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CXL™ Type 3 Device Component Command Interface over MCTP Binding Specification

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Foreword

71 The CXL™ (*Compute Express Link™*) Type 3 Device Component Command Interface over MCTP
72 *Binding Specification* (DSP0281) was prepared by the Platform Management Communications
73 Infrastructure (PMCI Working Group) of the DMTF.

74 DMTF is a not-for-profit association of industry members dedicated to promoting enterprise and systems
75 management and interoperability. For information about the DMTF, see <http://www.dmtf.org>.

76 The CXL Consortium is an open industry standard group formed to develop technical specifications that
77 facilitate breakthrough performance for emerging usage models while supporting an open ecosystem for
78 data center accelerators and other high-speed enhancements. For information about the CXL consortium,
79 see <https://www.computeexpresslink.org>.

80 **Acknowledgments**

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94

Introduction

95 The CXL™ Type 3 Device Component Command Interface over MCTP Binding Specification defines a
96 new MCTP message type used to convey CXL™ Type 3 Component Command Interface Messages over
97 MCTP to CXL Type 3 Devices.

98 **Document conventions**

99 **Typographical conventions**

100 This document uses the following typographical conventions:

- 101 • Document titles are marked in *italics*.
- 102 • Important terms that are used for the first time are marked in italics.
- 103 • Terms include a link to the term definition in the "Terms and definitions" clause, enabling easy
104 navigation to the term definition.
- 105 • ABNF rules are in monospaced font.

106 **ABNF usage conventions**

107 Format definitions in this document are specified using ABNF (see [RFC5234](#)), with the following
108 deviations:

- 109 • Literal strings are to be interpreted as case-sensitive Unicode characters, as opposed to the
110 definition in [RFC5234](#) that interprets literal strings as case-insensitive US-ASCII characters.
111

CXL™ Type 3 Device Component Command Interface over MCTP Binding Specification

1 Scope

The CXL™ Type 3 Device Component Command Interface over MCTP Binding Specification defines the bindings between CXL elements and MCTP elements in order to transport Component Command Interface Messages (CCI) for CXL Type 3 devices using MCTP. The specific Component Command Interface message contents will be documented outside of DMTF directly by the CXL consortium.

Portions of this specification rely on information and definitions from other specifications, which are identified in clause 2. The following references are particularly relevant:

- DMTF DSP0236, *Management Component Transport Protocol (MCTP) Base Specification 1.3*, defines the MCTP transport protocol over which the CXL Type 3 Component Command Interface over MCTP messages are to be conveyed.
- CXL Consortium, *Compute Express Link™ (CXL™) Specification Revision 2.0*, defines commands and message formats for CXL devices.
- CXL Consortium, *Compute Express Link™ (CXL™) Errata for the Compute Express Link Specification Revision 2.0*.
- CXL Consortium, *Type 3 Management Using MCTP CCI, ECN for management using MCTP CCI*, defines the CXL Type 3 Component Command Interface and message formats.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated or versioned references, only the edition cited (including any corrigenda or DMTF update versions) applies. For references without a date or version, the latest published edition of the referenced document (including any corrigenda or DMTF update versions) applies. Earlier versions may not provide sufficient support for this specification.

CXL Consortium, *Compute Express Link™ (CXL™) Specification Revision 2.0*, <https://www.computeexpresslink.org>

CXL Consortium, *Compute Express Link™ (CXL™) Errata for the Compute Express Link Specification Revision 2.0*, <https://www.computeexpresslink.org>

CXL Consortium, *Type 3 Management Using MCTP CCI ECN*, <https://www.computeexpresslink.org>

DMTF DSP0236, *Management Component Transport Protocol (MCTP) Base Specification 1.3* https://www.dmtf.org/sites/default/files/standards/documents/DSP0236_1.3.pdf

DMTF DSP0237, *Management Component Transport Protocol (MCTP) SMBus/I2C Transport Binding Specification 1.2* https://www.dmtf.org/sites/default/files/standards/documents/DSP0237_1.2.pdf

DMTF DSP0238, *Management Component Transport Protocol (MCTP) PCIe VDM Transport Binding Specification 1.1* https://www.dmtf.org/sites/default/files/standards/documents/DSP0238_1.1.pdf

DMTF DSP0233, *Management Component Transport Protocol (MCTP) I3C Transport Binding Specification 1.0*, https://www.dmtf.org/sites/default/files/standards/documents/DSP0233_1.0.pdf

