Modbus Organization Newsletter, Summer 2012

Bringing Water to the People of Lara…

Member company ProSoft Technology becomes involved in a critical water project in Venezuela:

Management of water resources in a state with large urban areas in addition to many acres of agriculture isn't an easy task, no matter what part of the world you are in.

HidroLara is responsible for administering drinking water in the Venezuelan state of Lara, which has a population of 2 million people, and includes Barquisimeto.

continued on page 3

Getting Value from Your Modbus Org Membership

For many of us, the start of the academic year is a good time for reflection and assessment. Planning to gear up for a busy fall?

We thought it would be a good moment to review the benefits of Modbus Organization membership and remind you of the ways to make the most of it.

All member organizations should take full advantage of the various publicity and promotion opportunities we make available.

Members receive preferential listings in the Modbus supplier and device directories. These directories are among the most frequently visited pages of the Modbus.org site, as users search the directories for appropriate Modbus compatible devices for their projects.

Are all your Modbus devices listed? Are spec. sheets or links to technical data included?

Member companies also publish Modbus application stories and product announcements on both the website and in the newsletter. Two such stories are in this edition, and we're always looking for more content to share about uses of the ubiquitous Modbus protocol from around the world.

Were you aware that you can advertise on the Modbus.org website?

With **a half million pages served to almost 30,000 unique visitors each month**, what better place to advertise your Modbus devices and software ?

Contact us for a rate sheet. A special member's discount makes banner advertising an even better deal for Modbus Organization member companies.

For general level members, technical benefits include a free Modbus TCP Developer's Toolkit, discounts on Modbus Conformance testing, and eligibility to become a self-testing entity.

Contact us if you have questions about your membership or you're ready to become our newest member.

Industrial Data Xchange (IDX) is one of the Modbus Organization's newest member companies.

IDX is a South African-based Industrial IT company, providing the products and services to Sub-Saharan Africa. The company offers industrial communications expertise and products such as (industrial gateways, interfaces, test tools and remote monitoring. Acting as a distributor for Anybus, COMsoft, HMS Industrial Networks & PROCENTEC, IDX also designs and manufactures its own products.

IDX provides training and support for many industrial fieldbuses and protocols including Modbus. The IDX Academy includes the PROFIBUS Competence Center and OPC Competence Center for the region.

JVL Industri Elektronik A/S develops and produces electronic controls for stepper and servo motors. The company offers a wide selection of products for motion control, including integrated AC-Servo motors and Stepper motors: AC-Servo motor controllers; DC-Servo motor controllers;

and Motor drivers.

Most recently, JVL announced its integrated servo motor MAC 141 in a stainless steel version especially for the food and medical industry. The MAC 141 has an option for built-in PLC, RS232/485, Profibus, CANbus or industrial Ethernet (including Modbus TCP and more).

These stainless steel motors are designed to handle IP67 and withstand high-pressure wash down conditions. The concept is based on a totally sealed stainless steel tube with stainless steel front flange and rear cover.

Ewing/Kessler,Inc., based in Hernando , Mississippi, specializes in providing total building automation and integration solutions from concept and design, to fully installed and managed systems.

Focusing on the total system provides innovative, customized, broad-spectrum plans for the future based on individual needs and desires. Committed to relationships, E|K AUTOMATION prides itself on being dedicated to service, and responsive to the needs of its clients.

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 nonprofit 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

Newsletter Editor:
Lenore Tracey (lenore@modbus.org)

Bringing Water to the People of Lara, cont'd...

Water resources are somewhat scarce in the state, and special management is essential.

Besides its urban areas, such as Barquisimeto, the state of Lara is largely agrarian.

HidroLara began a pilot project in 2011 at its Los Dos Cerritos water substation, which collects water and distributes it from the Los Dos Cerritos reservoir: The company installed a supervisory system based on Rockwell Automation's Factory Talk coupled with wireless communication. At the time, the Venezuelan water company was having a difficult time integrating the supervisory system and end devices, because of the multiple communication protocols involved, including Modbus and PROFIBUS DP.

Gathering data from the Los Dos Cerritos Reservoir and its aptly named substation is critical. "It's a fundamental part of the city, as a large amount of water is taken through these two facilities," said Juan de Sousa of LS Innovaciones, the integrator who devised the solution.

LS Innovaciones proposed a new communications architecture at the Los Dos Cerritos Water Substation using ProSoft Technology's gateways to communicate between the PROFIBUS DP and Modbus RTU network. Their solution involved both wired and wireless communication. On one end, radios were transmitting signals from pumps into the Hidrolara network, while the gateway was controlling and gathering data for the discharge valves on the other end of the network via PROFIBUS and Modbus.

HidroLara can see all the variables in the water substation and check important variables, such as the flow levels from the Los Cerritos Reservoir.

"Hidrolara is very happy with this project," de Sousa said. "They can see all the variables in the substation. They want to do this project in five additional substations."

