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Technical Insights

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EtherNet/IP Supported SCADA Manageable ProView Ethernet Switches

EtherNet/IP is a widely used protocol developed by Rockwell Automation. This document will give you a brief idea of how Advantech's SCADA manageable ProView Ethernet Switches* support EtherNet/IP as well as its benefits and related applications. The key elements being introduced in this document are as follows:

1. **What is EtherNet/IP?**
2. **The Benefits of EtherNet/IP**
3. **Application of the ProView Switch with EtherNet/IP**
4. **Selection Guide of ProView Series Ethernet Switch**

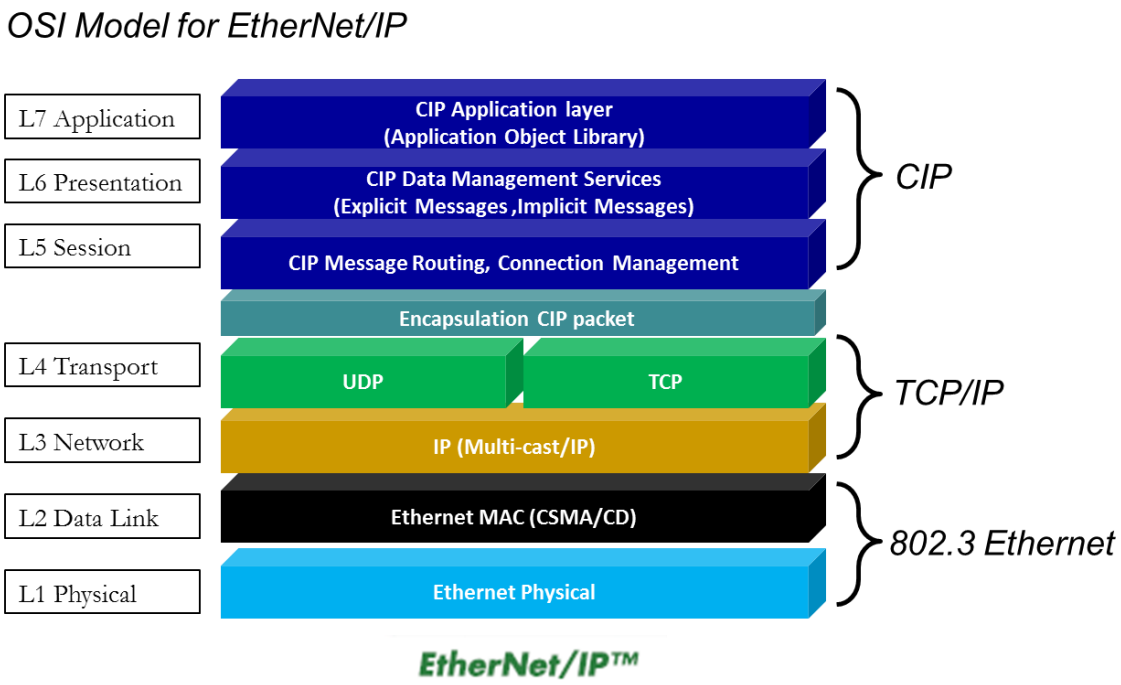
● What is EtherNet/IP?

EtherNet/IP can easily be confused with Ethernet and IP, the Internet Protocol. EtherNet's "IP" stands for Industrial (**NOT** Internet) Protocol. EtherNet/IP is an open industrial networking standard developed by Rockwell Automation, and is managed and maintained by Open DeviceNet Vendors Association (ODVA) and Control Net International (CNI).

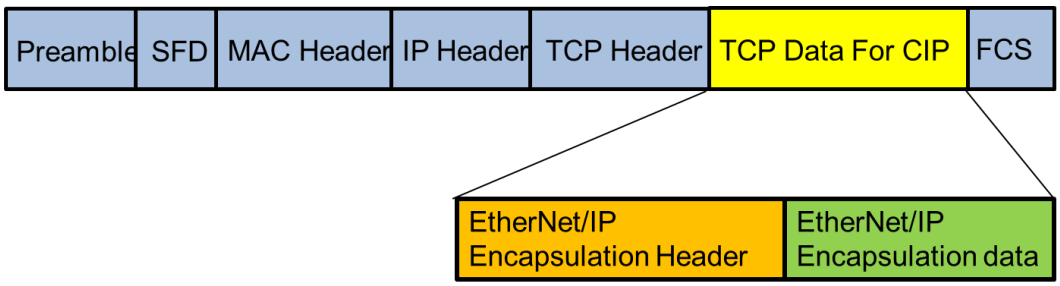
EtherNet/IP follows the Open System Interconnection(OSI) model, which defines a framework for seven layers : physical, datalink, network ,transport, session, presentation and application, and is an industrial protocol that operates over Ethernet (IEEE 802.3) and TCP/IP, and EtherNet/IP implements Common Industrial Protocols (CIP) at the Session layer protocol and above, so it means the Physical layer and Data-Link layer use the 802.3 Ethernet definition, the Transport and Network layer use the TCP/IP definition, and the Application layer uses the CIP definition, so that EtherNet/IP has encapsulation technology, meaning EtherNet/IP can

