



OpenLCB Standard	
OpenLCB Message Network	
Mar 19, 2012	Preliminary

1 Introduction (Informative)

(This Standard and TN are still being actively worked on. There's a lot of duplication between them, etc)

- 5 OpenLCB is based on a global exchange of individual messages. This specification defines the basic messages and how they interact. Higher level protocols are based on this message network, but are defined elsewhere.

2 Intended Use (Informative)

General discussion, not specific to any particular implementation. Implementations such as CAN, TCP/IP, etc, will have their own standards to specifics.

10 3 References and Context (Normative)

For more information on format and presentation, see:

- OpenLCB Common Information Technical Note

4 States

The message network layer in an OpenLCB node has two states:

- 15
- Uninitialized
 - Initialized

Nodes shall start in the Uninitialized state.

A node in the Uninitialized state may transmit an Initialization Complete message. A node in the Uninitialized state shall not transmit any other message type.

- 20 A node in the Initialized state may transmit any message type.

5 Message Format (Normative)

OpenLCB messages are sent using the transfer mechanism and format described in the specification for a specific wire protocol.

All messages shall contain a source Node ID and a message type indicator (MTI).

- 25 Each message type is defined to include or not include an Event ID (EID). If the type is defined to include an EID, the EID must be present all messages of that type.

- Each message type is defined to include or not include a destination Node ID (DID). If the type is defined to include a DID, the DID must be present all messages of that type. Message types without a DID are referred to as “global” or “non-addressed” messages. Message types with a DID are referred to as “addressed” messages.
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5.1 Global (non-addressed) messages

Global messages shall be delivered to all nodes.¹

5.2 Addressed messages

- Addressed messages shall be delivered to the node in their destination node ID. They may, but need not, be delivered to other nodes.
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6 Messages (Normative)

This section defines the format of common core messages.

6.1.1 Initialization Complete

- Indicates that the sending node initialization is complete, and once the message is delivered, reachable on the network.
- 40

Name	In Simple Node Protocol	Dest ID	Event ID	Flag Byte	Common MTI	Content
Initialization Complete	N	N	N		0x0000,0000	Sending Node ID

6.1.2 Verify Node ID

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Name	In Simple Node Protocol	Dest ID	Event ID	Flag Byte	Common MTI	Content
					0x0000,0000	

¹The “simple node protocol” is an exception to this, which needs to be worked into this Standard.

Message Type Indicator: 0x

Destination address present: Both yes and no

50 Simple subset: Yes

6.1.3 Verified Node ID

Name	In Simple Node Protocol	Dest ID	Event ID	Flag Byte	Common MTI	Content
					0x0000,0000	

55

Message Type Indicator: 0x

Destination address present: No (space reasons originally, but these no longer apply?)

Simple subset:

60 Priority group:

Content: NID of the sending node – this is sent in full 48 bit format in all wire protocols, even if an alternate form or alias is available elsewhere in the message

CAN frame format:

6.1.4 Optional Interaction Rejected

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Name	In Simple Node Protocol	Dest ID	Event ID	Flag Byte	Common MTI	Content
					0x0000,0000	

Message Type Indicator: 0x

Destination address present: Yes

70 Simple subset:

Priority group:

Content:

- Mandatory most recent MTI (2 bytes)
- Mandatory error code (TBD)
- Optional data content (TBD)

75

CAN frame format:

6.1.5 Terminate Due to Error

Name	In Simple Node Protocol	Dest ID	Event ID	Flag Byte	Common MTI	Content
					0x0000,0000	

80

Message Type Indicator: 0x

Destination address present: Yes

Simple subset:

Priority group:

85

Content:

- Mandatory most recent MTI (2 bytes)
- Mandatory error code (TBD)
- Optional data content (TBD)

CAN frame format:

90 7 Interactions (Normative)

All nodes shall take part in all standard interactions defined in this section.

7.1 Node Initialization

Newly functional nodes, once their start-up is complete and they are fully operational, including having the frame transfer layer in “Permitted state”, shall send an “Initialization Complete” message and enter
 95 Initialized state.

- There is no guarantee that any other node is listening for this. No reply is possible.
- Nodes must not emit any other OpenLCB message before the “Initialization Complete” message.

100 Sending the IC message is required to insure that higher-level tools are notified that they may start to work with the node.

7.2 Duplicate Node ID Detection

OpenLCB nodes must have unique node IDs. To detect this across the entire connected OpenLCB, all OpenLCB nodes must indicate an error if they detect an incoming message with a Source Node ID equal to their own. If possible, they should indicate it at the board itself using a light or similar. If
 105 possible, they should emit a PCER message with the “Duplicate Source ID detected” global event, which will carry the duplicate event ID in the Source Node ID field.

After sending the “Duplicate Source ID detected” global event, the node should not transmit any further messages until reset because this message will be received at the other duplicate-ID node(s),
 110 resulting in additional “Duplicate Source ID detected” global events and causing a possible message loop.

To further improve the reliability of this detection, OpenLCB nodes should, but need not, emit a Verified Node ID message every 30 to 90 seconds. As an implementation detail, it's recommended that CAN-attached nodes use their NIDa to pick that interval so that messages don't bunch up.

115 7.3 Node ID Discovery

Upon receipt of a Verify Node ID Number message addressed to it, or an unaddressed Verify Node ID Number message, a node must reply with an unaddressed Verified Node ID Number message.

7.4 Error Handling

There are multiple mandatory error-handling scenarios defined.

120 (Need to explain “optional” here)

7.4.1 Reject Addressed Optional Interaction

- Node A receives an addressed message from Node B that carries Node A's NID.
- The MTI indicates the start of an optional interaction.
- If Node A does not want to take part in the optional interaction, it may send an Optional
 125 Interaction Rejected message addressed to Node B with the original MTI in the message

content. There is no requirement that OIR be sent; the node may silently ignore the incoming message.

The message content also contains an optional reason code and an optional data value. The use of these fields is to be defined.

130 **7.4.2 Reject Unaddressed Optional Interaction**

- Node A receives an unaddressed message from Node B.
- The MTI indicates the start of an optional interaction.

If Node A does not want to take part in the optional interaction, it silently drops the message without reply.

135 **7.4.3 Reject Addressed Standard Interaction Due to Error**

- Node A is taking part in an addressed interaction with Node B. Either node may be able to send the next message.
- Some error condition prevents Node A from continuing the interaction.
- To terminate the interaction, Node A sends a Terminate Due to Error message to Node B. It then resets it's state so as to no longer be taking part in the addressed interaction.

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The message content contains the most recent MTI received in this interaction, a mandatory reason code and an optional data value. The use of these fields is to be defined.

Table of Contents

1 Introduction (Informative).....	1
2 Intended Use (Informative).....	1
3 References and Context (Normative).....	1
4 States.....	1
5 Message Format (Normative).....	2
5.1 Global (non-addressed) messages.....	2
5.2 Addressed messages.....	2
6 Messages (Normative).....	2
6.1.1 Initialization Complete.....	2
6.1.2 Verify Node ID.....	2
6.1.3 Verified Node ID.....	2
6.1.4 Optional Interaction Rejected.....	3
6.1.5 Terminate Due to Error.....	3
7 Interactions (Normative).....	3
7.1 Node Initialization.....	4
7.2 Duplicate Node ID Detection.....	4
7.3 Node ID Discovery.....	4
7.4 Error Handling.....	4
7.4.1 Reject Addressed Optional Interaction.....	5
7.4.2 Reject Unaddressed Optional Interaction.....	5
7.4.3 Reject Addressed Standard Interaction Due to Error.....	5