

# USB4 1.0 ENGINEERING CHANGE NOTICE FORM

**Title: Optional TMU for Peripheral Device Router**  
**Applied to: USB4 Specification Version 1.0**

**Brief description of the functional changes:**

Removes the requirement for TMU implementation in Peripheral Device Routers, making support optional.

**Benefits as a result of the changes:**

Devices that tunnel none time sensitive data and has only UFP are not required to implement the TMU handshake. Implementing the TMU registers is still mandatory since Connection Manager might fail enumeration if it does not exist.

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

None

**An analysis of the hardware implications:**

None

**An analysis of the software implications:**

None

**An analysis of the compliance testing implications:**

TMU functionality will not be tested in Device Routers that do not support it. TMU Registers will still be tested, regardless of TMU support.

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## Actual Change

### (a). Section 7 Time Synchronization, Page 247

#### To Text:

A Router shall implement the TMU Router Configuration Capability and the TMU Adapter Configuration Capability as described in sections 8.2.1.2 and 8.2.2.2.

A Router with one or more DFP shall support the USB4™ Time Synchronization Protocol described in this chapter. A Router with no DFPs may optionally support the Time Synchronization Protocol described in this chapter. A Router that does not support the Time Synchronization Protocol shall set the Time Synchronization Protocol Not Supported bit in the TMU Router Configuration Capability to 1b.



#### IMPLEMENTATION NOTE

A Peripheral Device Router that does not tunnel any time sensitive protocols does not need the Time Synchronization Protocol for its operation. However, it does need to implement the TMU registers because a Connection Manager may require them in order to enumerate the Router, regardless of whether or not the Time Synchronization Protocol is supported. The TMU registers in a Router that does not support the Time Synchronization Protocol may be set to their default values and have Read Only access.

Support for Inter-Domain Time Synchronization is optional for a Host Router. A Host Router that does not support Inter-Domain Time Synchronization shall set the IDNS bit in the TMU Router Configuration Capability to 1b. A Host Router that does not support Inter-Domain Time Synchronization can still be the Inter-Domain Time Source for a Host Router that support Inter-Domain Time Synchronization.

### (b). 8.2.1.2 TMU Router Configuration Capability, Page 368

#### To Text:

A TMU Router Configuration Capability shall have the structure depicted in Figure 8-3 and the fields defined in Table 8-4.

A Router that does not support the Time Synchronization Protocol may implement all of the fields in this section as Read Only (RO) type. If a Router does not support the Time Synchronization Protocol and it implements the Post Time Low and Post Time High registers as R/W, it shall clear these registers after they are written.

Any field that spans across multiple Doublewords (e.g. LocalTime Low, LocalTime Middle, and LocalTime High) shall use the Register Locking Mechanism defined in Section 8.2.1.2.1 and the Register Group Locking Mechanism defined in Section 8.2.1.2.2.

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## (c). Table 8-4 TMU Router Configuration Capability Fields, Page 247

### To Text:

DW	Register Name	Bit(s)	Field Name and Description	Type	Default Value
0	TMU_RTR_CS_0	<del>29:28</del>	Reserved	Rsvd	0
		29	<b><u>Time Synchronization Protocol Not Supported (TSNS)</u></b> <u>This field shall indicate whether or not the Time Synchronization Protocol is supported.</u> <u>0b – Time Synchronization Protocol is supported</u> <u>1b – Time Synchronization Protocol is not supported</u>	RO	<u>Vendor Defined</u>

## (d). Section 8.2.2.2 TMU Adapter Configuration Capability, Page 383

### To Text:

A TMU Adapter Configuration Capability shall have the structure depicted in Figure 8-8 and shall contain the fields defined in Table 8-11.

A Router that does not support the Time Synchronization Protocol may implement all the fields in this section as Read Only (RO) type.

