B+B SmartWorx
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Modbus Eavesdrop to MQTT IIoT Gateway

SmartSwarm 351

PRODUCT FEATURES

- Transparently connects to existing serial Modbus RTU networks
- Provides parallel data feed into Enterprise IIoT systems while the existing Modbus network continues to operate
- User configurable data enrichment and event triggers
- Extensive configuration options for interpretation of Modbus data
- Cellular or Ethernet connection to IIoT system
- Also acts as LAN to WAN bridge for 3rd party device connection

Introduction

Seamlessly connect existing Modbus process systems into the Industrial Internet of Things

While a number of "Modbus to MQTT" gateways exist, most expect to act as the local Modbus master device, recovering information from a network of connected slaves. This presents a problem for operators of existing process control systems. A Modbus network can only have a single master device. To use these gateways, any existing master system has to be disconnected. That is impractical if it is running the user's critical process.

The SmartSwarm 351 overcomes this limitation by transparently "eavesdropping" on communications between the existing master device and the connected slaves. It non-disruptively derives the I/O status of connected devices and uses this information to provide a real time data feed to a connected IIoT architecture.

Providing a real time data feed is only part of the story. Because of its origins, Modbus is a highly optimized protocol that returns data as a simple series of register values, leaving the master device to interpret the returned data. Any new applications that need to use this data must have intimate knowledge of the devices producing it. This is not a good situation for IIoT systems, where data should be semantically searchable and self-defining. For this reason, the SmartSwarm 351 offers powerful data enrichment and event triggering functionality to transform the base Modbus data into contextualized, filtered information right at the network edge. This enables direct consumption of the data by upstream IIoT applications, which need not have any prior knowledge of the details of the devices producing the information.

DATA ENRICHMENT

One of the key advantages of an IIoT architecture is that it allows applications to find information that is relevant to them, with no need for detailed knowledge of where or how the information was produced. Data enrichment is the process by which obscure, device-specific data such as that produced by a Modbus slave is transformed into topic-based, self-declaring data. SmartSwarm 351 uses a combination of MQTT topics and JSON payload formats to ensure that the information it publishes can be readily consumed by upstream applications. Default topic definitions and payload formats mean that -- even without configuration -- the SmartSwarm 351 can publish data it discovers about the Modbus network. Crucially, it allows users to configure both the topic alias and payload transformation in order to provide much more descriptive and semantically rich content.

DATA FILTERING

Much of the data that the gateway will see in the Modbus network is of little value. If a temperature reading rarely changes, for example, there is no point in reporting it every time it is sampled. For this reason, in addition to enriching the data, SmartSwarm 351 also allows users to configure the triggers that will cause a monitored value to be published. The triggers could include, for example, a temperature reading that has exceeded a threshold, has an excessive rate of change, or has moved by more than a configurable amount since the last time it was published. This means that the information published by the gateway is always significant and of value. At the same time, the gateway is decreasing the communications overhead and the enterprise processing bandwidth needed to handle it. Users can also configure what is published once an event trigger condition is met – this might be just the changed value, a range of data, or all data from the same register type within the RTU. This lets users optimize the traffic across the communications network.

CONNECTIVITY AND SECURITY

SmartSwarm 351 connects to enterprise applications via either a local Ethernet connection, or wirelessly via an internal cellular modem. The gateway can switch between these connections at any time, providing redundancy. All inbound WAN connections are prohibited by an Internal firewall. In addition, the gateway provides a second Ethernet port for a local LAN connection, and bridges traffic from this LAN to its active WAN connection. The gateway may be used as a cellular modem to allow any local Ethernet-enabled device to obtain an outbound WAN connection. OpenVPN tunneling is also supported. Outbound connections to the SmartWorx Hub remote configuration tool and the remote MQTT broker are authenticated and encrypted using TLS, with certificate authentication of the host and certificate provision by the gateway.

CONFIGURATION

Configuration is achieved via the SmartWorx Hub remote configuration management tool. This provides access to all of the configurable parameters, and also supports zero touch provisioning, where a unit's configuration can be entered prior to it arriving at site, and automatically downloaded once it is switched on. In addition to system configuration, SmartWorx Hub also supports remote upgrade of applications and firmware, on an individual device and/or group basis. Where a large number of Modbus slave points need to be defined, this information can be assembled offline and presented as a .CSV or Excel file and imported into SmartWorx Hub for subsequent download to a unit or group of units.