- 151 DMTF DSP0239, *Management Component Transport Protocol (MCTP) IDs and Codes 1.9*
152 https://www.dmtf.org/sites/default/files/standards/documents/DSP0239_1.9.pdf
- 153 DMTF DSP0241, *Platform Level Data Model (PLDM) over MCTP Binding Specification 1.0*
154 https://www.dmtf.org/sites/default/files/standards/documents/DSP0241_1.0.pdf
- 155 DMTF DSP0240, *Platform Level Data Model (PLDM) Base Specification 1.1*
156 https://www.dmtf.org/sites/default/files/standards/documents/DSP0240_1.1.pdf
- 157 DMTF DSP0248, *Platform Level Data Model (PLDM) for Platform Monitoring and Control Specification*
158 *1.2*
159 https://www.dmtf.org/sites/default/files/standards/documents/DSP0248_1.2.pdf
- 160 DMTF DSP0267, *Platform Level Data Model (PLDM) for Firmware Update Specification 1.1*
161 https://www.dmtf.org/sites/default/files/standards/documents/DSP0267_1.1.pdf
- 162 DMTF DSP0218, *Platform Level Data Model (PLDM) for Redfish Device Enablement 1.1*
163 https://www.dmtf.org/sites/default/files/standards/documents/DSP0218_1.1.pdf
- 164 IETF, RFC4122, *A Universally Unique Identifier (UUID) URN Namespace*, July 2005
165 <http://www.ietf.org/rfc/rfc4122.txt>
- 166 IETF RFC5234, *ABNF: Augmented BNF for Syntax Specifications*, January 2008,
167 <http://tools.ietf.org/html/rfc5234>
- 168 DMTF DSP4004, *DMTF Release Process 2.4*,
169 http://dmtf.org/sites/default/files/standards/documents/DSP4004_2.4.pdf
- 170 ISO/IEC Directives, Part 2, *Rules for the structure and drafting of International Standards*,
171 <https://isotc.iso.org/livelink/livelink.exe?func=ll&objId=4230456&objAction=browse&sort=subtype>

172 **3 Terms and definitions**

173 In this document, some terms have a specific meaning beyond the normal English meaning. Those terms
174 are defined in this clause.

175 The terms "shall" ("required"), "shall not", "should" ("recommended"), "should not" ("not recommended"),
176 "may", "need not" ("not required"), "can" and "cannot" in this document are to be interpreted as described
177 in [ISO/IEC Directives, Part 2](#), Clause 7. The terms in parentheses are alternatives for the preceding term,
178 for use in exceptional cases when the preceding term cannot be used for linguistic reasons. Note that

179 [ISO/IEC Directives, Part 2](#), Clause 7 specifies additional alternatives. Occurrences of such additional
180 alternatives shall be interpreted in their normal English meaning.

181 The terms "clause", "subclause", "paragraph", and "annex" in this document are to be interpreted as
182 described in [ISO/IEC Directives, Part 2](#), Clause 6.

183 The terms "normative" and "informative" in this document are to be interpreted as described in [ISO/IEC](#)
184 [Directives, Part 2](#), Clause 3. In this document, clauses, subclauses, or annexes labeled "(informative)" do
185 not contain normative content. Notes and examples are always informative elements.

186 Refer to [DSP0236](#) for terms and definitions that are used across the MCTP specifications.

187 Refer to the [CXL Specification](#) for terms and definitions that are used in the Compute Express Link™
188 Component Command Interface specification. For the purposes of this document, the following additional
189 terms and definitions apply.

190 3.1

191 **Compute Express Link™**

192 A low-latency, high-bandwidth link that supports dynamic protocol muxing of coherent accesses, memory
193 access, and IO protocols, thus enabling attachment of coherent accelerators or memory devices.

194 3.2

195 **CXL™ Type 3 Component Command Interface**

196 Command interface defined by the CXL consortium to manage Type 3 devices in a CXL system.

197 3.3

198 **CXL™ Type 3 Device**

199 A CXL memory device that supports CXL.io and CXL.mem protocols.

200 3.4

201 **Endpoint**

202 An MCTP endpoint unless otherwise specified.

203 4 Symbols and abbreviated terms

204 4.1

205 Refer to [DSP0236](#) for terms and definitions that are used across the MCTP specifications. Refer to the
206 [CXL Specification](#) for terms and definitions that are used in the Compute Express Link™ Component
207 Command Interface specification. For the purposes of this document, the following additional symbols
208 and abbreviated terms apply.

209 4.1

210 **CCI**

211 Component Command Interface

212 4.2

213 **CXL™**

214 Compute Express Link

215 4.3

216 **MC**

217 Management Controller

218 4.4 219 MCTP

220 Management Component Transport Protocol

221 5 Conventions

222 5.1 Reserved and unassigned values

223 Unless otherwise specified, any reserved, unspecified, or unassigned values in enumerations or other
224 numeric ranges are reserved for future definition by the DMTF.

