

October 2009

Modbus Members at ISA EXPO 2009

Several Modbus Organization member companies are exhibiting next week at the ISA EXPO 2009 Show in Houston, Texas. Need a device that “speaks” Modbus or advice on a Modbus issue? Experts at these firms are available to help.

A list of these companies and the booths where they can be found follows:

• Hirschmann	1509
• Kepware Technologies	1325
• MatrikonOPC	1335
• MOXA	2501
• Phoenix Contact	1231
• ProSoft Technology	2127
• Sealevel Systems	2437

modbus-tk: a python implementation of Modbus

A new project has been listed on the Modbus Organization’s Technical Resource page (www.modbus.org/tech.php). Modbus Test Kit (modbus-tk) is an implementation of the Modbus protocol in Python that supports Modbus RTU and TCP for writing masters and slaves. The developer’s main purpose in making this tool available is to make the development of testing tools as easy as possible. (The Python language is flexible and easy to learn and to use.) Modbus Test Kit is distributed under GNU LGPL license. Note that modbus-tk is different from pymodbus, which is an implementation of the Modbus stack in python.

The Modbus.org site offers links to third-party sites for Modbus users’ and developers’ convenience. These are not under the control of the Modbus Organization, and we are not responsible for the contents of any linked site or any changes or updates to such sites. The inclusion of these links does not imply endorsement of the site by the Modbus Organization or imply approval of any content, recommendation or application.

Member Companies Offer Modbus Learning Tools

Whether you’re a noobie or an old hand, you may be interested in checking out some of the Modbus tutorials made freely available by our member companies.

For a nice review of Modbus implementation, go to **Control Solution’s Modbus 101** tutorial:



www.csimn.com/CSI_pages/Modbus101.html

The tutorial covers topics such as:

- What is Modbus?
- Where do I start?
- Review of Modbus Register Types
- Review of Modbus Function Codes
- Modbus: When 40001 really means 1, or 0 really means 1
- If registers are 16-bits, how do I read Floating Point or 32-bit data?
- How many devices can I have on a Modbus network?



Acromag also offers an extensive *Introduction to Modbus TCP/IP* at its website (registration required):

www.acromag.com/supi_tutorials.cfm.

For a discussion specific to Modbus RTU, **Real Time Automation** provides a tutorial, *Modbus RTU Unplugged – An introduction to Modbus RTU Addressing, Function Codes, and Modbus RTU Networking* at:

www.rtaautomation.com/modbusrtu/



This paper includes topics such as

- Modbus RTU Drawbacks – Reporting by Exception
- Data Object Properties
- Modbus RTU versus Other Protocols
- Difference Between Modbus RTU and Modbus TCP

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Meet Some of Our Members...



SCADAMetrics' mission is straightforward: to offer innovative, industrial-grade SCADA Gateways for water meters.

The company's patent-pending EtherMeter was developed to erase the communication barrier between Encoder Registers and PLCs, RTUs, and SCADA controllers. The EtherMeter Gateway is equipped with two meter interface ports and three PLC/RTU/SCADA interface ports. It operates by reading Encoder Registers using the appropriate AMR protocol and transmitting the corresponding totalization and flow data to the SCADA equipment using industrial protocols, such as Modbus, DF1, EtherNet/IP™, raw ASCII, and ADAM-4000.

SCADAMetrics' EtherMeter Interfaces are targeted toward the SCADA, industrial control, and commercial submetering arenas. The EtherMeter is optimized for control system applications, and contains a plethora of features for applications in these markets.

(www.scadаметrics.com)

Proportion-Air, Inc. is a manufacturer of electronic air pressure regulators and air flow control valves. Founded in 1985, Proportion-Air offers a large family of electronic air pressure regulators and air flow control valves



that allow you to select the best product to match your exact application requirements.

The company recently released a Modbus version of its electro-pneumatic pressure control and flow control valves equipped with Modbus. Modbus serial communications capability is available on the popular QBT, QPV, and QB3 series of pressure control valves, which operate as Modbus slaves.

(www.proportionair.com)

Located in central Florida, **Motor Protection Electronics** was founded in 1983, and offers a full line of industrial controls for the water and wastewater industry.



MPE's Station Controller series (SC1000 & SC2000) are SCADA-ready pump controllers designed to perform level control in a wide range of lift station applications. The SC1000 operates the pumps based on selected setup values and the wet well level signal.

The source of the level input signal is menu selectable as either a 4-20 mA transducer or a 10-point conductance probe. The SC1000 alternates the pumps, performs lag pump delays, provides high and low alarms, and has a variety of control options available in the setup menu to customize the controller to the application.

