Modbus-IDA News

the architecture for distributed automation

Open Tools for Modbus Developers and Users

Were you aware that the Modbus Organization web site includes among its technical resources, various links to free tools for Modbus users and developers?

While these linked sites are not under the control of the Modbus Organization and we are not responsible for the contents of any linked site or any link contained in a linked site, or any changes or updates to such sites, we provide these links as a convenience. And although the inclusion of any link does not imply endorsement of the site by the Modbus Organization or imply approval of any content, recommendation or application information found on that site, they are well worth checking out.

That being said, we added three new resources this summer for your review:

• **Modbus® applications for the Mac OS X operating system**. ModBusProbe was developed by Matthew Butch of Volitans Software and Rudy Boonstra of R Engineering Inc. to provide one of the necessary tools to use the Apple Mac OS X platform for industrial control. Additionally, the framework ModBusKit was released to encourage further software development.

• **MBServer.** A collection of programs and libraries offering both client and server Modbus TCP functionality, MBServer includes both stand-alone servers and clients, as well as command line utilities and libraries which may be incorporated in your own application. The software is compatible with both Linux and MS-Windows and is licensed under the GPL as Free Software.

• **Free Modbus Simulator.** Modbus RTU and TCP/IP simulator intended as a client-tester and for users commissioning HMI/SCADA applications. This Modbus Simulator has several features, emulates multiple servers at once; and makes C++ sources available.

The authors of these tools would welcome feedback. Check out these and more on the **Modbus Technical Resources** page:

http://www.modbus.org/tech.php

Download Presentation: Integrating Modbus in CIP

Almost a year ago, ODVA extended the CIP standard to provide seamless access to Modbus devices, requiring no change for Modbus TCP and Modbus serial target devices or EtherNet/IP target devices (*CIP Networks Library Volume Seven: Integration of Modbus Devices into the CIP Architecture, Edition 1.0*). Conforming solutions allow Modbus devices to be integrated and accessed from CIP originators and software tools, giving CIP originators basic read/write access to data in Modbus devices. Modbus data is brought into the CIP application in a way that is consistent with the CIP communications model. Any device that can function as a Modbus server device can be included in a CIP network. This includes both simple devices, such as HMIs, and complex devices, such as PLCs.

E-mail us (info@modbus-ida.org) for a copy of the presentation on integrating Modbus into CIP that was distributed at Hannover Fair in April 2008 (pdf format) or download the presentation on the Modbus Organization home page:

http://www.modbus.org

Welcome to New Modbus Members!

• Byres Security Inc
• Guangzhou ZHIYUAN Electronics Co., Ltd.
• NIVUS GmbH
• Proportion-Air, Inc.
• Softing North America, Inc.
• Spinwave Systems, Inc
• Wachendorff Prozesstechnik Gmbh & Co KG

Meet Some of Our Members...

Guangzhou ZHIYUAN Electronics Co., Ltd. is an embedded solution provider in China. The company was founded in 2001 and its headquarters is located in Guangzhou. Guangzhou ZHIYUAN Electronics' industrial communication department is dedicated to the development of advanced industrial communication network technologies, providing high-quality products, solutions, and services with leading technologies including

Modbus, CAN-bus, DeviceNet, Industrial Ethernet, and other field bus-related application fields.

(www.embedcontrol.com)

Kalki Communication Technologies is a leader in standards-based control, communication and computing solutions for the energy automation industry.

Kalki helps organizations design, develop, and deploy intelligent products and systems that measure, monitor, control, visualize, manage and optimize the energy flow across the entire energy value chain: exploration, production, processing, conversion, renewable energy, transmission, distribution, trading, storage and consumption.

Kalki's product line includes secure, field-proven gateways for protocol integration and translation. The company's products are used for power generation, transmission and distribution, oil and gas, industrial automaton, utilities, and remote monitoring applications. Its industrial gateways are ideal for integrating multi-protocol industrial networks seamlessly and enable data acquisition, historical archiving as well as application integration. OEM embedded modules make it possible to integrate popular industrial protocols easily and quickly into OEM products.

(www.kalkitech.com)

Shouldn't your company be a member?

Modbus Newsletter

This is the newsletter of Modbus-IDA, the international nonprofit organization devoted to the evolution and support of the Modbus protocols.