225 Unless otherwise specified, numeric or bit fields that are designated as reserved shall be written as 0
226 (zero) and ignored when read.

227 5.2 Byte ordering

228 Unless otherwise specified, the byte ordering of multibyte numeric fields or multibyte bit fields in this
229 specification shall be "Big Endian": The lowest byte offset holds the most significant byte and higher
230 offsets hold lesser significant bytes.

231 6 Overview

232 6.1 General

233 Compute Express Link™ (CXL) is a dynamic multi-protocol technology designed to support accelerators
234 and memory devices. CXL provides a rich set of protocols that include I/O semantics similar to PCIe (i.e.,
235 CXL.io), caching protocol semantics (i.e., CXL.cache), and memory access semantics (i.e., CXL.mem)
236 over a discrete or on-package link.

237 CXL Type 3 devices are devices that support CXL.io and CXL.mem protocols. These devices can be
238 managed during runtime via a Component Command Interface (CCI) that represents a command target
239 to process management and configuration commands. The CCI and the commands that are supported
240 via the CCI are defined by the members of CXL Consortium in the Compute Express Link specification.
241 Refer to www.computeexpresslink.org and the [CXL specification](#) for more information.

242 This specification only defines how CXL Type 3 CCI commands are encapsulated in MCTP Messages
243 and transferred between MCTP Endpoints over transports that have a corresponding MCTP transport
244 binding specification. These are referred to in this document as CCI Messages over MCTP. The
245 definitions and semantics of the Type 3 CCI Commands themselves are outside the scope of this
246 specification and are defined in the CXL specification.

247 The MCTP Transport Bindings that are used for CXL Type 3 CCI over MCTP are defined in other
248 companion specifications including but not limited to the MCTP SMBus/I2C Transport Binding
249 Specification ([DSP0237](#)), MCTP I3C Transport Binding Specification ([DSP0233](#)) and the MCTP PCIe
250 VDM Transport Binding Specification ([DSP0238](#)).

251 6.2 Other Standards

252 CXL Type 3 devices may also support management capabilities using existing DMTF specifications
253 including but not limited to the Platform Level Data Model (PLDM) specifications such as the PLDM Base
254 Specification ([DSP0240](#)), PLDM over MCTP Binding Specification ([DSP0241](#)), PLDM for Platform
255 Monitoring and Control ([DSP0248](#)), PLDM for Firmware Update ([DSP0267](#)) and PLDM for Redfish Device

256 Enablement ([DSP0218](#)). Where applicable, the DMTF encourages use of these existing specifications to
 257 provide a common management experience that spans many device types and interfaces.

258 7 Message Type-specific considerations

259 7.1 Message Type number

260 The Message Type number for CXL Type 3 CCI over MCTP messages is defined in the MCTP IDs and
 261 Codes Specification ([DSP0239](#)) and the number assigned is 0x08.

262 7.2 CXL Type 3 CCI over MCTP specification version information

263 Implementations that follow this specification shall return the following version information in the response
 264 to the GET MCTP Version Support command when the Message Type parameter in the request is set to
 265 0x08 (return CXL Type 3 CCI over MCTP specification version information).

266 The Version Number Entry 1 field shall be used to indicate compatibility with Version 1.0.0 of the CXL
 267 Type 3 CCI over MCTP message type as:

268 1.0 [Major version 1, minor version 0, any update version, no alpha]

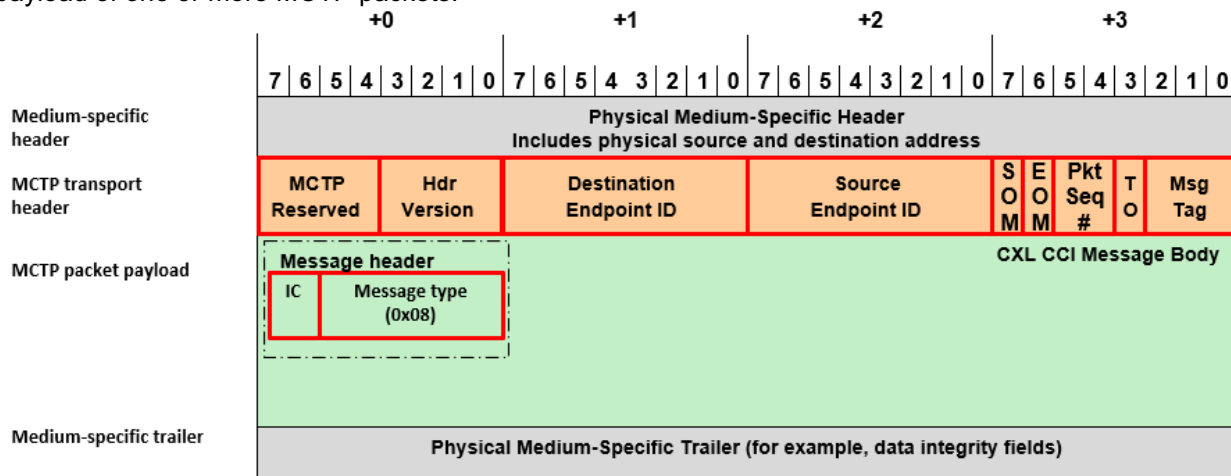
269 This is reported using the encoding as: 0xF1F0FF00

