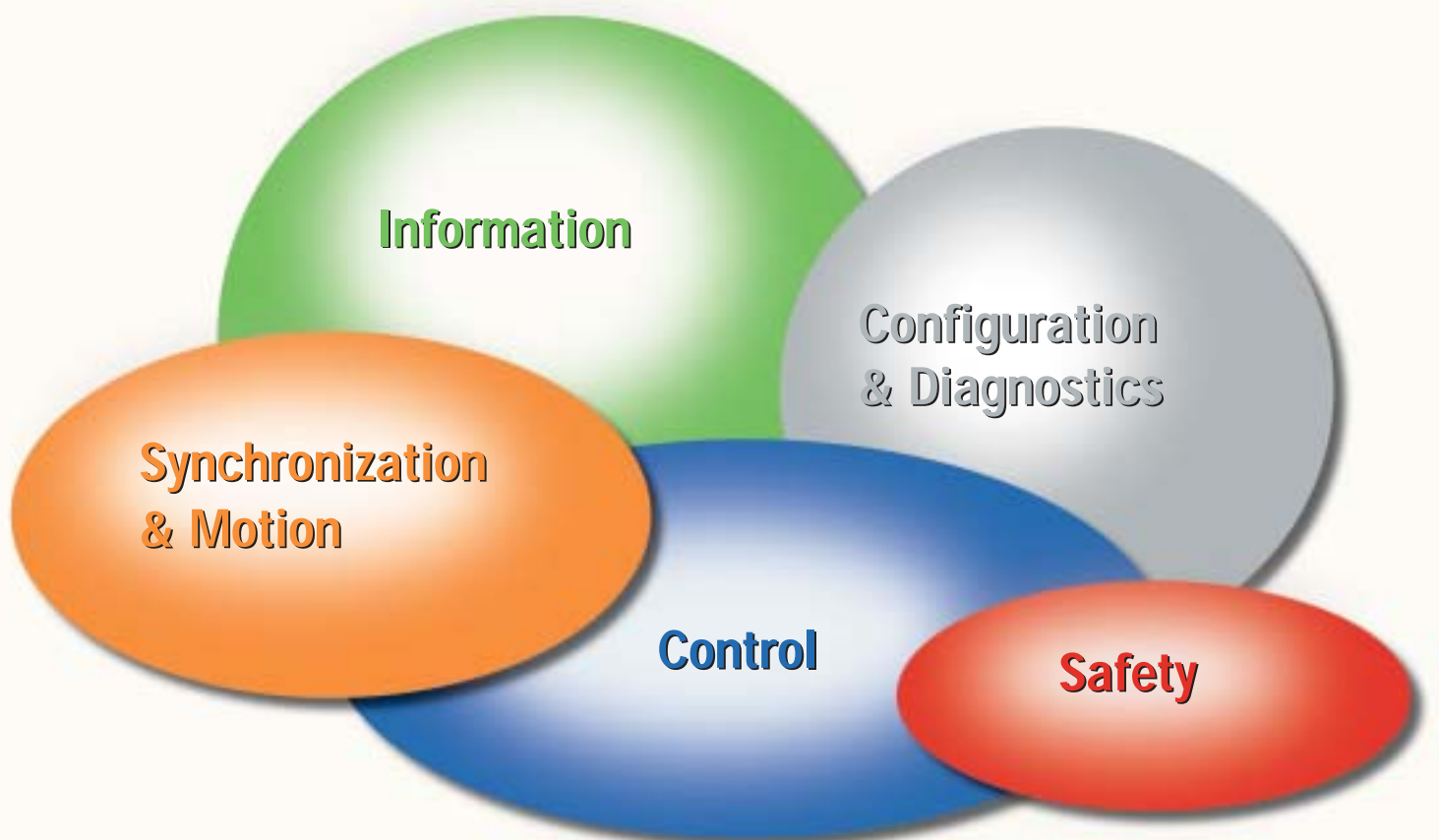


# Common Industrial Protocol (CIP)



The Common Industrial Protocol (CIP™) encompasses a comprehensive suite of messages and services for the collection of manufacturing automation applications – control, safety, synchronization, motion, configuration and information. Further, it allows users to integrate these manufacturing applications with enterprise-level Ethernet networks and the Internet. Supported by hundreds of vendors around the world and truly media-independent, CIP provides users with a unified communication architecture throughout the manufacturing enterprise. CIP allows users to benefit today from the many advantages of open networks while protecting their existing automation investments when upgrading in the future.

