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METHOD FOR A BIDIRECTIONAL USB TYPE C THUNDERBOLT PORT

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Method for a Bidirectional USB Type C Thunderbolt Port

This disclosure relates to a USB Type C Thunderbolt dual-role data (DRD) I/O port that can act as both an upstream (UFP) facing port to a host and a downstream (DFP) facing port to a device.

An architecture is disclosed that includes a collection of device functionality behind a Thunderbolt controller with at least two Thunderbolt ports where at least one port is capable of DRD functionality. This DRD capability allows for a Type C port with external connectivity to either a host or device. When configured as an UFP to an external host, the external host may control the collection of devices attached to the Thunderbolt controller. When configured as a DFP to an external device, the Thunderbolt controller is effectively configured as a hub allowing a second Thunderbolt UFP to another host, which then controls both the Type C DFP Thunderbolt external device and the internal shared devices. This second host may be internal or external to the system. Refer to Figure 1.

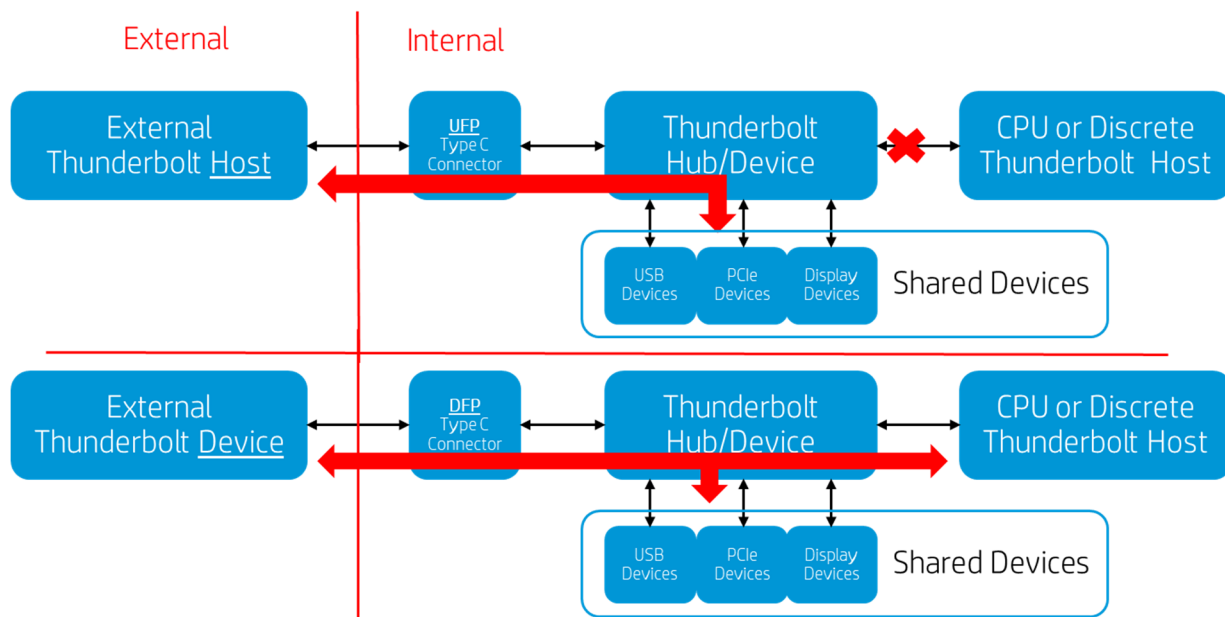


Figure 1 - Host Mode vs. Device Mode Data Flow

This architecture may be used in several contexts including a KVM switch or hybrid docking implementation that allows multiple hosts to share a common set of devices.

A bidirectional DRD Type C connector is a more efficient implementation versus two independent and dedicated UFP and DFP connectors as shown in Figure 1Figure 2. The second Type C connector increases material cost for both the connector and supporting circuits in addition to a second level of switches to share internal devices. The bidirectional controller architecture manages this host switching on the Thunderbolt side versus the back-end functional breakout of USB, PCIe, display, and other functionality.

