USB Type-C ENGINEERING CHANGE NOTICE

Title: Device Power Options Clarification
Applied to: USB Type-C Specification Release 1.1

Brief description of the functional changes:
No functional change is proposed. This ECR proposes text changes to the informative description in section 2.4 of the amount of power that is available on VBus under various power options.

Benefits as a result of the changes:
Table 2-1 has been mis-understood by implementers and others, in particular how much power is available to a Device under each scenario has been over-assumed. The aim of the ECR is to clarify the text so as to avoid these misunderstandings.

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

An analysis of the hardware implications:
None to conformant implementations

An analysis of the software implications:
None to conformant implementations

An analysis of the compliance testing implications:
None.

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Actual Change

Section 2.4 V_{BUS}

From Text:

2.4   Vbus

V_{BUS} provides a path to deliver power between a host and a device, and between a charger and a host/device. A simplified high-current supply capability is defined for hosts and chargers that optionally support current levels beyond the *USB 2.0* and *USB 3.1* specifications. The *USB Power Delivery Specification* is supported.

Table 2-1 summarizes the power supply options available from the perspective of a device with the USB Type-C connector. Not all options will be available to the device from all host or hub ports – only the first two listed options are mandated by the base USB specifications and form the basis of USB Type-C Current at the Default USB Power level.

Table 2-1 Summary of power supply options

Mode of Operation	Nominal Voltage	Maximum Current	Notes
USB 2.0	5 V	500 mA	Default Current, based on definitions in the base specifications
USB 3.1	5 V	900 mA	
USB BC 1.2	5 V	Up to 1.5 A	Legacy charging
USB Type-C Current @ 1.5 A	5 V	1.5 A	Supports higher power devices
USB Type-C Current @ 3.0 A	5 V	3 A	Supports higher power devices
USB PD	Configurable up to 20 V	Configurable up to 5 A	Directional control and power level management

The USB Type-C receptacle is specified for current capability of 5 A whereas standard USB Type-C cable assemblies are rated for 3 A. The higher rating of the receptacle enables systems to deliver more power over directly attached docking solutions or using appropriately designed chargers with captive cables when implementing *USB PD*. Also, USB Type-C cable assemblies designed for *USB PD* and appropriately identified via electronic marking are allowed to support up to 5 A.

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To Text:

2.4 VBUS

VBUS provides a path to deliver power between a host and a device, and between a charger and a host/device. A simplified high-current supply capability is defined for hosts and chargers that optionally support current levels beyond the _USB 2.0_ and _USB 3.1_ specifications. The _USB Power Delivery Specification_ is supported.

Table 2-1 summarizes the power supply options available from the perspective of a device with the USB Type-C connector. Not all options will be available to the device from all host or hub ports – only the first two listed options are mandated by the base USB specifications and form the basis of USB Type-C Current at the Default USB Power level.

Table 2-1 Summary of power supply options (device perspective)

Mode of Operation	Nominal Voltage	Maximum Current the Device may draw	Notes
USB 2.0	5 V	see _USB 2.0_	
USB 3.1	5 V	see _USB 3.1_	
USB BC 1.2	5 V	0.5A to 1.5 A[1]	Legacy charging
USB Type-C Current @ 1.5 A	5 V	1.5 A	Supports higher power devices
USB Type-C Current @ 3.0 A	5 V	3 A	Supports higher power devices
USB PD	Configurable up to 20 V	Configurable up to 5 A	Directional control and power level management

Notes:

1. _USB BC 1.2_ permits a power provider to be designed to support a level of power between 0.5A and 1.5A. If the _USB BC 1.2_ power provider does not support 1.5A, then it is required to follow power droop requirements. A _USB BC 1.2_ power consumer may consume up to 1.5A provided that the voltage does not droop below 2V, which may occur at any level of power above 0.5A

The USB Type-C receptacle is specified for current capability of 5 A whereas standard USB Type-C cable assemblies are rated for 3 A. The higher rating of the receptacle enables systems to deliver more power over directly attached docking solutions or using appropriately designed chargers with captive cables when implementing _USB PD_. Also, USB Type-C cable assemblies designed for _USB PD_ and appropriately identified via electronic marking are allowed to support up to 5 A.

