
EtherNet/IP as Communication Infrastructure for Distributed Control Applications

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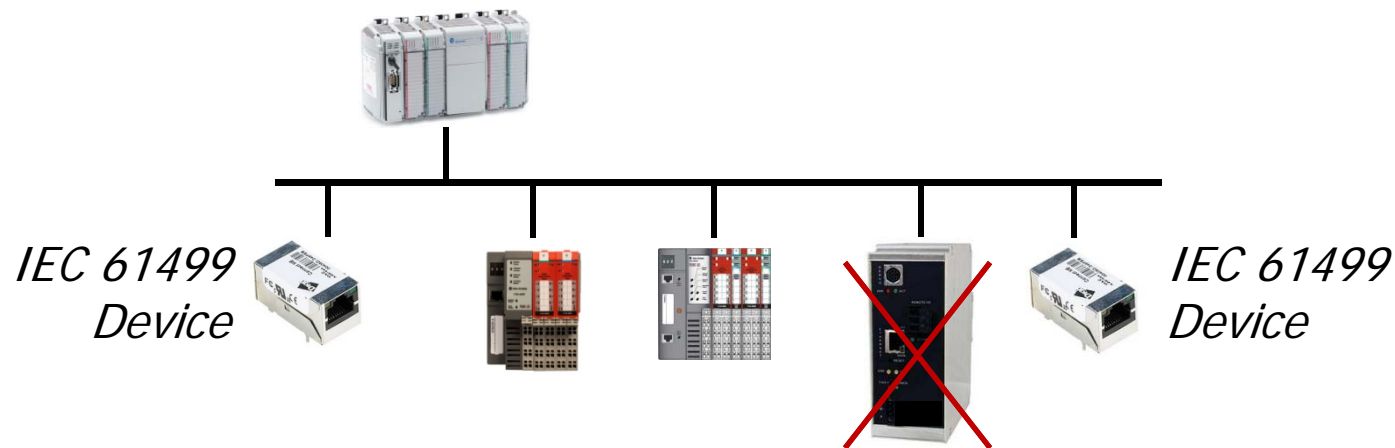
Alois Zoitl, Wilhelm Leonhartsberger

Content

- Motivation
- EtherNet/IP as suitable industrial Ethernet solution
- Identification of required communication scenarios
- Integration into FORTE
- Application test
- Conclusion and outlook

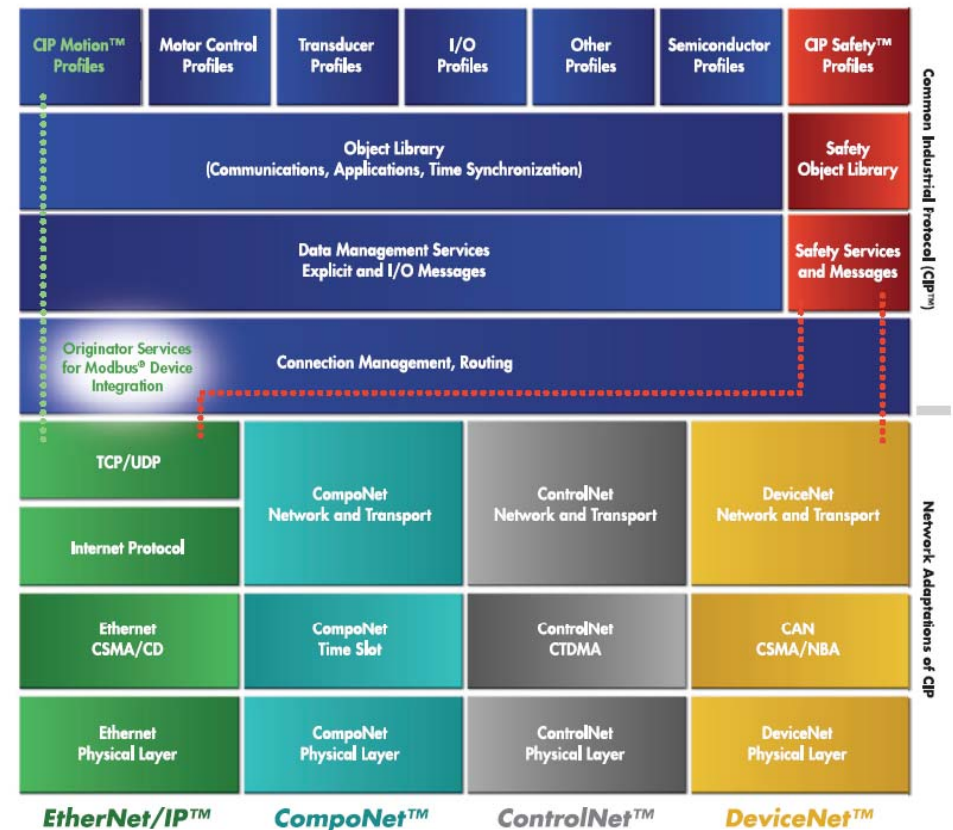
Motivation

- Combination of existing control equipment with IEC 61499 based control devices
 - Migration strategy
 - Retrofitting
- Industrial Ethernet on the rise



Why EtherNet/IP?

