USB Power Delivery ENGINEERING CHANGE NOTICE

Title: Fast Role Swap Clarification
Applied to: USB Power Delivery Specification Revision 3.0 Version 1.0a

Brief description of the functional changes proposed:
This is a clarification to bring this part of the spec in line with the Appendix and the intention as well as being more clear to avoid misunderstandings during compliance.

Benefits as a result of the proposed changes:
Less confusion among designers about what to implement.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
Since this is a clarification only, no impact should be expected.

An analysis of the hardware implications:
Since this is a clarification only, no impact should be expected.

An analysis of the software implications:
Since this is a clarification only, no impact should be expected.

An analysis of the compliance testing implications:
Since this is a clarification only, no impact should be expected. and as the compliance testers are not finished at the time at writing, they are expected to use this version.

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Actual Change Requested

(a). Section 7.3.15

From Text:

The interaction of the System Policy, Device Policy, and power supply that **Shall** be followed during a Fast Role Swap is shown in Figure 7-31. The parallel sequences that **Shall** be followed are described in Table 7-15. The timing parameters that **Shall** be followed are listed in Table 7-22 and Table 7-23. Negotiations between the new Source and the new Sink **May** occur after the new Source sends the final **PS_RDY** Message. Note: in Figure 7-31 and Table 7-15 numbers are used to indicate Message related steps and letters are used to indicate other events.
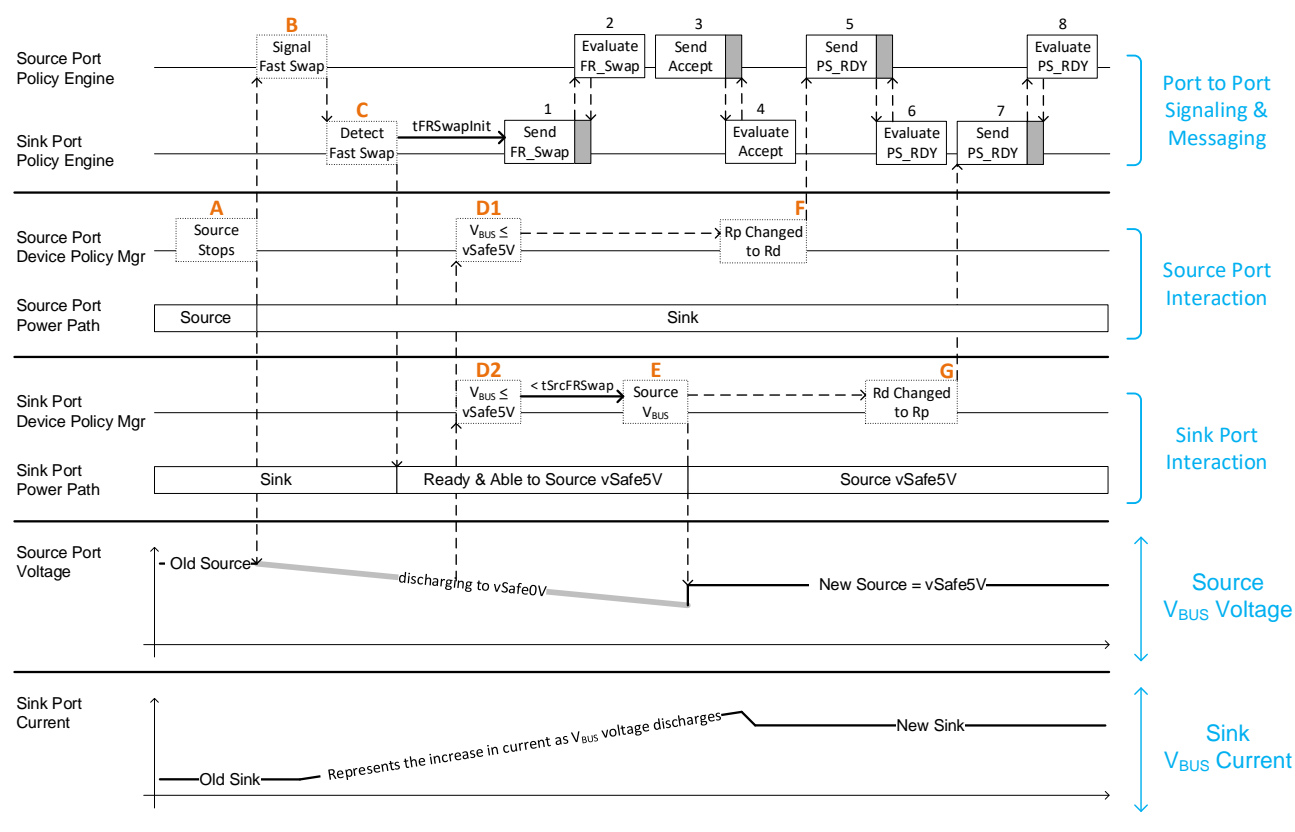
Figure 7-31 Transition Diagram for Fast Role Swap

