Support of ISA100.11a Devices by FieldMate

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The FieldMate versatile device management wizard is PC software mainly used for configuring and adjusting field devices. Under the concept of “one tool for all,” Yokogawa has been enhancing this software to support a wide range of field instruments and field communication protocols. In line with the advance of wireless technologies, its latest version, FieldMate R2.05, covers the lifecycle of wireless devices (startup, maintenance, and replacement). This paper introduces the functions of FieldMate and underlying ISA100.11a technologies.

INTRODUCTION

The FieldMate versatile device management wizard is PC software mainly used for configuring and adjusting field devices. Under the concept of “one tool for all,” Yokogawa has been enhancing this software to support a wide range of field devices and field communication protocols (1). In recent years, the practical use of wireless has been spreading remarkably in the industry in line with the tremendous progress of field wireless technologies. To keep up with this trend, Yokogawa has continued developing products conforming to the ISA100.11a standard.

The latest version of FieldMate, R2.05, covers the lifecycle of field wireless devices from startup to maintenance to replacement. This paper describes the functions of this software which are related to field wireless technologies.

OVERVIEW OF COMMUNICATION

To configure and adjust the various parameters of field wireless devices conforming to the ISA100.11a standard, FieldMate supports infrared communication as shown in Figure 1 and communication via gateways as shown in Figure 2.

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detector, and FieldMate performs infrared communications with these devices by using an infrared adapter (ACT-224UN) manufactured by ACTiSYS Corporation.

Infrared communication between field wireless devices and their hosts is implemented according to the Out of Band (OOB) provisioning specification, which was developed by the ISA100 Wireless Compliance Institute (WCI), an organization promoting the ISA100.11a standard. FieldMate infrared communication conforms to the Serial Infrared Physical Layer specification (IrPhy-SIR) of the Infrared Data Association (IrDA) and applies the 9600-bps baud rate specification.

By connecting the above infrared adapter to a USB port of a PC in which FieldMate is installed, and by specifying the corresponding COM port number, the FieldMate can establish infrared communication with field wireless devices.

Infrared communication is used for provisioning, and configuring and adjusting field wireless devices before putting them into the wireless network.

Overview of Communication via Gateways

FieldMate communicates with field wireless devices via the gateway in accordance with YGSAP, which runs on Ethernet, and the TCP/IP protocol.

YGSAP is a specification that Yokogawa developed based on the Gateway Service Access Point (GSAP), defined in the ISA 100.11a specification to define the interface between the gateway and the client.

By connecting with the gateway via Ethernet and specifying the gateway IP address or host name, FieldMate can communicate with all of the field wireless devices connected to the gateway.

SUPPORT OF ISA100.11a DEVICES BY FIELDMATE

Main Part of FieldMate

The following are features of the main part of FieldMate for supporting ISA100.11a devices. FieldMate R2.05 can view and manage up to 500 ISA100.11a devices connected to the gateway.

1) Communicates with ISA100.11a devices via infrared light, and provides the same look and feel operability as devices supporting other protocols, including HART.

2) Supports the two currently available gateways, YFGW 410 and 710 YFGW.

3) As for the information of wireless devices connected to the gateway, the main part of FieldMate accesses its cache and can immediately display the information in a list as shown in Figure 3. By selecting desired devices from the displayed information, users can communicate with the gateway, obtain detailed information such as device status which is not cached in the gateway, and display it in a list as shown in Figure 4. The response time of these operations varies depending on the wireless communication environment, device configuration, and device types.

4) After obtaining the cached information, users can start the Device Type Manager (DTM), used as a device configuration and adjustment tool, specifying an intended device as shown in Figure 5. The DTM obtains the required device information from the ISA100.11a device when starting the operation.

5) The main part of FieldMate can simultaneously communicate with up to 50 ISA100.11a devices for obtaining detailed information. The information of each device is displayed after respective communication is completed. This enables faster checking on the status of multiple devices.

