

# NR500 Series Industrial Cellular VPN Router

## Application Note 059

### DNP3 to IEC104

**Version:** V1.0.0  
**Date:** Aug 2021  
**Status:** Confidential



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# 1. Introduction

## 1.1 Overview

This document contains information regarding the configuration and use of DNP3 to IEC104.

This guide has been written for use by technically competent personnel with a good understanding of the communications technologies used in the product, and of the requirements for their specific application.

## 1.2 Compatibility

This application note applies to:

**Models Shown:** NR500 series.

**Firmware Version:** V1.1.6(0742bac) or newer

**Other Compatible Models:** None

## 1.3 Version

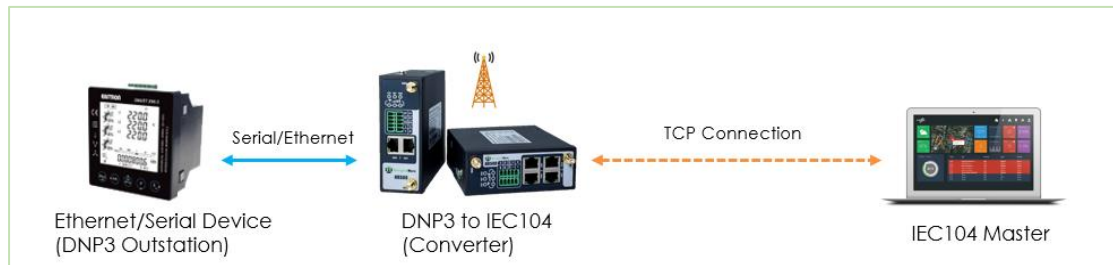
Updates between document versions are cumulative. Therefore, the latest document will include all the content of previous versions.

Release Date	Doc. Version	Firmware Version	Change Description
2021/08/10	V1.0.0	V1.1.6(0742bac)	First released

## 1.4 Corrections

Appreciate for corrections or rectifications to this application note, and if any request for new application notes please email to: [support@navigateworx.com](mailto:support@navigateworx.com)

## 2. Topology

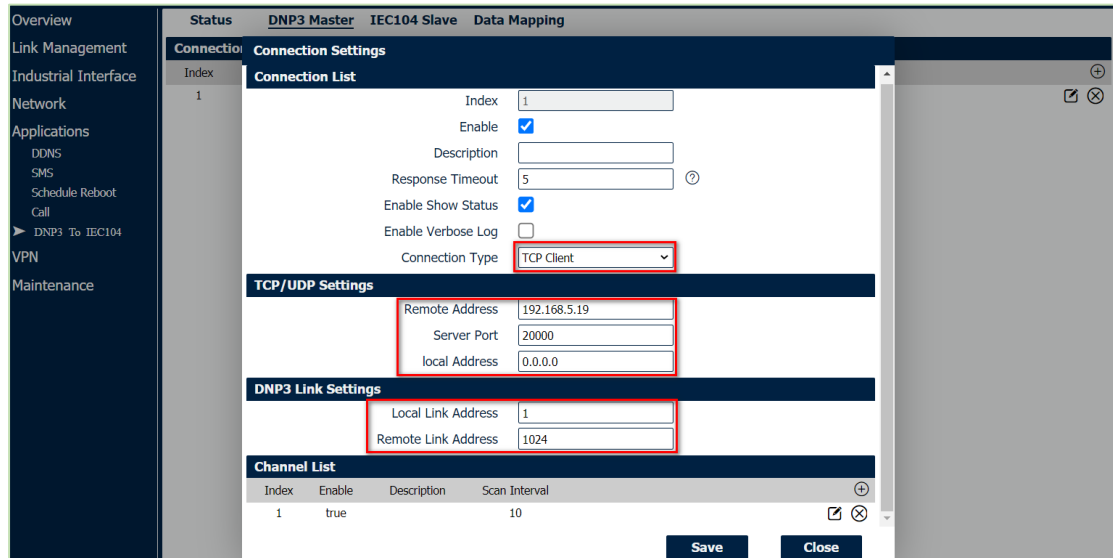


1. Navigateworx's Router runs as DNP3 to IEC104 converter, which act as DNP3 Master and IEC104 Slave.
2. A serial device or ethernet device support DNP3 protocol and acts as DNP3 Outstation. It connected to Navigateworx's router via serial port or Ethernet port.
3. Navigateworx's router poll the data from end device (DNP3 Outstation) and perform the data mapping, after that, the remote IEC104 Master start the TCP connection to the router (IEC104 Slave) and read the data.