Table 7-15 Sequence Description for Fast Role Swap

Step	Initial Source Port→ New Sink Port	Initial Sink Port → New Source Port
	Fast Role Swap Signaling and Power Transition	
A	The Source connected to the Hub UFP (see Figure 7-13) stops sourcing V$_{BUS.}$	
B	Policy Engine signals the Fast Role Swap to the initial Sink on the CC wire. If V$_{BUS}$ < **vSafe5V** (min), it tells the Device Policy Manager not to draw more than **pSnkStdby** until the **tSnkFRSwap** timer has elapsed.	

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Step	Initial Source Port→ New Sink Port	Initial Sink Port → New Source Port
C		Policy Engine detects the Fast Role swap signal on the CC wire from the initial Source and **Shall** send the *FR_Swap* Message back to the initial Source (that is no longer powering V$_{BUS}$) within time *tFRSwapInit*.
D1	The Policy engine monitors for V$_{BUS}$ ≤ *vSafe5V* so that a *PS_RDY* Message can be sent to the new Source at Step 5 of the messaging sequence.	
D2		The Policy engine monitors for V$_{BUS}$ ≤ *vSafe5V* so the initial Sink can assume the role of new Source and begin to source V$_{BUS.}$
E		When V$_{BUS}$ = *vSafe5V* the new Source *May* provide power to V$_{BUS.}$ When V$_{BUS}$ < *vSafe5V* the new Source **Shall** provide power to V$_{BUS}$ within *tSrcFRSwap* and the *PS_RDY* Message can be sent to the new Sink at Step 7 of the messaging sequence.
F	The CC termination is changed from Rp to Rd (see *[USB Type-C 1.3]*) before the new Sink sends the *PS_RDY* Message of Step 5 to the new Source.	
G		The CC termination is changed from Rd to Rp (see *[USB Type-C 1.3]*) before the new Source sends the *PS_RDY* Message of Step 7 to the new Sink.
Fast Role Swap Message Sequence		
1	Policy Engine receives the *FR_Swap* Message from the initial Sink that is transitioning to be the new Source.	Policy Engine sends the *FR_Swap* Message to the initial Source(that is no longer powering V$_{BUS}$) after detecting the Fast Role Swap signal of Step C.
2	Protocol Layer sends the *GoodCRC* Message to the initial Sink. Policy Engine then evaluates the *FR_Swap* Message.	Protocol Layer receives the *GoodCRC* Message from the initial Source.
3	Policy Engine sends an *Accept* Message to the initial Sink that is transitioning to be the new Source.	Policy Engine receives the *Accept* Message from the initial Source that is transitioning to be the new Sink.
4	Protocol Layer receives the *GoodCRC* Message from the initial Sink that is transitioning to be the new Source.	Protocol Layer sends the *GoodCRC* Message to the initial Source that is transitioning to be the new Sink.
5	Policy Engine sends a *PS_RDY* Message to the initial Sink that is transitioning to be the new Source. The Policy Engine **Shall** wait for Step D1 before sending the *PS_RDY* Message, and **Shall** send the *PS_RDY* Message within *tFRSwap5V* of sending the *Accept* Message.	Policy Engine receives the *PS_RDY* Message from the new Sink.
6	Protocol Layer receives the *GoodCRC* Message from the new Source.	Protocol Layer sends the *GoodCRC* Message from the initial Sink that has completed the transition to new Source. Policy Engine then evaluates the *PS_RDY* Message.
7	Policy Engine receives the *PS_RDY* Message from the new Source.	Policy Engine sends a *PS_RDY* Message to the new Sink. The Policy Engine **Shall** wait for Step E before sending the *PS_RDY* Message, and **Shall** send the *PS_RDY* Message within *tFRSwapComplete* of receiving the *PS_RDY* Message from the Initial Source Port.

