



# **EtherNet/IP for Automotive Assembly**

Laurentiu Silaghi, PMP  
Controls Engineer, Comau

**General Session and  
15<sup>th</sup> Annual Meeting of Members**

[www.odva.org](http://www.odva.org)

# About COMAU

COMAU is one of the leading suppliers of assembly lines for the automotive industry



COMAU offers machining and assembly modules, body welding systems, sub-assembly lines, integrated robotics, and comprehensive services

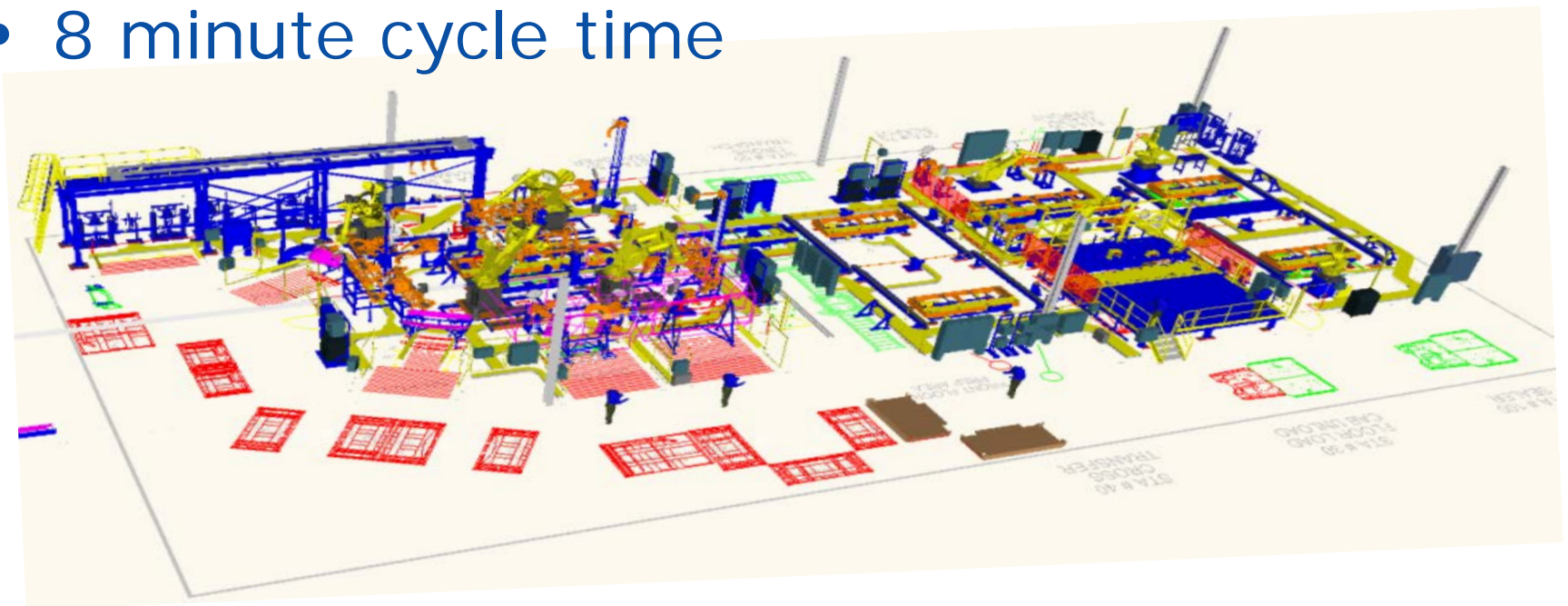
# About COMAU



A network of 23 operative centers in 13 countries

# Featured Application

- Framing line for an industrial truck
- 150 feet long, 50 feet wide, 18 feet high
- Consists of 8 stations
- 8 minute cycle time



# Evaluated Numerous Networks

- DeviceNet
- ControlNet
- EtherNet/IP
- EtherNet Powerlink
- Profibus
- Profinet

# COMAU Migrates to EtherNet/IP

**EtherNet/IP is used for 80% of data communication because it:**

- Cuts debugging time in half
- Eases installation by 30 percent
- Improves support with efficient traffic evaluation and a reduced learning curve
- Supports use of standard, off-the-shelf products and tools (ex. Wireshark)
- Is very flexible, as COMAU moves into new territory with adaptive solutions