(www.mpeelectronics.com)

Shouldn't your company be a member?



The Modbus Organization Mission

The Modbus Organization, Inc. 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 Organization also provides the infrastructure to obtain and share information about the protocols, their application, and certification to simplify implementation by users resulting in reduced costs.

Modbus Newsletter

This is the newsletter of the Modbus Organization, the international non-profit organization devoted to the evolution and support of the Modbus protocols. For more information about membership and other services, please refer to our website: www.modbus.org

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Modbus Discussion

Q&A

From the Modbus Discussion Forum...

Modbus master control...

Luis Soares asked the forum:

I want to know how I can solve the following situation:

I have one system that communicates using Modbus protocol and RS485 bus, with some network analyzers. I would like to put another Master on the line to make some requests to the network analyzers too.

The problem is that probably with two Masters on the line the messages will get screwed [up] and there will be collisions for sure.

Is there any hardware device (to which I can connect both Masters) that I can use to connect both systems to be able to manage the requests on the line? This device would buffer the requests from the two Masters and avoid problems on the line.

Or is there another way to solve this problem?

Jerry Miille replied:

The MARC Multi-Port (www.miille.com/din366-10p.pdf) is commonly used for connecting multiple Modbus Masters to a network of one or more Modbus Slaves. It works as you describe by buffering the messages and only replying to the Master that made the request. You can contact me directly if you have any questions. [jmiille \[at\] miille.com](mailto:jmiille@miille.com)

critiders had some thoughts and some questions:

I think that you would have to find a way to sync the two Masters somehow. When one of the Masters is communicating, then the other one doesn't, What type of Masters are you using, PLCs or PCs? Also are you using ASCII or RTU?

If you are using the RTU framing protocol, you could extend the silent interval of one of the Masters. Instead of a silent interval of 3.5 characters, try setting one Master's silent interval to something like five characters. This might give you enough of a window to perform the communications.

I never had to use two Masters before, so if you try it, please use caution.

Patrick L commented:

HMS makes a gateway that is a Modbus RTU Slave to Modbus RTU Slave. Connect one Master to one of the Slaves and the other Master to the other Slave. The gateway has a fixed mapping of 512 Bytes In and 512 Bytes Out.

For more info, go to ww.anybus.com or send me an email at: [support \[at\] hms.se](mailto:support@hms.se)

Lorne had another suggestion:

Check out the PLC09 Arbitrator (www.calta.com). It was developed for exactly this application.

Add your comments to this thread at modbus.control.com/thread/1253888117

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Modbus Discussion

Q&A

From the Modbus Discussion Forum...

MBLogic Free Soft Logic - Release...

In February, Michael Griffin announced:

The MBLogic Free/Open Source software project has a new release. The package, which has been known as MBServer, now has soft logic incorporated into it, and as a result is now known as MBLogic. This has been the goal of the project from the beginning.

This is Free Software released under a GPL license. You can use it free of charge, modify it, re-distribute it, etc.

The user-visible parts of the software have been designed to make it fairly simple to strip out the "MBLogic" branding, so if anyone wants to redistribute this under another brand name, that should be pretty straight forward.

MBLogic has the following features:

- Soft logic (PLC) programmability
- Networking to field I/O through Modbus TCP client and server.
- Web-based graphical HMI.
- Online (web-based) help (more than 40,000 words). This has been completely revised since the previous (MBServer) release.
- Online (web-based) status monitoring. This has been completely revised since the previous (MBServer) release.

I am looking for people to use it and would appreciate feedback.

The MBLogic_2009-02-22 package is available at:

<http://sourceforge.net/projects/mblogic/>

There are two versions of this package. The "tar.gz" package is for Linux, and the "zip" package is for MS Windows. Both are identical, except the MS Windows version has had the files modified to use the non-

standard MS-Windows newline (CR-LF) characters in the text files (for easy editing). The "tar.gz" package will probably also work on OS/X, but I don't have a Mac to test it on, so I can't say for sure.

Installation instructions are in a PDF file located in each package.

The project web site has not been updated yet (coming soon), but the packages are online, as well as new screen shots.

The web-based HMI has been tested with the following web browsers:

Firefox (Linux and MS-Windows).
Opera (Linux and MS-Windows).
Epiphany (Linux).
Google Chrome (MS-Windows).
Apple Safari (MS-Windows).
The HMI does **not** work with MS Internet Explorer, as that browser is based on outdated technologies and does not have the features needed for a graphical display. The help and status web pages however **do** work in MS IE (tested with version 8). The help and status web pages, of course, work with all the other browsers as well.