For more information about membership and other services of Modbus-IDA, please refer to our website: www.modbus.org

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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-IDA

Spinwave Systems develops next-generation wireless sensing products and deployment tools specifically designed for commercial building automation to enable highly energy-efficient building operations and productive and healthy environments.

Spinwave's products are designed for system integrators to incorporate wireless sensors into standard new construction or retrofit and upgrade projects with minimal change at a low cost.
Products are designed to interface with the broadest range of building automation systems allowing a high degree of flexibility.

The company's product line includes:

• Wireless sensors

• Mesh repeaters/routers that extend the range and node count of wireless sensor networks.

• Deployment tools, (e.g., a mobile site survey tool, NetQuest™ software for network commissioning and maintenance).

• Building Management System interface options.

(www.spinwavesystems.com)

Triangle MicroWorks provides communication protocol software libraries, conformance testing software, protocol gateways, and OPC drivers for industry-standard communication protocols such as Modbus, DNP3 and IEC 60870-5. Its ANSI standard "C" source code libraries are used by equipment vendors to cost-effectively implement Modbus, DNP3, and IEC 60870-5 communication protocols

directly in the target hardware.

The communication protocol test harness is a Windows application that can easily be configured as a typical client or server device. Tcl/TK scripts are available to perform conformance test procedures published by the technical committees of each protocol. The Windows PC-based protocol gateways are used by system integrators and utilities as data concentrators and to translate between communication protocols. A full 21-day evaluation version of the SCADA data gateway and communication protocol test harness applications may be downloaded directly from Triangle MicroWorks' website.

(www.TriangleMicroWorks.com)

Taiwan-based **Korenix Technologies Co., Ltd.** is devoted to designing and manufacturing quality industrial networking and communication products, such as industrial managed and unmanaged Ethernet switches, PoE managed and unmanaged switches communication computers, serial device servers, and Ethernet-based I/O modules.

Korenix products can be found in a wide variety of vertical markets around the world, such as transportation, automation, factory and facility management, energy and environmental monitoring, equipment control, military, banking, telecommunications, and medicine. Korenix also provides custom services.

Korenix recently won the 2008 Golden Penguin Award for its JetBox 9300 Series, reflecting the company's determination to bring the best embedded Linux solutions to its target market.

(www.korenix.com)

Modbus Discussion

Q&A

From the Modbus Discussion Forum...

Large Modbus Network...

In March, Yopy posed this question:

How to connect 400 Modbus devices into Modbus network? As far as I know Modbus protocol supports 255 devices, and if using RS-485, will only support 31 devices + 1 Modbus Client.

Jerry Miille replied:

It is not possible if all the Modbus devices are on the same communication network, because the Modbus address field is only 8 bits wide. Thus you cannot uniquely address 400 unique locations.

If you can divide the 400 devices into groups, then you can connect them all to a single client.

The product to use goes by several names such as Data Concentrator, IFE (Intelligent Front End) or Polling Client. There are other names as well; Google any of these terms and you will find more names.

The concept is that all these devices will collect data from one or more independent Modbus networks, each network having several Modbus Servers and store the data collected into a single "database". That database can then be accessed by another Modbus client using a single Modbus Address, thus "concentrating" the data from many Modbus Servers into a single Modbus address.

If you can split up your devices onto several networks, then the problem evolves to how much data you need to collect (thus, how many "data concentrators" do you need because they will have a finite database size), what kind of response time is required (it takes time to update the database by reading all the Modbus servers) and very significantly, if you are going to do controls, that is send a command to change an output from the single Modbus client to one of the 400

Modbus servers, how long does it take for the control to get to the proper server.

We have products that can function as a data concentrator. See this link http://www.miille.com/PCds.htm for data sheets on our Omnii-Comm products.

Add your advice to this thread, at modbus.control.com/1026244672.

Modbus Sniffing Serial Line...

On April 1, Patrick wrote to the forum:

We have a working installation on Modbus serial RS232 (point-to-point connection).

I want to visualise the data that goes over the line (like it is possible in Ethernet in promiscuous mode with Wireshark).

How can I do this?

