DNP3 Master

using COPA-DATA stack

straton user guide – Rev. 4

sales@straton-plc.com

CP_R31_006_H

straton

Content

1. Overview

This document describes how to configure the DNP3 master connection in the straton editor.

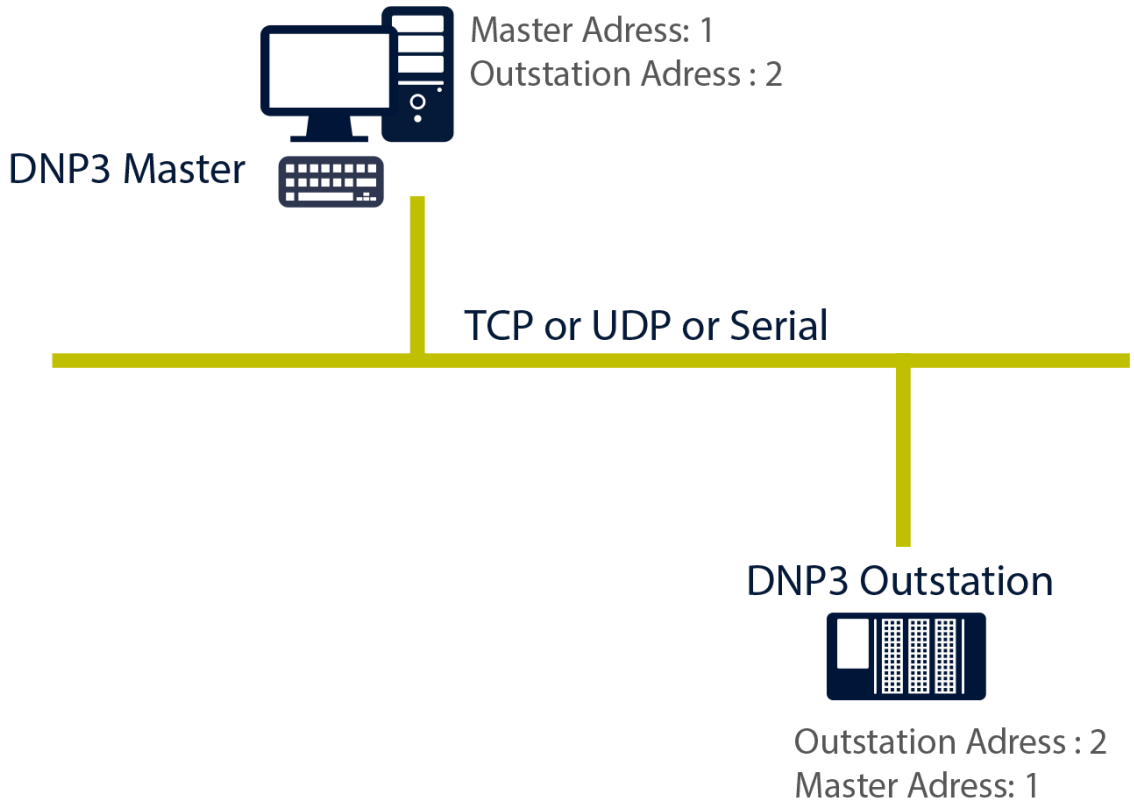
2. Requirement and setup

Download and install from https://straton-plc.com/telechargements/

3. Architecture

The DNP3 communication requires the declaration of CONNECTION/SESSION, each connection/session can have its own communication parameters.

Variables are refreshed in polling mode and/or in event mode, the data are group by Type, events are assigned to a Class. In the configuration, default values are set for all of these information but these can be overwritten.

