

Elmatic Sparrow NW10 Industrial Cellular VPN Router

Application Note 048

Modbus Master

Version:V1.0.0Date:Oct 2021Status:Confidential

Directory

1.	Introduction		3		
	1.1 Overview		3		
	1.2 Compatibility		3		
	1.3 Version		3		
	1.4 Corrections				
2.	Topology		4		
3.	Transport via TCP				
	3.1 Configuration	n on Modbus Slave	5		
	3.2 Configuration	n on Modbus Poll	5		
	3.3 Configuration	n on Modbus Transport	7		
4.	Transport via FTP				
5.	Transport via MQTT	Τ			

1. Introduction

1.1 Overview

This document contains information regarding the configuration and use of Modbus Master.

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:** Sparrow NW10 / Sparrow NW20 **Firmware Version:** V1.1.2 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
2021/09/30	V1.0.0	V1.1.2	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: **elmark@elmark.com.pl**

Omatic

2. Topology



- 1. Sparrow Router runs as Modbus Master and connect to Modbus Slave via Ethernet, RS232 or RS485 interface.
- 2. Sparrow router poll the modbus data from modbus slave and send to the remote management center via TCP, FTP or MQTT protocol.
- 3. Sparrow as Modbus Master and write the register value or coil to Modbus Slave.

Note: For this Application Note, we will set the Connection Type as "TCP" as an example, which means that Sparrow(Modbus Master) will connect to the Modbus Slave and read the value via Ethernet port. Of course, it also works with Serial Port (RS232/RS485).

3. Transport via TCP

a) Configuration on Modbus Slave

 Here we use "Modbus Slave" software to simulate the end device (Modbus Slave device), and the TCP Port: 502, Slave ID: 1, Function Code: 03-Holding-Register, like below setting:

-	3 Modbus Slave - Mbslav1							
File	e Edit Connection	Setup Display	View Window Help					
Ľ) 🖻 🔒 🎒 🗒	🚊 🤋 📢						
	Mbslav1							
IC) = 1: F = 03		Connection Setup X					
N	o connection		Connection					
	Alias	00000	O Serial Port O TCP/IP O UDP/IP	^				
	0	0	Cancel					
	1	0	Port 3 O RTU O ASCII					
	2	0	115200 Baud 🗡 – Flow Control					
ſ	3	21	8 Data bits V DSR CTS					
	4	0	RTS Toggle 1 [ms] RTS disable delay					
	5	0	None Party TCP/IP					
	6	0	1 Stop Bit V Port 502 Ignore Unit ID					
	7	0						

📓 Modbus Slave - Mbslav1		
File Edit Connection Setup Display View W	/indow Help	
🗅 🚔 🖬 🚭 📑 🗏 🚊 🛛 😵 🌾		
Mbslav1	Slave Definition X	
ID = 1: F = 03	Slave ID: 1 Function: 03 Holding Register (4x) Cancel	
Alias 00000	Address: 0	^
0 0	Quantity: 10	
1 0	View	
2 0	Rows ■ 10 ○ 20 ○ 50 ○ 100	
3 21	PLC Addresses (Base 1)	
4 0	Display: Signed V	
5 0	Error Simulation	
6 0	Skip response Insert CRC/LRC error	
7 0	(Not when using TCP/IP) 0 [ms] Response Delay Beturn exception 06. Rusu	
8 0	hetain exception oo, busy	*

b) Configuration on Modbus Poll

 Go to Application>Modbus Master>Modbus Poll, add a "Connection List" and specify the "Connection Type" as "TCP", specify the "TCP Setting" to connect to Modbus Slave, like below:

С

Connection Settings	
Connection List	
Index	1
Enable	
Description	test
Scan Rate	100 ⑦
Reconnect Interval	60 ⑦
Response Timeout	1000 ⑦
Delay Between Polls	0 ⑦
Connection Type	ТСР 🔻
Enable Show Status	
Enable Verbose Log	
TCP Settings	
Server Address	192.168.111.44 IP Address of
Server Port	502 Modbus Slave
Channel List	
Index Enable Description S	Slave ID Function Code Register Address 🕀
	Save Close

- 2. Click Save>Apply.
- Enable "Channel List", and specify the Slave ID as "1", Function Code as "03-Holding -Register", Register Address to "3", then it will poll the value from register address 3 of Modbus Slave:

Channel Settings		
Channel List		
Index	1	
Enable		
Description	test	
Slave ID	1	
Function Code	03-Holding-Register	•
Register Address	3	
Data type	Uint16	•
Data Endian	AB	•
Plus	0	0
Subtract	0	0
Divisor	1	0
Multiplier	1	0
Shift Right Bits	0	0
Number Of Bits	16	0
Keep Decimal Places	0	?
		Save Close

- 4. Click Save>Save>Apply. (Note: This is a secondary list, it needs to double click save)
- 5. Go to **Application>Modbus Master>Status**, then we can check the router had read the value from Modbus Slave successfully.

