USB Type-C ENGINEERING CHANGE NOTICE

Title: Addition of Try.SNK DRP
Applied to: USB Type-C Specification Release 1.1, April 3, 2015

Brief description of the functional changes:
Adds a new DRP variant called a "Try.SNK DRP", which strongly prefers to be a power sink role (such as a phone). Adds some overview text to suggest when to use the various state machines (Try.SNK, Try.SRC, standard DRP).

Benefits as a result of the changes:
With non-PD, dual-role phones and tablets coming out, the interaction between each other and larger devices needs to be predictable. In particular, attaching a phone to a tablet or laptop should always result in the phone being the device by default. Try.SNK enables this for phones and similar usually-charge devices.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
None.

An analysis of the hardware implications:
Additional states in hardware state machines for those that wish to support Try.SNK.

An analysis of the software implications:
Software workarounds are needed to implement Try.SNK with existing hardware state machines, but of the devices surveyed, this is feasible with reasonable complexity.

An analysis of the compliance testing implications:
Devices that are declared to be Try.SNK should always resolve into the SNK role when connected to a DRP (or Try.SRC DRP), and should be random when connected to another Try.SNK device. When connected to a UFP, VBUS should monotonically turn on.

Actual Change

(a). Section 2.3.3, Page 21

From Text:

A port that supports dual-role operation by being able to shift to the appropriate connected mode when attached to either a host-only or device-only port is a DRP. In the special case of a DRP being attached to another DRP, an initialization protocol across the CC pins is used to establish the initial host-to-device relationship, and in this case, the determination of which is DFP or UFP is random from the user's perspective.

Two methods are defined to allow a USB Type-C DRP to functionally swap data roles, one managed using USB PD DR_Swap and the other emulating a disconnect/reconnect sequence (see Figure 4-16). As an alternative to role swapping, a USB Type-C DRP may provide useful functionality by when operating as a host, exposing a CDC/network (preferably TCP/IP) stack or when operating as a device, exposing a CDC/network interface.

To Text:

A port that supports dual-role operation by being able to shift to the appropriate connected mode when attached to either a host-only or device-only port is a DRP. In the special case of a DRP being attached to another DRP, an initialization protocol across the CC pins is used to establish the initial host-to-device relationship. With standard DRPs, the determination of which is DFP or UFP is random from the user's perspective. To improve the user's experience when connecting devices that are of categorically different types, devices may be implemented to strongly prefer being a DFP or a UFP, such that the DFP/UFP determination becomes predictable when connecting two DRPs of differing categories. Table 2-1 illustrates the device categories (including DFP and UFPs), state machine variant, example device types and how they interact.

Table 2-1 Summary of Device Categories

Device Category	State machine	Examples	Interaction
Always DFP	SRC	Charger, desktop	
Usually DFP	Try.SRC DRP	Laptop, battery bank	Always initially DFP to and charging tablets and phones, can be powered by charger
Neutral	Standard DRP	Tablet	DFP to phones, UFP to laptops

Usually UFP	Try.SNK DRP	Phone	Always initially UFP and charging, unless connected to an accessory or wearable
Always UFP	SNK	Wearable, accessory	

Two methods are defined to allow a USB Type-C DRP to functionally swap data roles, one managed using USB PD DR_Swap and the other emulating a disconnect/reconnect sequence (see Figure 4-16). As an alternative to role swapping, a USB Type-C DRP may provide useful functionality by when operating as a host, exposing a CDC/network (preferably TCP/IP) stack or when operating as a device, exposing a CDC/network interface.

(b). Section 2.4, Table 2-1, Page 23 Renumber table to 2-2

(c). Section 4.5.2.1, Figures 4-16 and 4-17, Page 125

From Text:

Figure 4-16 illustrates a connection state diagram for a DRP that supports all possible states including Accessory Modes and Try.SRC.

Figure 4-16 Connection State Diagram: DRP with Accessory and Try.SRC Support
[figure]

