

USB Power Delivery ENGINEERING CHANGE NOTICE

Title: Capabilities Mismatch Update

Applied to: USB Power Delivery Specification Revision 3.2 Version 1.0

Brief description of the functional changes proposed:

This ECN updates Section 6.4.2.3 (Capabilities Mismatch) with regard to how the Source shall respond to the Sink setting the Capabilities Mismatch bit in the Request message. Today, a USB PD 3.x-based Source is told to only consider the Sink Capabilities Extended message when trying to satisfy the USB PD 3.x-based Sink's requirements, but this directed behavior does not cover voltage requirements that can only be known by also considering the Sink Capabilities and EPR Sink Capabilities messages. This ECR proposes to change the requirement to be less prescriptive of the Source's use of these messages so that both voltage and current/power needs can be considered by the Source.

Benefits as a result of the proposed changes:

Removes prescriptive languages that could be discouraging Source's from considering all of the Sink requirements from being considered in responding to Capabilities Mismatch.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:

No intended impact.

An analysis of the hardware implications:

As USB PD 3.x-based Sources already include support for both Sink Capabilities and Sink Capabilities Extended message types, this ECR most likely only impacts the Source's interpretation of the information available in these messages. Sources aren't required to use this information but for those that intend to use the information in its decision process, more firmware code might be required to cover *both* voltage and current/power needs of a Sink.

An analysis of the software implications:

No intended implications.

An analysis of the compliance testing implications:

Unknown impact, not sure to what extent testing takes shared port policy decisions into account. This ECR doesn't change the fundamental requirement for the Source to respond to Capabilities Mismatch.

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Actual Change Requested

(a). Section 6.4.2.3

From:

6.4.2.3 Capability Mismatch

A Capability Mismatch occurs when the Source cannot satisfy the Sink's power requirements based on the Source Capabilities it has offered. In this case the Sink **Shall** make a **Valid** request from the offered Source Capabilities and **Shall** set the Capability Mismatch bit (see [Section 8.2.5.2 "Power Capability Mismatch"](#)). When a Capabilities Mismatch condition does not exist, the Sink **Shall Not** set the Capabilities Mismatch bit.

When a Sink returns a Request Data Object with the Capabilities Mismatch bit set in response to a [Source_Capabilities](#) Message, it indicates that it wants more power than the Source is currently offering. This can be due to either a specific Voltage that is not being offered or there is not sufficient current for the Voltages that are being offered.

Sources whose [Port Reported PDP](#) is less than their [Port Present PDP](#) (see [Section 6.4.11 "Source_Info Message"](#)) **Shall** respond to the Requests with the Capabilities Mismatch bit set as follows. The Source within 2 seconds of the [PS_RDY](#) Message **Shall** send a new Source Capabilities Message (a [Source_Capabilities](#) Message or an [EPR_Source_Capabilities](#) Message depending on operating mode) that offers either:

1. The maximum power the Source can supply at this time as reported by the [Port Present PDP](#) or
2. Enough power to satisfy the Sink's requirements based on the power actually required by the Sink for full operation from either the:
 - [Sink_Capabilities_Extended](#) Message (Sink Operational PDP in SPR Mode or EPR Sink Operational PDP in EPR Mode) or
 - [Sink_Capabilities](#) or [EPR_Sink_Capabilities](#) Message if the [Sink_Capabilities_Extended](#) Message is not supported by the Sink.

To prevent looping, Sources **Should Not** send a new [Source_Capabilities](#) or [EPR_Source_Capabilities](#) Message in response to subsequent [Request](#) Message or [EPR_Request](#) Message with the Capabilities Mismatch flag set until its Port Present PDP changes.

Once a Guaranteed Capability Source that has responded to a Capabilities Mismatch, it **Shall Not** subsequently send out another [Source_Capabilities](#) Message or [EPR_Source_Capabilities](#) Message at a lower PDP unless the power required by the Sink (as indicated in its [Sink_Capabilities](#) Message or [EPR_Sink_Capabilities](#) Message or [Sink_Capabilities_Extended](#) Message) has also been reduced. Sources wishing to manage their power **May** periodically check [Sink_Capabilities](#) or [EPR_Sink_Capabilities](#) Message or [Sink_Capabilities_Extended](#) to determine whether these have changed.