I guess I have to build a sniffing tap and have two serial ports in my PC? Or can I convert it to RS485 and have this signal in my PC?

I want to see the traffic of both, and also timing is important. There are some problems (+/- four times a day).

Curt Wuollet replied:

I've used the Frontline product and it does work well for data capture, but if you want to timestamp, I've had better results under DOS. You can also hook up a storage scope to the handshake lines if you really want to unravel timing issues. You can also get scatter data on the timing and capture around NAKs.

Eric Ratliff suggested:

You would need three RS-485 converters; that should work. You might not catch events where both ends start transmitting at the same time though. They should not do that, but we know that something is wrong... You could use two of our [ICP DAS USA] I-7520 converters to get the

signal to two wire RS-485. Then one I-7561 to eavsedrop via USB (see link below).

If the Modbus client or server is a PC, you might be able to use just software, similar to using WireShark. See http://www.tucows.com/preview/301057 for example.

From Robert Scott:

Your idea of using two serial ports on a PC is a good one. You will be able to log the two separate data streams (TxData and RxData) by connecting them each to an RxData input of a serial port.

But then you said timing was important. This could be a problem. Serial ports on a PC running Windows or any other non-real-time operating system will buffer the serial data in their driver software so that you will have difficulty time-stamping the received characters with accuracy any better than about 50 msec. This means it might be difficult to see how the two data streams interleave or measure precise timing between messages in the two streams. Are you sure you need such precise timing information?

Usually the data alone is sufficient to debug protocol problems. If you have some idea of the nature of the failure you are trying to track down, and it only happens once in a while, then you might be able to program a custom filter on the sniffing program to look for suspicious patterns, rather than just log all raw data.

Read more comments or add your advice to this thread, at modbus.control.com/1026244892.

Spinwave Systems Announces New Wireless Pulse Counter

Spinwave Systems, Inc. produces wireless mesh networks for energy management and building automation. The company recently announced its next-generation wireless pulse counter for monitoring energy consumption and water usage. The new pulse counter replicates actual utility meter outputs dynamically, bringing the highest degree of responsiveness and accuracy to wireless energy management, sub-metering, building systems monitoring, and demand response.

The data collected shows actual consumption of electricity, water, or gas at a location. The new pulse counter also increases the range of environments in which wireless mesh systems can be installed, enabling a greater number of businesses to implement these systems.

The pulse counter's Adaptive Pulse Regeneration technology provides a groundbreaking way to transmit meter data with a battery-powered device. Pulse counters dynamically reproduce utility meter outputs, resulting in highly accurate, up-to-date data over wide demand ranges. This level of immediacy in data collection allows for better usage monitoring, which translates into better control and verification of energy management and demand response programs.

The device supports both alkaline and lithium batteries, for extended battery life in extreme temperature environments. In addition, it is specifically designed to increase battery life by conserving energy use. Each pulse counter goes to sleep between data transmissions, wakes up when called upon to transmit data, then goes to sleep again. With this technology, batteries can last up to eight years. The second generation of pulse counter continues to offer the high reliability, flexibility, and cost-effectiveness found in the first generation of Spinwave products.

Spinwave's wireless I/O module replicates the pulses of up to four meters, or meter data can also be made available using Spinwave's Modbus, LON, or BACnet gateways.

To learn more, please visit www.spinwavesystems.com.

Softing Announces Version 2.0 of Its Modbus OPC Server

Version 2.0 of the Modbus TCP OPC Server from Softing offers even greater functionality and an even higher level of user comfort. It is now available for Windows Vista and Server 2008 as well. The OPC Server offers quick and convenient access to the I/O registers and coils of any Modbus TCP device. An extra bonus of Softing's product is its ability to act as Modbus client and Modbus server at the same time. This product can help greatly reduce system design costs with an installation time of only one minute, a simple and intuitive user interface, and the ability to import the configuration from Excel. Support for symbolic variable names makes it easier to produce a clear system design with direct reference to the actual equipment.

An integrated Web server provides (remote) diagnostics and visualization of process data and states via a standard Web browser. Reading and writing the Modbus data in Visual Basic, Excel, and any SCADA system is easy using the supplied OPC ActiveX Controls. The integrated, server-side OPC tunnel also allows secure and efficient remote access to controller data without using DCOM — even through firewalls. Additional system security is provided by configurable access control based on user name and password.