- Coherent integration of I/O control, device configuration and data collection
- Seamless flow of information across multiple networks
- Ability to implement multi-layer networks without the added cost and complexity of bridges and proxies
- Minimised investment in system engineering, installation and commissioning
- Freedom to choose best of breed products, with the assurance of competitive prices and low integration cost.

## The Network Adaptations of CIP

With media independence comes choice: the ability to choose the CIP Network best suited for your application. As a single, media-independent platform that is shared by a variety of networking technologies, the Common Industrial Protocol (CIP) provides the interoperability and interchangeability that is essential to open networks and open systems.

### **EtherNet/IP™** – CIP on Ethernet Technology

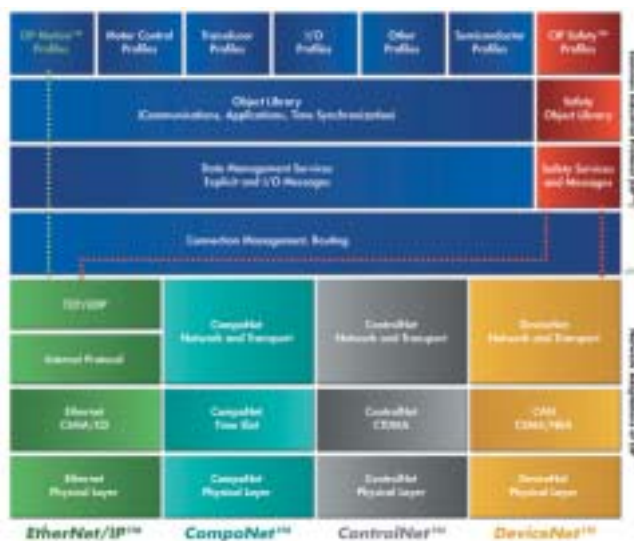
EtherNet/IP provides users with the network tools to deploy standard Ethernet technology for manufacturing applications while enabling Internet and enterprise connectivity...data anytime, anywhere. EtherNet/IP uses a star topology in conjunction with standard Ethernet infrastructure devices.

### **DeviceNet™** – CIP on CAN Technology

DeviceNet provides users with a cost-effective network to distribute and manage simple devices throughout their architecture. DeviceNet uses a trunkline-dropline topology and has dc power available on the network cable for simple and compact machine installations.

### **ControlNet™** – CIP on CTDMA Technology

ControlNet provides users with the tools to achieve deterministic, high-speed transport of



time-critical I/O and peer-to-peer interlocks. ControlNet offers a choice of topology options including trunkline-dropline, star or tree.