De Sousa chose ProSoft Technology's gateways, because they support a variety of protocols that can be used in many different applications.

"ProSoft Technology offers several products that interface different communication protocols," De Sousa said. "Our company often connects different devices, and having a platform like ProSoft is very important. We have used different ProSoft gateways with different protocols including Modbus, Profibus, DNP 3.0, Ethernet/IP and Modbus TCP, and they all work correctly. We have also used ProSoft wireless devices, which have given us very good results."

ProSoft® TECHNOLOGY

De Sousa also added that ProSoft Technology products are easy to configure and its technical support is top notch. "Latin-American Support Engineer Jose Victor provides excellent support when there is any question about the product."

Victor Garcia,
ProSoft Technology

Products such as ProSoft's ProLinx family Modbus Client/Server to PROFIBUS Client communications gateway (5104-MCM-PDPMV1) create a connection between devices on a Modbus network and PROFIBUS DP Server devices. The module is a stand-alone DIN-rail mounted protocol gate-way that provides one serial port and one PROFIBUS Client DB9F port.

Modbus TCP Client-to-Client Communication ...

A large oil and natural gas platform in the North Sea was expanding its facility capabilities by adding a massive system module (over 1.5 million lbs) to the existing platform infrastructure. In order for the two systems to communicate seamlessly with one another, the proper communication channels needed to be established.

COMTROL® Network Enabling Devices

Control systems on each structure were configured to communicate with each other through a serial Modbus RTU RS-232 or RS-485 channel. However, the Modbus device configuration on each side was designed to communicate as a client, while traditional Modbus communication takes place between a client and a server.

Each structure's respective developers had invested substantial resources into their control systems, so the systems integrator needed to find a way to overcome this obstacle by converting one configuration to act as a server in the most cost-effective way possible – or by making two Modbus client devices communicate with one another.

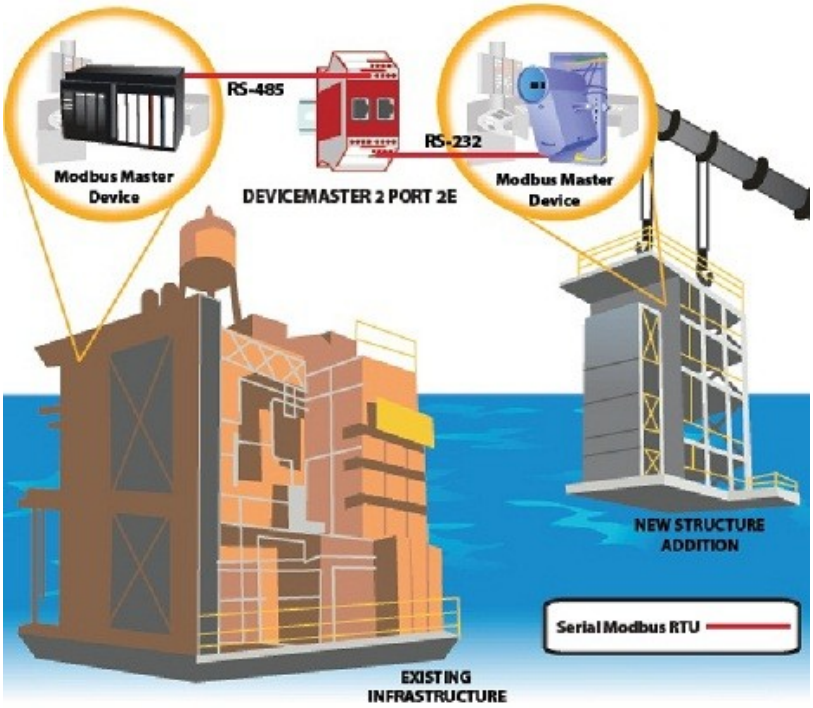
Many industry experts have e pressed that client-to-client Modbus communication is impossible, but Comtrol had developed an innovative process to make a Modbus client communicate with another client.

The systems integrator assigned to this task researched client-to-client connectivity, and ultimately discovered the DeviceMaster UP's capabilities on a respected online forum. Hesitantly beginning the application, the integrator was highly satisfied with the end result.

As seen in the diagram, Comtrol was able to address this integrator's problem using the DeviceMaster UP 2-Port 2E Modbus gateway running Modbus TCP firmware. Information coming from each control system/Modbus client device would be routed through serial Modbus RTU into the DeviceMaster UP.

Internally, the firmware essentially provides a Modbus server to respond to each (external) client's commands. The servers are then internally linked to each other to complete the communication process. Unless one views the DeviceMaster UP's internal configuration, the end user only observes that he/she is able to connect one client to another successfully .

The Modbus TCP firmware is the original DeviceMaster UP Modbus application. It was designed to provide great flexibility for connecting both Modbus serial servers and Raw/ASCII devices to a variety of Modbus controllers and applications. Such advanced Raw/ASCII options as filtering, command/response mode, peer-to-peer Modbus communications, and simultaneous connections to multiple Modbus controllers and/or Ethernet TCP/IP applications make the Modbus TCP firmware the flagship of all Modbus gateways.



