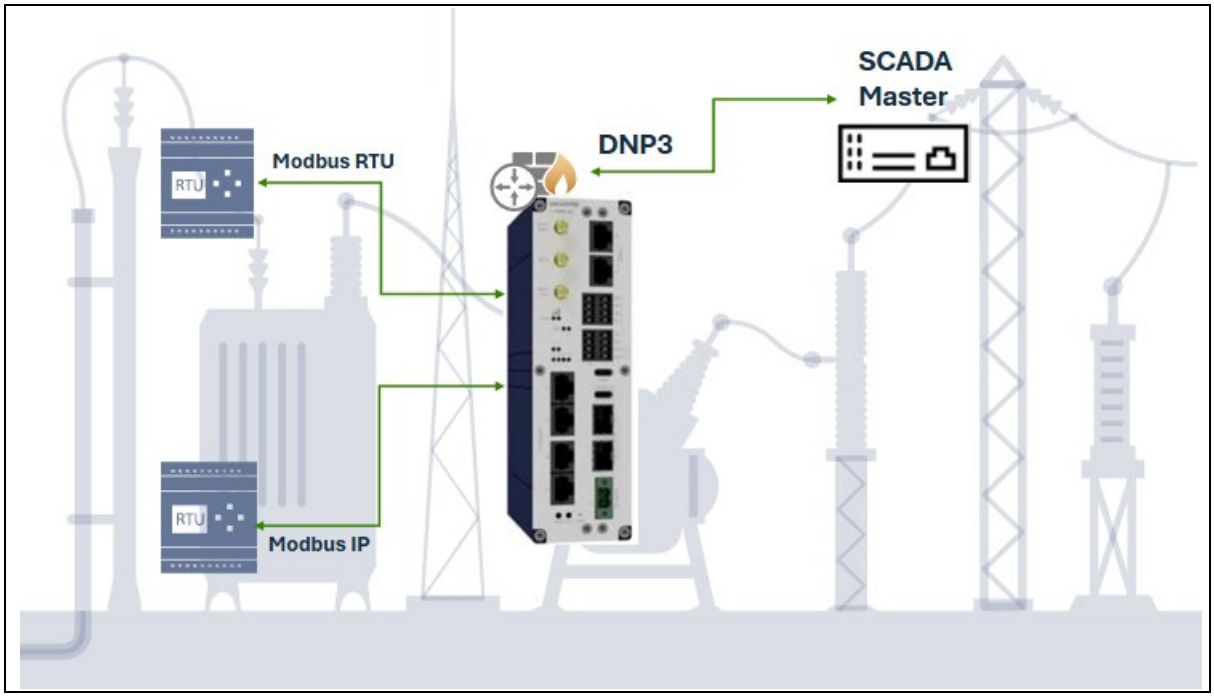
Merlin SCADA Protocol Conversion

Conversion scenario: Modbus RTU to DNP3 Master

AN-002-WIE



Hardware Models	Merlin Series
Revision	1.01
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Date:	12 June 2025
Brief description	Merlin SCADA Protocol Conversion Scenario: Modbus RTU to DNP3 Master

1 Overview

This application note details the steps to configure a protocol conversion between a DNP3 Master and a MODBUS RTU. The application note will show the typical steps required for protocol conversion configuration through web management.

The IECD application is available in the SCADA section. You must configure Master and Server interfaces as well as at least one Data Point for signal mapping. The interfaces used to communicate with local RTUs are referred to as the Master Protocol, while the interface used to communicate with the external Master is referred to as the Server (Slave) Protocol.

A knowledge of SCADA protocol (Modbus/DNP3) parameters is required, and the setup is common for all Merlin and Westermo Ireland/Virtual Access brand routers available.

1.1 Firmware information

Firmware version: SXL-25.04.16.000 or newer.

1.2 Assumptions

This application note shows the Merlin 4407 router and assumes the router has a factory default configuration. Instructions can be applied to other routers in the Merlin Series.

1.3 Corrections

Requests for corrections or amendments to this application note are welcome and should be addressed to support.ie@westermo.com

Requests for new application notes can be sent to the same address.

2 Configuring an IECD application

Browse to the IECD configuration page via the WebUI and follow the steps below.

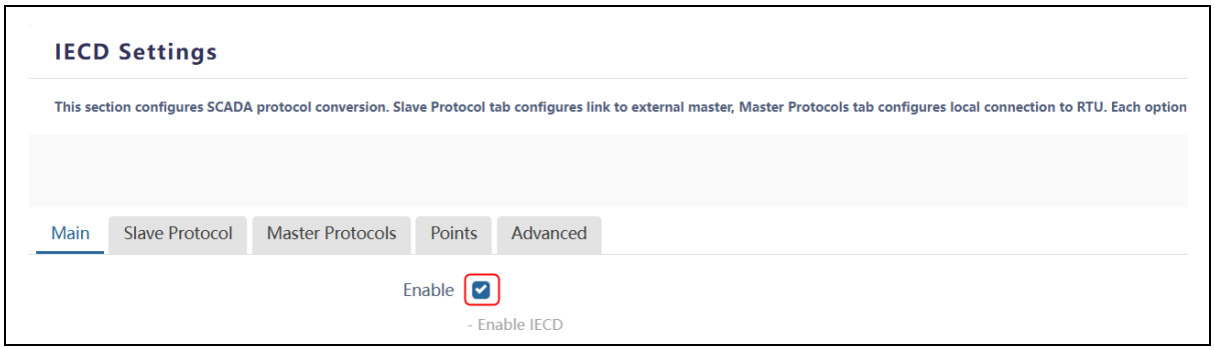

Figure 1: IECD Main Settings

2.1 Setting up the scenario

To set up the scenario, you must configure three key elements: Enable application, the server protocol, the master protocol and at least one data point for conversion.