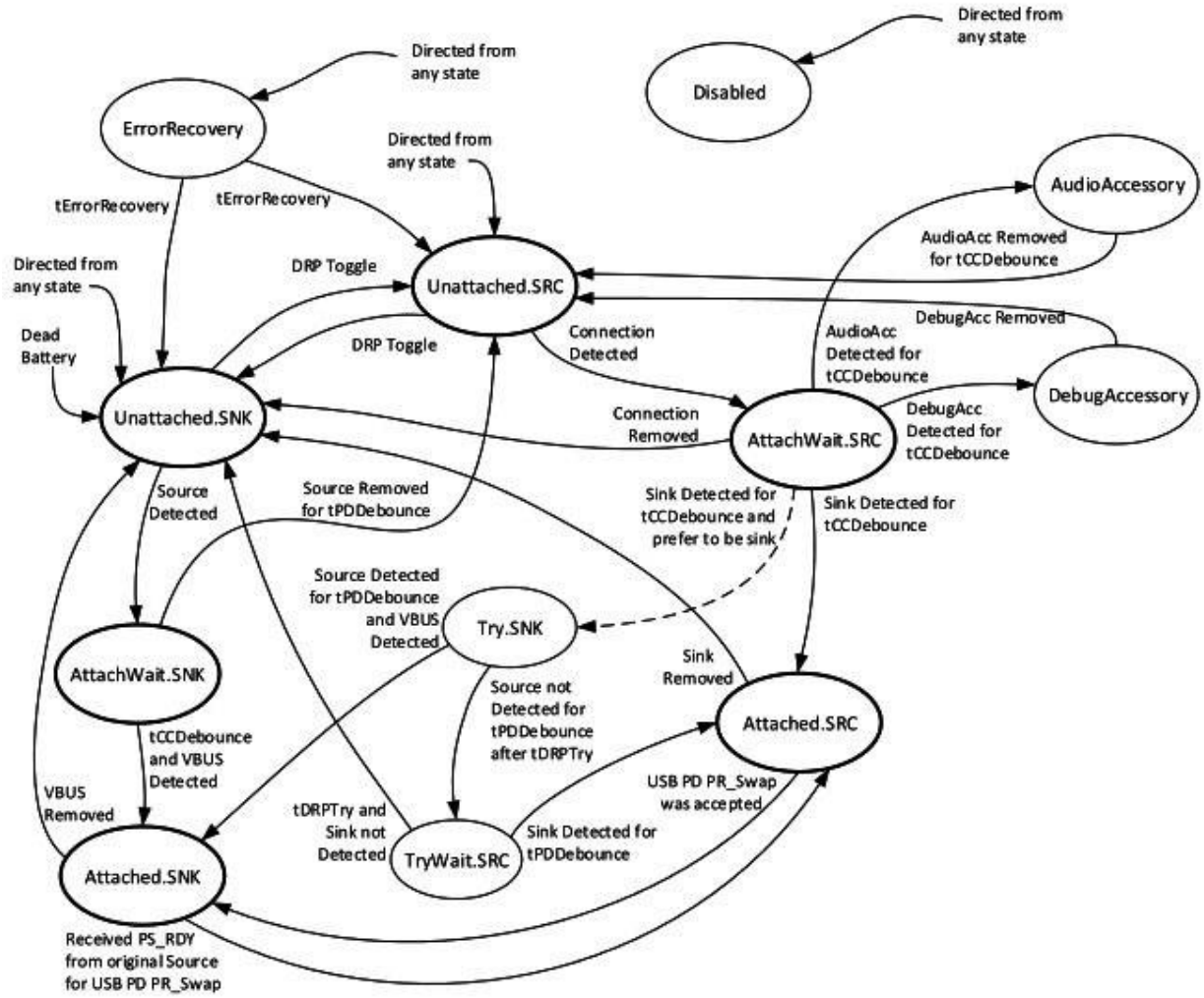
To Text:

Figure 4-16 illustrates a connection state diagram for a DRP that supports Try.SRC and Accessory Modes.

Figure 4-16 Connection State Diagram: DRP with Accessory and Try.SRC Support
[figure]

Figure 4-17 illustrates a connection state diagram for a DRP that supports Try.SNK and Accessory Modes.

Figure 4-17 Connection State Diagram: DRP with Accessory and Try.SNK Support



(d). Section 4.5.2.2.7.2, Page 130

Append Text:

A DRP that strongly prefers the Sink role may optionally transition to Try.SNK instead of Attached.SRC when VBUS is at vSafe0V and the SRC.Rd state is detected on exactly one of the CC pins for at least tCCDebounce.

(e). Section 4.5.2.2.17 - 4.5.2.2.18, Page 135+

Add section:

4.5.2.2.17 Try.SNK State

This state appears in Figure 4-17.

When in the Try.SNK state, the port is querying to determine if the port partner supports the Source role.

4.5.2.2.17.1 Try.SNK Requirements

The port shall not drive VBUS or VCONN.

Both CC pins shall be independently terminated to ground through Rd.

4.5.2.2.17.2 Exiting from Try.SNK State

The port shall wait for tDRPTry and only then begin monitoring the CC pins for the SNK.Rp state. The port shall then transition to Attached.SNK when the SNK.Rp state is detected on exactly one of the CC pins for at least tPDDebounce and VBUS is detected. Alternatively, the port shall transition to TryWait.SRC if SNK.Rp state is not detected for tPDDebounce. Note the Source may initiate USB PD communications which will cause brief periods of the SNK.Open state on both CC pins, but this event will not exceed tPDDebounce.

4.5.2.2.18 TryWait.SRC State

This state appears in Figure 4-17.

When in the TryWait.SRC state, the port has failed to become a Sink and is waiting to attach as a Source.

4.5.2.2.18.1 TryWait.SRC Requirements

The requirements for this state are identical to Unattached.SRC

4.5.2.2.18.2 Exiting from TryWait.SRC State

The port shall transition to Attached.SRC when VBUS is at vSafe0V and the SRC.Rd state is detected on exactly one of the CC pins for at least tPDDebounce.

