NPort Real COM Mode for DNP3 Applications

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1. Introduction

This note describes how to apply NPort Real COM Mode to DNP3 communications. Real COM Mode can provide a virtual COM port for original applications, just as if it is on a computer's native serial port. The benefit is to use Ethernet to extend the functional distance for legacy applications. Users can install the Real COM driver on their SCADA system, which creates an additional COM port. This serial port will be mapped to the IP address of the remote NPort.

DNP3 (Distributed Network Protocol) is a set of communication protocols used between components in process automation systems. It was developed for communication between various types of data acquisition and control equipment. It plays a crucial role in SCADA systems, where it is used by SCADA master stations (control centers), programmable logic stations (PLCs), remote terminal units (RTUs), and intelligent electronic devices (IEDs). It is primarily used for communication between a master station (DNP3 Master) and RTUs or IEDs (DNP3 Outstation).

Thus, an NPort can be located at remote locations providing real-time access to serial DNP3 outstation devices via Ethernet.



The system topology is shown in Figure 1 below:

Figure 1: System Topology

2. Applicable Products

Product Line	Model Names
NPort 5000A	NPort 5100A series, NPort 5200A series, NPort 5400A series,
	NPort IA5250A
NPort 5000	NPort 5100 series, NPort 5200 series, NPort 5400 series,
	NPort 5600 series, NPort IA5150, NPort IA5250

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3. System Overview

In this example, we use the Protocol Test Harness application to simulate a DNP3 master and a DNP3 serial outstation (Figure 2).



NPort: 192.168.32.31

Figure 2: Demo topology

If you would like to use the Protocol Test Harness application, you can refer to this link: http://www.trianglemicroworks.com/products/testing-and-configuration-tools/test-ha rness-pages

4. NPort Settings

4.1. Mapping COM Port

Run "NPort Windows Driver Manager", then click "Add" to map the COM port of the NPort's Port 1 (Figure 3).

<u>F</u> ile <u>C</u>	OM Mapping Configuration ⊻iew <u>H</u> elp	
Exit	Add Remove Apply Undo Setting	
No	COM Port / Address 1	Address 2
1	COM7 192.168.32.31 950:966 (Port1)	
2	COM8 192.168.32.31 951:967 (Port2)	-

Figure 3: Mapping COM Port

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4.2. Serial Settings

In the NPort web console, click on "Serial Settings \rightarrow Port 1" to set serial parameters (Figure 4). Parameter settings should be the same as the outstation settings.

Port=1			
Port alias			
Serial Parameters			
Baud rate	115200 💌		
Data bits	8 🕶		
Stop bits	1 -		
Parity	None 🔻		
Flow control	None 💌		
FIFO	🖲 Enable 🔘 Disable		
Interface	RS-232 -		
Apply the above settings to all serial ports			

Figure 4: Serial Settings

4.3. Operation Mode Settings

In the NPort web console, click on "Operation Settings \rightarrow Port 1" to set operation mode. Select "Real COM Mode" and the NPort will provide the virtual COM port for original applications (Figure 5).

Operating Settings					
Port=1					
Operation mode	Real COM Mode 🔹				
TCP alive check time	7 (0 - 99 min)				
Max connection	1 -				
Ignore jammed IP	◎ No ○ Yes				
Allow driver control	◎ No ○ Yes				
Data Packing					
Packing length	0 (0 - 1024)				
Delimiter 1	0 (Hex) Enable				
Delimiter 2	0 (Hex) 🗆 Enable				
Delimiter process	Do Nothing • (Processed only when Packing length is 0)				
Force transmit	0 (0 - 65535 ms)				
Apply the above settings to all serial ports					
Submit					

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Figure 5: Operating Settings

5. DNP3 Outstation Settings

To input settings for the DNP3 Outstation, run the Protocol Test Harness application. Select "Open \rightarrow Slave Session \rightarrow DNP3" to add a DNP3 slave channel and session (Figure 6).