# EtherNet/IP Architecture

## EtherNet/IP:

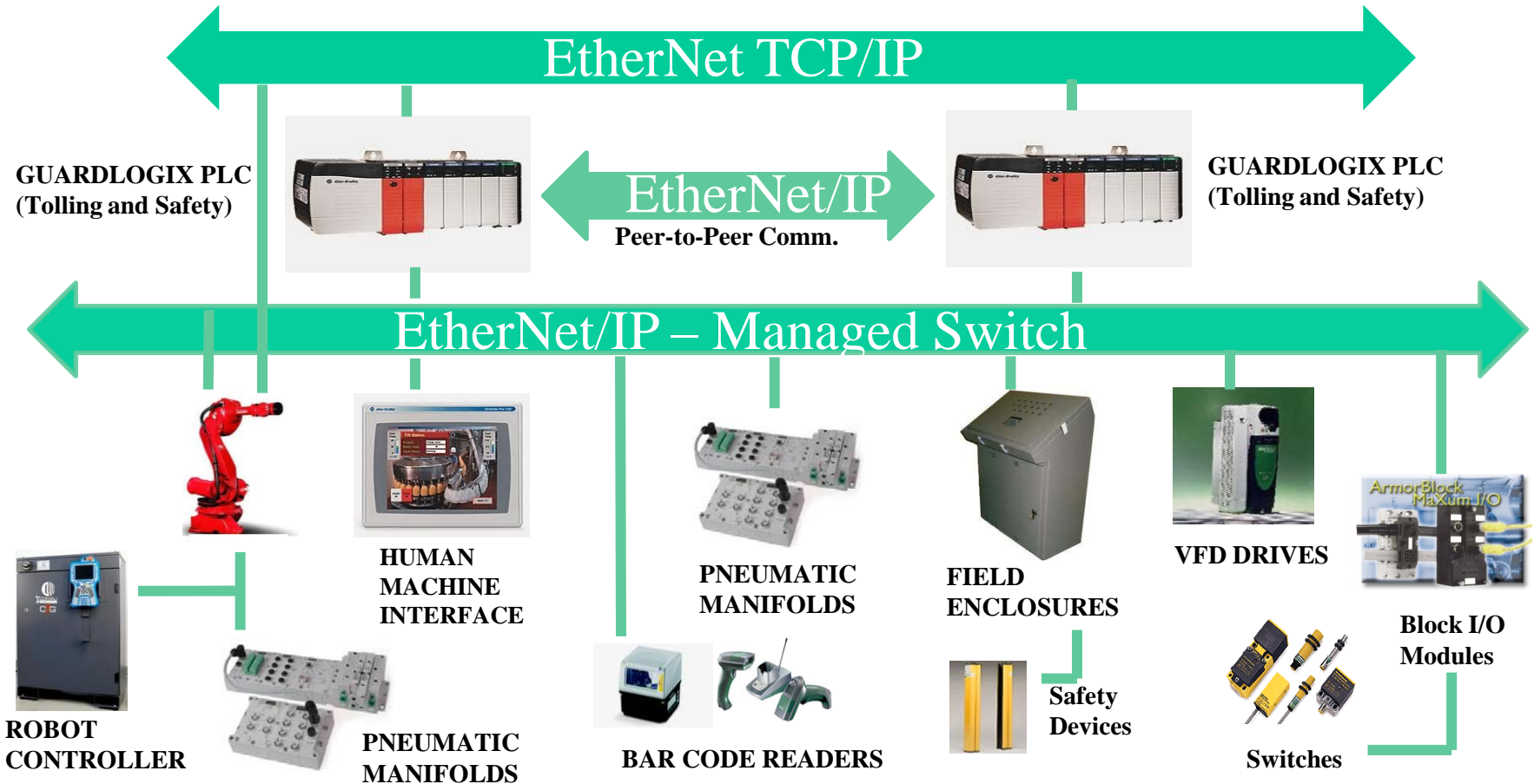
- Enables all network devices to “speak the same language”
- Extends Ethernet TCP/IP to the plant floor while reassuring the industrial robustness
- Provides a pure, standards-based Ethernet solution for interoperability
- Enables connectivity anywhere, anytime

# Network Architecture Overview

- In addition to EtherNet/IP, COMAU uses DeviceNet
- These networks share the Common Industrial Protocol (CIP)
- As we all know, CIP encompasses a suite of services, including control, safety, motion, synchronization, configuration and information



# Basic Controls Architecture



Motors and drives use EtherNet/IP, simplifying equipment design, configuration and commissioning

# Bill of Materials

- A-B GuardLogix controllers 1756-L61s /LSP
- Rockwell RSLogix 5000 programming software
- A-B EtherNet/IP communication cards 1756-EN2T
- A-B Panelview Plus Terminals
- Cisco IE 3000 managed switch
- Hirschmann EtherNet/IP managed switches
- Numatics G3 EtherNet/IP manifolds
- A-B 1734 Point I/O
- SICK safety light screens and laser scanners
- Emerson VFD Drives

# Design Considerations

- What functionality does the product require today and in future applications?
  - Master(scanners), Slave (node adaptor) – Ex. Robot comm.
  - Peer-to-peer messaging
- What are the physical requirements?
  - IP20, IP65 or IP67
- What hardware should be chosen for this product?
- What firmware version should be used for this application?
- What are the configuration requirements?
- What design and verification tools should be used?