Overview	Statu	<u>s</u> Modb	ous Poll Modbus	Alarm	Modbus Write				
Link Management	Channe	l Status							
Industrial Interface	Index	Description	Connection Index	Туре	Slave ID	Register Address	Function Code	Status	Value
Network	1	test1	1	TCP	1	3	3	read successed	21
Applications DDNS SMS Schedule Reboot GPS Modbus Master Modbus Transport									

c) Configuration on Modbus Transport

 Go to Application>Modbus Transport>Modbus Transport, enable "Connection List", and specify the TCP server IP address and port to send the data to remote TCP server. The Data Format could be defined accordingly or set it as default.

Connection Settings	
Connection List	
Index	1
Enable	
Description	TCP Setting
Protocol	TCP-Client •
Server Address	14.215.177.39
Server Port	2000
Reconnect Interval	60 ⑦
Connection Timeout	30 ⑦
Enable Verbose Log	
Transport Data Settings	
Data Location	NULL • ⑦
Data Format	\$SERIAL_NUMBER,\$DATE,\$S ③
Line Break	
Modbus Channel	
Index Enable Connection Index Filter I	tems Channel Index Slave ID Register Address \oplus
	Save Close

2. Enable "Modbus Channel", Modbus Master will select the value send to the remote TCP server from Modbus Slave.



Channel Settings			
Modbus Channel			
	Index	1]
	Enable		
	Connection Index	1 •] 💿
2	Filter Items	Slave ID 🔹]
0	Slave ID	1] ⑦
			Save Close
	Reconnect Interval	00] 🔍
(Connection Timeout	30]
E	Enable Verbose Log		
Transport Data Settin	igs		
	Data Location	NULL] 🤊
	Data Format	\$SERIAL_NUMBER,\$DATE,\$S] ⑦
	Line Break		\
Modbus Channel			
Index Enable Con	nection Index Filter Ite	ems Channel Index Slave	ID Register Address
			Save Close

- 3. Click Save>Save>Apply.
- 4. Go to **Application>Modbus Transport>Status**, Sparrow(Modbus Mater) had connected to the remote server successfully via TCP protocol.

<u>Stat</u>	ius M	lodbus Transpor	t X.509 Ce	rtificate		
Conne	ction Stat	tus				
Index	Enable	Description	Protocol	Status	Uptime	
1	true	TCP Setting	TCP Client	Connected	00:02:35	

5. Remote TCP Server received the data successfully.

🔄 🖆 CreateConnn 🔕 CreateServe	er 🏖 StartServer 😤 🤅	🕽 😤 Connect 🧝 🌺 DisconnAll 💥 DeleteConn 🎇 🔟 🍃 💂	
Properties 🛛 🕂 🗙	192.168.111.199	2:54324	⊳×
- Client Mode Server Mode → Cocal(192.168.247.1):2000 → 192.168.111.199:54324	DestIP: 192.168.111.199 DestPort: 54324 ✓ LocalPort 2000 Type TCP ✓ AtuoConn Eve 0 S ✓ AutoSend Eve 46291984 ms	Send AtuoSend Eve 100 ms Send Stop Send Hex Send File Send Received Clear Option BroadOpti	on
< >>	Count Send 0 Reov 62622 Clear	Rec StopShow Clear Save Option ShowHex 19015124330001, 2020-02-18 16:31:15, 1, 3, 21 19015124330001, 2020-02-18 16:31:16, 1, 3, 21 19015124330001, 2020-02-18 16:31:16, 1, 3, 21 19015124330001, 2020-02-18 16:31:16, 1, 3, 21 19015124330001, 2020-02-18 16:31:16, 1, 3, 21 19015124330001, 2020-02-18 16:31:16, 1, 3, 21 19015124330001, 2020-02-18 16:31:16, 1, 3, 21 19015124330001, 2020-02-18 16:31:17, 1, 3, 21 19015124330001, 2020-02-18 16:31:17, 1, 3, 21 19015124330001, 2020-02-18 16:31:17, 1, 3, 21 19015124330001, 2020-02-18 16:31:17, 1, 3, 21 19015124330001, 2020-02-18 16:31:17, 1, 3, 21 19015124330001, 2020-02-18 16:31:17, 1, 3, 21 19015124330001, 2020-02-18 16:31:17, 1, 3, 21	· · · · · · · · · · · · · · · · · · ·

Omatic

4. Transport via FTP

- 1. Please refer to the "3.1 Configuration on Modbus Slave" and "3.2 Configuration on Modbus Poll" to finish and setting.
- 2. Go to **Application>Modbus Transport>Modbus Transport**, enable "Connection List", and specify the FTP server IP address, port, username and password to send the data to remote FTP server. The File Name and Data Format could be defined accordingly or set it as default.