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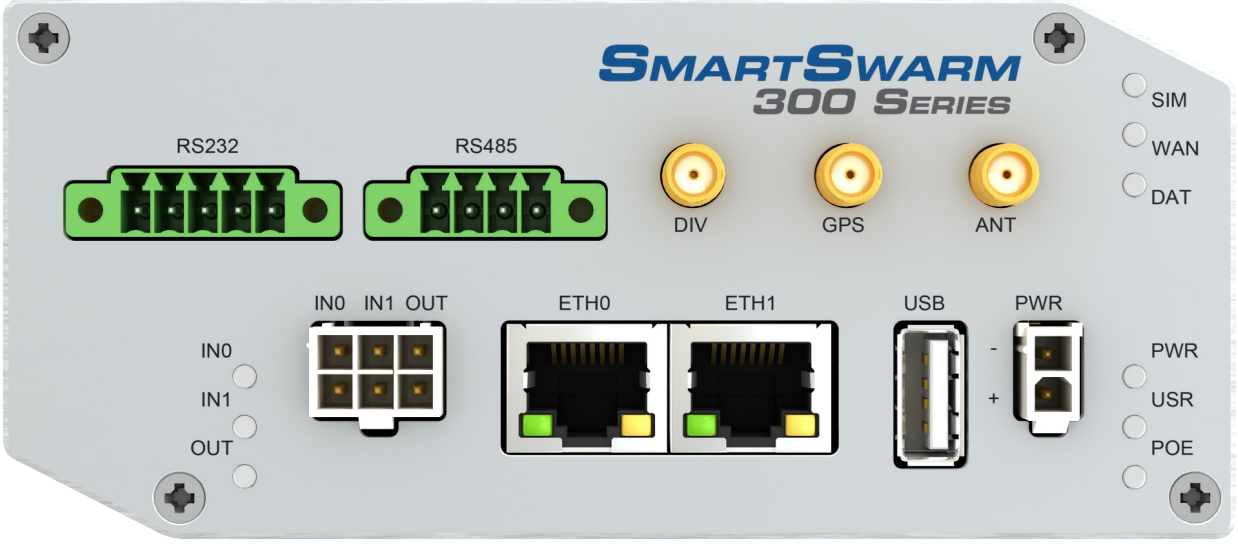
SPECIFICATIONS

POWER	
Voltage	10 – 60 Vdc; PoE PD optional
Power	4W typical; 11W peak
ENVIRONMENTAL	
Operating Temperature	-40°C to 75°C (-40°F to 167°F)
Cold Start Temperature	-35°C (-31°F)
Storage Temperature	-40°C to 85°C (-40 to 185°F)
Operating Humidity	0% to 95% (non-condensing)
Storage Humidity	0 to 95% non condensing
Ingress Protection	IP42
MECHANICAL	
Dimensions	55 x 97 x 125mm
Weight	375g
Mounting	Flat Surface or DIN rail
PORTS & INTERFACES	
Serial Modbus RTU interface	RS-232 or RS-485
Ethernet	2 x 10/100 Mb via RJ45
SIM	Mini SIM (2FF)
ANT & DIV antennae	SMA
Cellular	LTE, UMTS/HSPA+, GPRS/EDGE

MODBUS COMMANDS SUPPORTED
01 Read Coil Status
02 Read Input Status
03 Read Holding Registers
04 Read Input Registers
05 Force Single Coil* *
06 Preset Single Register*
15 Force Multiple Coils*
16 Preset Multiple Registers*
22 Mask Write 4X Register*
23 Read/Write 4X Registers*
* Note that for output command types, the unit interprets these as inputs to the IoT enrichment process. It does not support output of data from the IoT system
MODBUS DATA TYPES SUPPORTED
Boolean
Multi-bit Encoded Boolean (e.g. 2 bits provide 4 states for one point)
16 Bit Packed Boolean
16 Bit Integer (signed/ unsigned)
16 Bit Counter
32 Bit Integer (signed/unsigned) (single 32 bit or 2x16 bit registers)
32 Bit Counter (single 32 bit or 2x 16 bit registers)
32 Bit Float (single 32 bit or 2x 16 bit registers)
32 Bit Packed Boolean (single 32 bit or 2x 16 bit registers)
Multi-register Text
Endian order is configurable both within and between registers

FRONT PANEL



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