and entry when a USB Type-C device has been connected. Before attempting any alternate mode entry, both the partner and cable need to have completed USB PD discovery. For each alternate mode, the DFP will attempt a discovery flow to determine if it can enter that alternate mode with the attached partner and cable. It will only enter an alternate mode after successfully completing the mode discovery flow.

1. The DFP attempts USB4 discovery defined in Section 5.1 and illustrated in Figure 5-1
    a. If successful the DFP enters USB4 and completes mode entry
2. If the DFP fails USB4 discovery, it attempts Thunderbolt 3 discovery defined in Appendix F and illustrated in Figure F-1
    a. If successful the DFP enters Thunderbolt 3
    b. Optionally, the DFP can check why USB4 discovery failed and inform the user. Figure E-6 illustrates a case where the user is notified when USB4 discovery fails due to the cable.
    c. After entering Thunderbolt 3, the DFP completes mode entry
3. If the DFP fails Thunderbolt 3 discovery, it will attempt DisplayPort alternate mode discovery defined in Section E.4.3
    a. Unlike USB4 and Thunderbolt 3, DisplayPort alternate mode does not explicitly define cable conditions required for mode entry. A DFP should still check the cable to confirm it supports a sufficient data rate for DP signals as a condition of DisplayPort alternate mode discovery. While this will prevent entering DisplayPort alternate mode with a cable that should not work for connecting displays, it will also prevent mode entry in cases where non-compliant cables would work for connecting displays but are not properly e-marked. Figure E-6 shows a case where cable checks are part of DisplayPort alternate mode discovery and entry.
    b. If DisplayPort alternate mode entry succeeds, the DFP can optionally check why USB4 and Thunderbolt 3 discovery failed then notify the user
    c. If DisplayPort alternate mode entry failed, the DFP can optionally check why USB4, Thunderbolt 3 and DisplayPort alternate mode discovery failed then notify the user
    d. After attempting discovery for all alternate modes and entering the highest priority alternate mode that successfully finished its discovery flow, the DFP completes mode entry