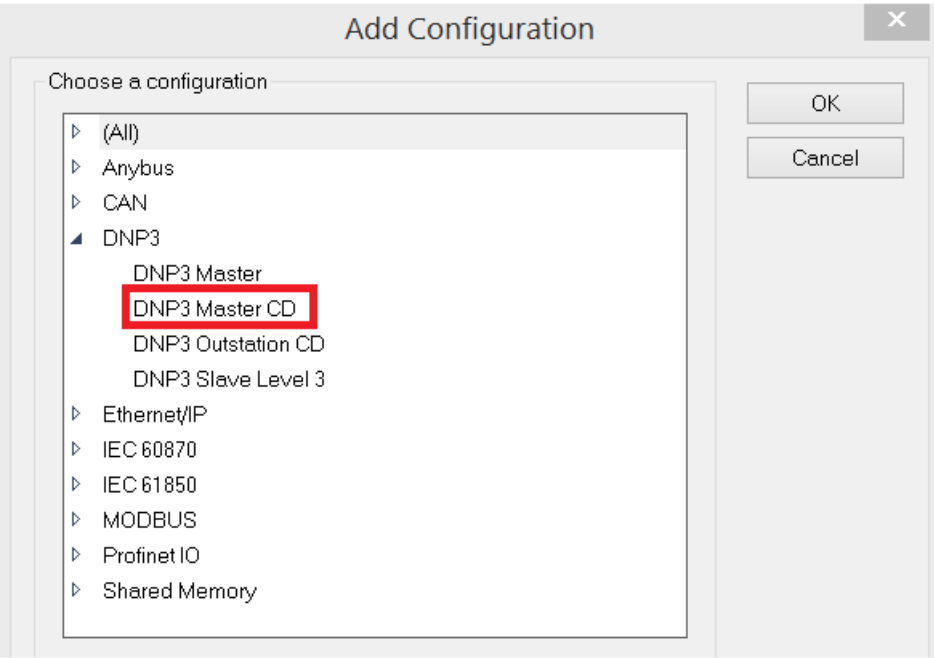


4. Configuration in straton

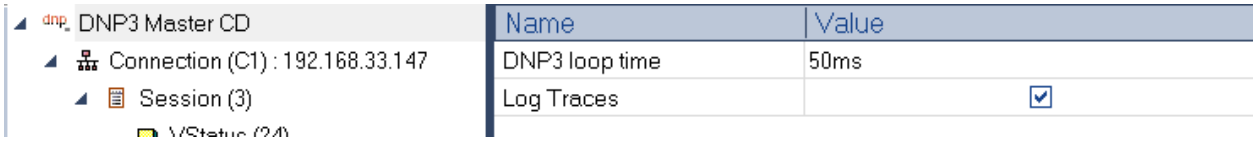
Open the IO Drivers window using the tool bar ( ) or right click on the project > Insert Shortcut > Fieldbus configurations

Insert a Fieldbus

Insert a new Fieldbus using the tool bar ( ) or menu Insert > Insert configuration and select the "DNP3 Master CD" driver.



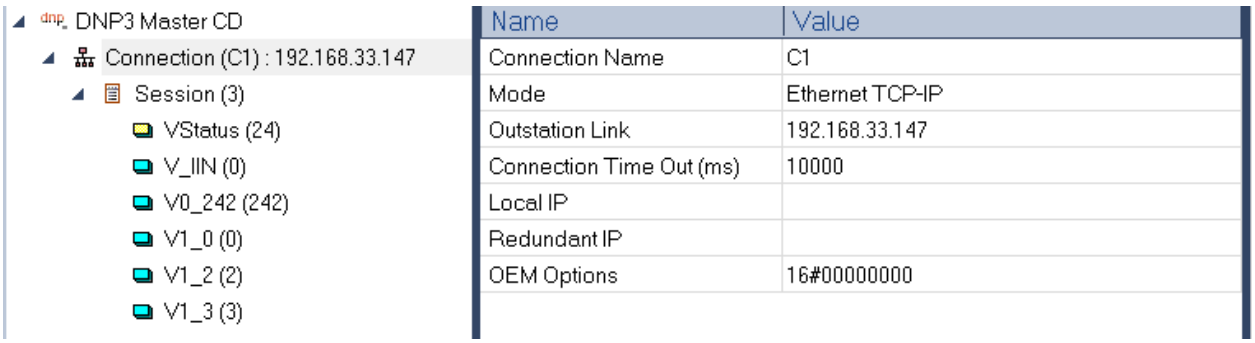
Select the appropriate parameters for the new Fieldbus