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Section 4.6 Power

From Text:

4.6   Power

Power delivery over the USB Type-C connector takes advantage of the existing USB methods as defined by: the _USB 2.0_ and _USB 3.1_ specifications, the _USB BC 1.2_ specification and the _USB Power Delivery_ specification. The USB Type-C Current mechanism allows the DFP to offer more current than defined by the _USB BC 1.2_ specification.

All USB Type-C-based devices shall support USB Type-C Current and may support other USB-defined methods for power. The following order of precedence of power negotiation shall be followed: _USB BC 1.2_ supersedes the _USB 2.0_ and _USB 3.1_ specifications, USB Type-C Current at 1.5 A and 3.0 A supersedes _USB BC 1.2_, and _USB Power Delivery_ supersedes USB Type-C Current. Table 4-12 summarizes this order of precedence of power source usage.

Table 4-12 Precedence of power source usage

Precedence	Mode of Operation		Nominal Voltage	Maximum Current
Highest	_USB PD_		Configurable	5 A
	USB Type-C Current @ 3.0 A		5 V	3.0 A
↓	USB Type-C Current @ 1.5 A		5 V	1.5 A
	USB BC 1.2		5 V	Up to 1.5 A
	Default USB Power	_USB 3.1_	5 V	900 mA
Lowest		_USB 2.0_	5 V	500 mA

For example, once the PD mode (e.g. a power contract has been negotiated) has been entered, the device shall abide by that power contract ignoring any other previously made or offered by the USB Type-C Current, _USB BC 1.2_ or _USB 2.0_ and _USB 3.1_ specifications. When the PD mode is exited, the device shall fallback in order to the USB Type-C Current, _USB BC 1.2_ or _USB 2.0_ and _USB 3.1_ specification power levels.

All USB Type-C ports shall tolerate being connected to USB power source supplying default USB power, e.g. a host being connected to a legacy USB charger that always supplies V BUS.

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All USB Type-C-based devices shall support USB Type-C Current and may support other USB-defined methods for power. The following order of precedence of power negotiation shall be followed: *USB BC 1.2* supersedes the *USB 2.0* and *USB 3.1* specifications, USB Type-C Current at 1.5 A and 3.0 A supersedes *USB BC 1.2*, and *USB Power Delivery* supersedes USB Type-C Current. Table 4-12 summarizes this order of precedence of power source usage.

Table 4-12 Precedence of power source usage

Precedence	Mode of Operation		Nominal Voltage	Maximum Current
Highest	*USB PD*		Configurable	5 A
	USB Type-C Current @ 3.0 A		5 V	3.0 A
	USB Type-C Current @ 1.5 A		5 V	1.5 A
↓	*USB BC 1.2*		5 V	0.5A to 1.5 A[1]
	Default USB Power	*USB 3.1*	5 V	see *USB 3.1*
Lowest		*USB 2.0*	5 V	see *USB 2.0*

Notes:

1. *USB BC 1.2* permits a power provider to be designed to support a level of power between 0.5A and 1.5A. If the *USB BC 1.2* power provider does not support 1.5A, then it is required to follow power droop requirements. A *USB BC 1.2* power consumer may consume up to 1.5A provided that the voltage does not droop below 2V, which may occur at any level of power above 0.5A

For example, once the PD mode (e.g. a power contract has been negotiated) has been entered, the device shall abide by that power contract ignoring any other previously made or offered by the USB Type-C Current, *USB BC 1.2* or *USB 2.0* and *USB 3.1* specifications. When the PD mode is exited, the device shall fallback in order to the USB Type-C Current, *USB BC 1.2* or *USB 2.0* and *USB 3.1* specification power levels.

All USB Type-C ports shall tolerate being connected to USB power source supplying default USB power, e.g. a host being connected to a legacy USB charger that always supplies V_{BUS}.