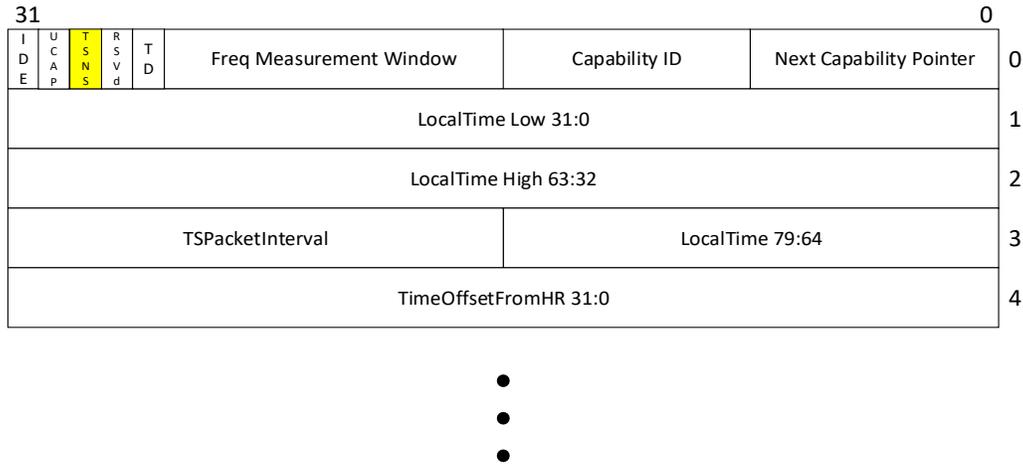
For a USB4 Port with two enabled Lane Adapters, the values in the TMU Adapter Configuration Capability of both Adapters shall be identical. When a value in the TMU Adapter Configuration Capability of one Lane Adapter is written to, the other Lane Adapter in the USB4 Port shall update its value to match.

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## (e). Figure 8-3 Structure of the TMU Router Configuration Capability

To Text:

Figure 8-3. Structure of the TMU Router Configuration Capability



## (f). Table 8-11, TMU Adapter Configuration Capability Fields, Page 386

To Text:

3	TMU_ADP_CS_3	28:0	<b>Reserved</b>	Rsvd	0
		29	<b>EnableUniDirectionalMode (UDM)</b> A Connection Manager uses this bit to enable Uni-Directional Time Sync Handshakes. The TMU Adapter shall set this bit to 0b when its USB4 Port is disconnected.	R/W	0
		30	<b>Inter-Domain Time Responder (IDTR)</b> A Connection Manager uses this bit to configure the USB4 Port as an Inter-Domain Time Responder (i.e. the responder to Time Sync Handshakes across an Inter-Domain Link). If set to 1b, the USB4 Port shall respond to Time Sync Handshakes over the Interdomain Link as initiated by the ITDI Port. Otherwise this bit shall be set to 0b.	R/W	0
		31	<b>Inter-Domain Time Initiator (IDTI)</b> A Connection Manager uses this bit to configure the USB4 Port as an Inter-Domain Time Initiator (i.e. the initiator of Time Sync Handshakes across an Inter-Domain Link). <u>A Connection Manager may set this bit to 1b in DFPs that are in the Domain of a Host Router only if the Host Router supports Inter-Domain Time Synchronization.</u> If set to 1b, the USB4 Port shall Initiate Time Sync Handshakes over the Inter-Domain Link. Otherwise this bit shall be set to 0b.	R/W	0

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## (g). Section 9.1.1.7, ITP Encapsulation, Page 387

### To Text:

An Upstream USB3 Adapter Layer that receives an ITP Tunneled Packet from the Transport Layer shall:

~~1.~~ 1. ~~If the Router does not support the Time Synchronization Protocol, proceed to step 4.~~

~~1-2.~~ 1-2. ~~Else, U~~update the Delta field of the ITP according to the formula below:

- Updated Delta = Delta + (Host Router time Nanosecond - TMU Time Capture) / tIsochTimeStampGranularity.  
*Note: tIsochTimeStampGranularity is defined in the USB 3.2 Specification.*
- A USB3 Adapter Layer shall meet the required accuracy of the Delta field in the ITP as defined by Section 8.7 of the USB 3.2 Specification.

~~2-3.~~ 2-3. Update the CRC-16 field in the ITP.

~~3-4.~~ 3-4. Forward the ITP to the internal USB3 device.