Property	Description
DNP3 loop time	Refresh rate of DNP3 stack
Log Traces	Display warning messages in the output

4.1. Insert a connection

Insert a CONNECTION ( ) or Menu > Insert > Insert Master/Port

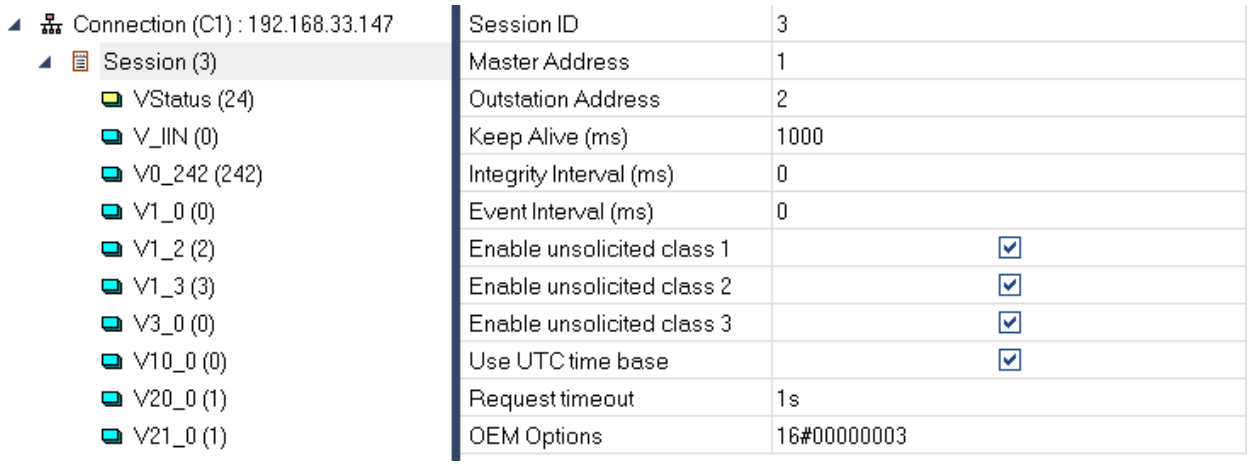


Connection:

Property	Description
Connection Name	Name of the connection : free information
Mode	Select serial or TCP/IP or UDP connection
Outstation Link	For Ethernet: IP address and port number of the Outstation. Default port is 20000. For SERIAL: Settings of the serial port: "COM1:9600,N,8,1"
Connection Time Out	Connection timeout of 10s is recommended (10 000 ms)
Local IP	For PC with more than on Ethernet card select the IP address and port of the Ethernet card used for DNP3 Can be useful for multi connections. Default port is 20000. Can be empty.
Redundant IP	Select the IP address and port for redundancy link
OEM Options	Reserved

4.2. Insert a SESSION

Insert a SESSION using tool bar ( ) or menu Insert > Insert Slave/Data block. A SESSION contains various parameters for DNP3 communication.



Session:

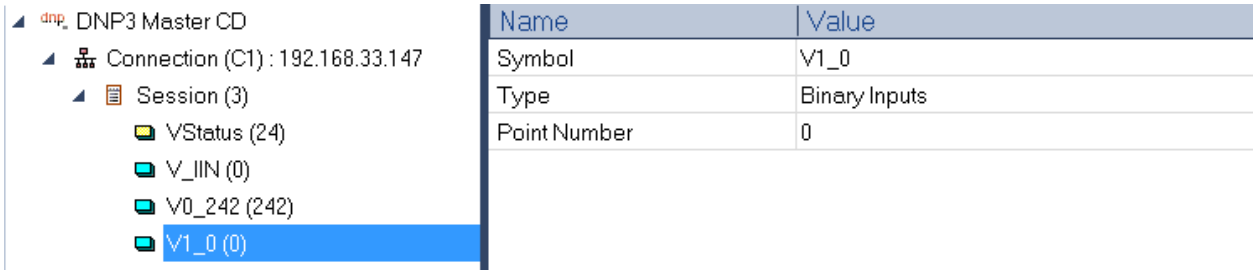
Property	Description
Session ID	Identifier of the session (Number)
Master address	Master address in this session
Outstation address	Outstation address in this session
Keep alive	Zero if not activated or time in ms (Default deactivated) It is recommended to activate the keep alive.
Integrity interval	Triggers a General Interrogation each time interval (ms). Zero to disable.
Event interval	Triggers a read event each time interval (ms). Zero to disable.
Enable unsolicited class 1	Enable unsolicited event from class 1
Enable unsolicited class 2	Enable unsolicited event from class 2
Enable unsolicited class 2	Enable unsolicited event from class 3
Use UTC time base	Use UTC time for time stamp
Request timeout	Timeout for a master request
OEM options	Options