## Robot Communication

Most of the robots require several tool changes: e.g. material handling, SPR guns, sealer, drill, vacuum



- **Issue:** EtherNet/IP communication time was 12s~30s, which would impact cycle time
- **Solution:** Implemented DeviceNet Quick Connect; proved application with less than 1s connection time (will migrate to EtherNet/IP now that Quick Connect is available)

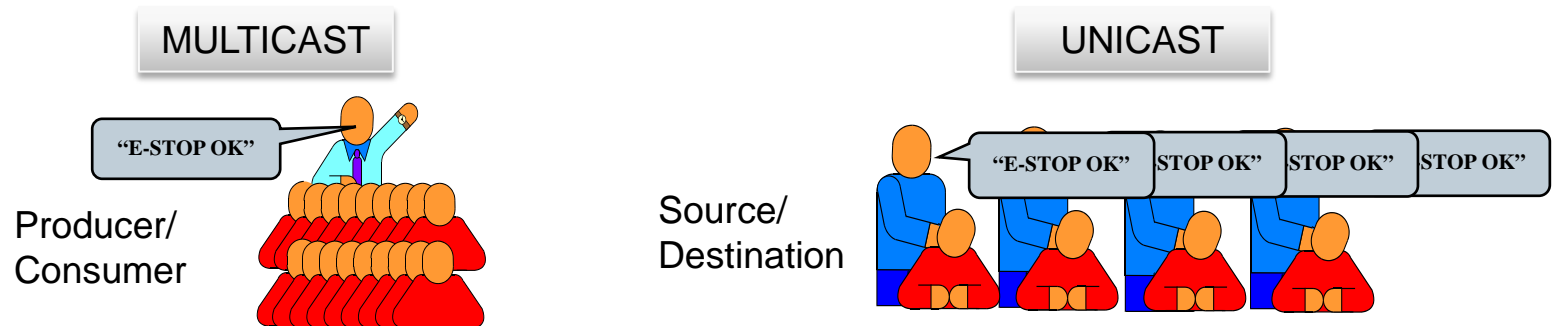
## Remote Control

Our customer made a late request for remote control in a router configuration (with multiple VLANs).

- **Issue:** I/O or Producer/Consumer tag traffic will not pass through a router
  - ❑ By design, the time-to-live parameter was configured in the firmware for a value of 1
  - ❑ This value will be reduced by a router and then discarded
- **Solution:** Overlapping the VLANs and opening the subnet mask on devices to allow multicasting

# Producer/Consumer is Multicast

- CIP uses the Producer/Consumer model, as opposed to the source/destination message addressing scheme

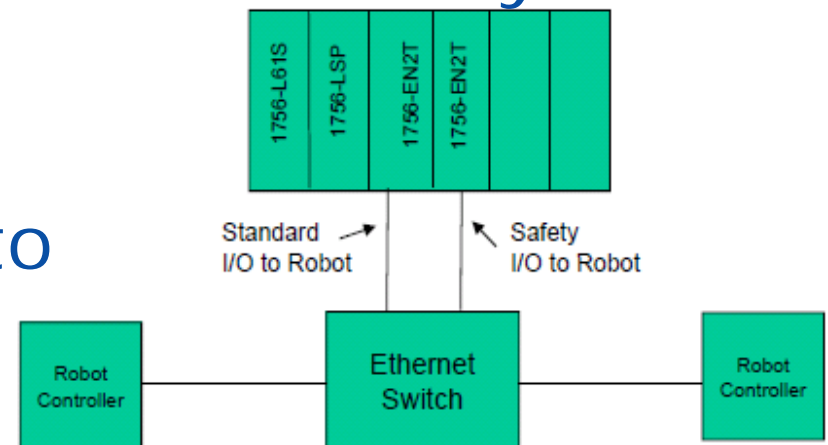


- Nodes on the Producer/Consumer network determine if they should consume the data in a message

## Hardware Convergence

To use DCS (Dual Check Safety) and a single Ethernet network cable for safety and process, we needed to establish independent instances of Ethernet (for dual-check safety relative to process communication)

- **Issue:** A logical and visible distinction must be made between process and safety-related communications
- **Solution:** We routed safety communication to a separate EN2T card



# Benefits of EtherNet/IP

- Higher speeds, more data transfer within a shorter amount of time
- Cost effective solution supported by hundreds of vendors
- IT friendly, compatible with standard Internet protocols
- Remote diagnostics and maintenance from the office network
- Proven, complete solution for manufacturing automation



# Specific Results

- Installation, Commissioning and Debugging for 10 stations, 12-15 robots takes couple days rather than 1-1/2 week.



- Unicast communication for improved performance
  - ❑ Available with RSLogix v20
- EtherNet/IP Quick Connect
  - ❑ Available, currently in testing at Comau