Note: a Source Capabilities Message refers to a [Source_Capabilities](#) Message or an [EPR_Source_Capabilities](#) Message, and a Sink Capabilities Message refers to a [Sink_Capabilities](#) Message or [EPR_Sink_Capabilities](#) Message depending on operating mode.

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To:

6.4.2.3 Capability Mismatch

A Capability Mismatch occurs when the Source cannot satisfy the Sink's power requirements based on the Source Capabilities it has offered. In this case the Sink **Shall** make a **Valid** request from the offered Source Capabilities and **Shall** set the Capability Mismatch bit (see [Section 8.2.5.2 "Power Capability Mismatch"](#)). When a Capabilities Mismatch condition does not exist, the Sink **Shall Not** set the Capabilities Mismatch bit.

When a Sink returns a Request Data Object with the Capabilities Mismatch bit set in response to a **Source_Capabilities** Message, it indicates that it wants more power than the Source is currently offering. This can be due to either a specific Voltage that is not being offered or there is not sufficient current for the Voltages that are being offered.

Sources whose **Port Reported PDP** is less than their **Port Present PDP** (see [Section 6.4.11 "Source_Info Message"](#)) **Shall** respond to the Requests with the Capabilities Mismatch bit set as follows. The Source within **2-seconds** **tCapabilitiesMismatchResponse** of the **PS_RDY** Message **Shall** send a new Source Capabilities Message (a **Source_Capabilities** Message or an **EPR_Source_Capabilities** Message depending on operating mode) that offers either:

1. **Enough power** The set of Source Capabilities needed to **minimally** satisfy the Sink's requirements based on **the power what it** actually requires **sd by the Sink** for full operation **from either by evaluating** the:
 - a. **Sink_Capabilities_Extended** Message **(Sink Operational PDP in SPR Mode or EPR Sink Operational PDP in EPR Mode) (if supported by the Sink) and/or**
 - b. **Sink_Capabilities** or **EPR_Sink_Capabilities** Message **if the Sink_Capabilities_Extended Message is not supported by the Sink.**
2. The **maximum power set of Source Capabilities** the Source can supply at this time **as reported by based on** the **Port Present PDP** **or**

To prevent looping, Sources **Should Not** send a new **Source_Capabilities** or **EPR_Source_Capabilities** Message in response to subsequent **Request** Message or **EPR_Request** Message with the Capabilities Mismatch flag set until its **Port Present PDP** **Port Present PDP** changes.

Once a Guaranteed Capability Source that has responded to a Capabilities Mismatch, it **Shall Not** subsequently send out another **Source_Capabilities** Message or **EPR_Source_Capabilities** Message at a lower PDP unless the power required by the Sink (as indicated in its **Sink_Capabilities** Message or **EPR_Sink_Capabilities** Message or **Sink_Capabilities_Extended** Message) has also been reduced. Sources wishing to manage their power **May** periodically check **Sink_Capabilities** or **EPR_Sink_Capabilities** Message or **Sink_Capabilities_Extended** to determine whether these have changed.

Note: a Source Capabilities Message refers to a **Source_Capabilities** Message or an **EPR_Source_Capabilities** Message, and a Sink Capabilities Message refers to a **Sink_Capabilities** Message or **EPR_Sink_Capabilities** Message depending on operating mode.

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(b). Section 6.6.22, Table 6.69

From:

Table 6.69 "Time Values"

Parameter	Value (min)	Value (nom)	Value (max)	Units	Reference
<i>tCableMessage</i>	750			μs	Section 6.6.14
<i>tChunkingNotSupported</i>	40	45	50	ms	Section 6.6.18.1

To:

Table 6.69 "Time Values"

Parameter	Value (min)	Value (nom)	Value (max)	Units	Reference
<i>tCableMessage</i>	750			μs	Section 6.6.14
<i>tCapabilitiesMismatchResponse</i>			2	s	Section 6.4.2.3
<i>tChunkingNotSupported</i>	40	45	50	ms	Section 6.6.18.1