OEM options:

- Bit 0: If true, variable status bits are used from the straton database.
- Bit 1: If true, timestamps are used from the straton database.

4.3. Insert a VARIABLE

Insert variables using tool bar ( ) or menu Insert > Insert Variable...



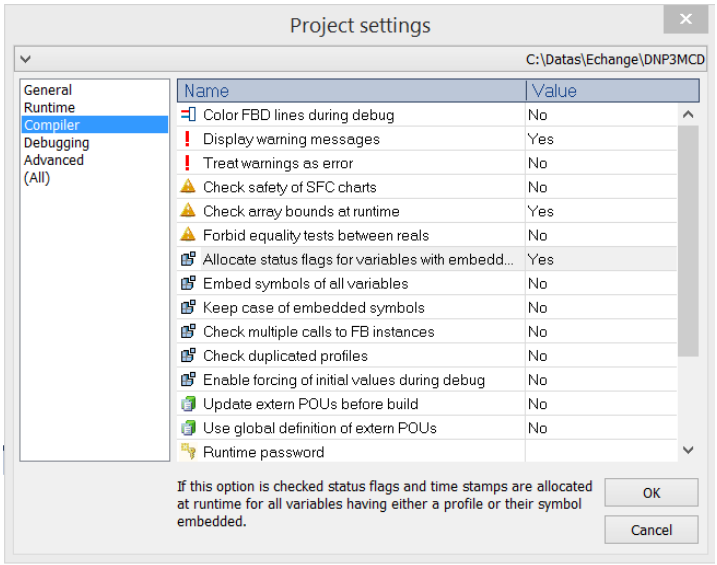
Variables:

Property	Description
Symbol	Variable name
Type	(1) Binary inputs, (3) Double Inputs, (10) Binary Output Status, (20) Running Counters , (21) Frozen Counters, (30) Analog inputs, (40) Analog Output Status, (110) String Data, Internal Indication bit, Status
Point number	Point number (Max 65535)

5. How to use Status Bits and Time Stamp

To use these properties open Fieldbus Configurations ( ) and set the *OEM options* of the selected session to 16#00000003.

For each project, from the toolbar go to '*Project ->Settings...*' and check the option '*Allocate status flags for variables...*' in the Compiler menu.



Variable must be embedded: use embed symbol in dictionary for a particular variable or select "Embed symbols for all variables" in project settings