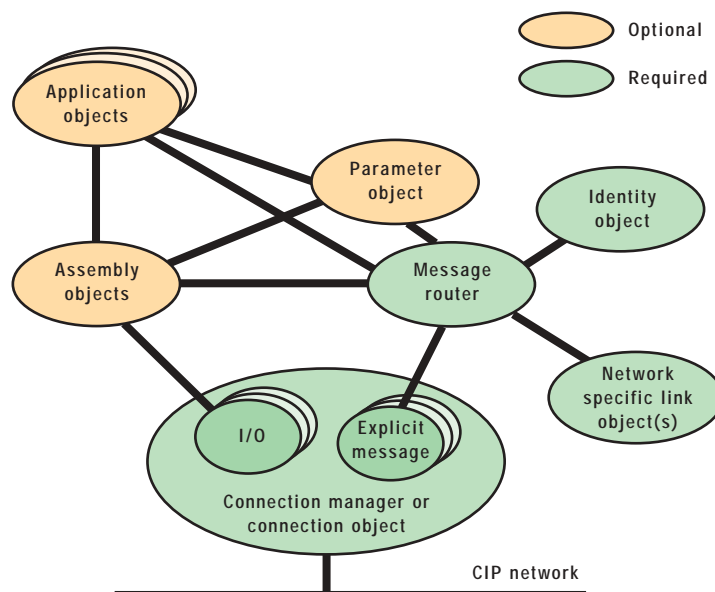
### **CompoNet™** – In development

CompoNet will enable manufacturers to transmit small packets of data quickly between controllers and sensors and actuators, and to connect these devices using cost-effective physical media that is simple to install.

## The CIP Technology

**CIP Object Model** CIP is a strictly object-oriented protocol, at the upper layers. Each CIP object has attributes (data), services (commands), connections, and behaviors (relationship between attribute values and services). CIP includes an extensive object library to support general purpose network communications, network services such as file transfer, and typical automation functions such as analog and digital input/output devices, HMI, motion control, and position feedback.

To provide interoperability, the same object, or groups of objects, implemented in two or more devices behaves identically from device to device. A grouping of objects used in a device is referred to as that device's "Object Model." The Object Model in CIP is based on the producer-consumer communication model which can provide more efficient use of network resources than a source-destination model by allowing the exchange of application information between a sending device (e.g., the producer) and many receiving devices (e.g., the consumers) without requiring data to be transmitted multiple times by a single source to multiple destinations.



**Device Profiles** In order to provide further interoperability in CIP Networks comprised of devices from multiple vendors, CIP defines standard grouping of objects as "Device Profiles." In addition to the set of objects implemented in the device, Device Profiles specify configuration options and I/O data formats. Devices that implement one of the standard Device Profiles will respond to all the same commands and will have the same network behavior as other devices that follow that same profile.

## The CIP Application Coverage for Safety, Synchronization and Motion

**CIP Sync™ (Synchronization)** CIP Sync is a time synchronization extension to CIP, based on the recent IEEE-1588 standard – Precision Clock Synchronization Protocol for Networked Measurement and Control Systems – providing the increased control coordination needed for sequencing demanding events recording, distributed motion control and other highly distributed applications where absolute time-synchronization of devices is vital.

**CIP Motion™ (Real-time, Deterministic Multiaxis Motion Control)** CIP Motion is an extension to EtherNet/IP that allows integration of field devices and motion drives on the same network,

eliminating the need for a separate motion optimized network. This provides lower system cost, improved system performance, and greatly reduced system complexity.

**CIP Safety™ (Functional Safety)** CIP Safety provides the ability to mix safety devices and standard devices on the same network or wire for seamless integration and increased flexibility. The safety protocol provides fail-safe communication between nodes such as safety I/O blocks, safety interlock switches, safety light curtains and safety PLCs in safety applications up to Safety Integrity Level (SIL) 3 according to IEC 61508 standards.

## The CIP Advantage

Common network application layers are the key to advanced communication and true network integration. The Common Industrial Protocol (CIP™), which is managed jointly by ODVA and ControlNet International, allows complete integration of control with information, multiple CIP Networks and Internet technologies. Built on a single, media-independent platform that provides seamless communication from the plant floor through the enterprise with a scalable and coherent architecture, CIP allows companies to integrate I/O control, device configuration and data collection across multiple networks. This ultimately helps minimize engineering and installation time and costs while maximizing ROI.

- Comprehensive suite of messages and services for manufacturing automation provides functionality needed for control, configuration, information, safety, synchronization and motion.
- Producer-consumer architecture allows efficient use of network bandwidth.
- Seamless bridging and routing allows topology options for network architectures without having to program or configure intermediate devices.
- Device profiles provide common application interface.
- Conformance practice helps to ensure interoperable, multi-vendor systems.
- Specification management and enhancement process promotes stable, open, and expanding network technologies



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