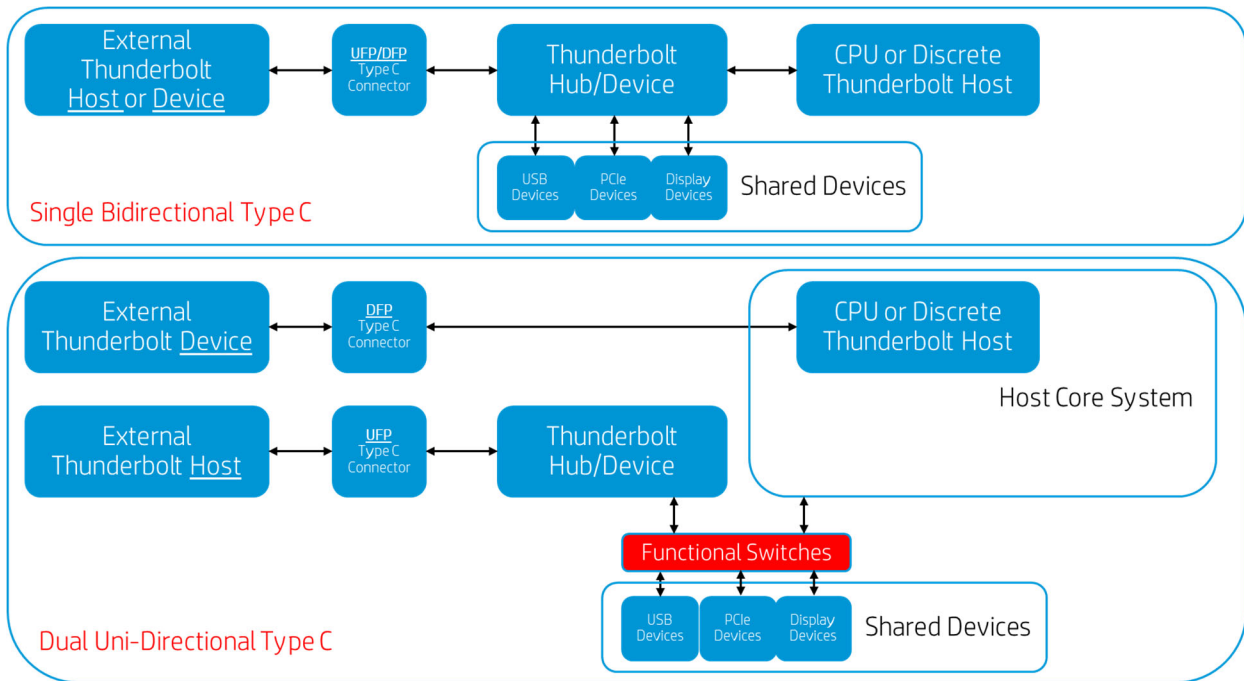


Figure 2 - Unidirectional vs. Bidirectional Type C Connectors

A bidirectional Type C connector may also be constructed by inserting a Thunderbolt switch between the Type C connector and separate host and device Thunderbolt controllers as shown in Figure 3. However, this architecture also requires the back-end switches like the dual connector architecture.

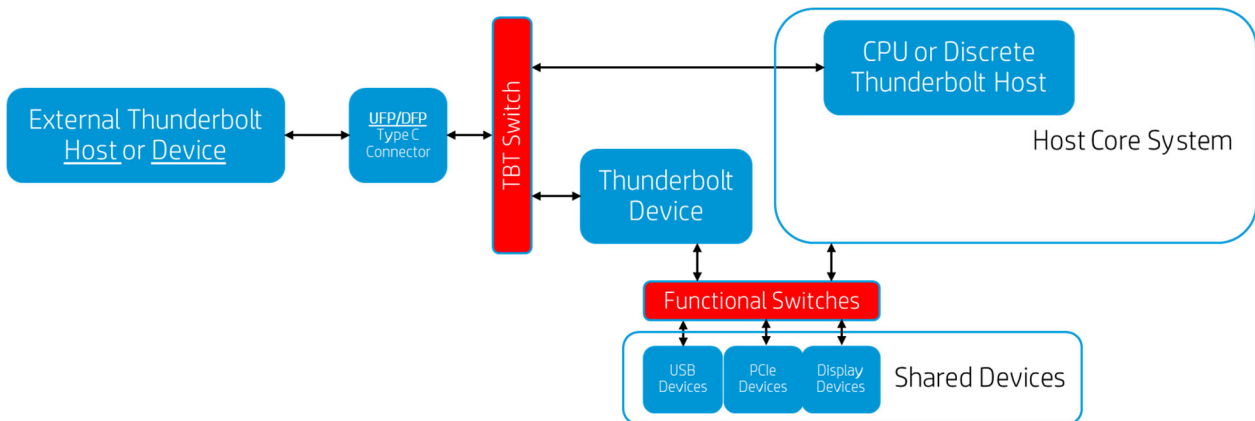


Figure 3 - Thunderbolt Switch

Disclosed by Patrick Ferguson, HP Inc.