Enable the application and click **SAVE & APPLY**. Remember to save and apply your WebUI configuration regularly.

3 Configuring server protocol (DNP3)

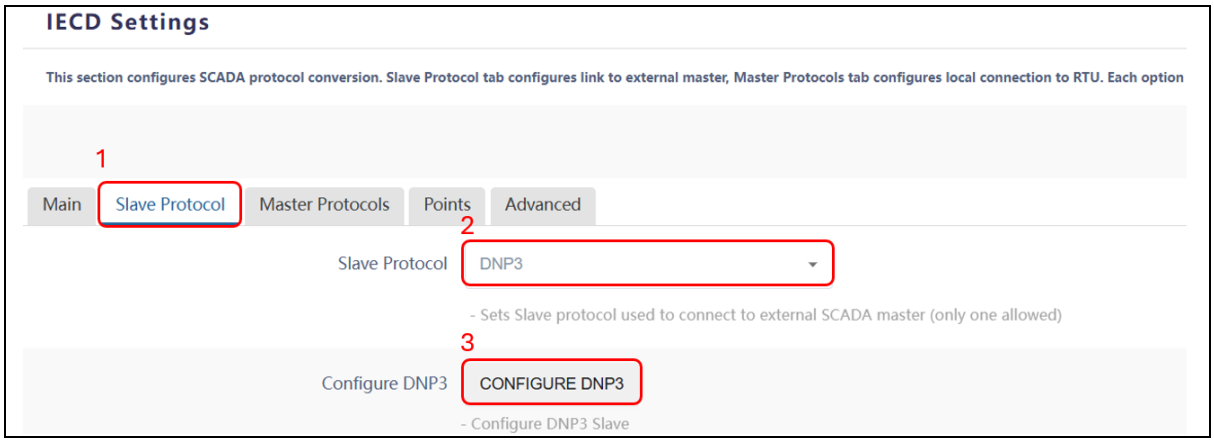

Figure 2:Slave Protocol tab in IECD Server Settings

1. Click **Slave Protocol**.
2. Select **DNP3** as the Server protocol.
3. Click **CONFIGURE DNP3**

Figure 3: Net tab in DNP3 Settings

4. Click **Net**.
5. Set the **DNP3 local IP** address.
6. Set the **DNP3 Listening TCP Port**.

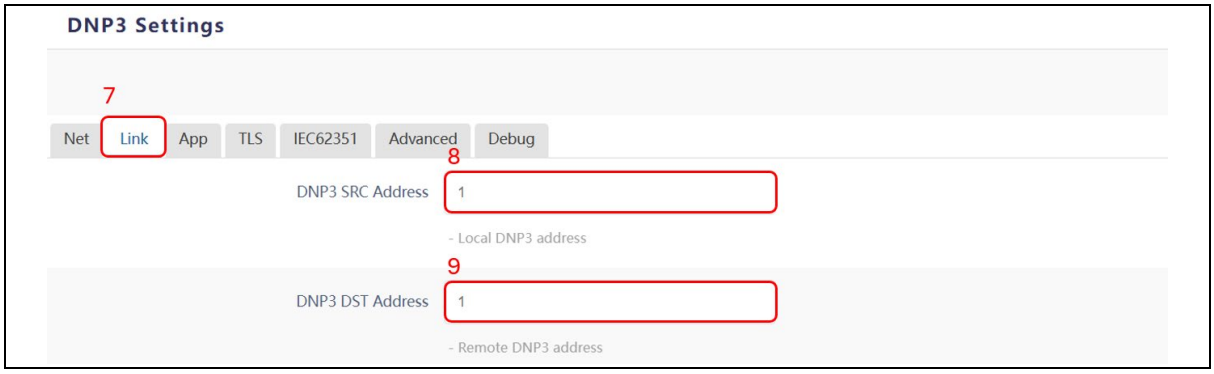

Figure 4: Link tab in DNP3 Settings

7. Click **Link.**
8. Set the **DNP3 Source Address**.
9. Set the **DNP3 Destination Address**.

- Additional DNP3 parameters are available in the remaining tabs:
- App tab: for application layer settings such as unsolicited messages.
- Net tab: for networking settings
- Advanced tab: for advanced settings
- TLS tab: for TLS settings (IEC62351-3)

4 Configuring a master protocol (MODBUS)

You can configure a Modbus Master to connect to the MODBUS RTU using **Serial**, or TCP**/IP**.