270 7.3 Timing specifications

271 CXL Type 3 CCI messages over MCTP are made up of one or more MCTP packets. Each MCTP packet
 272 shall comply with the timing, arbitration, and fairness requirements of the transport binding specifications
 273 for the media through which it passes. For examples, refer to the MCTP SMBus/I2C Transport Binding
 274 Specification ([DSP0237](#)) and the MCTP PCIe VDM Transport Binding Specification ([DSP0238](#)) for
 275 specific packet and message timing requirements.

276 7.4 CXL Type 3 CCI over MCTP message format

277 Referring to Figure 1, the CXL Type 3 CCI Messages over MCTP are carried via the MCTP packet
 278 payload of one or more MCTP packets.



279

280

Figure 1: MCTP Message fields

281 7.4.1 Integrity Check (IC), Tag Owner (TO) and Message Tag (Msg Tag) usage

282 CXL Type 3 CCI over MCTP messages do not include an overall message integrity check field and shall
283 set the Integrity Check (IC) bit to 0b.

284 When request/response message exchange is used and the Tag Owner (TO) bit is set to 1b in the
285 request, a responder shall return the same Message Tag with the Tag Owner bit cleared to 0b in the
286 corresponding response message.

287

Field Name	Field Size	Description
TO	1 bit	1b - CXL Type 3 CCI Request messages 0b – CXL Type 3 CCI Response messages
IC	1 bit	Message Integrity Check bit = 0b CXL Type 3 CCI over MCTP messages do not include an overall Message Integrity check field.
Message type	7 bits	CXL Type 3 CCI = 0x08 This field identifies the MCTP message as carrying a CXL Type 3 CCI message.
CXL Type 3 CCI Message Body	Variable	The CXL Type 3 CCI message fields are defined in the CXL Specification

288 **Table 1: CXL Type 3 CCI over MCTP Message Field Descriptions**

289 For a definition of CXL Type 3 CCI request and response messages, refer to the [CXL Specification](#).

290 7.4.2 Message assembly

291 CXL Type 3 CCI messages over MCTP may be split into one or more MCTP packets thus requiring
292 segmentation and assembly. All multi-packet CXL Type 3 CCI over MCTP messages shall comply with
293 the message packetization and assembly rules of the MCTP base specification ([DSP236](#)). Specifically,
294 sections in the MCTP base specification related to Message assembly, Dropped packets, Starting
295 message assembly, Terminating message assembly/dropped messages, and Dropped messages shall
296 be complied with. CXL Type 3 CCI messages when transported over MCTP shall not require any
297 changes to the MCTP base specification.

298 7.5 Maximum message size

299 The CXL Type 3 CCI message body over MCTP shall be less than or equal to 1088 bytes. All MCTP
300 endpoints shall support this maximum message body size of 1088 bytes, which includes a maximum of
301 1024 bytes for the CXL Type 3 CCI message payload and a maximum of 64 bytes for the CXL Type 3
302 CCI header. This corresponds to a transfer of 17 MCTP packets using a baseline transmission unit of 64
303 bytes for the MCTP packet payload. See the CXL Specification for a definition of the CXL Type 3 CCI
304 message payload and headers.

305 The maximum message size includes the IC bit and Message Type fields plus any additional Message
306 Type-specific header fields, as required by the CXL Type 3 CCI. Refer to the [CXL Specification](#) for any
307 additional restrictions on message sizes.

308 **7.6 Multiple MCTP physical transports**

309 In order to facilitate identification of devices that are accessible via multiple physical transports, the
310 endpoints in the device shall support the Get Endpoint UUID MCTP command.

311 An MCTP endpoint is not required to support more than one outstanding command over a single physical
312 transport. A requestor shall have requests outstanding on only one physical transport at a time.

313 Otherwise, this specification does not define any additional behaviors related to communicating with
314 CXL™ Type 3 devices over MCTP that may be accessed through more than one type of MCTP physical
315 transport on a given MCTP network.

316
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318
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ANNEX A (informative)

Change log

Version	Date	Description
1.0.0	2021-12-28	Initial Version.

320