

industrial ethernet book

The Journal of Industrial Network Connectivity



Moving into the era of IoT and Big Data

8

How OPC UA enables SCADA management **16**

Intelligent CNC machine tools use EtherCAT **28**

Taking Profinet networks into the cloud **30**

Technology perspective on Internet of Things **40**

Directions in convergence: SCADA & IT management

New switch technology is balancing the advantages and costs of managed versus unmanaged switches. Lower cost, lower functionality Layer 2 technology is aiming to meet the degree of connectivity required by IoT applications, leveraging solutions that support both Modbus/TCP and SNMP to simplify network management.

SENSORS, CONTROL NODES, PLCs AND SCADA servers are connected in the industrial environment using switches and wireless APs to create complex networks. As the number of devices increase, management and issue diagnostics are a challenging job for both IT and automation professionals.

With the onset of Industrial IoT initiatives for plant management, the drive to make the industrial Ethernet robust and transparent becomes a bigger focus in 2015.

Resolving network issues will be a large concern. Switch visibility would be implemented to ensure an agile network, a role usually reserved for a topology of robust, managed switches. The drawback is that such switches can be costly and require a ramp-up time to implement.

Industrial Ethernet infrastructure

IHS issued a new report on the market for industrial Ethernet infrastructure components in December 2014 in which John Morse predicts that “the introduction of lower-cost, lower-functionality layer-2 switches will economically serve the need of users as networks are expanded to meet the degree of connectivity required to join the industrial IoT revolution.” Morse later added that, “this trend may, in the longer term, see the demise of the unmanaged switch as the prices converge, much in the way the hub has become all but extinct.”

Advantech introduced new switch technology in 2014 aimed at enabling convergence management in support for Automation Engineers and IT staff. ProView technology combines the advantages of both



SOURCE: ADVANTECH

To allow automation and IT software to monitor status, the switch technology supports both Modbus/TCP and SNMP.

managed and unmanaged switches at the price point of the latter, and introduces a simple solution that serves port information for all central network management on SCADA or SNMP systems.

In order to allow both automation software and IT software to monitor the switch status, the technology supports both Modbus/TCP and SNMP protocols. This allows SCADA software such as Wonderware InTouch, Advantech WebAccess, WinCC, iFix, and IT Network Management System (NMS) software such as SNMPc and OpenNMS to monitor device status in real time, and remotely. Such a benefit will be key in an Industry 4.0-aligned network, for quick port issue resolution via remote diagnostic that allows visibility for both Automation Engineers and IT staff.

In addition to real-time status monitoring, the devices come with Port-based QoS for deterministic data transmission that allows data from the VIP port to have a higher priority compared to data from a normal port.

Communication via Modbus/TCP

The Modbus/TCP protocol allows a majority of popular SCADA systems such as InTouch, InduSoft, WinCC and iFIX to obtain device status and information. This allows all devices, including ProView switches and I/O control devices, to be controlled and monitored through one HMI/SCADA system.

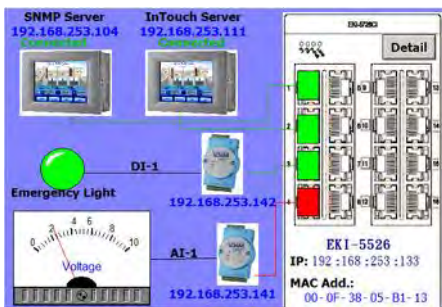
In the following SCADA software example,

by using InTouch from Wonderware, the system is able to connect a SCADA server, one analog I/O Modbus TCP module and a digital I/O Modbus TCP module to a switch that uses ProView technology.

SCADA software is used to access the memory address through Modbus/TCP which makes it possible to obtain the device information such as the device name, FW version, MAC and IP address, and also the port status information such as port link up/down, link up counter and port speed.

This information further helps the engineer diagnose any issue. When a signal is lost by the end device, by having both the network information and the device information displayed on the SCADA, users are able to conclude that the signal loss is caused by either the network or the end device itself. For example, by reading the status of port 4 at the designated memory location through Modbus/TCP, the user is able to know that the port has been disconnected and combined with SCADA HMI, the status indicator of port 4 turns red. On-site engineers can then easily identify that the lost signal is caused by a disconnected network cable or by malfunction of the voltmeter or the Modbus TCP module. This helps to quickly narrow down the root cause of an issue.

As well as basic device information and the port link up/down status, the technology provides detailed statistical information on



SOURCE: ADVANTECH

Switch device information, switch port status and I/O device reading in one SCADA system. The red rectangle indicates that the port 4 has been disconnected.

each port including speed, linkup counter, count on the multicast packet, count on unicast packet and count on error. This allows engineers to observe the network status and statistic in detail from any HMI / SCADA software which supports Modbus/TCP.