Q&A from the Modbus Discussion Forum...

Firmware Update an Embedded System over Modbus RTU using UART...

Vee posted this message to the forum :

Can I update the firmware of an embedded system using Modbus RTU over UART? If yes, what function code needs to be used for firmware update? and how?

Currently, my system supports 1, 2, 3, 4, 5, 6, 15, 16, 23 function codes.

A quick reply will be highly appreciated.

David replied:

I'm aware of one control device that uses Modbus for download and upload of configurations. It uses function codes 20 and 21 to transfer the configuration data.

That same device applies firmware updates with a Windows based "loader" application that manages the firmware data download.

My gut feeling is that if you have to ask how to accomplish a firmware update, you're not in a position to execute an update successfully.

Vee responded:

Can you please name that control device? [In] what format [do] you receive a file on the device; how does it get stored in memory?

I'm a novice programmer for Modbus and firmware update. I've implemented Modbus using some function codes as mentioned.

Your response refers to function codes 20 (0x14) & 21 (0x15) which are Read File Reference & Write File Reference respectively.

I feel that there is no file read or write function under Modbus.

Does the use of the function code 16 (0x10), which would allow to write 200 bytes of data per message, from PC to device resolve my problem?

Following are the steps I would like to implement for firmware update through Modbus RTU over serial (loading device with a new image file):

1. Break down the image file (FW update) into groups of bytes not to exceed 200 bytes per group.

2. Encapsulate each of the 200 byte groups as write register commands (i.e., add destination Modbus Address 1-249), function code (16 (0x10) = write multiple registers), starting address (two bytes, value depends on how you are managing the counting of groups), qty = 2 bytes value 200 decimal, and than the error check (CRC-16 two bytes).

3. Transmit the groups of bytes from PC to device ONE group at a time. As the response indicates that group of bytes is received, send the next one.

4. Assemble the file from the received groups on the other end (server).

Please correct me if I'm wrong.

Lynn August Linse jumped in:

As someone else pointed out, most vendors either use proprietary functions like 0x7D, or the file read/write. Using standard functions like 16 will be problematic since Modbus holding registers have no notion of moving 128Kbytes as a whole, which is why the file read/write is preferred.

Plus how are you going to prevent missing a block or duplicating a blocks? Imagine this situation — you write block #75, the server sends a response so now expects block #76, but your master misses the response and resends block #75.

In your design you are already demanding a custom "client" tool breaking up the file and sending it, as well as a custom "server" function — why bother misusing using function 16? What does it buy you? Problems is all that I can see you gaining.

The file read/write include offsets, plus if I understand the standard correctly the 10000 'records' can be, for example, 200 bytes each, so one could move a file of up to 2 MB. If your product has different text/code segments, those could be different files which allow you to replace the code in phases.

Read more or add your comments to this thread.

Join! Design! Test! Promote! Apply!

We're with you. The Modbus Organization is there to help suppliers and users of the Modbus protocol succeed. Our members range from Modbus device suppliers, 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.

Designing with Modbus

Modbus developers rely on the Modbus Organization for valued assistance with their projects:

- Start by downloading specifications and other design documents from the modbus.org website.
- To save time, purchase the Modbus TCP Toolkit CD (FREE to general members); it contains source code and a myriad of other resources.
- If you come across technical issues that have you stumped, post your question on the modbus.org forum. One of the many experienced Modbus implementers who frequent this forum will likely have your answer.

Conformance Testing

When your project's done, how do you know it really conforms to the Modbus specification? 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.

Then submit your product for testing to the Modbus Organization for conformance testing. 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.

Your company will 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?

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

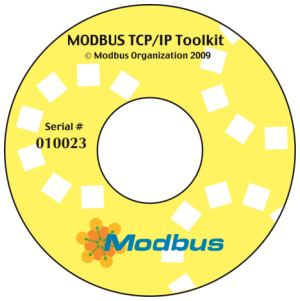
The Future is Yours

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.

Download the Modbus Organization Membership Application to learn about the different membership levels and their associated benefits.

Modbus TCP Toolkit v3.0

The Modbus TCP Toolkit provides all the necessary pieces to develop a Modbus-compliant device, including documentation, diagnostic tools, sample source code, and pretest software to prepare for Modbus conformance certification.



The toolkit is available as a benefit of corporate-level membership in the Modbus Organization or can be purchased separately for US$500 plus shipping and handling. The toolkit contains the following items:

Modbus Documentation

- Modbus Application Protocol Specification, v1.1b
- Modbus Messaging on TCP Implementation Guide, v1.0b

Tools

- Modbus TCP Client & Server Diagnostic Tools

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

Modbus Conformance Testing

- Conformance Test Tool v3.0
- Conformance Test Tool v2.1

Additional Resources