The new soft logic feature is based on the MBLogicEngineCk libraries, which were previously released as a stand alone library. The instruction set and addressing are fully documented in the online help. At present, programming is IL only (ladder support is in the planning stages).

The system ships with a demo program that will run on start up. The soft logic program now controls the HMI "tank" demo screen that was used in the previous MBServer release.

If you modify the sample soft logic program, the changes will be reflected in the HMI behavior. The soft logic and HMI can be changed while the system is running via the status web management interface (effectively, "online programming").

I would appreciate it if people would download this and give me feedback.

Recently, Rudi asked:

Can the MBLogic software be adapted to work with I2C (I²C) and X10? I would use it to replace the software I use today in my home automation system.

If not, could you please point me to some cheap Modbus I/O systems? I need about 64 digital outputs and 16 analog inputs.

Michael Griffin responded:

I haven't implemented any drivers for I2C or X10, as I don't have any suitable hardware to test with. For inexpensive Modbus TCP hardware, I would suggest looking at Advantech. I'm assuming you want the I/O as distributed blocks, in which case the ADAM 6000 series is probably the most suitable.

From Rudi:

I was thinking maybe I can use a Modbus to I2C converter. Googling for such a thing I got the idea to maybe program a micro-controller to do this. There are some with I2C already on board. Don't know if somebody already did.

Read the rest of this thread and add your suggestions at modbus.control.com/thread/1235372036

Modbus users & suppliers get together on the Modbus Community for:

- **Interactivity**
- **Knowledge aggregation**
- **Contact with Modbus users and suppliers**

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Modbus Discussion

More from the Modbus Discussion Forum...

Kepware Modbus TCP with Serial Server...

In September, Jay Banks wrote:

I have an issue and I'm sure someone has run into this before.

Setup:

- B&B ESP901 serial server
- Kepware OPC
- hmisys.com Modbus slave sim
- Modbus TestPro

I set up an old IBM laptop with a Modbus slave simulator configured on it. Seems to work fine.

Using Kepware OPC, I set up two different devices: one TCP and one serial, with the serial using a virtual comm port.

On Kepware, the TCP poll fails, but the serial (on the virtual comm) works fine. The B&B was configured for multiple connections, so that isn't the issue.

Using a program called Modbus TestPro, I can poll the laptop using TCP and it also works. BUT, I can only poll it when I select "raw" TCP.

I'm thinking that since it works on my secondary program, Kepware may be using normal TCP and the B&B only works with raw TCP packets.

I can't find anything on changing these settings on Kepware or the B&B.

If anyone has run into this, I would be interested in hearing solutions.

Ryan Plester responded:

With Modbus, there are in general two ways to communicate via TCP/IP. The first (which Kepware seems to be using) is Modbus TCP. This is basically the regular Modbus serial protocol with some header information sent via TCP/IP.

The second method is usually referred to as Modbus RTU via TCP. This is exactly the same as the Modbus serial protocol except that it is sent via TCP/IP. This protocol does not have the additional header information that Modbus TCP has. This sounds like the "raw" mode of your other applications.

I am not certain how to set this up in Kepware's OPC sever but the MatrikonOPC server for SCADA Modbus has this as a selectable option for each Modbus device you connect to. Also, the OPC server for Modbus allows you to specify this by using the terminal server configuration option. Contact MatrikonOPC Support at support@MatrikonOPC.com or 780-945-4011.

Mark (PeakHMI) offered this:

I tested the Modbus TestPro with the PeakHMI Modbus TCP simulator and one other simulator. I could only run Modbus TestPro in demo mode and the results are the same for both simulator programs.

Both programs received the same request and both responded with the same data and then Modbus TestPro gives an error "Could not send outgoing packet." I assume that is because it is not registered.

From the help dialog in Modbus TestPro "raw" means without the TCP wrapper. I do know the PeakHMI simulator and the other one I tested with will not respond to a "raw" message.

Everest Software also has a Modbus Master/Slave OPC server (serial and TCP). You might want to give it a try.

Jay replied:

I will say that Modbus TestPro will work just fine unregistered. The only thing it will do is annoy the heck out of you with a pop-up. Which means you must have something set up wrong.

I'm no expert on test software, but Modbus TestPro is very reasonably priced and one of the best programs I have used. Or at least I can say, it is much better than any free Modbus master I have tried, and much cheaper than most other commercial software I tried.

The Modbus serial slave sim, on the other hand, works, but is a little quirky at times. But hey, it's free!

Bill Graham (Industrial Thinking) commented:

I am not familiar with the B&B terminal server but the packets used for TCP Modbus and serial Modbus are different.

You can either use a device like a Lantronix box with Modbus firmware (UDS1100 may have been superceded now) to do the packet adjustment for you or you can set up a serial Modbus device in Kepware and tick the use Ethernet Encapsulation option. This effectively sends the Modbus packets in serial format over raw TCP.

Jay answered:

The Ethernet Encapsulation option worked. I did mess with that yesterday, but I now see I wasn't doing it right.

Am I right in thinking that "virtual" comm ports aren't the best way to do things. It seems that in a large setup, you wouldn't want to load a large number of virtual drivers on a system.

Kepware's Fred Loveless chimed in:

If you set the B&B converter to be a Modbus TCP to Modbus Serial converter then you can use the Modbus TCP driver to talk to the serial devices and the converter will strip the Modbus TCP Header and footer from the message and send a normal serial packet.

If the converter is just configured as a Serial to Ethernet converter, then you would use the Modbus Serial driver and select Etherent Encapsulation. This sends a raw Modbus serial packet over Ethernet. Essentially this is what the virtual comm port is doing as well.

E-mail technical support at Kepware and they can help trouble shoot it more.

Add your connects to this thread at modbus.control.com/thread/1253728575

Modbus Products and Innovations

Precision Digital's ConsoliDator Systems Go Wireless

PDS941 & PDS981 Wireless ConsoliDator Systems are prepackaged system configurations that can accommodate up to eight wireless analog input signals, up to four wireless analog output signals (retransmission), as well as wireless Modbus serial communications. The Wireless ConsoliDator will also accept wireless Modbus PV signals in place of any channels 4-20 mA input.

Wireless capability allows for economical long-distance communication, with the additional advantage of avoiding issues associated with hard-wiring inside the plant or factory. Wireless technology provides a wider range of options for solving application problems.

ConsoliDator Systems are packaged to make installation easy; wireless modules are pre-programmed, and internal sub-panels are prewired.

For more information, visit www.predig.com.



ConsoliDator Wireless



Phoenix Contact's New 900-MHz Radio for I/O

Phoenix Contact recently added a busable 900-MHz radio as the newest addition to its Trusted Wireless Ethernet (TWE) portfolio of industrial wireless products. The RAD-ISM-900-EN-BUS allows direct connection of I/O modules to the radio.



RAD-ISM-900-EN-BUS

The radio allows users to collect I/O without a remotely located PLC or I/O data concentrator. The bused I/O is made accessible to the network using Modbus, and can easily be integrated into new or existing PLC, SCADA, or DCS systems.

Phoenix Contact has also added a multiple master function to the 900-MHz TWE radio family to create redundancy and wireless failover

connections if a master or host radio is not accessible. The new multiple master function and busable radio make the 900MHz TWE radios suitable for a variety of industrial applications, such as tank level, pressure, and temperature monitoring, pump status and control, and SCADA system expansion.

For more information, visit www.phoenixcon.com



Need a Modbus Device for Your Project?

Search the database at www.modbus.org/devices.php to find the right Modbus device for your application.

Learning Tools

continued from page 1

Member company **Triangle Microworks** is active in both the Modbus and DNP communities. Triangle Microworks offers test tools, drivers, and source code for both Modbus and DNP. Download the company's paper, *Comparison between Modbus and DNP3* at its website:



www.trianglemicroworks.com/documents/Modbus_and_DNP_Comparison.pdf

This paper includes sections on:

- History
- Data Types
- Reading Data (Inputs)
- Control Operations (Outputs)

Remember that you can always download a copy of the most recent Modbus protocol specifications and Implementation Guides at www.modbus.org.

Join! Design! Test! Promote! Apply!

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

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

To join the Modbus Organization, order a Toolkit, or arrange conformance testing, visit our website:

modbus.org

Designing with Modbus

Each day, Modbus developers turn to the Modbus Organization 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 (FREE with general membership); it 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 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.

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

Visibility: Your Company & Your Products

Your membership in the Modbus Organization also 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, our newsletter, and through our various trade show appearances are all options that allow you to make the most of your Modbus Organization 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.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 the Modbus Organization. You'll get the support you need today, and have opportunities to help guide Modbus to a dynamic future.

The Modbus TCP Toolkit

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 conformance certification. The toolkit is available as a benefit of membership in the Modbus Organization or can be purchased separately for US\$500 plus shipping and handling.



Toolkit Contents

Modbus Documentation

- Modbus Application Protocol Specification, V 1.01b
- Modbus Messaging on TCP Implementation Guide, Rev. 1.0b

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