In a multi-RTU setup, you have the flexibility to choose either serial or TCP for any of the communication links. Follow steps 4-6 in section 4.2 to configure Modbus Master over serial. Follow steps 4-6 in section 4.3 to configure Modbus Master over TCP.

4.1 Configuring MODBUS Master

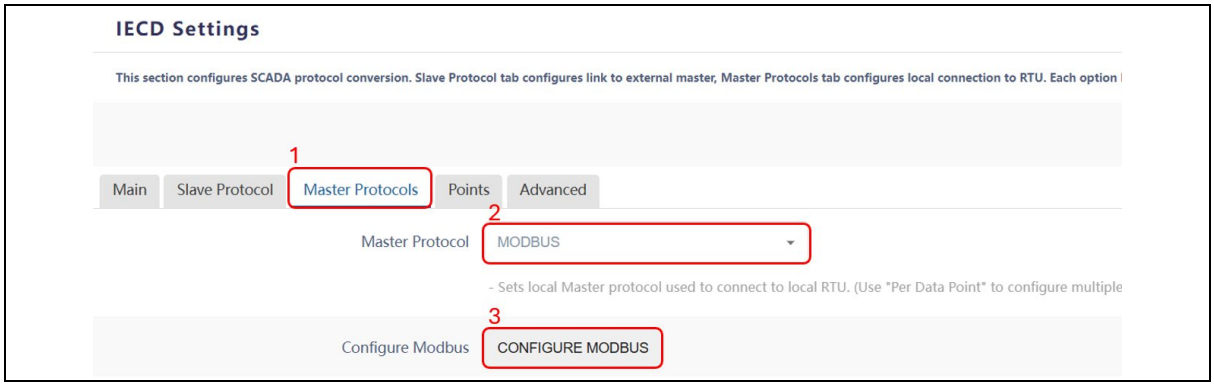

Figure 5: Master Protocol tab

1. Click **Master Protocols**.

2. From the drop-down menu, select Master protocol as **MODBUS**.
3. Click **CONFIGURE MODBUS**.

Note: up to two links can be selected for the Modbus Master (Multi RTU).

4.2 Configuring MODBUS Master over Serial

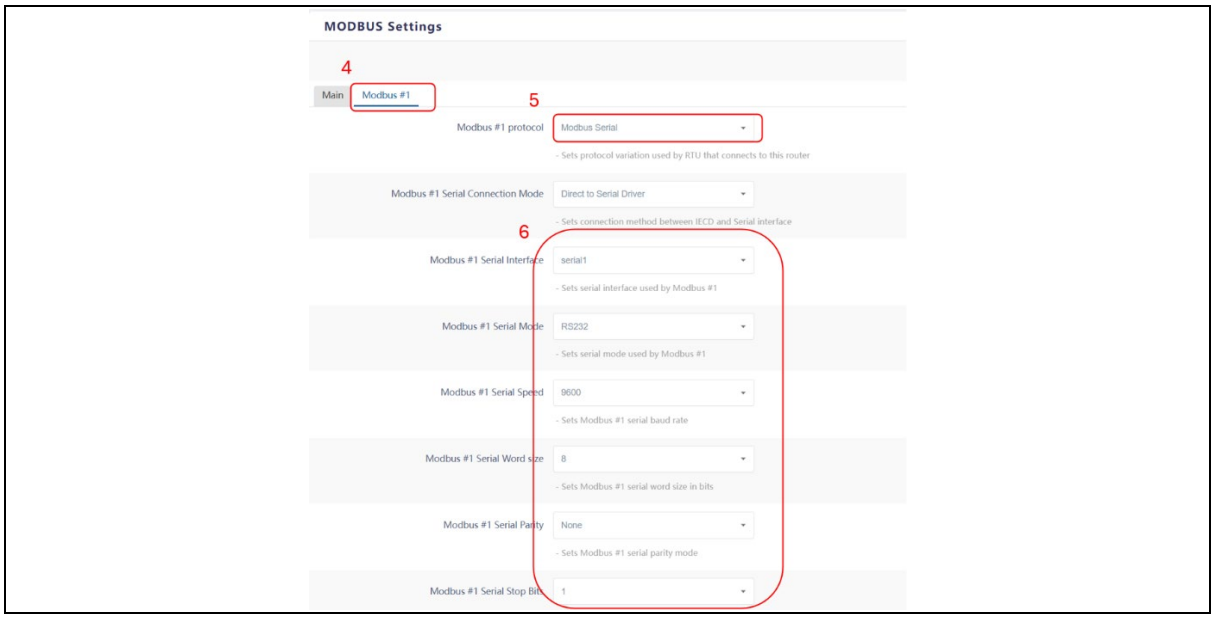

Figure 6: Modbus over Serial Settings

4. Navigate to Modbus Settings and click **Modbus #1**.
5. Set Modbus #1 protocol as the **Modbus Serial**.
6. Configure Serial-related settings.

4.3 Configuring MODBUS Master over TCP

Figure 7:Modbus over TCP Settings

4. Navigate to Modbus Settings and click **Modbus #1**.

5. Select Modbus #1 protocol as **Modbus TCP**.

6. Configure TCP-related settings.

For Modbus Master interface you must configure a TCP route. You can specify multiple routers. Modbus protocol supports up to 247 routes.

