

DWORD Control Packet (DCP) Specification

Revision	Date	Who	Description
0.0	2012-03-23	S.Siegel	Creation
0.1	2012-04-08	S.Siegel	NOP Requests have no side-effect

DWORD Control Packet (DCP)

A DCP is a means for an initiator to perform a DWORD read or write access request upon a target; and for a target to complete each request with a response. Each and every initiator request is acknowledged by a target response. Thus all DCP requests are non-posted and have a corresponding response. DCP messages are identified by an 8b rolling message tag which discriminates one message from the next in case a request or response is dropped. The DCP is an Ethernet MAC layer 2 protocol identified by the 2B ad hoc EtherType code **0xF040** (clause 3.2.6). The MAC layer will insert/remove the 14B 3-tuple of (6B)DST-(6B)SRC-(2B)EtherType, leaving the DCP to be comprised of payload messages from 6 to 14 Bytes, or more, in length as described here.

2B DCP Payload Length Indication (PLI)

Following the 0xF040 EtherType code, every DCP has exactly 2B (16b) of DCP payload length indication (PLI). This serves the purpose of explicitly indicating the exact length in Bytes of the DCP payload that follows the EtherType. This unsigned integer quantity includes the count for 2B of the payload length indication itself, as well as the message payload which follows.

PLI Byte	Bits	Description
0	[7:0]	Payload Length in Bytes (MS-bits) [15:8]
1	[7:0]	Payload Length in Bytes (LS-bits) [7:0]

4B DCP Message Header (DMH)

Following the 2B DCP payload length indication is the 4B DCP Message Header (DMH).

DMH Byte	Bits	Description
0, 1	[7:0]	Reserved, Set to 0
2	[7:6]	Reserved, Set to 0
	[5:4]	DCP Message Type NOP: 0x0 = Request No Operation Write: 0x1 = Request Write Operation Read: 0x2 = Request Read Operation Response: 0x3 = Response Completion Operation
	[3:0]	On Requests: DWORD Byte Enables 1=Enable 0=Disable 0xF=4B; 0xC=2B(MS); 0x3=2B(LS); 0x8=1B(B3); 0x4=1B(B2); 0x2=1B(B1); 0x1=1B(B0) On Response: Control Plane Response Code 0x0=OK; 0x1=Timeout; 0x2=Error; 0x3-0xF=Reserved
3	[7:0]	DCP Message Tag (Generated by request; returned to identify completion)

Table of DCP Message Types

DCP Message Type	Bytes Follow	DCP Bytes Total	Description (what data follows DCP header, if any)
NOP	4	10	Request No Operation (4B Initiator Advertisement)
Write	8	14	Request DWORD Write (4B Write Address, 4B Write Data)
Read	4	10	Request DWORD Read (4B Read Address)
Response	4	10	Completing NOP Request (4B Target Advertisement)
Response	0	6	Completing Write Request
Response	4	10	Completing Read Request (4B Read Response Data)

The NOP message allows the initiator to test for presence of the target(s) ***without any side effect*** in the control plane. For NOP messages the target will ignore the requestor's DCP Message Tag. It will not update its internal state of the last tag received. It will return the last tag received (or the default 0). The initiator adds to the NOP message 4B of Initiator Advertisement which describes to the target the initiator's capabilities. In response, the target acknowledges the NOP with a response containing 4B of Target Advertisement.

The next two tables describe the capability information sent from initiator to target and target to initiator respectively.

4B Initiator Advertisement

Byte	Bits	Description
0	[7:0]	0x80 (Bit 31 of the 4B sequence set – Initiator Advertisement)
1	[7:0]	0x00
2	[7:0]	0x00
3	[7:0]	Maximum Number of Coalesced Write Responses Allowed (1-255) Default 1

4B Target Advertisement

Byte	Bits	Description
0	[7:0]	0x40 (Bit 30 of the 4B sequence set – Target Advertisement)
1	[7:0]	0x00
2	[7:0]	0x00
3	[7:0]	Maximum Number of Coalesced Write Requests Allowed (1-255) Default 1

Write Coalescing

Write requests and their corresponding responses may be coalesced for reduced latency and improved throughput. Provided at least one successful NOP request and response has taken place; both the initiator and target know their partner's maximum number of permitted coalesced writes from the data communicated in their respective capabilities advertisements.

Coalesced write requests pack N 3-tuples of DCPHead(2B)-Addr(4B)-Data(4B) back-to-back within a single message. Each Write request has its own unique DCP message tag.

Coalesced write responses pack together M 2B Responses within a single message. Each Write response indicates the DCP message tag of the request and the associated write's completion.

Baseline default implementations must support 1 write, which is effectively no coalescing. In the absence of any NOP request-response interchange, the default behavior is no write-coalescing.

Initiator Responsibilities:

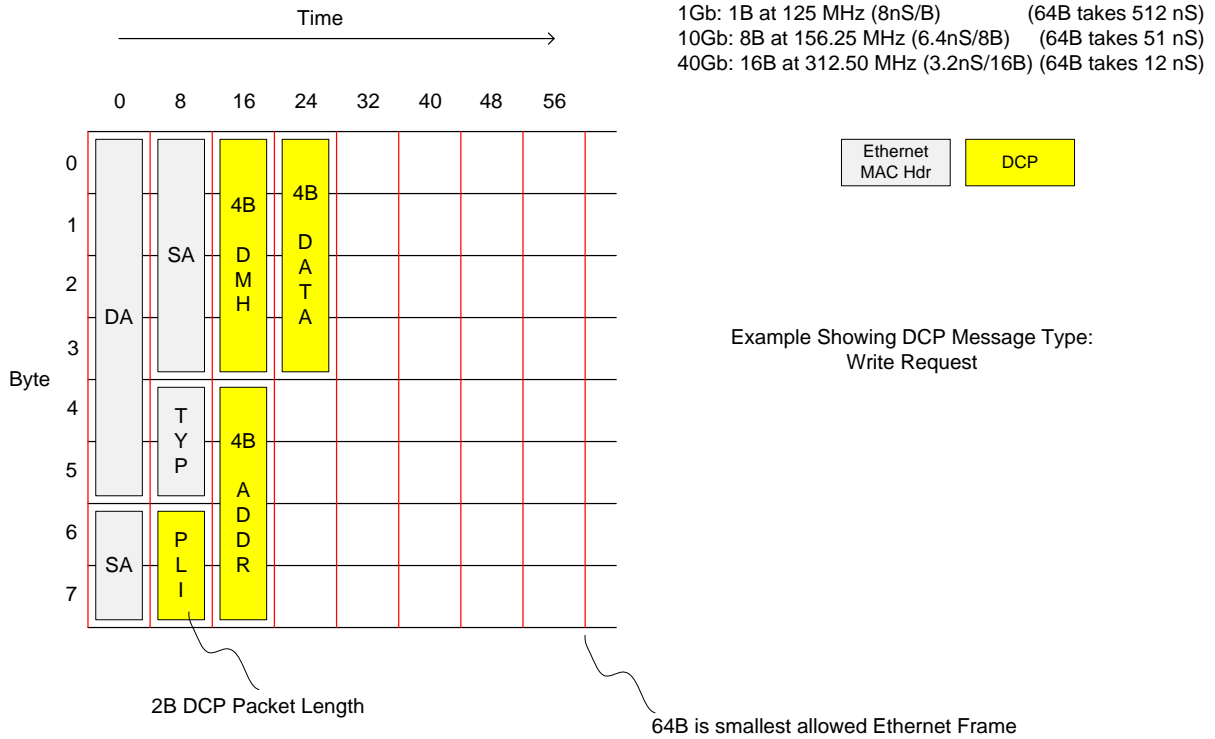
The initiator is responsible for transmitting defined requests and receiving defined responses.

When the initiator initiates a NOP message, it must correctly populate the 4B Initiator Advertisement field with its capabilities.

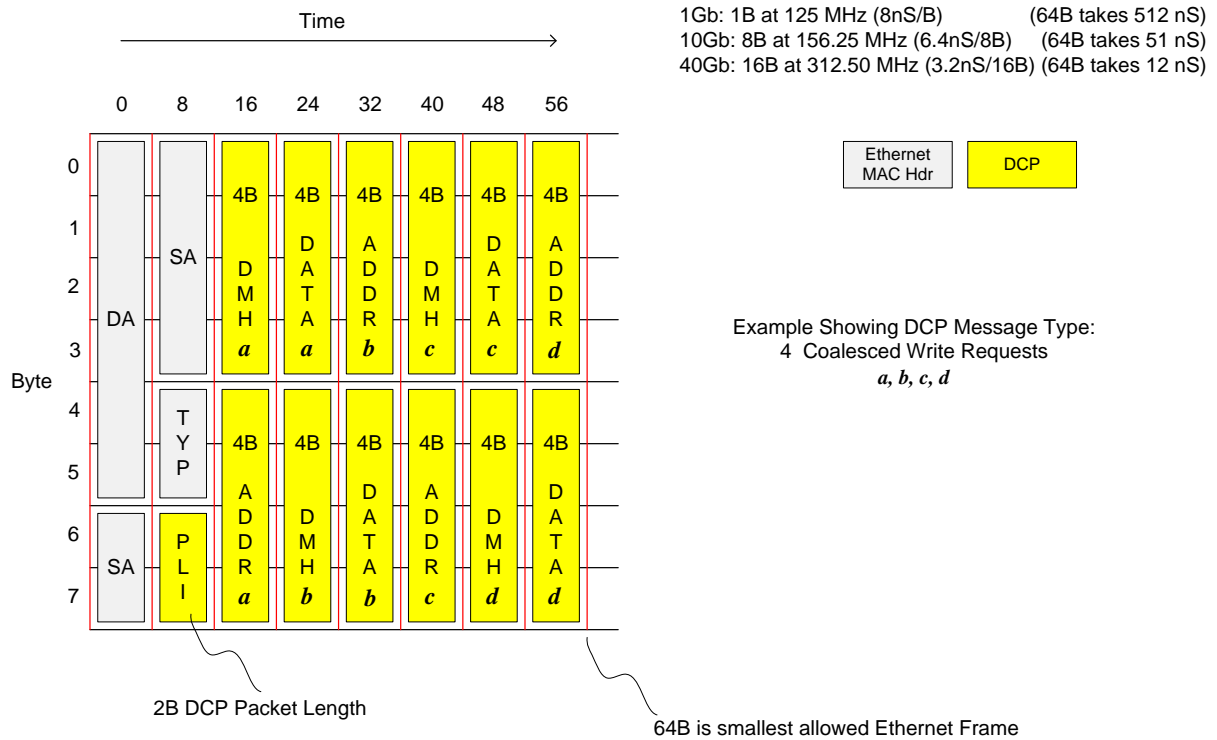
Target Responsibilities:

The target shall store the message tag from non-NOP requests and the response of at least one previous DCP message.

On reception of a request whose message tag appears to be original, the target shall perform the control plane operation requested. On reception of a request whose message tag appear to be a retransmission of a previous message, no control plane action is taken; but the stored response is (re)sent. This clause highlights a tacit understanding that layer 2 delivery may be unreliable.

Example Messages:**DCP Write Request:**

DCP Write Request Coalesced:



DCP Read Request:

