Modbus-IDA News

Modbus in the Wireless World

We're not kidding when we say Modbus is everywhere. As the most ubiquitous industrial communications protocol in the world, Modbus is found in every conceivable industry and application. Modbus serial predominates in many legacy applications and the number of Modbus TCP/IP applications grows as Ethernet becomes the preferred communication medium.

The most recent space to find Modbus is in wireless applications. This is the focus of the Modbus Organization's exhibit planned for ISAEXPO 2006.

We will be showcasing applications in four wireless technology spheres. Member companies will be there to talk about Modbus products in:

- GPRS (General Packet Radio Service) (Spectrum Controls)
- Radio (ProSoft Technology, Inc.)
- 802.11 (Wi/Fi) (Sealevel Systems)
- Bluetooth (Schneider Electric)

Visit the Modbus-IDA booth to learn about devices and applications in all four technologies. Members will display their products and be available to help out with questions about both wireless and traditional Modbus applications.

Modbus TCP/IP IEC Update

Modbus-IDA Technical Director, Rudy Belliardi, has been working closely with the IEC as the Modbus TCP/IP protocol progresses through the process of review and voting by member countries.

In September 2004, the protocol along with a companion protocol known as RTPS, was submitted to IEC SC65C as a real-time industrial Ethernet suite.

With the positive vote in 2004, the Modbus TCP/IP profile was accepted by the IEC as a Publicly Available Specification and eligible to become part of future editions of the International Standards IEC 61158 and IEC 61784-2.

In approving the document, several national committees asked that the specification be reformatted for better integration into the revision of IEC-61158 (Ed 4.0 2007), the well-known fieldbus standard.

Today, the reformatted specification has been submitted for review, and the organization is awaiting comments and requests for changes that will be addressed by a deadline later in the year. After that, more review and a final vote is expected in late 2007.

When this process is completed, Modbus-IDA plans to make the revised protocol available on the Modbus-IDA website as soon as possible.

The current version of the protocol is available on the Technical Resources page , www.modbus.org/tech.php.

**Visit Modbus-IDA
ISA EXPO 2006
October 17 - 19
Houston, Texas
Booth 2005**

Members, join Modbus-IDA's Marketing Committee. Help steer the organization's marketing programs to best serve your company's needs!

e-mail info@modbus-ida.org

Meet Some of Our Members...

Hilscher develops and manufactures solutions for fieldbus and industrial Ethernet, including PC cards, gateways, ASICs for major systems such as Modbus, Profibus, Profinet, DeviceNet, CC-Link, InterBus, CANopen, ControlNet, AS-Interface, SERCOS, Industrial Ethernet, and EtherNet/IP.

Hilscher's PKV 30 Protocol Converter provides protocol conversion between different standard protocols such as 3964R, RK512, Modbus, Modnet, and more.

(www.hilscher.com)

California-based **Automated Solutions** develops OPC servers and ActiveX controls for HMI and SCADA development. The company offers fully functioning 30-day trial versions of all its software products. These include an OPC Server for Modbus/TCP compatible devices, OPC Server for Modbus RTU and ASCII compatible devices, Modbus/TCP Master ActiveX Control, Modbus RTU and ASCII Master ActiveX Control, Modbus Plus Master ActiveX Control, and Modbus RTU/ASCII/TCP Server ActiveX Controls. (www.automatedsolutions.com)

The **Central Power Research Institute (CPRI)** is the power house of the Indian electrical industry. Set up in 1960 by the Government of India, it functions as a center for applied research in electrical power engineering assisting the electrical industry in product development and quality assurance. CPRI also serves as an independent authority for testing and certification of power equipment. CPRI's governing body includes professionals from industry, utilities, academic and research institutions, and the government. (powersearch.cpri.res.in)

The **Betec Engineering** development team has extensive experience in industrial electronics. They work cooperatively on complex tasks in hardware and software, bringing innovative ideas to manufacturing reliably and economically. Together with the users, technical designers and buyers, they define a project's requirements, then set their development engineers to creating the new design, coordinating hardware and software development into prototyypes, optimizing the new product until the prototype passes testing and is ready for production. In short, Betec offers technical support during product and process development; hardware and software design, system development, and housing prototyping. (www.betec-electronic.de)

Modbus Represented at Upcoming MatrikonOPC User's Group Meeting in Houston

Phoenix Contact Inc. develops and manufactures specialized electronic components and connection systems. The company offers a diverse range of products designed for industrial applications including terminal blocks, power supplies, signal conditioners, industrial connectors, and automation systems. Phoenix Contact has U.S. headquarters located in Harrisburg, Pennsylvania and world headquarters in Blomberg, Germany. (www.phoenixcon.com)

Trojan Technologies is a leading water treatment technology company with the largest installed base of UV systems in operation around the world. It specializes in the design, manufacture and sale of pressurized and open-channel ultraviolet disinfection systems for: municipal wastewater; municipal, commercial and residential drinking water; environmental contaminant treatment; and industrial applications.

(www.trojanuv.com)

FSC, Inc., based in Falls Church, Virginia, is an independent software vendor providing IT solutions for property managers in the Federal Enterprise. The company's Federal Real Property Management/Energy Consumption application supports the requirements of the Energy Policy Act of 2005 and includes an EDI module for processing invoices received from utilities that are in electronic format. FSC's advance meter module uses Modbus protocol to collect interval data on an enterprise basis. (www.govtproperty.com)

Matrikon Inc. will be sponsoring its MatrikonOPC User Group Conferences this fall. The conferences are focused on "Driving Connectivity." They promise to provide practical hands-on information for industrial connectivity issues.

The MatrikonOPC User Group conference has something to offer for professionals from the plant-floor to the boardroom. Sessions are designed to equip attendees with intelligence for users of all experience levels, with tracks focused on OPC fundamentals, advanced OPC integration and corporate strategies.

Scheduled in Houston, Texas on September 13 and 14 and Koln, Germany on October 11 and 12, 2006, MatrikonOPC, industry experts, and end-users will present best practices, lessons learned, case studies and vendor-neutral solutions. Events surrounding the conference dates include OPC hands-on workshops, Executive Standardization sessions, SCADA Security Classes and interactive panel discussions.

Modbus-IDA will be at the conference at both the table-top exhibition and as a presenter. Fred Cohn, Modbus-IDA president, will lead a session titled, *Modbus Protocol's Openness and Simplicity Complement OPC's Power in Industrial Ethernet.*

He will focus on OPC as the industry standard method for SCADA and information systems to access plant floor information. OPC's Client/Server architecture fits perfectly in the PC environments hosting SCADA systems. For OPC Servers to acquire data from the plant floor, a simple, cost-effective, open protocol is needed

that is consistent with the architectures and cost targets of industrial devices.

The Modbus protocol, originally developed for serial device communications, has successfully migrated to industrial Ethernet architectures due to its simplicity, openness, and scalability. Modbus, therefore, perfectly complements the OPC architecture by allowing OPC Servers to communicate easily and efficiently to a full range of end devices found in industrial applications

Other speakers at the conference includes Dick Morley, father of the programmable controller (PLC); Jim Pinto, industry commentator; Tom Burke, OPC Foundation President; Eric Murphy, OPC Foundation HDA Chairperson, and others.

Conference topics include:

- Understanding the advantages of implementing OPC technologies
- Learning different OPC specifications (OPC DA, A&E, HDA, XML, UA)
- Resolving common and advanced DCOM problems
- Securely passing Process Data through firewalls
- Increasing system interoperability
- Automating Process Control systems
- Data exchange and amalgamation
- SCADA Security

Register for the MatrikonOPC User Conference

Dates:
Houston, TX – Sept 13-14
Koln, Germany – Oct 11-12
www.matrikonopc.com/opcug

Anybus X Gateways Translate (almost) Anything

HMS Industrial Networks picked the right name when they developed the Anybus X series gateways. The Anybus-X Gateways have been designed for use in harsh industrial environments featuring standard DIN rail mounting, IP 20 rating and 24-Volt DC power supply. The Gateways are intelligent standalone devices supporting fanless operation and industrial operating temperatures. The design is based on two embedded Anybus communication modules and one additional gateway processor. Thanks to the wide range of Anybus-S Server and Anybus- M Master modules, **more than 150 Anybus-X Gateway combinations are available**. There is no programming involved. You simply choose the gateway version that supports the two networks you want to bridge. For each of all possible network combinations, there is a separate gateway. The gateway concept primarily focuses on the transfer of cyclic I/O data between two networks. During the set-up of the gateway, you select the amount of I/O to be transferred between Network 1 and Network 2. Since industrial networks support different amounts of I/O data, the network with the smaller amount of I/O data determines how much data can be transferred in each case.

The Anybus-X Gateway product family supports 17 different Fieldbus networks. The Anybus-X Gateways help control systems integrators to interconnect any two networks enabling consistent information flow throughout the entire plant.

For more information, visit www.anybus.com.

Anybus X Gateway

Modbus Port Expander Plus

Phoenix Digital's Modbus Port Expander Plus (MPE+) product operates as a Modbus Multi-Client Multiplexer, network server, and communication controller all in one. Phoenix Digital's Modbus Optical Communication Modules (OCMs) provide multidrop fiber optic communications for high reliability Modbus communications. The MPE+ and OCMs are available in modular standalone, panelmount enclosures and 19-inch rackmount/panelmount enclosures with integral 120/220 VAC, 24 VDC, or 125 VDC power supplies. Modbus Port Expander+ features include:

• Multi-Client Multiplexer
   Muliplex up to 8 Modbus Clients with a Single MPE+
   Cascade multiple MPE+ units for additional Modbus Client Multiplexing capability.

• Self-teaching, real-time database
   Instantaneous Modbus Response
   No-Wait Screen Updating.

• Hot standby, failsafe operation

• Peer-to-peer Modbus Communications
   Communicate directly between Modbus server devices

• Host-to-Host Modbus Comunications
   Communicate directly between Modbus host devices

• Interfaces dissimilar Modbus devices
   On-the-fly conversion of all Modbus communication parameters, including ASCII/RTU

For more information, visit www.phoenixdigitalcorp.com.

Modbus Port Expander

Q&A

From the Modbus User Forum...

Newbie Question on Register Assignments...

On June 10th Ed Francy asked,

I am starting development of a Modbus server. Is there some standard for mapping Modbus registers for configuration and measurements? How is a Modbus client configured to use these if I just assign them any way I wish?

I have implemented a HART server previously, and HART controllers have a special language (DDL) for defining how HART clients interact with servers. Is there anything like this for Modbus?

All the specs. I have found on the Modbus protocol define just the protocol, not specfics about how to map your device's I/O. Am I missing something?

Another question - must I do the "multiply floating point values then divide on the other end" method to transfer floating point values? Or can I transfer a 4 byte floating point number with two register reads?

Dweebyone replied,

There are 4 basic types of register in Modicon Modbus:

- 0x register represents a digital output
- 1x register represents a digital input
- 4x register represents an analogue output (16 bit)
- 3x register represents an analogue input (16 bit)

Only the Modbus client can initiate communications. The Modbus client can request data from any server on the network. It should receive a reply from the server in question. You can also broadcast i.e., send a request to ALL the servers on the network. When broadcasting, no reply is given to the client.

There are various Modbus "Function codes" that specify what the client is asking of the server. For example, you may wish to read one off 1x register, or multiple 1x registers. There would be a different function code for these two instructions. There are various function codes for reading/writing or both, for 0x , 1x, 3x, and 4x type registers.

See www.modbus.org for more info.

An anonymous poster commented,

Modbus is the protocol (language) that you use to communicate to the device. The address assignments are a function of the device you are working with and they vary.

Modicon addressing (which is a standard since it was associated with Modbus initially) uses the first digit to determine if it is a digital or analog input/output and the other digits for the addressing.

With PLCs, which allow you to address the I/O as you like, my experience is it is preferable to start your hardware addressing (input/output modules) from the lowest address and keep the addresses contiguous. Allow for future expansion if required.

If your device isn't flexible then you have to use the addressing that they have configured.

Another user suggested:

Clients come in different shapes, forms, and flavors.

Some Modbus clients have the ability to read contiguous server registers as a "block."

So you want to consider which server registers might be most useful to the client and designate them as contiguous registers. Leave the rarely used or esoteric value registers on the periphery of the server map.

Ask your question or help out a fellow engineer on the Modbus Discussion Forums:
modbus.control.com

Modbus RTU to Ethernet...

On June 15th, Carsten Roll wrote:

I want to talk to some meters using Modbus RTU across Ethernet. I have an RS 485 serial to Ethernet converter. Is that possible with the device? Or do I need a special Modbus Ethernet converter? I have the ADAM 4570 from www.advantech.com, but I am wondering why they sell a special Modbus Ethernet converter. My Modbus network is a 2-wire RS485.

bscook replied,

The single biggest factor in determining compatibility with converters is timing. Since Ethernet is packet-based, it can impose delays into the serial stream. Modbus RTU doesn't tolerate delays greater than 13 ms. This should be fine for most adapters on the market, provided that network routing is kept to a minimum. This involves the physical and virtual architecture (e.g., if you're trying to maintain control across a companywide network or (worse) the Internet, you'll have troubles, especially if you have a busy network.)

Also, if your network administrator permits it, converters in UTP/IP mode are faster, have less overhead, and provide the kind of timing you likely need. Many network admins don't permit it, because it floods the network with traffic.

If you have a managed network, your admin can probably set it up to permit UTP/IP across whatever segments you'll be using, without letting it flood the rest of the network.

The downside of UTP/IP vs TCP/IP is that it is more likely to introduce errors into the data stream over very large packet-switched networks, but is generally just fine in smaller networks.

To follow this discussion further, go to modbus.control.com/1026223137

eWON Industrial VPN Solution

It all started with a customer that needed to monitor 220 sites in real time from a central location. The sites had a mix of newer and older equipment from several vendors, some with Ethernet connectivity, most without. The question was: How to interconnect such a variety of devices and protocols both locally and over a distance?

Available options did not meet the project's required reliability, flexibility, or scale. Prices were sky-rocketing, and simplicity and ease of use were often missing.

Browsing the Internet looking for new ideas, the system integrator found the eWON web site and started to think he had found "THE" solution for his customer.. eWON could deliver all the features he needed:

• a serial to Ethernet gateway

• a protocol gateway to Modbus or SNMP

• secure, permanent Internet connection

• remote access for support and remote monitoring

eWON's open architecture and compliance to common industry standards offered features and services he assumed he had to give up, such as a customized web interface, local alarm management, and scripts programming.

What's more, the solution fit the budget with a neat, straightforward implementation, designed specifically for the automation industry.

Modbus Connectivity

Modbus was chosen early in the project as the standard for monitoring critical process data. The PLCs at the newer installations all had Modbus TCP, but the majority of sites had a mix of Modbus RTU, DF1 (Allen Bradley serial protocol), MPI (Siemens' S7 serial protocol), and older AS511 devices (Siemens' S5 series PLCs).

One option was to keep the various protocols and operate remote devices using VCOM gateways. That would be less expensive than purchasing network cards and gateways and could also streamline and unify the communication model. But VCOM lacked overall reliability, and for the scale of the

> **VCOM lacked overall reliability, and for the scale of the project, seemed flimsy and unconvincing.**

project, seemed flimsy and unconvincing.

Another option was to upgrade the older PLCs and let them speak the Ethernet protocol of their own manufacturer. But cost and lead times were unacceptable, not to mention that making major changes to the sites was out of the project's original scope.

A less intrusive solution had to be found. And whatever option was chosen for IP connectivity at the local sites, the project still required a network infrastructure to connect 220 sites at a reasonable cost.

The customer first considered a permanent connection using leased lines. But the cost of installation and operation far exceeded the budget. Dial-up routers on the PSTN or ISDN would also work, but this was inconvenient and would require too much time and attention to set up.

Finally, the idea of connecting the sites through the Internet was considered. Office IT equipment had done this withVPN technology for several years. Dial-up routers could connect to the Internet and establish secure and encrypted connections.

Nice start, but this required outsourcing half the project to an IT and telecom company with the skills to build such a network architecture over the Internet.

The Modbus-IDA Mission

Modbus-IDA is a group of independent users and suppliers of automation devices that seeks to drive the adoption of the Modbus communication protocol suite and the evolution to address architectures for distributed automation systems across multiple market segments. Modbus-IDA will also provide the infrastructure to obtain and share information about the protocols, their application and certification to simplify implementation by users resulting in reduced costs.

Modbus Application Stories

Locally, the eWon solution is a serial to Ethernet gateway that acquires data in a number of protocols and publishes it in Modbus TCP.

The issue of connecting serial devices on each site remained.

eWON VPN Solution

The eWON product family is designed to address the connectivity concerns of the automation industry. Locally, it is a serial to Ethernet gateway that acquires data in a number of protocols and publishes it in Modbus TCP. It stores the data in its own memory tags, monitors the data, and issues alarm notifications, e.g., by e-mail or trap SNMP. It offers a web browser interface to interact with the process through animated synoptics similar to a SCADA HMI.

It is also a transparent gateway, allowing remote maintenance of the serial device using the manufacturer's programming environment. Connectivity between the sites is achieved using an eWON 4005. VPN clients connect through conIX ADSL routers across the Internet to the eSYNC VPN server at the central site.

eSYNC is a software application running on a server at the central site. All eSYNC requires is a public IP address from an Internet service provider. eSYNC takes care of confidentiality, security, and authentication of its clients. eSYNC establishes the private intranet and distributes the routing tables to all connecting parties.

On each site, access to the Internet is ensured by a conIX ADSL router. Next to conIX, eWON 4005 holds the VPN client that connects and reconnects automatically to eSYNC.

eCATCHER, a VPN client running on a PC allows support personnel to join the virtual intranet and perform necessary interventions directly on the local process through the HMI on eWON website.

By seamlessly integrating local automation connectivity into a private wide area intranet, eWON sets new precedents for the industry. More than combining PLC process control with IT and telecommunications, eWON brings Internet tools and technologies — with all their benefits — into the automation world.

This brings significant changes to our vision on remote infrastructure management. The old days of modem polling are over.

Jean-Paul Verheylewegen (jpv@actl.be) is Sales and Marketing Manager for eWON products. He is responsible for ACTL's international network of distributors.
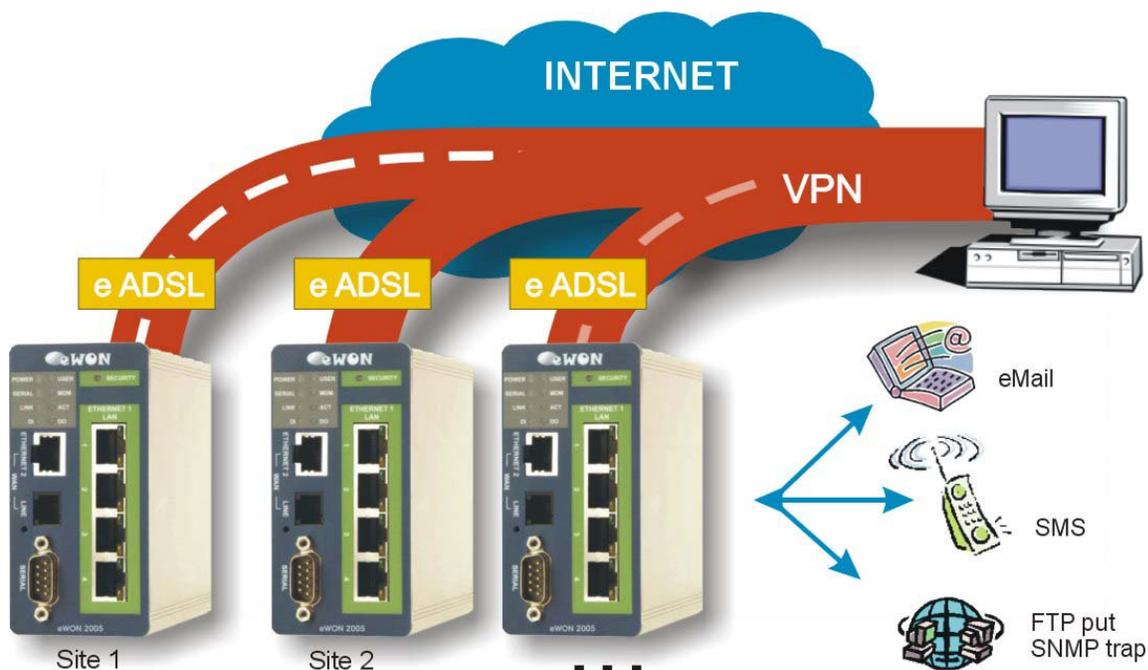
Central Site: OPC server, SCADA, data acquisition, remote maintenance;
Remote sites: serial or Ethernet devices (Modbus RTU, Modbus TCP, ASCII...