In a HMI / SCADA system such as InTouch, address mapping and Modbus/TCP connection is the initial step in the InTouch setup.

Communication via SNMP

Support for SNMP (Simple Network Management Protocol) allows IT NMS (Network Management System/Station) software such as SNMPc, SUSIAccess NMS and OpenNMS to perform device management including status monitoring, configuration and even events notification.

This allows IT engineers to have better monitoring and control on the network and easier troubleshooting when something is incorrect on the network.

In an industrial environment such as manufacturing, nothing is more important than keeping the network, which is formed by thousands of sensor devices, running smoothly without any downtime. SNMP has been widely used by engineers to monitor the network device status and an NMS is able to provide an intuitive network topology with a real time device status. For information that is not supported by a standard SNMP MIB library, a private MIB file that allow NMS software have the method of obtaining this information.

As well as device monitoring, IT can also control or perform certain system configurations through SNMP. The setting of the device location, device IP mode, device IP, device netmask, default gateway and read/write community name can be configured directly through the NMS software.

For the statistical port information, the technology is able to provide statistical information including count on unicast, multicast and broadcast packet for each individual Ethernet port.

By supporting SNMP traps which automatically notify the SNMP server when there are events such as port link-down/up, cold start and warm start occurs, this information allows IT engineers to be notified of a network status change, not just on the switch, but also on the devices connected to it, imminently and act quickly.

QoS deterministic data transmission

A maximum of two VIP ports with high transmission priority can be used for deterministic data transmission. The priority ratio between the VIP port and the normal port is 1.5 to 1. For example, when there are two traffic flows on a switch at the same time.

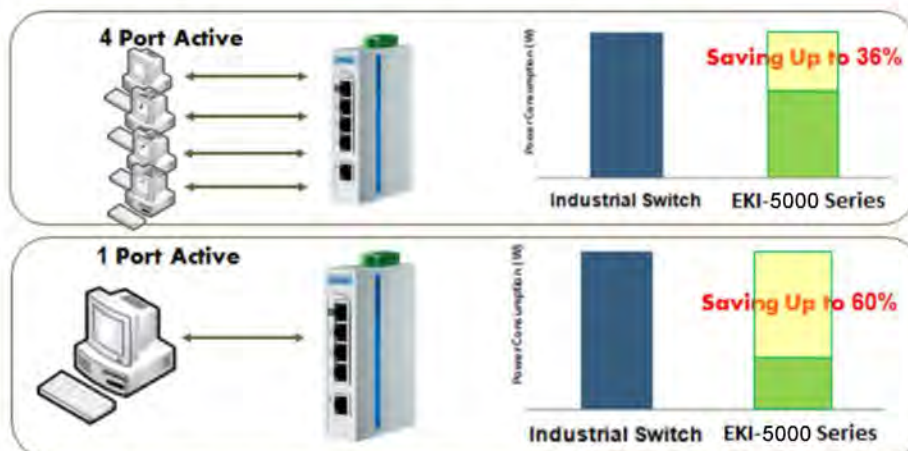
When traffic flow 1 is transmitting data from VIP port 1 to port 5 and also traffic flow 2 is forwarding data from port 3 to port 5, traffic flow 1 can have 50% more throughput than traffic flow 2. The port base QoS is useful to ensure high priority on important data to be transmitted in a busy network.

By supporting IEEE 802.3az standard, the technology provides a method for switching between higher power state (data mode) / lower power state (LPI mode) in response to whether data is flowing through them. This allows power saving up to 60%.

Managed vs. unmanaged switches

With the communication capability using both Modbus/TCP and SNMP protocol, the new classification of networking switches will provide management convergence between industrial control and IT networking management. ProView technology is positioned in between the two switch classes to introduce an option for increasingly complex industrial networking to bring plant engineers a robust and easily-diagnosed network with very little learning curve. In all, this means finding and resolving issues fast – practically as fast as Industry 4.0 nimbleness claims to be.

Technology report by *Advantech*.



Use of IEEE802.3az provides a method for switching between higher power state (data mode) /lower power state (LPI mode) in response to whether data is flowing through them -- to reduce power consumption.

DINSpace

SNAP™

**Compact DIN-Rail
Fiber Optic and
CAT 6 Patch Panels**



Now UL Listed 1863

www.dinspace.com/ieb

Phone: 214-613-0349

Email: sales@dinspace.com