

Summer 2005

ARC Advisory Study Places Modbus TCP in the Lead

A new study by ARC Advisory Group, the leading analyst firm covering automation and enterprise software, shows Modbus TCP as the top industrial Ethernet protocol, in terms of units shipped in 2004.

This standing for Modbus TCP is particularly significant given the current and projected growth of Ethernet in industrial applications. According to ARC Advisory Group, “the worldwide market for Industrial Ethernet is expected to grow at a Compounded Annual Growth Rate (CAGR) of 51.4 percent over the next five years. The market totaled 840 thousand units in 2004 and is forecasted to total just over 6.7 million units in 2009.”



Ken Crater, president of Modbus-IDA, cites the familiarity and ease of application of Modbus TCP, along with the protocol’s openness, as reasons for its current success in the marketplace. According to Crater, “the proliferation of Modbus TCP is related to the open posture we have adopted for the protocol. The Modbus specification may be freely downloaded on the web, and there is widespread familiarity with its application due in part to the number of open-source implementations of the protocol that are available today.”

Crater credits the simplicity of implementation as an important factor in the protocol’s popularity: “Absent a compelling business need to the contrary, straightforward protocols such as Modbus TCP are easier and faster to code, apply, and troubleshoot than more complex protocols. This reduces cost and helps companies move more quickly in their markets.”

As is often the case, however, success may, in fact, be the primary reason for success. The serial versions of the Modbus protocol have long enjoyed a position of market leadership, and a number of gateway products exist that can bridge between the serial and Ethernet variants of the protocol. The availability of hundreds of compatible products, combined with legacy installations of the serial protocol, have doubtless contributed substantially to the rapid acceptance of Modbus TCP.

Modbus RFC Process Unveiled

Modbus-IDA is pleased to announce an on-line Request for Comments (RFC) system open for the input of Modbus developers’ worldwide. The RFC process will be up and running on the new Modbus-IDA web site (www.modbus-ida.org) by the first of September, 2005. This process is the Modbus-IDA mechanism used to influence the evolution of the Modbus protocol. Initially available only to Modbus-IDA members, the process will be open to all registered Modbus developers.

Allowing broad participation is the best way to assure that the protocol evolves in a direction that meets the needs of the community. It is one of many policy decisions that reflect the organization’s commitment to Modbus’ status as an open protocol.

Two steps will be required to participate in the RFC process:

- Obtain a login account on the Modbus-IDA *Technical Resources* page. Some users already have an account. To open a new account, follow the instructions on the page to obtain a Username and Password. The page also offers help in case you forgot the Username or the Password of a previously obtained account.
- Send e-mail with the subject “Username for RFC,” containing your Username in the body of the message, to info@modbus-IDA.org.
(continued on page five)

Organization News • Organization News

Meet Some of Our Members...



ACKSYS Communications & Systems

was founded in 1984 as a hardware and software consulting firm. Today the company designs and manufactures a comprehensive range of communication solutions for all those sectors of the industry for which performance, reliability, and sustainability constitute a main objective (e.g., industrial automation, telecommunications, aeronautics, army, transport and medical fields). The company's products include serial multiport boards, intelligent serial synchronous controllers, serial-to-Ethernet device servers, serial-to-wireless device servers and interface converters.

For more information visit the ACKSYS website. (www.acksys.fr)

Founded in 1993 by Serge Bassem and Pierre Crokaert, the Belgian firm **ACT'L** began as an electronic and industrial engineering company. In 1996, in cooperation with the University of Brussels, ACT'L started developing the QWave, an innovative quality control system to supervise large electric power networks. At the same time

ACT'L continued to develop hardware and provide industrial automation services to the food and drug industry. In 2000, ACT'L introduced the eWON system, based on a smart industrial data router accessible remotely through the Internet. Today, the eWON product range includes three different versions covering a wide scope of price/performance requirements. (www.ewon.biz)



Dataforth Corporation was founded in 1984 by engineering management personnel from Burr-Brown Corporation (now Texas Instruments). The company has become a worldwide leader in Instrument Class® Industrial Electronics – rugged, high-performance isolated signal conditioning, data acquisition and data communication products that play a vital role in maintaining the integrity of industrial automation, test and measurement and quality assurance systems. Dataforth products directly connect to most industrial sensors and protect valuable measurement and control signals and equipment from the dangerous and degrading effects of noise, transient power surges, internal ground loops, and other hazards present in industrial environments. (www.dataforth.com).