Name	Type	Dim.	Attrib.	Syb.
Global variables				
VStatus	DINT			☐
V1_1	BOOL			☑

5.1. Status bits

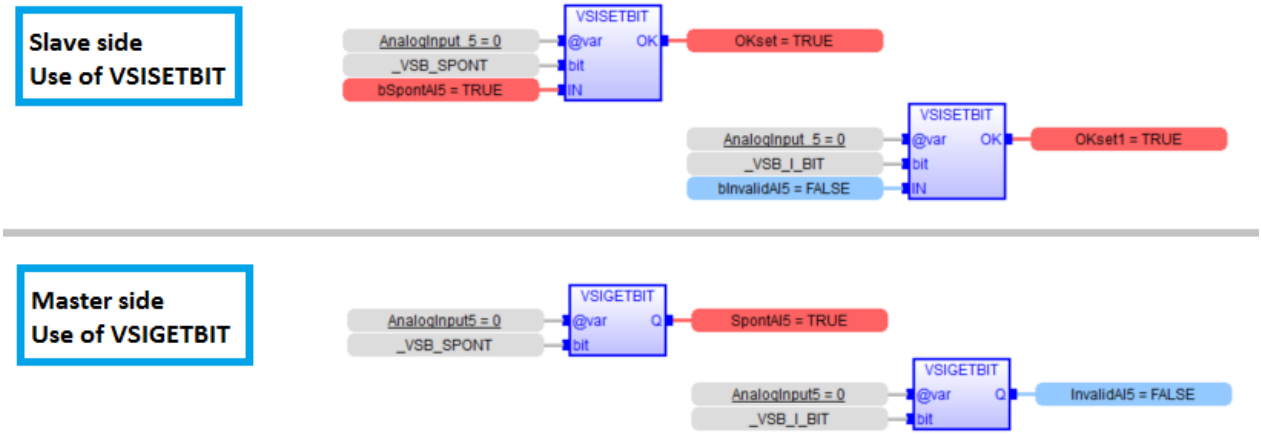
Five status bits can be used and have to be set by the Outstation to be read by the Master.

Available status bits are:

`_VSB_SPONT, _VSB_I_BIT, _VSB_ST_M1, _VSB_ST_M2, _VSB_ST_M3, _VSB_OV_BIT and _VSB_SP_BIT.`

To set these bits one has to use the '*VSISETBIT*' function block from the Outstation side and to retrieve them from the Master side by using '*VSIGETBIT*'.

The name of these bits is already declared in Straton so one doesn't need to create some variables having their name.



5.2. Time stamp and Date stamp

The principle is the same as for status bits, the Outstation is setting up the time stamp of a variable while its value is changing and the Master retrieves it using '*VSIGETTIME*' and '*VSIGETDATE*' function blocks.

It's important to notice that these attributes can only be set on variables that handle it, it means that:

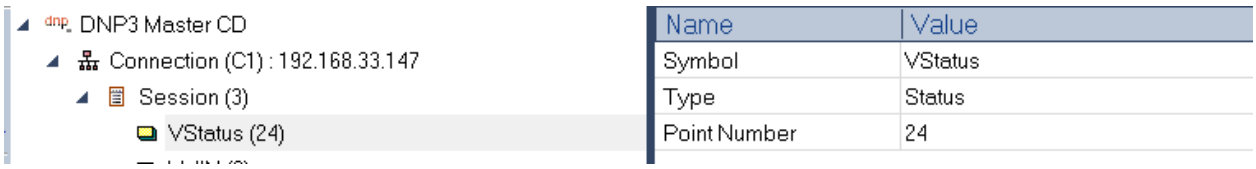
- Outstation: the variable must use a variation "with time". The available variation numbers are described in the DNP3 Outstation tutorial. These parameters must be set by opening DNP3S Variable settings in the Outstation application. The variable must be embedded.
- Master: the variable must be embedded.

6. Improve diagnostic

6.1. Status variables

Status variables can be used to improve diagnostic

For the point configuration, only point number is significant. All others parameters are ignored



- Point number 3: Nb Invalid Bytes Received
- Point number 6: Nb Frame CRC Errors
- Point number 13: Nb Frames Received
- Point number 15: Nb Link Status Error

You can detect a connection error if "Link Status Error" has been incremented.

If "Nb Frames Received" is incremented the master sent a valid frame i.e. connection should be good again.

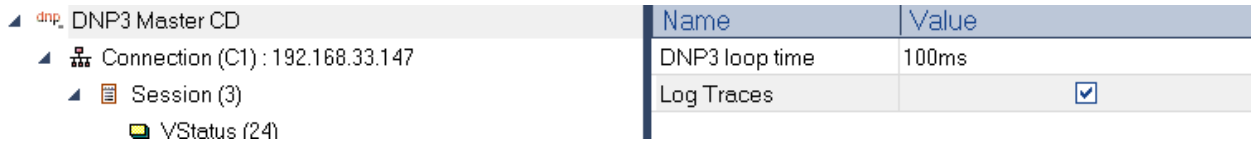
- Point number 24: Current state: IDLE = 0, ERROR = 1, CONNECTING = 2, CONNECTED = 3

6.2. Log Traces

Some additional diagnosis can be made, for example to check the connection's state between the Master and the Outstation.