Figure 6: Opening Slave Channel and Session

In the "Session" tab, set "Link Layer Addresses" (Figure 7).

inel Sessi	on Next Step
ion Name	sDNP
nk Layer Ad	drassas
irce:	4 .
stination:	3 +
	atabase or Device Simulator pase - Change values in Data Window
efault Datab Enable DNF	pase - Change values in Data Window P3 Secure Authentication
efault Datab Enable DNF	Pase - Change values in Data Window P3 Secure Authentication are User Numbers and Update Keys
efault Datab Enable DNF	pase - Change values in Data Window P3 Secure Authentication
efault Datab Enable DNF	Pase - Change values in Data Window P3 Secure Authentication are User Numbers and Update Keys

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Figure 7: Setting Link Layer Addresses

In the "Channel" tab, select "Connection Type" as "Serial" then input serial port settings. Click on "Advanced Settings" to set other serial parameters (Figure 8).

Channel Session Next Step	Advanced Settings
Channel Name SDNP	
Connection Type Serial C TCP/IP	UseConnectorThread True Win232Disabled False Serial Communications Configuration Settings
Serial Port	FirstCharWait 0 NumCharTimesBetwee 4
Serial Port COM1 -	Win232baudRate 115200 Win232comPortName COM1
Baud Rate 115200	Win232numDataBits BITS_8 Win232numStopBits BITS_1
	Win232parity NONE
	Win232portDtrMode DISABLE Win232portMode NONE
	Win232portRtsMode DISABLE
	Win232numDataBits Specify the number of data bits for the channel. For MODBUS ASCII this would normally be 7
Advanced Settings	Cancel OK

Figure 8: Setting Serial Parameters

After settings are complete, click "Open" to start the DNP3 outstation.

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6. DNP3 Master Settings

In "Protocol Test Harness", Select "Open \rightarrow Master Session \rightarrow DNP3" to add a DNP3 master channel and session (Figure 9).



Figure 9: Adding a Master Channel and Session

In the "Session" Tab, set "Link Layer Addresses".

nannel Jessi	ion Next Step		
Session Name	mDNP		
-Link Layer A	ddresses		
Source:	3	÷	
Destination:	4		
	ter Restart IIN pro	eceived	
Enable af	ter Restart IIN pro	cessing finished	
Enable af	P3 Secure Authen	cessing finished	
Enable af	P3 Secure Authen	tication	
Enable af	P3 Secure Authen	tication	ings

Figure 10: Setting Link Layer Addresses

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In the "Channel" tab, select "Connection Type" as "Serial" then input serial port settings. Click "Advanced Settings" to set other serial parameters. After inputting the settings, click "Open" to start the DNP3 master (Figure 11).

Protocol	DNP	A		
RxBufferSize	256	_	Channel Name mDNP	
RxFragmentSize	2048			
RxFrameSize	292		Custom	
RxFrameTimeout	15000		Connection Type	
TxFragmentSize	2048		Serial C TCP/IP	
TxFrameSize	292			
Гуре	RS232			
JseConnectorThread	True		Serial Port	
Win232Disabled	False		Serial Port COM7 👻	
Serial Communicati	ions Configuration	Settings	Serial Port COM7 💌	
FirstCharWait	0			
NumCharTimesBetwee	4		Baud Rate 115200	
Nin232baudRate	115200			
Win232comPortName	COM7			
Nin232numDataBits	BITS_8			
Min232numStopBits	BITS_1			
Nin232parity	NONE			
Min232portDtrMode	ENABLE			
//in232portMode	NONE			
Min232portRtsMode	DISABLE	-		
1e				
name of this channel.				
			Advanced S	

Figure 11: Setting Serial Parameters

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7. DNP3 Communication Verification

In "DNP3 Commands", click "Integrity Data Poll – Class 0123". Set repeat interval to 10 seconds. Click "Start Repeat" to start testing (Figure 12).



Figure 12: Integrity Poll Configuration

In "Statistics", we should see that both the "Requests Sent" and "Responses Received" counts are increasing.

Under normal operation, "Requests Failed", "Requests Time Out", and "Channel Errors" should not have values (Figure 13). If errors are displayed, recheck the configurations.

Statistics - mDNP.mDNP		
Action Target		
	Responses Received	11
	Requests Failed	0
Requests Sent 📊	Requests Timed Out	0
	Channel Errors	0

Figure 13: Statistics

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