Figure 8: Modbus TCP Route settings

7. Navigate to the bottom of the page, navigate to the Modbus TCP Route section and click **ADD**.

Figure 9: Modbus TCP Route settings

8. Set the link no.

9. Set a device address.

10. Set the remote IP of the Modbus RTU.

11. Set the TCP port number. The default port for Modbus is **502**.

12. To save the configuration and run/restart the IECD application, at the bottom of the page, click **SAVE & APPLY**

5 Configuring points (data points)

You must specify a signal mapping to allow the conversion between two different protocols. Each data point represents a single value. The following example will configure one data point mapping of a Modbus DI (Discrete Input) – index 0 with an IEC104 Type ID 1 (Single Point) of Information Object Address (IOS) – 100.

The configuration of data points follows the same principle where both sides Master and Server need to be configured.

5.1 Configuring data points using Web UI

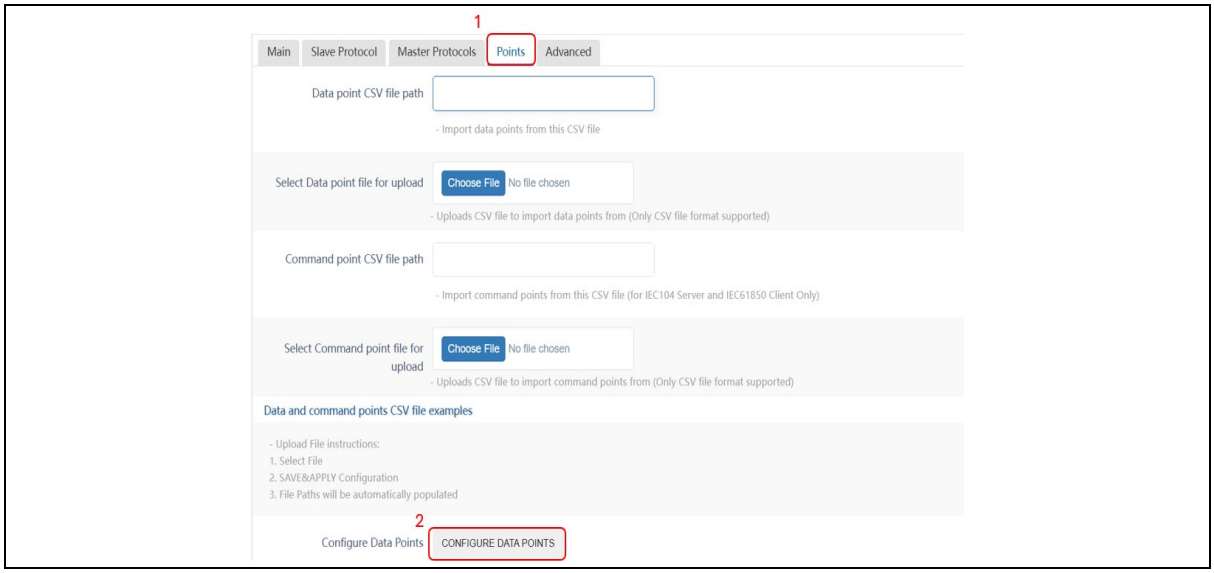

Figure 10:Points tab in data point configuration

1. In the IECD page, click **Points**.
2. Click **CONFIGURE DATA POINTS**.

Figure 11:Data point configuration

3. Click **ADD** in the Data Points section. A data point will be added.
4. Click **EDIT** to configure the added point.

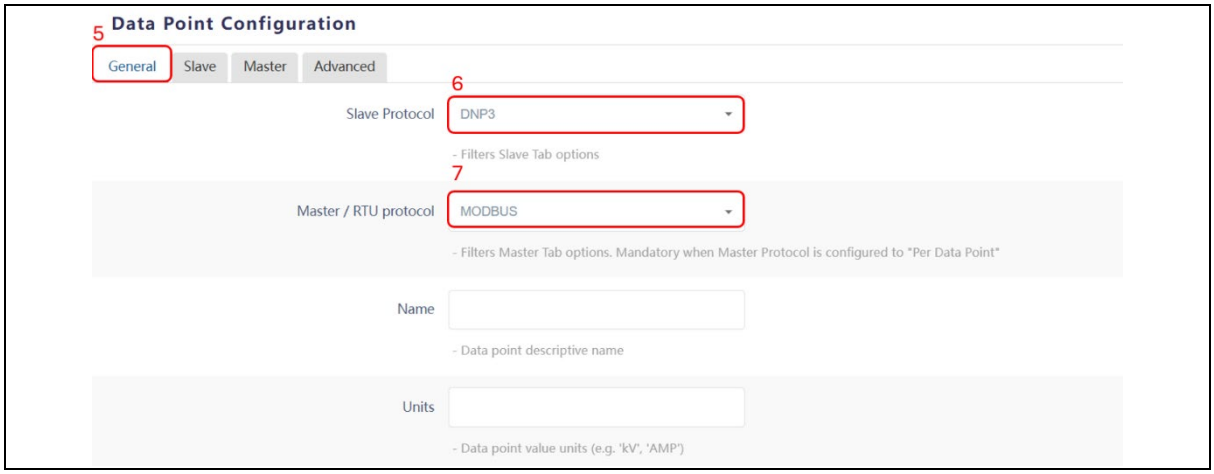

Figure 12:Data point configuration

5. On the Data Point Configuration page, click **GENERAL**.
6. Set the Slave Protocol as **DNP3**.
7. Set the Master/RTU protocol as **Modbus**.