These errors values and their description can be recovered by:

Checking "Log Traces" in the Master configuration. While the application is in RUN mode, click on the "Runtime" tab at the bottom of the Straton Editor, then if an error occurs it's printed in the *Output window*:

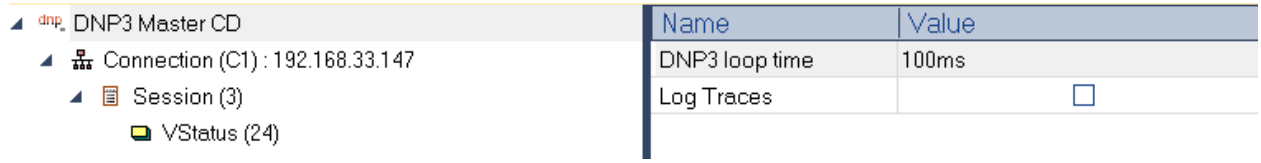


7. DNP3 Loop Time

It is possible to modify the DNP3 Loop Time. This option allows the user to diminish or increase the refreshment delay of the DNP3 stack.

By default this delay is set to 100ms.

This parameter can be found in the Master settings, clicking on the node in the Fieldbus Configuration ( ):



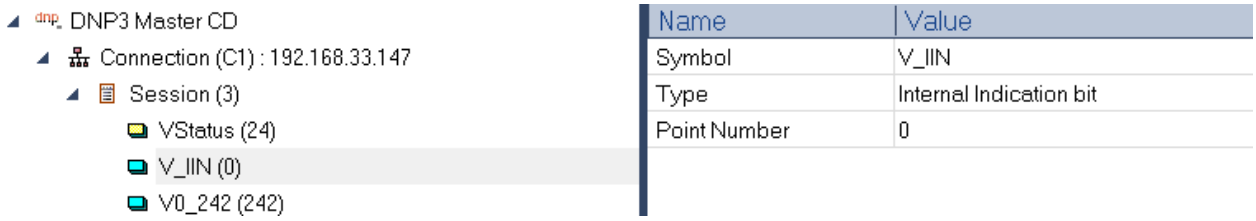
Notes:

- Due to hardware configurations, there are some restrictions concerning this parameter.
- It can't be too small otherwise some errors could occur, for example communication loss.

8. IIN Bits

Create a new variable ( ) and choose Internal Indication Bit.

The point number value correspond to the bit (bit 0 -> 15).



Note: You can also read IIN Bits using the DNP3M_READGROUP block

(Group: 80 / Variation: 1 / Quality: 1 / Starting point: 0 / Stopping point: 15)

ANNEX 1

Description for IIN Bits in straton

A_IIN_BROADCAST	0x0001	IIN bit 1.0
A_IIN_CLASS_1_EVENTS	0x0002	IIN bit 1.1
A_IIN_CLASS_2_EVENTS	0x0004	IIN bit 1.2
A_IIN_CLASS_3_EVENTS	0x0008	IIN bit 1.3
A_IIN_NEED_TIME	0x0010	IIN bit 1.4
A_IIN_LOCAL_CONTROL	0x0020	IIN bit 1.5
A_IIN_DEVICE_TROUBLE	0x0040	IIN bit 1.6
A_IIN_DEVICE_RESTART	0x0080	IIN bit 1.7
A_IIN_NO_FUNC_CODE_SUPPORT	0x0100	IIN bit 2.0
A_IIN_OBJECT_UNKNOWN	0x0200	IIN bit 2.1
A_IIN_PARAMETER_ERROR	0x0400	IIN bit 2.2
A_IIN_EVENT_BUFFER_OVERFLOW	0x0800	IIN bit 2.3
A_IIN_ALREADY_EXECUTING	0x1000	IIN bit 2.4
A_IIN_CONFIG_CORRUPT	0x2000	IIN bit 2.5
A_IIN_RESERVED_2	0x4000	
A_IIN_RESERVED_1	0x8000	