Based in Malmo Sweden, **connectBlue** supplies complete Bluetooth® solutions for industrial and commercial use. The company's staff has been involved in the development of Bluetooth wireless technology since its conception. connectBlue's offering includes OEM and serial port adapters and the Bluetooth Enabler Development Kit, **connectBlue** as well as data and voice interfacing UARTs, general purpose I/O, SPI, Ethernet, industrial fieldbuses and more. The company's embedded development staff helps customers embed applications into the Bluetooth Baseband Controller (single CPU solutions). From simple cable replacement to advanced products that enable full Bluetooth functionality, connectBlue has products and expertise to assist customers with their special requirements. Through Bluetooth University, they also offer a program to teach about Bluetooth technology and its implementation. (www.connectBlue.com)



Join
Modbus-IDA
see back cover for details...

Modbus-IDA at Hannover Fair 2005

In Hall 9, stand A 59, Modbus-IDA made its second appearance at Hannover Fair. Expanding the booth and hosting 14 booth partners, the organization received lots of attention this year.

We were pleased to be able to introduce our members and the Modbus-IDA mission to a worldwide audience of over 205,000 visitors from April 11 through April 15.

The show was a day shorter this year than it has been in the past, but the number of inquiries about Modbus-IDA and its activities and member companies increased significantly.



Modbus-IDA Booth, Hannover Fair, April 2005



Modbus-IDA members meet with customers in the Modbus booth at Hannover Fair 2005

Modbus-IDA

*Join the Modbus-IDA
Marketing Committee
and help us help you!*

Participate by e-mail!



*Modbus-IDA Booth at
ISA EXPO October 2004*

In October 2005: Modbus-IDA to Show at ISA EXPO

Modbus-IDA is currently planning its exhibit for ISA EXPO 2005. This year's show is at the McCormick Place Lakeside Center October 25 - 27.

We keep listening and keep improving exhibition opportunities for our members. What better way to promote your company's Modbus products than exhibiting with Modbus-IDA? Once again show partners will have premium exhibition space with lockable kiosks, signage, and wireless connectivity.

For more information about Modbus-IDA's [Show Partner](#) and [Show Visibility](#) Programs, e-mail info@modbus-ida.org.

Modbus Products and Innovations

TESTED

Dataforth's isoLynx SLX200 Certified for Modbus TCP and Modbus over Serial Line

DataForth Corporation's isoLynx SLX200 recently passed conformance testing for both Modbus TCP and Modbus over serial line. The isoLynx SLX200 is a fast, intelligent, fully isolated data acquisition system that provides reliability, accuracy, and isolation for a wide range of rugged industrial applications. The isoLynx SLX200 uses Dataforth's line of SCM5B signal-conditioning modules and SCMD digital modules. The system supports up to 60 analog and 128 digital I/O channels. All I/O is channel-to-channel isolated. The device supports communication using Modbus RTU over RS-232 or RS-485 (two or four wire) and Modbus TCP over 10Mbps Ethernet.

The isoLynx SLX200 supports Modbus Function Codes 1, 2, 3, 4, 5, 6, 15, 16, and 23.

Other features include a free software configuration utility and a selection of over 650 different I/O modules. The isoLynx SLX200 system is CE compliant. CSA, FM, and ATEX approvals are pending. For more information, visit the company's website www.dataforth.com.



isoLynx SLX 200

Niobrara R&D Offers a Full Range of Modbus-Compatible Devices

Niobrara Research & Development Corporation is one of Modbus-IDA's earliest members and supporters. Founded in 1987, NR&D manufactures industrial communication equipment such as protocol translation modules, network interfaces, I/O bus interfaces, specialty modems, smart cables, and accessories for programmable controllers and other industrial automation equipment.

Like us, you may have wondered about the company's name: Niobrara. It turns out that the founder thought about people's assumption that high-tech companies in the United States are on the coasts. Being from the Midwest, and not wanting to move, he went looking for a coast. In the late Cretaceous period, what is today the midwestern United States was covered by a shallow in-land sea. (This explains why Kansas and Nebraska are so flat.) That sea is called the Niobrara Sea. So, with its location in Joplin, Missouri, NR&D sits on the coast of the Niobrara Sea — just 65 Million years too late.

Today NR&D's devices are sold around the world. The company has focused on providing a wide range of Modbus-compatible products and sells into the aftermarket to users that have standardized on Schneider Electric devices. The company's products include converters and cables, modules, racks, and accessories for the Quantum, Compact, Momentum, and SY/MAX PLCs, as well as network cards for Altivar drives and accessories for Seriplex devices.



MST Momentum™ Serial
Communications Adapter

Programmable Serial Communications
Module for Modicon Compact PLC



Modbus Products and Innovations

Modbus RFC Process Unveiled *(continued from page one)*

This Username will be placed in the “RFC allowed” group. You will then be authorized to go to the RFC page, which you can access from the *Technical Resources* page by clicking on the link *Modbus RFC Site*.