For more information, go to Softing's website: http://www.softing.com/home/en/industrialautomation/products/opc/server/modbus-tcp.php.

Building Automation's New Vistas

To some the vision of the future is more about soaring energy costs, global warming concerns, and increased environmental awareness, and less so space exploration and brave new worlds. The "Enterprise" the building automation industry is trying to reach is more down to earth than that of Captain Kirk and crew. Its mission is to improve the design and operation of building processes to reduce emissions and improve energy usage. Fulfilling this destiny means the enterprise systems need to be monitored and maintained. Far from being science fiction, providing the ability to connect building automation systems to the enterprise using OPC is very much a reality today.

Beam Me Up, Scotty

Wouldn't it be nice to be able to transport any object across great distances almost instantly? In the today's building automation systems, real-time information does just that. A modern building management system monitors and operates all technical facilities; heating and air conditioning, security and surveillance, lighting, fire and safety systems and other equipment. Managing these data sources ensures optimal building performance by enabling integrated control of building systems.

However, enterprise facility management requires more than just building automation control systems. Real-time information from these sources must also be supplied to advanced applications, such as decision support systems, historical analysis, process optimization and energy calculation, and other high-level information processing systems.

United Federation of Data

The various building automation subsystems come from many manufacturers using a wide range of different connectivity methods. Building automation and control systems have to communicate with several common interfaces such as Modbus®, BACnet,

and LonWorks®, as well as a wide range of proprietary protocols. Advanced automation, systems integration, enterprise-level connectivity, and a new generation of efficient and intelligent hardware bring real advantages that businesses can leverage to make buildings more productive and less expensive to operate. To realize these benefits the building automation systems must

integrate with higher level systems.

OPC is the preferred method for standardizing the integration of facility management systems, building automaton systems and business management applications to perform the complex task of enterprise energy management. OPC is like a federation of different worlds of data, united to achieve a common goal.

To Boldly Go Where No One Has Gone Before

The mission is more than just automating buildings. It is now a question of ensuring the greatest return on this green investment. Improving the use of existing systems requires timely access to data to determine the best way to control and manage the building systems. OPC allows users to integrate real-time and historical building system information into existing business applications for a complete view of their facilities and energy requirements.

The vision of the near future is complete enterprise-wide integration of managed assets including building systems across the space of the Internet. The OPC UA is the next generation of OPC specifications, which are implemented on a service-based architecture. This promotes the power of standard-based connectivity across more layers of the enterprise. Service-based models

also allow OPC UA to leverage standard security aspects such as authentication, encryption, data integrity and auditing.

Another key component of OPC UA is its ability to be an enabling technology for other industry standards. An example of such a standard in the building control world is oBIX (OASIS Open Building Information eXchange Technical Committee), which is an industry-wide initiative to define XML- and Web services-based mechanisms for building control systems. Using standardized protocols such as OPC UA and oBIX enables facilities and their operations to be managed as full participants in knowledge-based businesses.

Organizations are using OPC to integrate real-time and historic building information into existing business applications to improve the balance between people, infrastructure, facilities and the overall impact on the enterprise bottom line. As new connectivity standards and building management systems technologies converge with existing enterprise systems, building owners and property managers will see increasing benefits. By providing interoperability between disparate equipment throughout the enterprise, OPC leverages a company's total technology investment for better system performance and a greater return on investment.

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, and educational institutions.

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.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 (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-IDA Conformance Test Lab. We'll certify your product as compliant, and post that information on the Modbus website for the world to see.

Visibility for You and Your Products

Your products, your membership in Modbus-IDA 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, 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

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
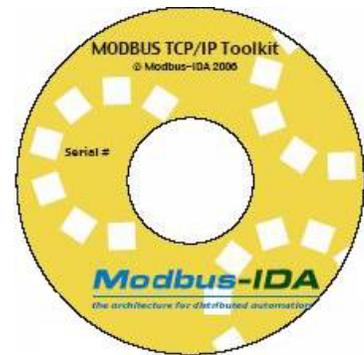
Modbus Documentation

• Modbus Application Protocol Specification, V 1.01b

• 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