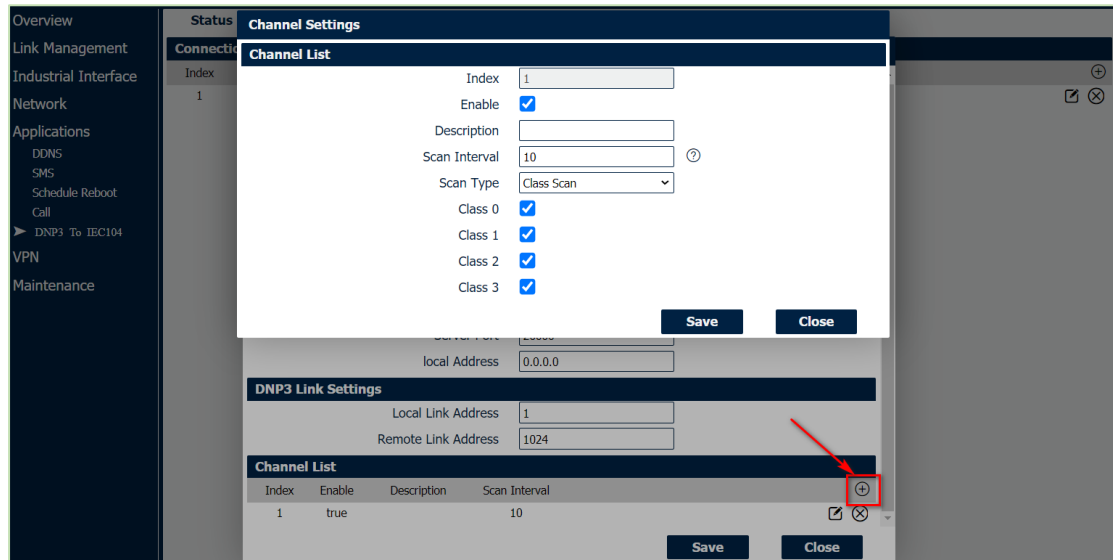
## 3. Configuration

### 3.1 Configuration on DNP3

1. Go to **Applications>DNP3 To IEC104 >DNP3 Master**, specify the DNP3 settings to make the router connect to DNP3 Outstation via ethernet interface:

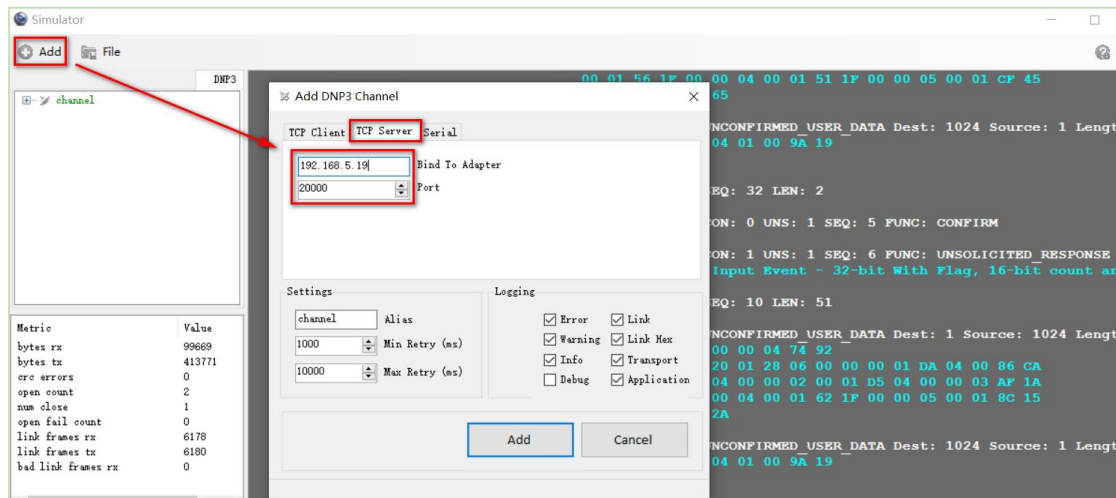


The screenshot shows the configuration page for the DNP3 Master. The left sidebar contains navigation options: Overview, Link Management, Industrial Interface, Network, Applications (DDNS, SMS, Schedule Reboot, Call, DNP3 To IEC104), VPN, and Maintenance. The main content area is titled 'Status DNP3 Master IEC104 Slave Data Mapping'. Under 'Connection Settings', the 'Connection List' table has one entry with Index 1. The settings for this entry are: Index 1, Enable checked, Description empty, Response Timeout 5, Enable Show Status checked, Enable Verbose Log unchecked, and Connection Type 'TCP Client'. Below this are 'TCP/UDP Settings' with Remote Address 192.168.5.19, Server Port 20000, and local Address 0.0.0.0. 'DNP3 Link Settings' show Local Link Address 1 and Remote Link Address 1024. The 'Channel List' table has one entry with Index 1, Enable true, and Scan Interval 10. 'Save' and 'Close' buttons are at the bottom right.

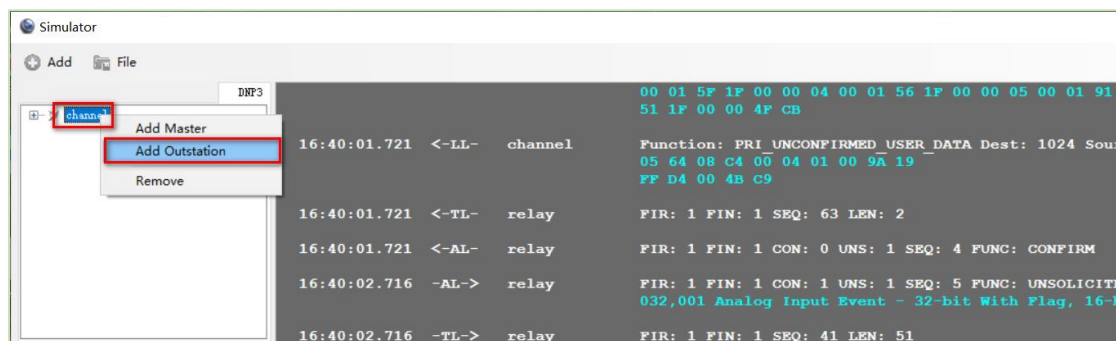


This screenshot shows a 'Channel Settings' dialog box. The 'Channel List' table has one entry with Index 1, Enable checked, Description empty, Scan Interval 10, and Scan Type 'Class Scan'. Below the table are checkboxes for Class 0, Class 1, Class 2, and Class 3, all of which are checked. 'Save' and 'Close' buttons are at the bottom right. A red arrow points to a plus sign icon in the bottom right corner of the dialog box, indicating a 'Add' function.

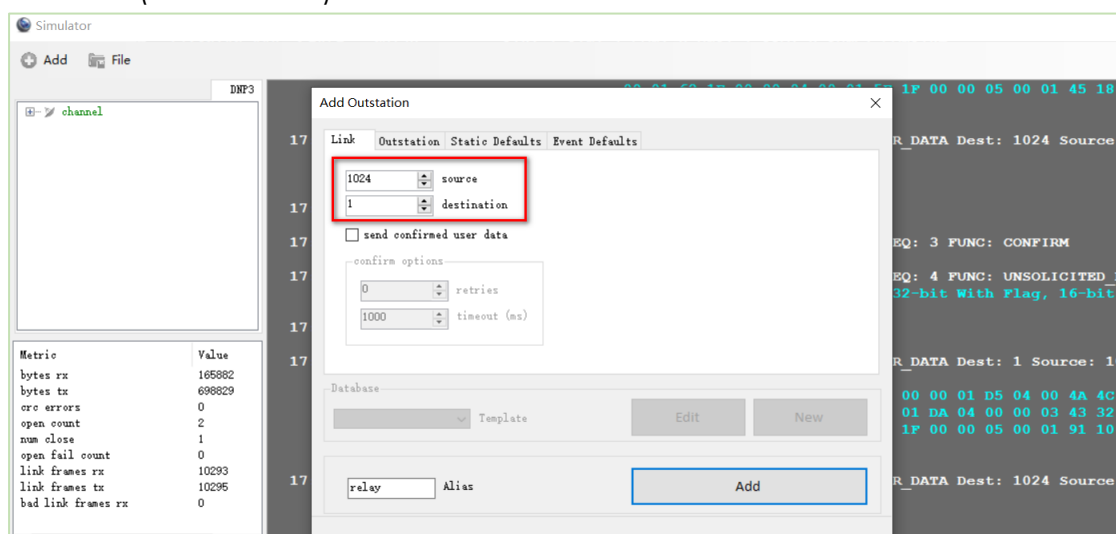
- Run the DNP3 Simulator on PC and specify the IP Address and Port as below so that the router connect to the DNP3 Outstation:



- Right Click "channel", and Add Master:



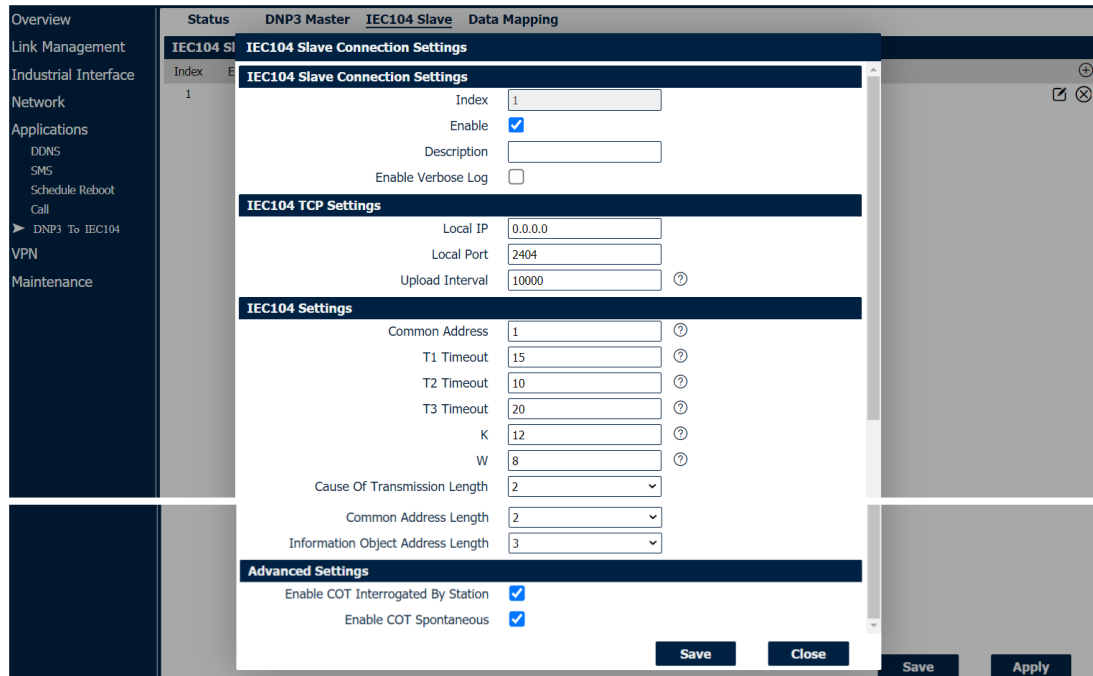
- Specify the address on DNP3 Outstation, to make it match the settings on NR500(DNP3 Master):