The port shall transition to Unattached.SNK after tDRPTry if neither of the CC pins are in the SRC.Rd state.

(f). Section 4.5.2.4, Table 4-11, Page 137 Add rows:

Try.SNK[4]	N/A	N/A	Optional	Not Permitted
TryWait.SRC[5]	N/A	N/A	Optional	Not Permitted

Add notes:

4. Try.SNK and Try.SRC shall not be supported at the same time, although an unattached device may dynamically choose between Try.SRC and Try.SNK state machines based on external factors. 5. TryWait.SRC is mandatory when Try.SNK is supported.

(g). Section 4.5.3.1.4, Figure 4-22, Page 142

From text:

Figure 4-22 DRP to DRP Functional Model – CASE 2

To text:

Figure 4-22 DRP to DRP Functional Model – CASES 2 & 3

(h). Section 4.5.3.1.4, Page 143

Add text:

CASE 3: The following describes the behavior when a DRP is connected to another DRP. In this flow, the DRP #1 chooses to drive the random result to the opposite result using the Try.SNK mechanism.

1. Both DRPs in the unattached state
    - DRP #1 and DRP #2 alternate between Unattached.SRC and Unattached.SNK
2. DRP #1 transitions from Unattached.SRC to AttachWait.SRC
    - DRP #1 in Unattached.SRC detects a CC pull down of DRP #2 in Unattached.SNK and enters AttachWait.SRC
3. DRP #2 transitions from Unattached.SNK to AttachWait.SNK
    - DRP #2 in Unattached.SNK detects pull up on a CC and enters AttachWait.SNK
4. DRP #1 transitions from AttachWait.SRC to Try.SNK
    - DRP #1 in AttachWait.SRC has been in this state for tCCDebounce and detects DRP #2's pull-down on CC but strongly prefers the Sink role, so transitions to Try.SNK
    - DRP #1 in Try.SNK asserts a pull-down on CC and waits
5. DRP #2 transitions from AttachWait.SNK to Unattached.SRC to AttachWait.SRC.
    - DRP #2 in AttachWait.SNK no longer detects DRP #1's pullup on CC and transitions to Unattached.SRC
    - DRP #2 in Unattached.SRC applies a pullup on CC
    - DRP #2 in Unattached.SRC detects a pull-down on a CC and enters AttachWait.SRC
    - DRP #1 detects DRP #2's pull-up on CC remains in Try.SNK.
6. DRP #2 transitions from AttachWait.SRC to Attached.SRC
    - DRP #2 in AttachWait.SRC times out (tCCDebounce) and transitions to Attached.SRC
    - DRP #2 in Attached.SRC turns on VBUS and VCONN
7. DRP #1 transitions from Try.SNK to Attached.SNK
    - DRP #1 in Try.SNK after detecting VBUS, enters Attached.SNK
8. While the DRPs are in their respective attached states:
    - DRP #2 adjusts Rp as needed to limit the current DRP #1 may draw

- DRP #1 detects and monitors vRd for available current on VBUS
- DRP #2 monitors CC for detach and when detected, enters Unattached.SRC (and resumes toggling between Unattached.SNK and Unattached.SRC)
- DRP #1 monitors VBUS for detach and when detected, enters Unattached.SNK (and resumes toggling between Unattached.SNK and Unattached.SRC)

(i). Section 4.5.3.2.3, Page 147

From text:

The following describes the behavior when a DRP is connected to a legacy device adapter that has an Rd to ground so as to mimic the behavior of a UFP.

1. DRP in the unattached state
    - DRP alternates between Unattached.SRC and Unattached.SNK
2. DRP transitions from Unattached.SRC to Attached.SRC
    - DRP in Unattached.SRC detects the adapter's pull-down on CC and enters AttachWait.SRC
    - DRP in AttachWait.SRC times out (tCCDebounce) and transitions to Attached.SRC
    - DRP in Attached.SRC turns on VBUS and VCONN
3. While the DRP is in the attached state:
    - DRP monitors CC for detach and when detected, enters Unattached.SRC (and resumes toggling between Unattached.SNK and Unattached.SRC)

To text:

The following describes the behavior when a DRP is connected to a legacy device adapter that has an Rd to ground so as to mimic the behavior of a UFP.

1. DRP in the unattached state
    - DRP alternates between Unattached.SRC and Unattached.SNK
2. DRP transitions from Unattached.SRC to Attached.SRC
    - DRP in Unattached.SRC detects the adapter's pull-down on CC and enters AttachWait.SRC
    - DRP in AttachWait.SRC times out (tCCDebounce) and transitions to Attached.SRC
    - DRP in Attached.SRC turns on VBUS and VCONN
    - DRP in AttachWait.SRC may support Try.SNK and if so, may transition through Try.SNK and TryWait.SRC prior to entering Attached.SRC
3. While the DRP is in the attached state:
    - DRP monitors CC for detach and when detected, enters Unattached.SRC (and resumes toggling between Unattached.SNK and Unattached.SRC)