Note: names and units are optional.

5.2 Configuring the server side

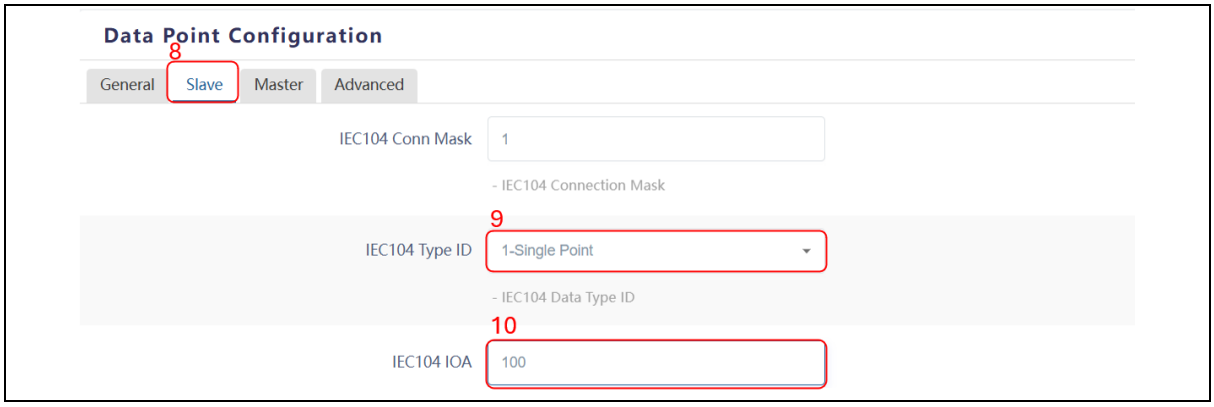

Figure 13:Data point configuration

8. Click **Slave**.
9. From the drop-down menu, select the **DNP3 Slave Group**.
10. Set **DNP3 Index**.

5.3 Configuring the Master side

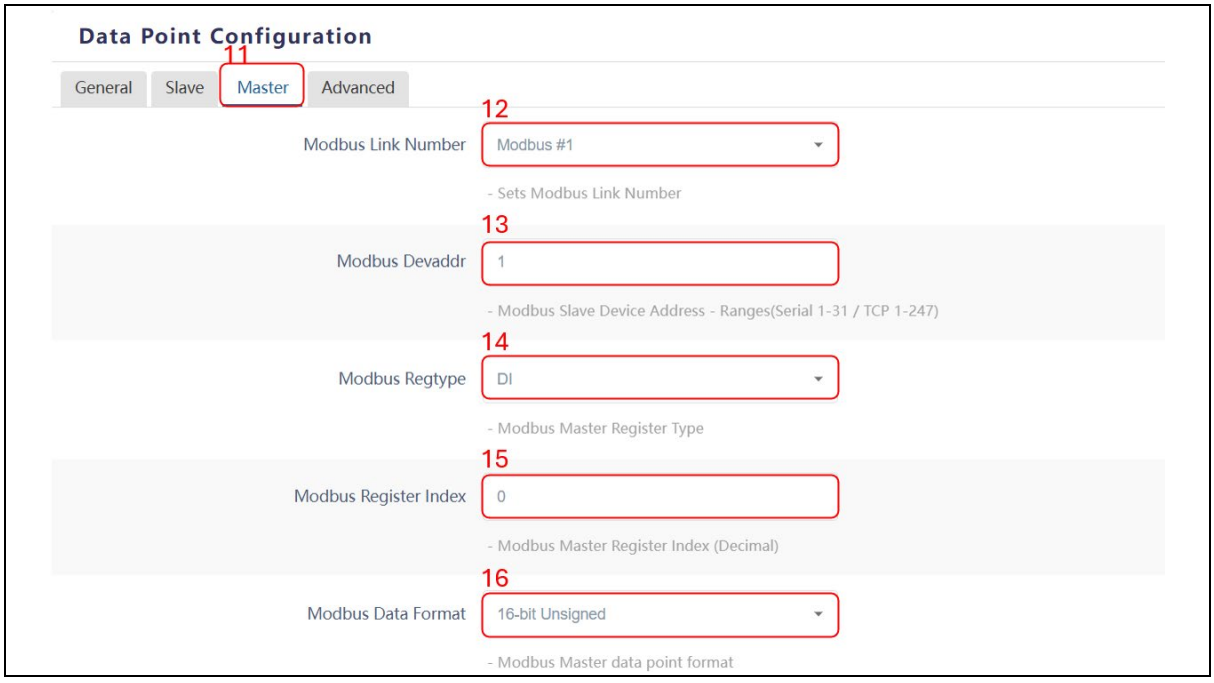

Figure 14:Data point configuration

11. Click **Master**.

12. From the drop-down menu, set **Modbus link number**.

13. Specify the **Modbus Device address**.

14. From the drop-down menu, select the **Register Type**.

15. Set the **Register Index**.

16. From the drop-down menu, select the **Data Format**.

Figure 15: The SAVE & APPLY button

17. To save the configuration and run/restart the IECD application, at the bottom of the page, click **SAVE & APPLY**.

Note: it is important to SAVE the configuration regularly while configuring via the WebUI.

