CXL ENGINEERING CHANGE NOTICE

TITLE:	CXL Online FW Activation Capabilities ECN
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Part I

1. Summary of Functional Changes

This ECN focuses on changes needed in the output payload of the Get FW Info CCI command (Opcode 0200h) at the offset 02h to add FW slot specific online FW activation capability, to give more clarity to the users on the currently active and non-active FW packages available on the device.

Gap addressed by the ECN:

The current definition assumes that online FW update capability is not dependent on the new FW image, but solely dependent on the current active image. However, we expect designs where the online update capability is dependent on both - the current FW and the new FW package. This change allows the device to express this restriction.

Changes proposed in this ECN:

1) Update in Activate FW CCI command description in section 8.2.9.3.3
2) Update bit field definition for Byte Offset 02h of Get FW Info Output Payload, Table 8-65

2. Benefits as a Result of the Changes

This ECN assures that users specifically know the availability of online FW activation information along with online FW activation capability for each of the FW package in all the available FW slots on the device.

3. Assessment of the Impact

This change impacts user space implementation of online FW activation. Also, when a new FW is downloaded to a particular slot, the current FW needs to extract the online FW activation capability from the new FW package's header and return the same in the output payload of Get FW Info CCI command.

4. Analysis of the Hardware Implications

To support this ECN, CXL components need to save per slot basis online activation capability for each available FW package. Also, the active FW needs to return up to 5

new bits in the output payload of Get FW Info CCI command. CXL components also need to return the correct error code, if a FW package is attempted to be activated online but it doesn't support this feature.

5. **Analysis of the Software Implications**
   To take advantage of this feature, software will be required to discover the 5 new bits that got introduced as described in this document. And handle the new error code for online FW activation.

6. **Analysis of the Compliance and Test Implications**
   As this ECN repurpose 5 reserve bits new compliance tests could be introduced to ensure per slot basis online FW activation capability that are saved across resets.

Part II

Detailed Description of the change

Blue content shown in the following sections are changes originating from this ECN.

Updates in section 8.2.9.3.3 Activate FW CCI command description:

8.2.9.3.3 Activate FW (Opcode 0202h)

Activate FW is an optional command to make a FW previously stored on the device with the Transfer FW command, the active FW. Devices may support activating a new FW while online or on reset, as indicated by the Get FW Info command.

If a device supports online firmware activation, this command may be executed as a background command as indicated by the command return code.

If the new FW fails to online activate, the device shall roll back to the previous FW, if possible. A cold reset may be required to restore the operating state of the FW on activation failure.

If Software attempts to online activate a FW package that is not online activatable, the device shall return an error code. It is strongly recommended that the device return Activation Failed, FW Rolled Back in this scenario.

Online FW activation does not affect the data, the metadata bits (if present) and Extended Metadata (if present), that are stored by the device. In addition, CXL requests are correctly processed during online firmware activation.

In support of confidential computing, if the device has been locked while utilizing secure CXL TSP interfaces and the device was not enabled for FW update after being locked, the device shall reject this command by returning Invalid Security State status. See Section 11.5 for details on locking a device and locked device behavior.

Updates in bit field definition of Get FW Info Output Payload at offset 02h, Table 8-65

In the output payload of Get FW Info CCI Command, at Byte Offset 02h, 5 new Bits are introduced from the current pool of reserve bits and also the description of the Bit[0] is modified to add more clarity on its relevance while its actual significance remain the same.

Table 8-65. Get FW Info Output Payload

Byte Offset	Length in Bytes	Description
…		
02h	1	~~**FW Activation Capabilities**: Defines the capabilities supported by the device for activating a new FW without a reset.~~ • ~~Bit[0]: When set, the device supports online FW activation with the Activate FW command~~ • ~~Bits[7:1]: **Reserved**~~ **FW Activation Capabilities**: Defines the capabilities supported by the device for activating a new FW without a reset. • Bit[0]: When set, the currently active FW on the device supports online FW activation with the Activate FW command • Bit[1]: When set, per slot FW activation information is available. When this bit is 0, then Bit[5:2] at this offset are Reserved. • Bit[2]: When set, FW package in Slot 1 is online activatable. If 0, either no FW is available in Slot 1, or the FW package in Slot 1 is not online activatable. • Bit[3]: When set, FW package in Slot 2 is online activatable. If 0, either no FW is available in Slot 2, or the FW package in Slot 2 is not online activatable. • Bit[4]: When set, FW package in Slot 3 is online activatable. If 0, either no FW is available in Slot 3, or the FW package in Slot 3 is not online activatable. • Bit[5]: When set, FW package in Slot 4 is online activatable. If 0, either no FW is available in Slot 4, or the FW package in Slot 4 is not online activatable. • Bits[7:6]: **Reserved**