There you'll find a workflow diagram in pdf format; it explains the process and the decision tree by which changes to the protocol are submitted, discussed, and implemented or denied.

The RFC process was made available to all Modbus-IDA members in May, and will be available to the Modbus-IDA community at-large, to include anybody having an account.

As explained in the workflow diagram of the RFC process, Modbus-IDA members have a strong say in the RFC process, with privileges to moderate RFC submissions and select the Workgroup composition for any particular RFC. These two logistic activities will be carried out via e-mail.

We expect broad participation in this process to further strengthen what is already the most popular industrial communications protocol in the world.

**List your company's
Modbus compatible
products on the
Modbus-IDA website.**

info@modbus-ida.org

Modbus Libraries & Services from MESCO Engineering's Fieldbus Competence Center

Since releasing its Modbus RTU driver, Modbus-IDA member MESCO Engineering now has developed a highly compact package to link the Modbus driver and TCP/IP stack (with or without RTOS) for embedded solutions.

MESCO's library offers a complete solution for encapsulating Modbus telegrams into TCP/IP packages. Fieldbus devices equipped with it comply to the specifications issued by Modbus-IDA and fulfill the requirements for registration and certification.



MESCO is a contractor for the development of hardware and software for industrial applications. As a fieldbus competence center, MESCO offers master/slave implementations for Modbus and gateways to other network protocols. Device manufacturers may draw on MESCO's expertise in Safety Layer implementation and product development for safe devices (SIL2/3, complying to IEC 61508). MESCO are Modbus-related services, e.g. training and consultation.

MESCO Engineering is currently applying to become a certified test center under Modbus-IDA's Conformance Test Program. They offer complete pre-certification services (e.g., conformance tests, documentation) are available at the present stage from MESCO's multi-vendor / conformance test laboratory. For additional information, visit www.mesco-engineering.com.

Programmable Industrial Router from ACT'L

The eWON4002™ is ACT'L's full-option programmable industrial router. It offers users ease of implementation and is configured through user-friendly web pages. The eWON4002 meets the toughest industrial standards and has the restricted access required in open networks. It features a TCP/IP router, embedded firewall, three serial links for connectivity, remote control, scripting, reporting tools, alarm notification, six analog inputs, nine digital inputs, three digital outputs and datalogging.

The eWON4002 can be used in combination with PLCs using the following protocols Modbus RTU-TCP, UniTelWay-XIP, DF1-EIP, MPI and the protocols using the ASCII convention.

eWON supports TCP/IP and PPP protocols, and allows use of standard software tools such as Internet Explorer, FTP, SNMP Manager, and Mail Recipient, thereby reducing the cost of implementation and the cost of ownership.

Key features include:

- Ethernet port 10/100 BaseT; 3 serial ports
- 8+1 digital inputs, 2+1 digital outputs
- 4 analog inputs (AI) configurable in 0-10V or 0-20mA
- Embedded PSTN or GSM/GPRS modem
- TCP/IP Router + NAT
- Modbus/TCP, Modbus/485 support
- SNMP MIB2 support
- Embedded Firewall



**eWON4002 Programmable
Industrial Router**

Find more information about the eWON4002 and other products in the eWON family at the company's website: www.ewon.biz.

Modbus-IDA Technical Committee News

The **Conformance Test Policy** Committee passed a Conformance Testing Policy at its April 21 meeting. This is the first step in developing a new program. The goals of the new policy include:

- Increased confidence on the part of users that their devices will interoperate and provide expected network functionality.
- Confirmation of supplier design decisions in implementing the Modbus protocol.
- Creation and maintenance of a definitive test process and procedure for confirming adherence to the Modbus specification.

- Identification of products adhering to that specification, and providing this information to the user community.

With the new policy, Modbus-IDA will offer two options for testing:

- *Modbus-IDA Testing*, which is available to members and non-members. Modbus-IDA will subcontract testing services to one or more approved

Technical Committees Work on Modbus' Future

**Contact Modbus-IDA
(info@modbus-ida.org)
for more information
or to join a Modbus-IDA
committee or
technical group.**

Modbus-IDA Conformance Test Laboratories.

- *Device Manufacturer Self-testing Program.* Modbus-IDA corporate and institutional members in good standing are eligible to apply to test their own devices under the Modbus-IDA Conformance Testing Program.

For members with a large number of devices to test, this can result in much lower costs and the greater convenience of in-house testing.

**Join one of
Modbus-IDA's
technical groups:
*IT Infrastructure
Conformance Test
Policy
Device Description
Safety Layer
Real Time***

Application for the Self-test Program may be made to Modbus-IDA by completing the application form and submitting a one-time application fee. Applicants will be notified within 45 days whether they are accepted into the Self-test Program.