5.4 Configuring commands points

Note: configure DNP3 command points via the Data Points section (Command points are applicable to IEC104 configuration only).

5.4.1 Uploading a CSV file

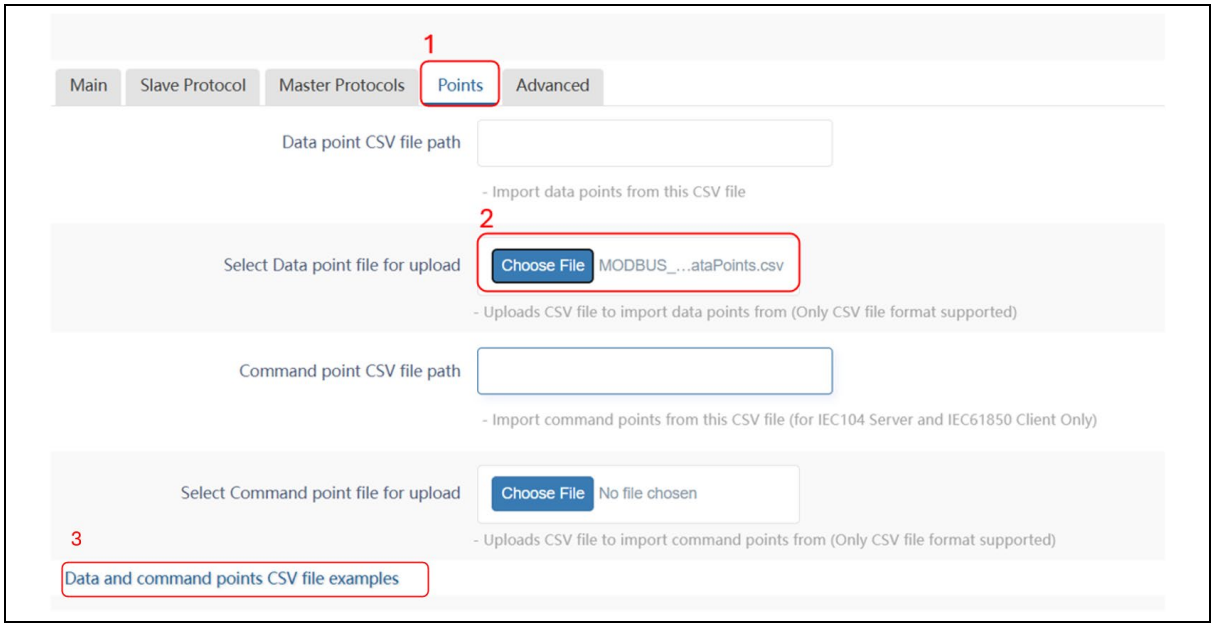

Figure 16: Steps for uploading CSV files

1. Click **Points**.

2. Click **Choose File** and select the data points CSV file.

3. Click for information regarding the supported structure of CSV file.

4. To save the configuration and run/restart the IECD application, at the bottom of the page, click **SAVE & APPLY**

6 Troubleshooting

Basic troubleshooting involves verifying the connection status of the IECD application, as well as reviewing the logs to identify any error messages.

6.1 Basic status

6.1.1 Checking IECD status using WebUI

The IECD statistics page provides information on IEC104 server connections to the SCADA Master, data points and command points.

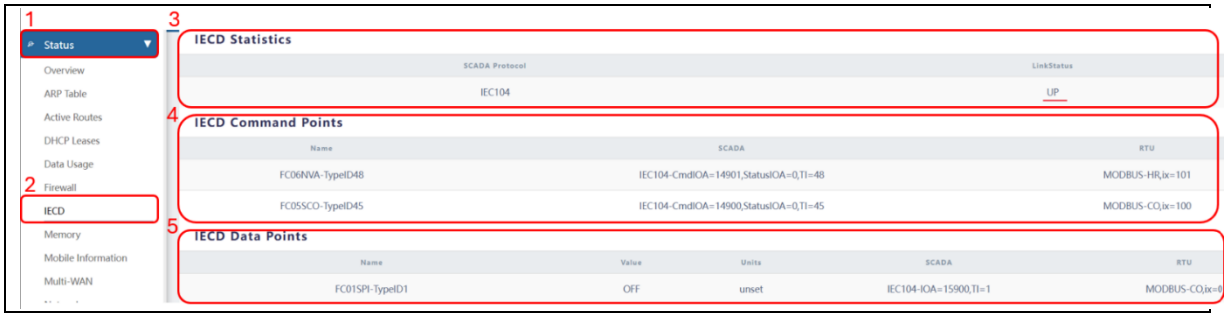

Figure 17:IECD status WebUI

1. In the left-hand menu, click **Status**.
2. Click **IECD**.
3. The **IECD Statistics** section shows the connection status between the IEC104 Server and the IEC104 SCADA Master.
4. The **IECD Command Points** section shows the configured command points for the scenario type.
5. The IECD Data Points section shows the configured data points along with their values for the scenario.