Join! Design! Test! Promote! Apply!

We're with you. Modbus-IDA exists to help suppliers and users of Modbus protocols succeed. Our members range from suppliers of Modbus-compliant products, to system integrators, end users, educational institutions, and even individuals.

The common link? They all value the information and services provided by Modbus-IDA, and they all play a role in determining the future of the world's most broadly applied protocol.

To join Modbus-IDA, order a Toolkit, or arrange conformance testing, visit our website:

WWW. modbus- ida.org

Designing with Modbus

Each day, Modbus developers turn to Modbus-IDA for valued assistance with their projects:

• Start with downloading specifications and other design documents from the modbus-ida.org website.

• To really save time, purchase the Modbus TCP Toolkit CD (hint: it's FREE with membership), which contains source code and a myriad of other resources.

• Then, if you come across technical issues that have you stumped, post your question on our highly active developer's forum. One of the many experienced Modbus implementers who frequent this forum will likely have your answer.

Conformance Testing

When your project's done, what then? How do you know it really conforms to Modbus specifications? How do your users know?

The answer starts with running the conformance test suite included with your Modbus TCP Toolkit. This self-test helps you check your design assumptions and catch the subtle "gotchas" that might otherwise slip through your design review.

But to make the definitive statement of your company's commitment to open protocols, submit your product for testing to the independent Modbus-IDA Conformance Test Lab. We'll certify your product as compliant, and post that information on the Modbus-IDA website for the world to see.

Visibility for You and Your Products

And, speaking of the world seeing your products, your membership in Modbus-IDA opens the door to a powerful range of visibility options to highlight your company as a supplier of Modbus-based products.

Exposure on our website, in our newsletter, and through our various trade show appearances are all options that allow you to make the most of your Modbus-IDA membership.

If your company is truly on the cutting edge of new technology, you'll likely also value the opportunity to participate in our technical committees. There, your company's knowledge, experience and technology can help guide future enhancements, extensions and adaptations of Modbus to keep it the world's leader for decades to come.

Time to Apply

When it comes time to get your Modbus network up and running, it's comforting to know that hundreds of thousands of applications have preceded yours. But what if things don't go as planned?

The modbus-ida.org users forum is ready to answer your questions and provide guidance. Thousands of users from diverse backgrounds read the forum, giving you a powerful base of experience from which to draw.

The Future is Yours

So, whatever your role in the use of Modbus, consider joining Modbus-IDA. You'll get the support you need today, and have opportunities to help guide Modbus to a dynamic future.

The Modbus TCP Toolkit CD

The Modbus TCP Toolkit provides all the necessary pieces to develop a Modbus-compliant device, including documentation, diagnostic tools, sample source code, and pre-test software to prepare for Modbus-IDA conformance certification. The toolkit is available as a benefit of membership in Modbus-IDA or can be purchased separately for US$500 plus shipping and handling.
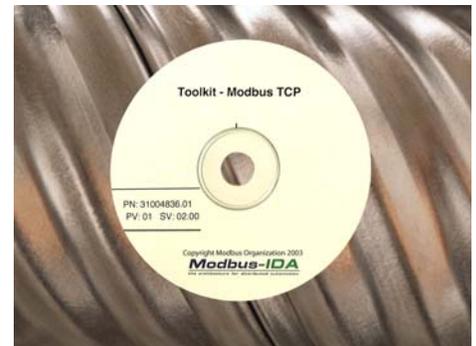
Toolkit Contents

Modbus Documentation

• Modbus Application Protocol Specification, V 1.01a

• Modbus Messaging on TCP Implementation Guide, Rev. 1.0a

Tools

• Modbus/TCP Client Diagnostic Tool

• Modbus/TCP Server Diagnostic Tool

Sample Source Code

• Modbus/TCP Sample Client Code for Visual Basic Win32

• Modbus/TCP Sample Client Code for C/C++ Win32

• Modbus/TCP Sample Server Code for C/C++ Win32

• Modbus/TCP Sample Server Code for C VxWorks

• Modbus/TCP Sample Server Code for C++ VxWorks

Conformance Testing

• Modbus/TCP Conformance Test Software