6) A search function enables users to locate desired devices from the list of devices. Figure 6 shows an example of the complex search to filter through 500 devices, and the results of the extraction.
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Communication DTM

The communication DTM converts requests sent from the device DTM through the Field Device Tool/Device Type Manager (FDT/DTM) interface into formats which conform to the YGSAP or OOB provisioning specifications, so that these requests can be received by field wireless devices.

Device DTM

Yokogawa has developed the device DTM for field wireless devices based on the device DTMs for HART and FOUNDATION fieldbus™ communications. The device DTM enables users to configure and adjust field devices. The structure and functions of the device DTM are described below with reference to Figure 7.

Responding to requests from an FDT frame application such as DTMWorks, the device DTM communicates with field devices via the communication DTM for gateway communication or the communication DTM for infrared communication. The communication can be performed regardless of the types of communication by using the unified interface of the communication optimization module.

The FDT/DTM interface interacts with the frame application and configures the window which is the base of DTM’s user interface.

The menu tree generation module converts the interpreted results of the Electronic Device Description (EDD) by the EDD parser to DTM internal data.

The rendering module uses this internal data to display the menu tree and corresponding parameters in the DTM window.

Figure 8 shows an example of the window. Users can read or write parameters of ISA100.11a devices and execute Methods in this window. The remaining battery capacity of the device is displayed as an icon at the top of the window.

Offline parameter import/export and save/load functions are added. These functions can be applied to scenarios such as: an offline work scenario which sets pre-set values to devices at sites; a device setup scenario which sets the same settings to multiple devices; and a device replacement scenario which sets the saved settings of a device to another device. The save/load functions are performed through files created by an FDT frame application to contain serialized offline parameters. These are performed by the import/export part.

Table 1 Provisioning methods

<table>
<thead>
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<th>Provisioning method</th>
<th>Description</th>
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<tbody>
<tr>
<td>OTA provisioning</td>
<td>Provisioning on ISA100.11a wireless networks</td>
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<tr>
<td>OOB provisioning</td>
<td>Provisioning via infrared communication</td>
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The provisioning of devices is carried out through the Provisioning information tab shown in Figure 9. First, click the “Obtaining device information” button to obtain the information of the target device. The information is displayed as the Provisioning device information in the window of PDTool. After changing parameters in the entry field of the Network ID and Device tag, click “Start Provisioning” button to start provisioning. Any attempts of provisioning for devices not displayed in the Provisioning device information are denied. PDTool keeps the information on provisioning for each device. Clicking the “Export Provisioning Information” button can export the displayed information as a provisioning information file.

![Figure 9 PDTool provisioning window](image)

**Joining ISA100.11a Wireless Networks**

Figure 10 shows a wireless system configuration including PDTool.

To join a device to an ISA100.11a wireless network, the provisioning information must be added to the engineering tool for managing the ISA100.11a wireless network.

To join wireless devices to a wireless network, the following process is necessary.
1) Perform the provisioning of devices with PDTool.
2) Export the provisioning information of the devices by PDTool as a provisioning information file.
3) Import the file into the engineering tool. The provisioning information is successfully added to the engineering tool.
4) The information is loaded onto the ISA100.11a gateway by the engineering tool.
5) Connecting the provisioned devices to the ISA100.11a wireless network allows them to participate in the wireless network.

![Figure 10 Wireless system configuration including PDTool](image)

**CONCLUSION**

This report has described the functions which are added to FieldMate for managing field wireless devices. With these new features, FieldMate has become an indispensable tool for Yokogawa’s wireless systems. Yokogawa will offer optimal solutions for the promising field wireless market, and aim to deliver tools or platforms which serve as part of our “Asset Excellence (2).” To achieve these aims, we will make quicker responses to the evolution of the standards than any other company.

**REFERENCES**


(2) ARC Advisory Group, Yokogawa VigilantPlant Services™ Provide a Sustainable Approach to Continuous Plant Improvement, ARC White Paper, JANUARY 2010

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