## 3.2 Configuration on IEC104 and Data Mapping

1. Go to **Applications>DNP3 To IEC104>IEC104 Slave**, specify the IEC104 slave setting as below:



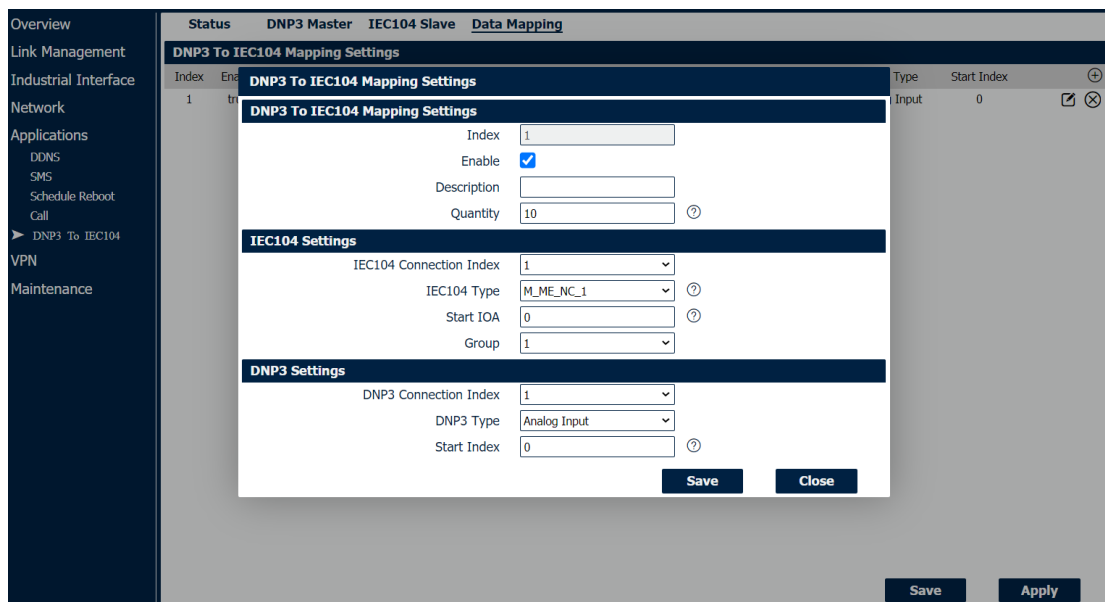
The screenshot shows the 'IEC104 Slave Connection Settings' window. The left sidebar contains a navigation menu with 'Applications' expanded to 'DNP3 To IEC104'. The main window has tabs for 'Status', 'DNP3 Master', 'IEC104 Slave', and 'Data Mapping'. The 'IEC104 Slave' tab is active, displaying the following settings:

- IEC104 Slave Connection Settings:** Index: 1, Enable: , Description: (empty), Enable Verbose Log:
- IEC104 TCP Settings:** Local IP: 0.0.0.0, Local Port: 2404, Upload Interval: 10000
- IEC104 Settings:** Common Address: 1, T1 Timeout: 15, T2 Timeout: 10, T3 Timeout: 20, K: 12, W: 8, Cause Of Transmission Length: 2, Common Address Length: 2, Information Object Address Length: 3
- Advanced Settings:** Enable COT Interrogated By Station: , Enable COT Spontaneous:

Buttons for 'Save' and 'Close' are visible at the bottom right of the window.

2. Click Save>Apply.

3. Go to **Applications>DNP3 To IEC104>Data Mapping**, specify the Data Mapping settings as below:



The screenshot shows the 'DNP3 To IEC104 Mapping Settings' window. The left sidebar is the same as in the previous screenshot. The main window has tabs for 'Status', 'DNP3 Master', 'IEC104 Slave', and 'Data Mapping'. The 'Data Mapping' tab is active, displaying the following settings:

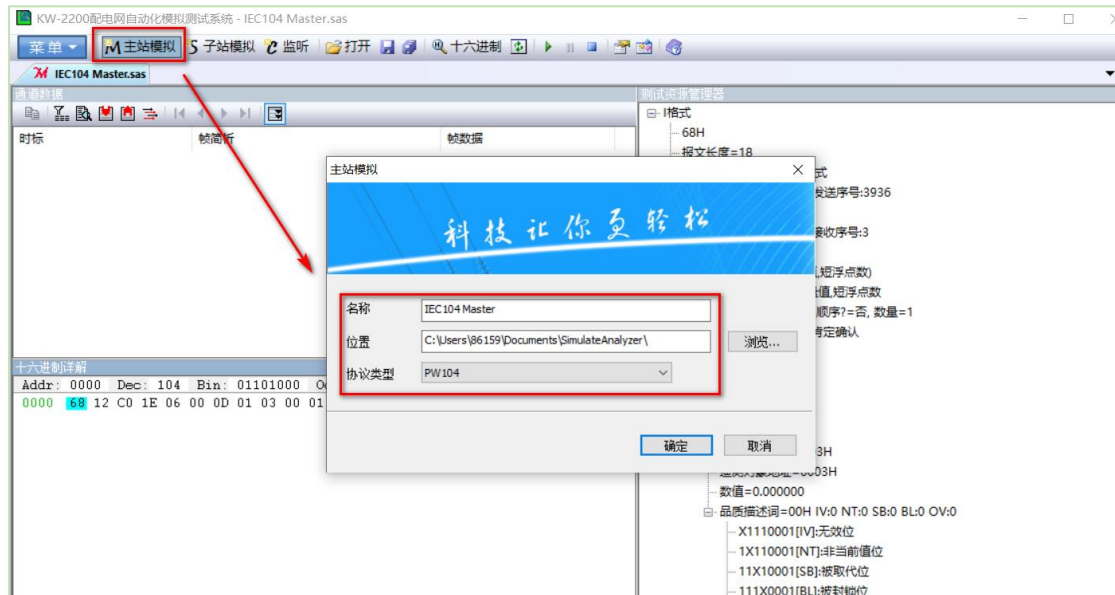
- DNP3 To IEC104 Mapping Settings:** Index: 1, Enable: , Description: (empty), Quantity: 10
- IEC104 Settings:** IEC104 Connection Index: 1, IEC104 Type: M\_ME\_NC\_1, Start IOA: 0, Group: 1
- DNP3 Settings:** DNP3 Connection Index: 1, DNP3 Type: Analog Input, Start Index: 0

Buttons for 'Save' and 'Close' are visible at the bottom right of the window.

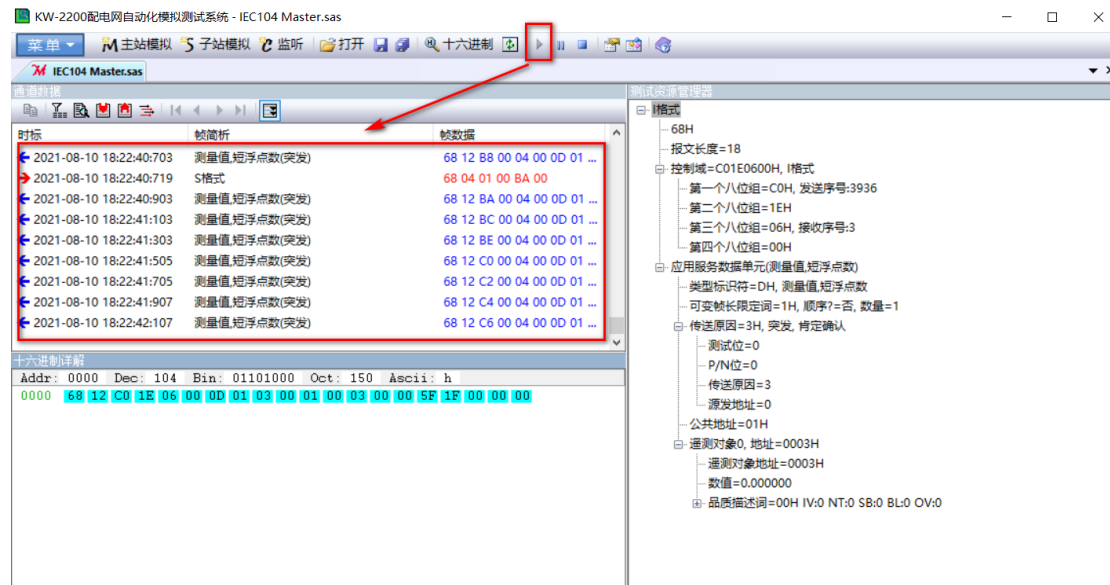
4. Click Save>Apply.



