VLCB Versatile Layout Control Bus

Node Variable Service Specification

Service# 2

Version 1.3, March 2025, for Service version 2

Compatible with CBUS ® 4.0 Rev 8j

0.1 Table of Contents

0.2 Document History

Date	Changed by	Summary of changes	Service version
18th October 2022	Ian Hogg M.5144	Initial document	1
14 April 2023	Ian Hogg M.5144	Changed name to VLCB	1
29 August 2023	Ian Hogg M.5144	Changed Service name to Node Variable.	1
12 February 2025	Ian Hogg M.5144	Added clarification regarding dependencies between NVs and NVs with EVs.	1
10 March 2025	Ian Hogg M.514	NVRD NV#0 additional responses now dependent upon not being in FCU compatibility mode	2

1. VLCB Services

This document describes the VLCB Node Variable (NV) service. This service is an optional addition to the VLCB Minimum Node Specification. There is a single Node Variable service covered by this document.

Modules wishing to use the VLCB Node Variable service shall conform to this specification.

2. Node Variables

A user may change a module's functionality by modifying its configuration. Part of the configuration is stored as a set of node variables (NVs). Modules may also have configuration stored as event variables (EVs) please see the Event services for information about EVs.

NVs are used to control the functionality of a module.

NVs are configurable 8 bit variables which take a value between 0 and 255. The NMS allows a module to have a quantity between 0 and 254 NVs. The actual quantity of NVs is returned by the module as parameter 6 (as returned by the PARAMS message). The NVs are referenced by a node variable number/index between 1 and the module's maximum number.

MNS does not place any requirement of the meaning or use of the NVs, this is module type specific and defined by the module designer.

A module must implement the following:

- Parameter 6 must indicate the number of NVs supported by the module.
- **NVSET** request may be used to set (write) a NV to value. A module may place constraints on the values permitted so that the actual value written may not be the value within the request.
    - A **WRACK** response indicates that the write operation has been completed. The module may be unavailable between receiving the NVSET and responding with **WRACK**.
    - A **GRSP** response indicates success or failure of the request. The value being written may be invalid for the NV or the NV index may be out of range. There may also be a hardware failure preventing the write.
      In addition, a **CMDERR** response indicates a failure of the request. (Kept for backwards compatibility)
- **NVRD** request may be used to read the current value of a NV. It is permitted that a NV's value may change during the module's operation.
    - Requesting NV#0 will first return the quantity of NVs and then if not in FCU compatibility mode all the NV values as a series of NVANS messages.
    - Requesting a non zero NV# will return a **NVANS** response with the NV's current value.

    - A **GRSP** response is also possible if the NV index is out of range or the module defines the NV as being non-writable. Similarly, a **CMDERR** response is also possible (kept for backwards compatibility).

- **NVSETRD** request may be used to set (write) a value to a NV. A module may place constraints on the values permitted so that the actual value written may not be the value within the request.

    - A **NVANS** response contains the actual value written and indicates that the write operation has been completed. The module may be unavailable between receiving the **NVSETRD** and responding with **NVANS**.

    - If an error occurs the module shall respond with a **GRSP** indicating the cause of the error.

2.1 Dependencies on other services

The NV service depends upon the mandatory Minimum Node Service.

3. Summary of Opcodes

Refer to the VLCB Opcode Specification document for details of the opcodes.

Request to Module	Module's Response	Use/meaning
NVSET	WRACK	Set a Node Variable
	GRSP, CMDERR	Error response
NVRD	NVANS	Read a Node Variable
	GRSP, CMDERR	Error response
NVSETRD*	NVANS	Set a node variable with read
	GRSP	Error response
ESD*	SD, ESD	Reports number of node variables.

* added VLCB opcode

4. Service Specific Modes

No additional operating modes are specified by the NV service.

5. Service Specific Status Codes

No additional GRSP status codes are specified by the NV service.

6. Service Specific Diagnostic Data

Diagnostic number	Name	Description
1	naccesses	Number of accesses to node variables. Ie the number of NVRD and NVSETRD messages that resulted in NVANS.
2	nfailures	Number of failures. Ie the number of NVRD and NVSETRD messages that resulted in an error. (GRSP/CMDERR).

7. Service Specific Automatic Power-up Tests

No service specific power-up tests are specified by the NV service.

8. Service Documentation

A module which uses the NV service shall document the purpose of each NV including:

- Permitted values or range,
- Default value,
- Scale and units of values,
- Interdependencies between NV values.

9 Module Design Considerations

Modules should use NVs to configure module operation and hardware usage whereas EVs can be used to configure the event behaviour.

NVs may have dependencies with each other and/or with events. The dependencies should follow the following rules where “earlier” refers to NVs with a lower index and “later” refers to NVs with a higher index.

- An NV’s permitted values may depend upon the values of earlier NVs.
- The value of an NV should not depend upon the value of a later NV.
- The value of an NV may change when an earlier NV’s value is changed.
- The value of an NV should not change when a later NV is changed.
- NV dependencies must be uni-directional so that if NVb depends on NVa then NVa must not depend upon NVb.
- Events and their EVs may be associated with NVs and those events may be automatically changed when the value of those NVs are changed.
- NVs must not depend upon EVs.

These rules allow management systems to write NVs in increasing NV order followed by the writing of events and EVs in increasing order to restore a module's configuration from backup.

10 Service Data

10.1 Parameters

The following parameters are associated with the NV service and shall be supported.

Param#	Name	Usage	VLCB should set these values	Value if NV service is not supported
6	No NV	Number of Nvs	Number of Nvs	0

10.2 ESD data bytes

The number of NVs is passed in Data1, other Data bytes are set to 0.