

USB Type-C ENGINEERING CHANGE NOTICE FORM

Title: Multi-port Chargers

Applied to: USB Type-C Specification Release 1.2

Brief description of the functional changes:
This ECN adds technical definition to the USB Type-C spec that covers the behavior and requirements for multi-port chargers, including hubs that behave as such. Today, the behavior and requirements for a single port charger that implements a combination of USB Type-C and USB PD is quite clear, including the requirements for power rules and certification. What needs to be addressed are those chargers that offer multiple ports and are supplied by a shared power resource, especially with regard to power rules and certification.

Benefits as a result of the changes:
Primary benefits are twofold: one to provide a clear direction for charger designs, the other to establish a predictable behavior of multi-port chargers that can be explained via a combination of the certification logo, product descriptions and user education. The existing power rules as a basic for the certification logo is adequate for single-port chargers, the model gets much more complicated when multiple ports are present.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
No impact envisioned ... this change is addressing a new emerging market and certification for multi-port products has yet to start.

An analysis of the hardware implications:
Will impact pre-definition implementations of multi-port chargers ... may add new constraints on power supply design requirements in order to meet requirements for consistent operation to an established set of multi-port power rules.

An analysis of the software implications:
None expected although software may in the future be able to dynamically assist the user in understanding multi-port charging behavior

An analysis of the compliance testing implications:
Will define new requirements specifically to address the new product category of multi-port chargers that will form the basis for certifying multi-port chargers.

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Actual Change

The following is new content for the USB Type-C spec ... initially be crafted as Section 4.8.6.

4.8 Chargers

4.8.6 USB Type-C Multi-Port Chargers

A USB Type-C Multi-Port Charger is a product that exposes multiple USB Type-C Source ports for the sole purpose of charging or powering multiple connected devices. A compliant USB Type-C charger may offer on each of its ports a mix of power options as defined in Section 4.6.

Multi-Port Chargers will generally fall into two categories as defined by the following.

1. Assured Capacity Chargers: a multi-port charger where the sum of the maximum capabilities of all of the exposed ports, as indicated to the user, is equal to the total power delivery capacity of the charger.
2. Shared Capacity Chargers: a multi-port charger where the sum of the maximum capabilities of all of the exposed ports, as indicated to the user, is less than the total power delivery capacity of the charger.

A Multi-Port Charger may offer in a single product separate visually identifiable groupings of charging ports. In this case, each group can independently offer either one of the two charging categories, either an Assured Capacity Charger or a Shared Capacity Charger.

This section defines the requirements and provides guidelines for the operation and behavior of a USB Type-C Multi-Port Charger.

4.8.6.1 General Requirements

Individual source ports shall always comply with power negotiation and rules set forth by the USB Type-C and USB Power Delivery specifications, adjusted as needed when available resources are reduced as other ports are powered.

The minimum capability of all individual USB Type-C ports shall be 5V @ 900 mA independent of how many of the other ports are in use.

When a USB Type-C Charger includes charging ports that are based on USB Standard-A receptacles, the following requirements shall be met.

- The USB Standard-A ports shall be implemented as an independent group, i.e. USB Standard-A ports shall not be included in a group of USB Type-C ports behaving as a Shared Capacity Charger.
- The minimum capability of all USB Standard-A ports shall be 5V @ 500 mA independent of how many of the other ports are in use.

4.8.6.2 Multi-Port Charger Behaviors

Each Source port of Assured Capacity Chargers shall, by design, behave independently and be unaffected by the status and loading of the other ports. An exception to this behavior is allowed if the charger has to take any action necessary to meet an overall product operational safety requirement due to unexpected behavior on any port.

For Shared Capacity Chargers, the following behavioral rules shall apply:

- Prior to any Source ports being connected to a power Sink, each of the exposed Source ports of the charger shall be capable of the same maximum capability. For example, if the

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maximum capability of a USB Type-C Source port is to offer USB PD with a PDP of 35 W, then all of the exposed Source ports will be able to offer this same USB PD 35 W capability prior to any port being connected with a power contract established.

- As Source ports are connected and a power contract is established, the remaining Source ports shall equally offer the best available capability remaining from the unused capacity of the total power delivery capacity of the charger. For example, if the total power delivery capacity of a USB Type-C two-port charger is 60 W with a port PDP of 35 W and the first connected Source port has established a 35 W power contract with its connected Sink, then the second Source port will offer a PDP of 25 W.
- When establishing the remaining available capacity, a charger that supports policy-based power rebalancing may include the power that can be reclaimed from ports already in use:
 - by adjusting advertised source capabilities equivalent with a reduced PDP to one or more ports that are already in use; or
 - by issuing a USB PD GotoMin command to one or more ports already in use.

Policy-based power rebalancing should consider providing good user experience and preserving nominal USB functionality on impacted devices. Fixed rebalancing algorithms that do not factor in overall USB system policy may not be appropriate for power rebalancing implementations.

4.8.6.3 Multi-Port Charger Port Labeling

Multi-port chargers shall have OEM-designed port labeling consistent with the following rules.

- For Assured Capacity Chargers, each exposed Source port shall be labeled to indicate the maximum power capability of the port. In this case, the user will be able to expect that each of the labeled ports will be able to meet power contracts consistent with the labeling independent of how many of the Source ports are in use.
- For Shared Capacity Chargers, each Source port shall be labeled to indicate the same maximum power capability. Additionally, the charger shall have a label that, with a minimum of equal visual prominence, indicates the total power delivery capacity being shared across all of the ports identified as a group.

A Multi-Port Charger that offers in a single product separate groupings of charging ports, each grouping shall be clearly identified as a separate grouping and each grouping shall be individually labeled consistent with that group's behavior model, either as an Assured Capacity Charger or a Shared Capacity Charger.

Refer to the USB Implementers Forum (USB-IF) for USB Type-C Chargers certification along with further labeling guidelines.

4.8.6.4 Multi-Port Chargers That Include USB Data Hub Functionality

Multi-Port chargers that also incorporate USB data hub capabilities shall meet the same requirements as standalone chargers. These charging-capable hubs shall be self-powered and shall fully operate as a charger independent of the state of the USB data bus connections.

For hub-based Multi-Port Chargers that offer power to the upstream-facing port (to the host), this port may either behave as an Assured Capacity Charging port (e.g. be a dedicated charging port) or as a Shared Capacity Charging port (e.g. sharing capacity with downstream-facing ports). In either case, it should be clearly labeled consistent with its designed behavior, including identifying it as part of a group if it is sharing capacity with other ports.

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When the upstream-facing port is sharing capacity with the downstream-facing ports, the PDP of the upstream-facing port can differ from the downstream-facing ports.