6.1.2 IECD status via CLI

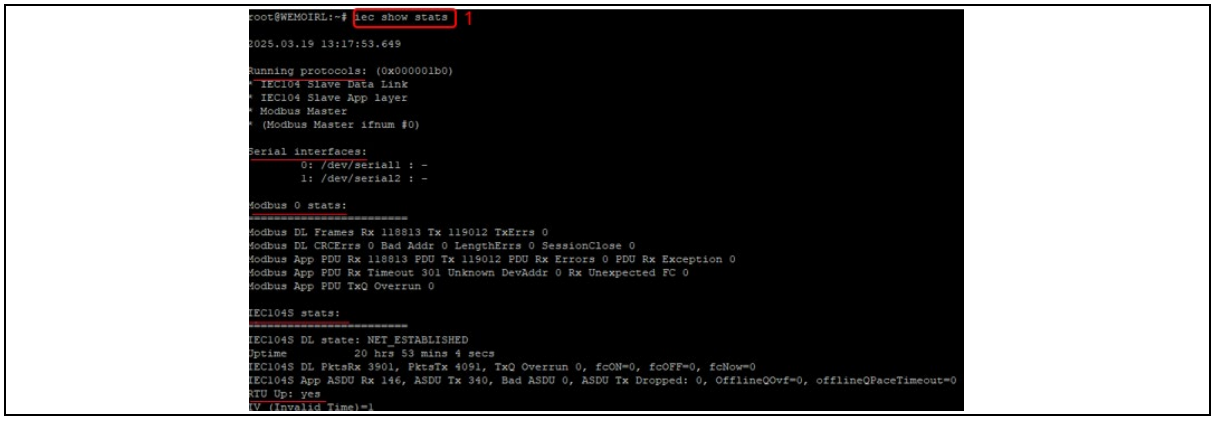

Figure 18: IECD status CLI output

1. To check the IECD status using CLI, connect to the router via SSH and enter the command `iec show stats`.

2. This will display the running protocols, serial interface in use, server and master protocol statistics such as the number of transmitted and received frames, and more. This information serves as a starting point for basic troubleshooting.

6.2 Enabling logs for troubleshooting

6.2.1 Configure global setting

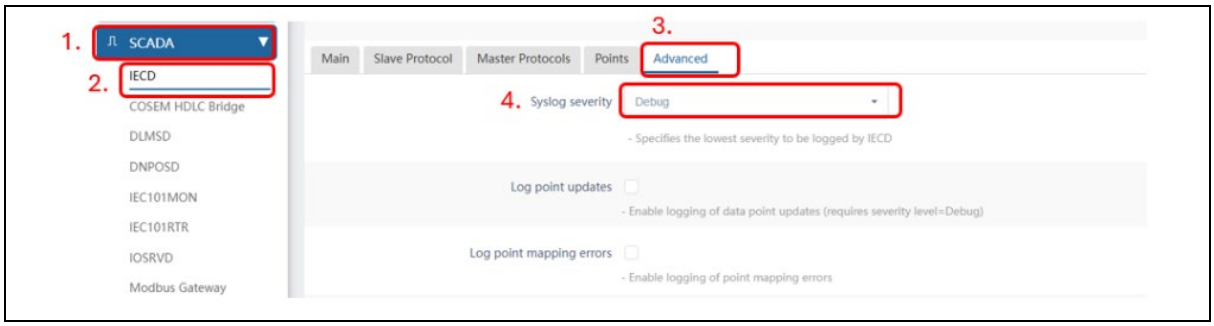

Figure 19: Enabling IECD logs

1. Click **SCADA**.
2. Click **IECD**.
3. Click **Advanced**.
4. From the Syslog severity drop-down menu, set the Syslog severity to **Debug**.
5. To save the configuration and restart the IECD application, scroll to the bottom of the page and click **SAVE & APPLY**.