Acceptance criteria include:

- Execution of the Modbus-IDA Self-testing Agreement,
- Absence of a history of self-test problems,
- Meeting all relevant test site requirements, and
- Successfully passing an audit by Modbus-IDA.

The next step in developing the program will be a review and revision of the test specification for Modbus TCP/IP to be followed by the development or adoption of the appropriate tools to meet the test specification.

A revision of the test specification for Modbus over Serial Line will follow.

The Conformance Test Committee meets monthly by teleconference. Members of Modbus-IDA that wish to join the Conformance Test Committee, please sign on by contacting Lenore Tracey at the Modbus office (lenore@modbus-ida.org).

The Modbus-IDA Newsletter

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

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

Q&A

From the Modbus User's Forum...

Modbus via radio...

Donnel Brown wrote to the Forum:

I am using 2.4-GHz RS232 Radios to transmit Modbus to my substations. My configuration is:

- Host to Repeater
- Repeater to Substations (7)
- Point-to-MultiPoint communication.

The question is, can Modbus be transmitted via radio? If so, why do I get all these CRC errors? Should I use a radio that converts Modbus to some other protocol (like MDLC, TCP/IP and others) and then changes it back to Modbus at the Host and Substations? Could someone out there help me with this problem? I am desperate. Thanks in advance for your assistance.

Andrzej replied:

Of course you can transmit Modbus over radio. Try to change RS baudrate to lower speed. Try to change the Modbus frame length. Does your radio have buffer for the RS transmission? If yes, try to change it too.

An anonymous poster suggested:

Look at the products from Moore Industries. [Their] WLM wireless link module, would probably serve the purpose.

Mike Lamond offered some background information:

Modbus has two flavors, RTU and ASCII. You're probably using Modbus RTU, which does not work well over smart radio and modem links. The problem with RTU is that a received message is considered complete when there is no data for 3.5 character times. If your radio breaks a message in the middle, the receiving end looks at the partial message and finds a bad checksum.

Some radios have an option to keep data

packets together, and this usually helps if you have to use Modbus RTU.

The other option is to switch your communications to Modbus ASCII. In this mode, the data is sent as hexadecimal characters instead of binary, and messages begin with a colon and end with a line feed and a carriage return. There is no time-out problem. It's actually possible to type a message using a terminal program and get a reply using Ctrl-M Ctrl-J instead of the return key as the message terminator.

Depending on your hardware and software, the RTU/ASCII selection may appear as an 8-bit/7-bit data selection. That's how the Modicon 984 XMIT block works, offering only 8-bit RTU or 7-bit ASCII. Some devices separate the 7/8-bit and RTU/ASCII options, and at least one device offered only 8-bit ASCII mode.

According to Pat T:

If this is a radio for industrial automation protocols like Modbus, you might need to see if there is a buffer function that can be turned on if you're using ModbusRTU. An IA radio (like MDS or Freewave) often uses a proprietary protocol to transmit the IA protocol and will split the message into parts to be sent separately. If this is your garden variety FM FSK radio, make sure your CTS and SCTO times are long enough to allow radios to key up and quiet the channel before sending the message, and then stay keyed until well past end of message to prevent corruption. If there is noise in the radio channel (not full quieting) reliable communications will not be possible.

I've used ModbusRTU with the MDS radios on serial and Ethernet with good success on 900 MHz, and Motorola radios at 450 MHz. It will work.

Matt added:

If the radio signal can't be cleaned up, try ASCII mode but remember to include parity checking.

Segal Tsur suggested:

Try ASAP the Dataradio products and solutions. They can offer you seamless communication and diagnostics as well.

Dick Webb ended the thread with the following idea:

You might want to get a hex dump of the data coming out of the radio to see what is really happening. Perhaps it is not a CRC problem. For example, if the radio receives data in packets, you may get the first 32 bytes from the radio and then a pause before the next set of bytes. This pause may cause the receiver to think the Modbus packet has finished arriving and will then calculate a CRC and find that it fails.

Take a look at the ModHopper product from Obvius

(<http://www.obvius.com/documentation/Obvius/R9120-1overview.html>).

We've used this with good success. The radios verify the checksum of the Modbus packets arriving on the serial port before sending over the air, and will re-send the packets between the radios if the checksum fails at the receiver end. The receiving radio only sends data out the serial port when the entire Modbus packet is in the buffer and ready to go.

Ask your question or help out a fellow engineer on the Modbus User's Forum: modbus.control.com

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, to end users and 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 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 1.0
- Modbus Messaging on TCP Implementation Guide, Rev. 1.0

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