*Please refer to Product Selection Guide for the spec and protocol support list.

encapsulate the content of the CIP protocol to the TCP or UDP data frames, and use the TCP/IP for the data transmission), the network architecture and TCP encapsulation is shown in Figure 1 and Figure 2 (CIP is the same protocol used by DeviceNet and ControlNet networks, allowing interoperability between various industrial devices).



(Figure 1) EtherNet/IP over OSI model



(Figure 2) TCP encapsulation for EtherNet/IP

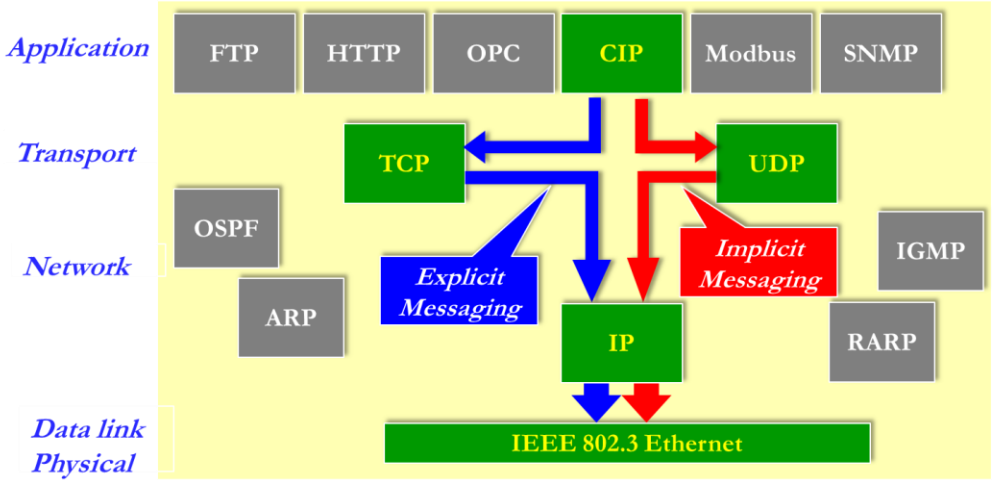
Types of EtherNet/IP communications:

CIP uses **Explicit** and **Implicit** EtherNet/IP communication types (The comparison and the architecture is shown on Table 1 and Figure 3).

Explicit Messaging has a request/reply (or client/server) nature, this type of communication is used for non-real-time data (ie data that doesn't have a specific transmission time), such as program download/upload, diagnostics and configuration etc. The CIP message is encapsulated on the TCP/IP protocol for data transmission, and both the request and reply will be unicast.

Explicit messages include a description of their meaning (expressed explicitly), so the transmission is less efficient, but flexible. It may be used by a HMI to collect data, or by a device programming tool.

Implicit Messaging is often referred to as "I/O" and is time-critical in nature. Typically this type of communication is used for real-time data exchanges, where speed and low latency are important. Implicit messages include very little information about their meaning, so the transmission is more efficient, but less flexible than *explicit* messaging. The interpretation of the transmitted data is fast. For EtherNet/IP, Implicit Messaging uses UDP for the encapsulation and can be multicast or unicast.



(Figure 3)

CIP Message Type	Transport Protocol	Communication Type	Typical Use	Example
Explicit	TCP/IP	Request/reply transactions	Non time-critical information data	Read/Write configuration parameters
Implicit	UDP/IP	I/O data transfers	Real-time I/O data	Real-time control data from a remote I/O device

(Table 1)

- **The Benefits of EtherNet/IP**

EtherNet/IP offers several unique advantages for manufacturing automation applications:

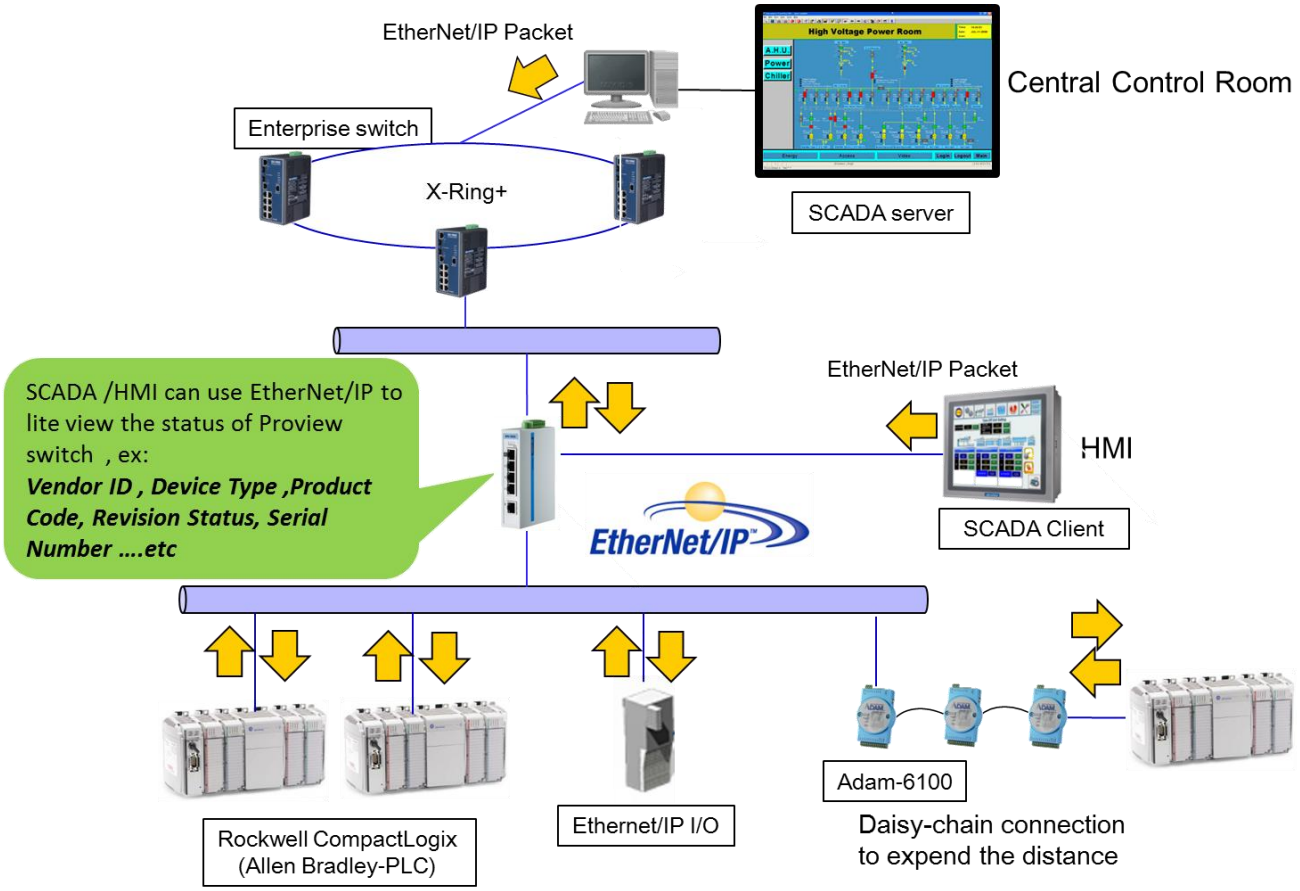
(1) Complete producer- consumer services let you enable multipoint for Multicast, broadcast polling data transmission and higher efficiency simultaneously control, configure and collect data from intelligent devices over a single network or use a single network as a backbone for multiple distributed CIP Networks.

(2) Compatible with standard Internet protocols — e.g. HTTP, FTP, SNMP, DHCP and standard industrial protocols for data access and exchange

(3) Compliance with IEEE Ethernet standards provides users with a choice of network interface speeds — e.g., 10, 100 Mbps and 1 Gbps — and a flexible network architecture compatible with commercially available Ethernet installation options including copper, fiber, fiber ring and wireless etc

The Application of the ProView switch with EtherNet/IP

The ProView switch supports EtherNet, so it can not only forward the EtherNet/IP packet to terminal devices such as PLCs or other EtherNet/IP suitable devices, but can be viewed through an EtherNet/IP packet. We can use the HMI or SCADA to view the status of the ProView switch such as Vendor ID, Device Type, Product Code, Revision Status, Serial Number etc by the EtherNet/IP function, the application topology is shown in Figure 4



(Figure 4)