6.2.2 Configure Master protocol

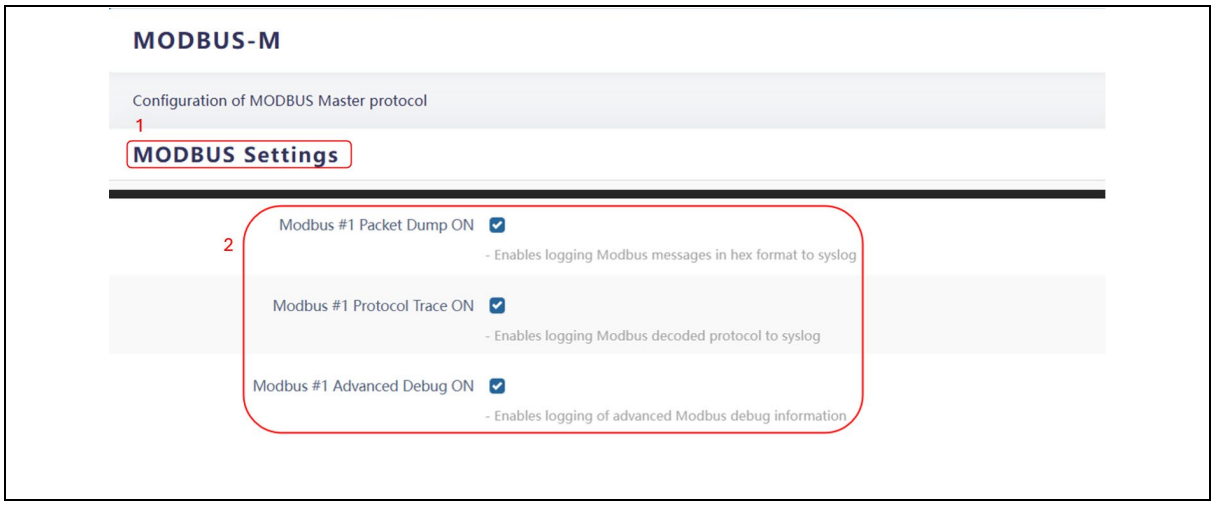

Figure 20:Modbus master protocol settings

1. Navigate to **Modbus Master Link** settings.
2. Enable additional logging settings.

3. To save the configuration and restart the IECD application, scroll to the bottom of the page and click **SAVE & APPLY**.

6.2.3 Configure server protocol

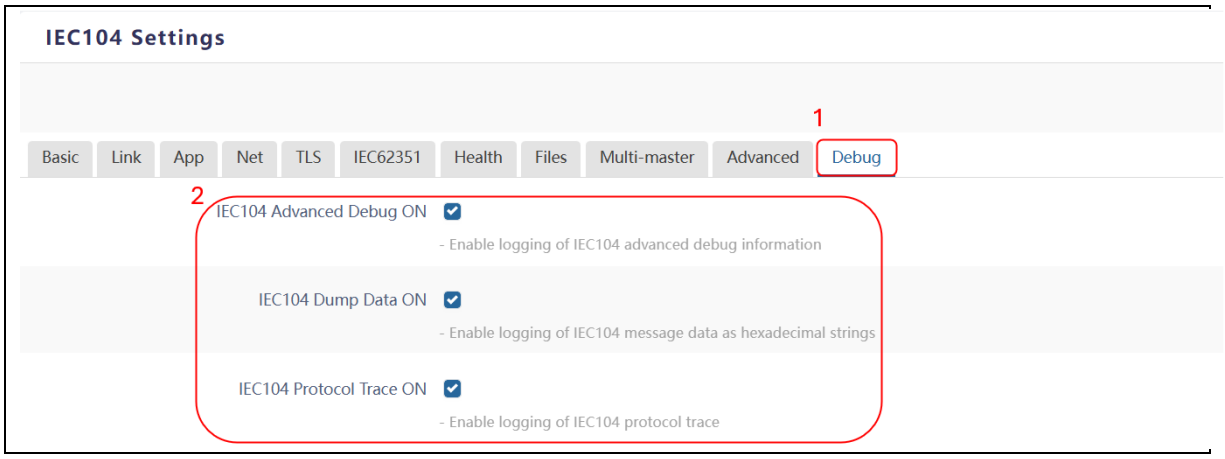

Figure 21: Enabling server protocol logs

1. Return to IEC104 Server settings and click **Debug**.
2. Check all the boxes to enable additional logs.
3. To enable logging, scroll to the bottom of the page and click **SAVE & APPLY**.

6.2.4 Accessing logs via the WebUI

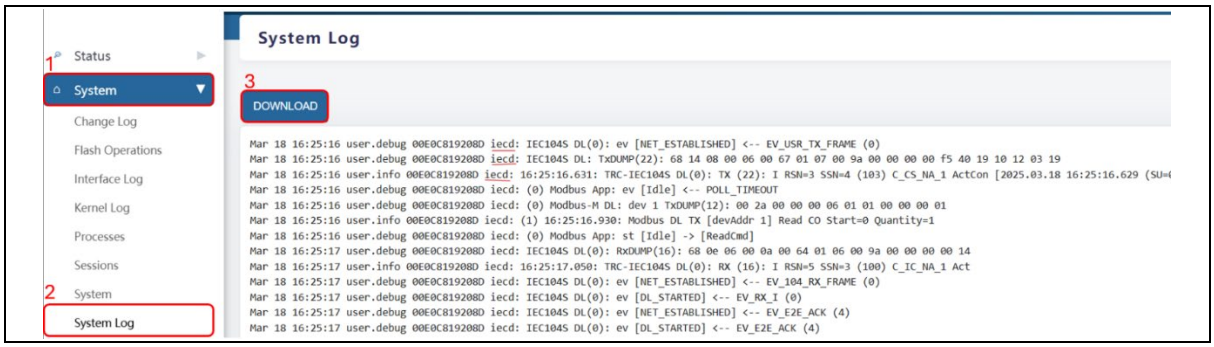

Figure 22: The system log interface

1. To check logs, in the left-hand menu, click **System**.
2. Click System log and search for logs related to IECD. These logs have the name **iecd**.
3. To download the logs, click **Download**.