Connection Settings			
Index		1	
	Enable		
	Description	FTP Setting	
	Protocol	FTP •	1
	Server Address	14.215.177.39	
	Server Port	21	
	Username	admin	
	Password	adminftp	
Co	nnection Timeout	30	0
Try To Send		3	0
Enable Verbose Log			
Transport Data Settings			
Data Location		NULL	0
Add CSV File Title			_
File Name		\$SERIAL_NUMBER_\$DATE.cs	0
Upload Interval		30	0
Data Format		\$SERIAL_NUMBER,\$DATE,\$S	0
			Save Close

3. Enable "Modbus Channel", Modbus Master will select the value send to the remote FTP server from Modbus Slave.

Channel Settings			
Modbus Channel			
	Index	1	
	Enable	•	
	Connection Index	1	• ?
2	Filter Items	Slave ID	·
	Slave ID	1	0
			Save Close
	Try To Send	3	0
E	Enable Verbose Log		
Transport Data Settings			
Data Location		NULL	0
Add CSV File Title			
File Name		\$SERIAL_NUMBER_\$DATE.cs	0
Upload Interval		30	
Data Format		\$SERIAL_NUMBER,\$DATE,\$S] 💿 💦 📘
Modbus Channel			
Index Enable Co	nnection Index Filter I	tems Channel Index Slave	e ID Register Address 🕒 🖵
			Save Close

- 4. Click Save>Save>Apply.
- 5. Go to **Application>Modbus Transport>Status**, Sparrow(Modbus Mater) had connected to the remote server successfully via FTP protocol.

Stat	us M	lodbus Transport	X.509 C	ertificate		
Conne	ction Stat	tus				
Index	Enable	Description	Protocol	Status	Uptime	
1	true	FTP Setting	FTP	Sent Successfully		

6. Remote FTP Server received the CSV file successfully.

► FTP SERVER FOLDER					
	名称	修改日期	类型	大小	
	19015124330001_2020-02-18_16-57-50.csv	2020/2/18 16:57	Microsoft Excel	1 KB	
	19015124330001_2020-02-18_16-58-21.csv	2020/2/18 16:58	Microsoft Excel	1 KB	
<i>ж</i>	19015124330001_2020-02-18_16-58-52.csv	2020/2/18 16:58	Microsoft Excel	1 KB	
Я	19015124330001_2020-02-18_16-59-23.csv	2020/2/18 16:59	Microsoft Excel	1 KB	
*	19015124330001_2020-02-18_16-59-55.csv	2020/2/18 16:59	Microsoft Excel	1 KB	

5. Transport via MQTT

- 1. Please refer to the "3.1 Configuration on Modbus Slave" and "3.2 Configuration on Modbus Poll" to finish and setting.
- 2. Go to **Application>Modbus Transport>Modbus Transport**, enable "Connection List", and specify the MQTT Broker IP address, port, username and password to Publish the Topic with Modbus data to remote MQTT Broker. The Data Format could be defined accordingly or set it as default.

Connection Settings				
Enable				
	Description	MQTT Setting	_	
	Protocol	MQTT •	1	
	Server Address	192.168.111.93		
	Server Port	1883		
	Enable SSL			
	Username	mo_test		
	Password	test123456		
	Client ID		0	
Subscribe Topic			0	
Keepalive		60	0	
Reconnect Interval		60	0	
Co	nnection Timeout	30	0	
Enable LWT				
Enable Verbose Log				
Transport Data Settings				
	Data Location	NULL	0	
	Data Format	\$SERIAL_NUMBER,\$DATE,\$S	0	
			Save	Close

3. Enable "Modbus Channel", define the "Topic" to publish to MQTT Broker with Modbus data.

Channel Settings				
Modbus Channel				
	Index	1		
	Enable			
	Publish Topic	test		
	Connection Index	1 • ?		
2	Filter Items	Slave ID 🔻		
	Slave ID			
		Save Close		
Co	onnection Timeout	30 ⑦		
	Enable LWT			
E	nable Verbose Log			
Transport Data Settin	igs			
	Data Location	NULL •		
Data Format		\$SERIAL_NUMBER,\$DATE,\$S ⑦		
Line Break				
Modbus Channel				
Index Enable Con	nection Index Filter I	Items Channel Index Slave ID Register Address 🕀 🚽		
		Save Close		

- 4. Click Save>Save>Apply.
- 5. Go to **Application>Modbus Transport>Status**, Sparrow(Modbus Mater) had connected to the remote MQTT broker successfully.

Stat	us	Modbus Transport	X.509 C	ertificate		
Conne	ction Sta	atus				
Index	Enable	Description	Protocol	Status	Uptime	
1	true	MQTT Setting	ΜQTT	Connected	00:23:04	

6. Run the MQTT Client (MQTT Subscriber), to subscribe the topic just published to MQTT broker with modbus data. Then we can get the modbus data successfully.

Publish Subscribe Scripts Broker S	itatus Log
test	Subscribe Qo., Qo., Qo., Autoscroll OST
test 237	QoS 0
Dump Messages Mute Unsubscribe	test 233
	QoS 0
	test 234
	QoS 0
	test 235
	Q050
	test 230
	tect 227
	QoS 0
Topics Collector (0) Scan Stop Corr	test 237
	18-02-2020 18:27:36.66456286 QoS 0
	19015124330001,2020-02-18 18:27:35,1,3,21
	Payload decoded by Plain Text Decoder