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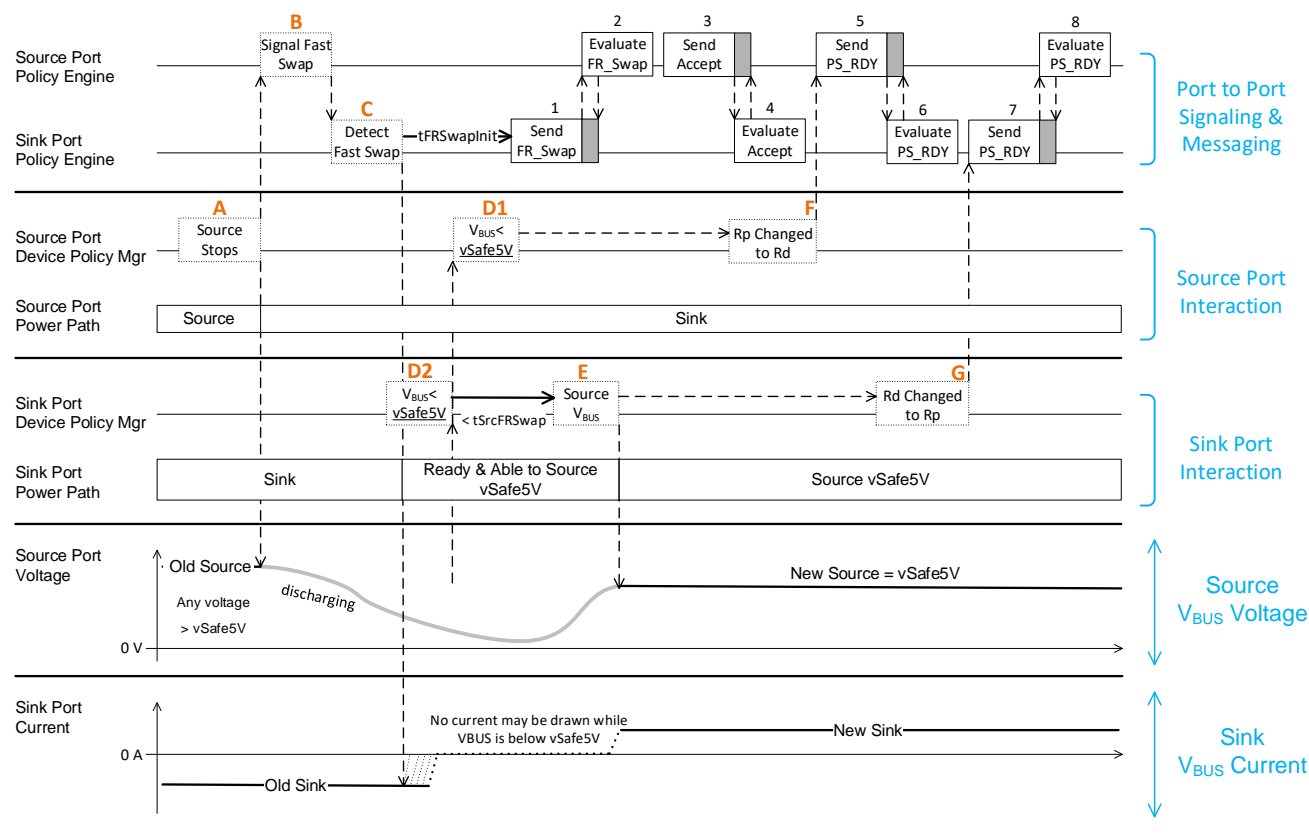**Figure 7-31 Transition Diagram for Fast Role Swap**