5. Run the IEC104 simulator and set the IEC104 Master as below:



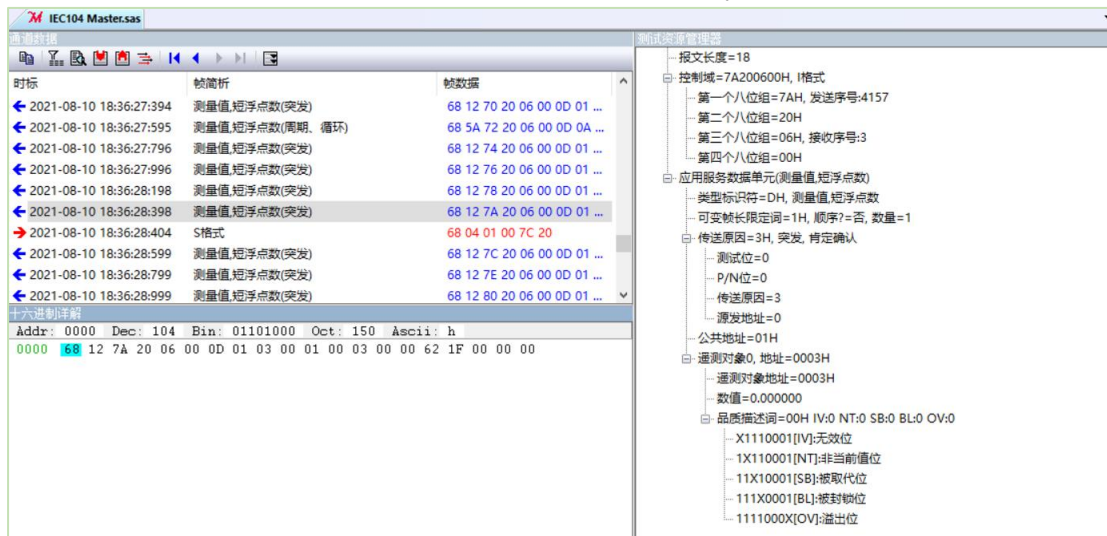
6. Start the IEC104 Master, it connects to the router (IEC104 Slave) and read data successfully:



Status						
<b>DNP3 Master Status</b>						
Index	Enable	Description	Connection Type	Connection Status	Task Scan Status	
1	true	11	TCP Client	Connected	Success	
<b>IEC104 Slave Status</b>						
Index	Enable	Description	Client IP	IEC104 Connection Status		
1	true		192.168.5.19	Activated		
<b>DNP3 Connection 1 Channel Status</b>						
Index	Data Index	Type	Value	Flags	Timestamp	
1	0	Binary	TRUE(1)	Online, State		
2	0	Analog	1243	Online		
3	1	Analog	1237	Online		
4	2	Analog	1241	Online		
5	3	Analog	8034	Online		
6	4	Analog	8031	Online		
7	5	Analog	8022	Online		
<b>DNP3 Connection 2 Channel Status</b>						
Index	Data Index	Type	Value	Flags	Timestamp	

## 4. Testing

1. IEC104 Master is able to read the data successfully:



The screenshot shows the IEC104 Master software interface. On the left, a list of data points is displayed with columns for time, description, and data value. The selected data point is '测量值\_短浮点数(突发)' with a value of '68 12 7A 20 06 00 0D 01 ...'. Below the list, the hexadecimal and ASCII representations of the data are shown.

On the right, a detailed view of the data point is shown, including the following information:

- 报文长度=18
- 控制域=7A200600H, I格式
- 第一个八位组=7AH, 发送序号=4157
- 第二个八位组=20H
- 第三个八位组=06H, 接收序号=3
- 第四个八位组=00H
- 应用服务数据单元(测量值\_短浮点数)
- 类型标识符=DH, 测量值\_短浮点数
- 可变帧长限定词=1H, 顺序?=否, 数量=1
- 传递原因=3H, 突发, 肯定确认
- 测试位=0
- P/N位=0
- 传递原因=3
- 源发地址=0
- 公共地址=01H
- 遥测对象0, 地址=0003H
- 遥测对象地址=0003H
- 数值=0.000000
- 品质描述词=00H IV:0 NT:0 SB:0 BL:0 OV:0
- X1110001[IV]:无效位
- 1X110001[NT]:非当前值位
- 11X10001[SB]:被取代位
- 111X0001[BL]:被封锁位
- 1111000X[OV]:溢出位

2. Test successfully.