Table 7-15 Sequence Description for Fast Role Swap

Step	Initial Source Port→ New Sink Port	Initial Sink Port → New Source Port
	Fast Role Swap Signaling and Power Transition	
A	The Source connected to the Hub UFP (see Figure 7-13) stops sourcing V_{BUS}.	
B	Policy Engine signals the Fast Role Swap to the initial Sink on the CC wire. When V_{BUS} < *vSafe5V* (min), it tells the Device Policy Manager not to draw more than *pSnkStdby* until the *tSnkFRSwap* timer has elapsed.	
C		Policy Engine detects the Fast Role swap signal on the CC wire from the initial Source and **Shall** send the *FR_Swap* Message back to the initial Source (that is no longer powering V_{BUS}) within time *tFRSwapInit*.

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Step	Initial Source Port→ New Sink Port	Initial Sink Port → New Source Port
D1	The Policy engine monitors for V_{BUS} ≤ *vSafe5V* so that a *PS_RDY* Message can be sent to the new Source at Step 5 of the messaging sequence.	
D2		The Policy engine monitors for V_{BUS} ≤ *vSafe5V* so the initial Sink can assume the role of new Source and begin to source $V_{BUS.}$
E		When V_{BUS} = *vSafe5V* the new Source *May* provide power to $V_{BUS.}$ When V_{BUS} < *vSafe5V* the new Source *Shall* provide power to V_{BUS} within *tSrcFRSwap* and the *PS_RDY* Message can be sent to the new Sink at Step 7 of the messaging sequence.
F	The CC termination is changed from Rp to Rd (see *[USB Type-C 1.3]*) before the new Sink sends the *PS_RDY* Message of Step 5 to the new Source.	
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Fast Role Swap Message Sequence		
1	Policy Engine receives the *FR_Swap* Message from the initial Sink that is transitioning to be the new Source.	Policy Engine sends the *FR_Swap* Message to the initial Source(that is no longer powering V_{BUS}) after detecting the Fast Role Swap signal of Step C.
2	Protocol Layer sends the *GoodCRC* Message to the initial Sink. Policy Engine then evaluates the *FR_Swap* Message.	Protocol Layer receives the *GoodCRC* Message from the initial Source.
3	Policy Engine sends an *Accept* Message to the initial Sink that is transitioning to be the new Source.	Policy Engine receives the *Accept* Message from the initial Source that is transitioning to be the new Sink.
4	Protocol Layer receives the *GoodCRC* Message from the initial Sink that is transitioning to be the new Source.	Protocol Layer sends the *GoodCRC* Message to the initial Source that is transitioning to be the new Sink.
5	Policy Engine sends a *PS_RDY* Message to the initial Sink that is transitioning to be the new Source. The Policy Engine *Shall* wait for Step D1 before sending the *PS_RDY* Message, and *Shall* send the *PS_RDY* Message within *tFRSwap5V* of sending the *Accept* Message.	Policy Engine receives the *PS_RDY* Message from the new Sink.
6	Protocol Layer receives the *GoodCRC* Message from the new Source.	Protocol Layer sends the *GoodCRC* Message from the initial Sink that has completed the transition to new Source. Policy Engine then evaluates the *PS_RDY* Message.
7	Policy Engine receives the *PS_RDY* Message from the new Source.	Policy Engine sends a *PS_RDY* Message to the new Sink. The Policy Engine *Shall* wait for Step E before sending the *PS_RDY* Message, and *Shall* send the *PS_RDY* Message within *tFRSwapComplete* of receiving the *PS_RDY* Message from the Initial Source Port.