- EtherNet/IP: EtherNet Industrial Protocol
- Standard Ethernet hardware
- Supports multi-master communication
- Mechanisms for industrial grade communication on Ethernet
- Common protocol for several different communication technologies

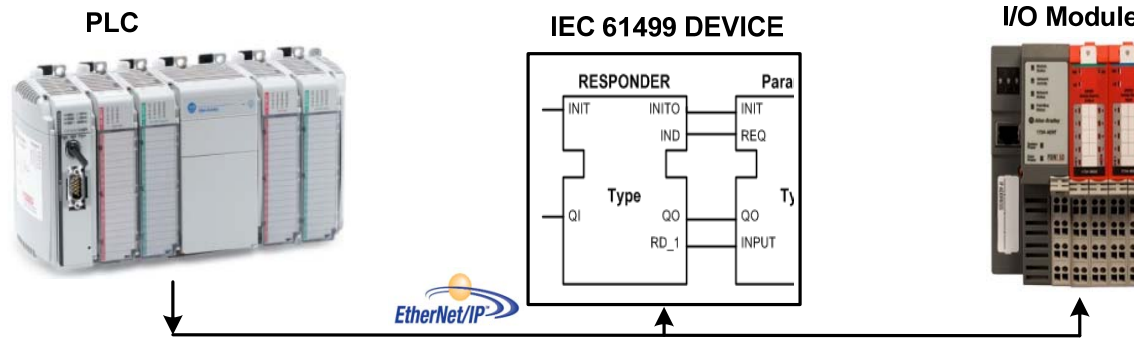


OpENer – Open Source EtherNet/IP Adapter Stack

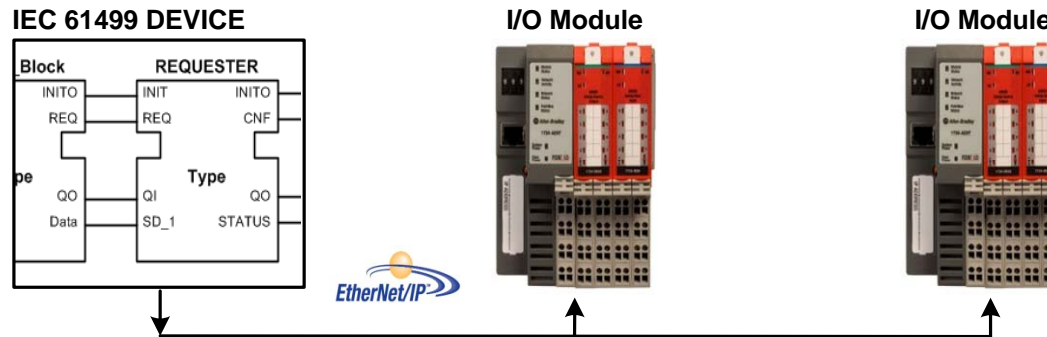
- EtherNet/IP stack for “slave” devices
- Target: Small Ethernet enabled devices
 - Implemented in C
 - Typical code size (Linux):
38k (O0), 27k (O2)
Options left for optimization
- First industrial products based on OpENer available
- License: BSD style license
- Published through Sourceforge
 - opener.sourceforge.net

Identified Communication Scenarios

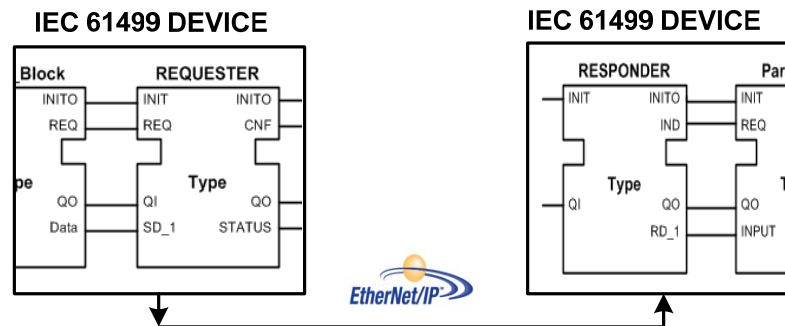
Scenario 1: Smart Field Device



Scenario 2: Reuse of Legacy I/O Modules



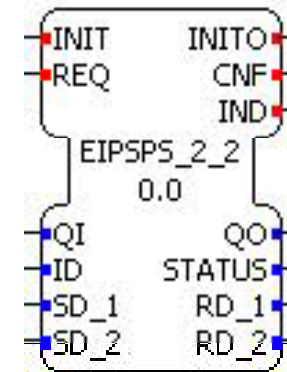
Scenario 3: Peer to Peer Communication



Developed Communication Function Blocks

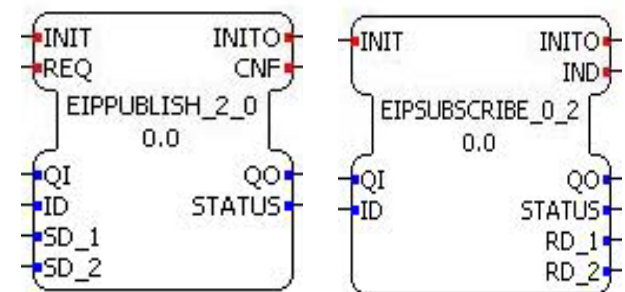
■ Communication with PLC

- Slave behavior
- FB configures OpENer as connection target
- Provides received data to application
- Collects data to send from application

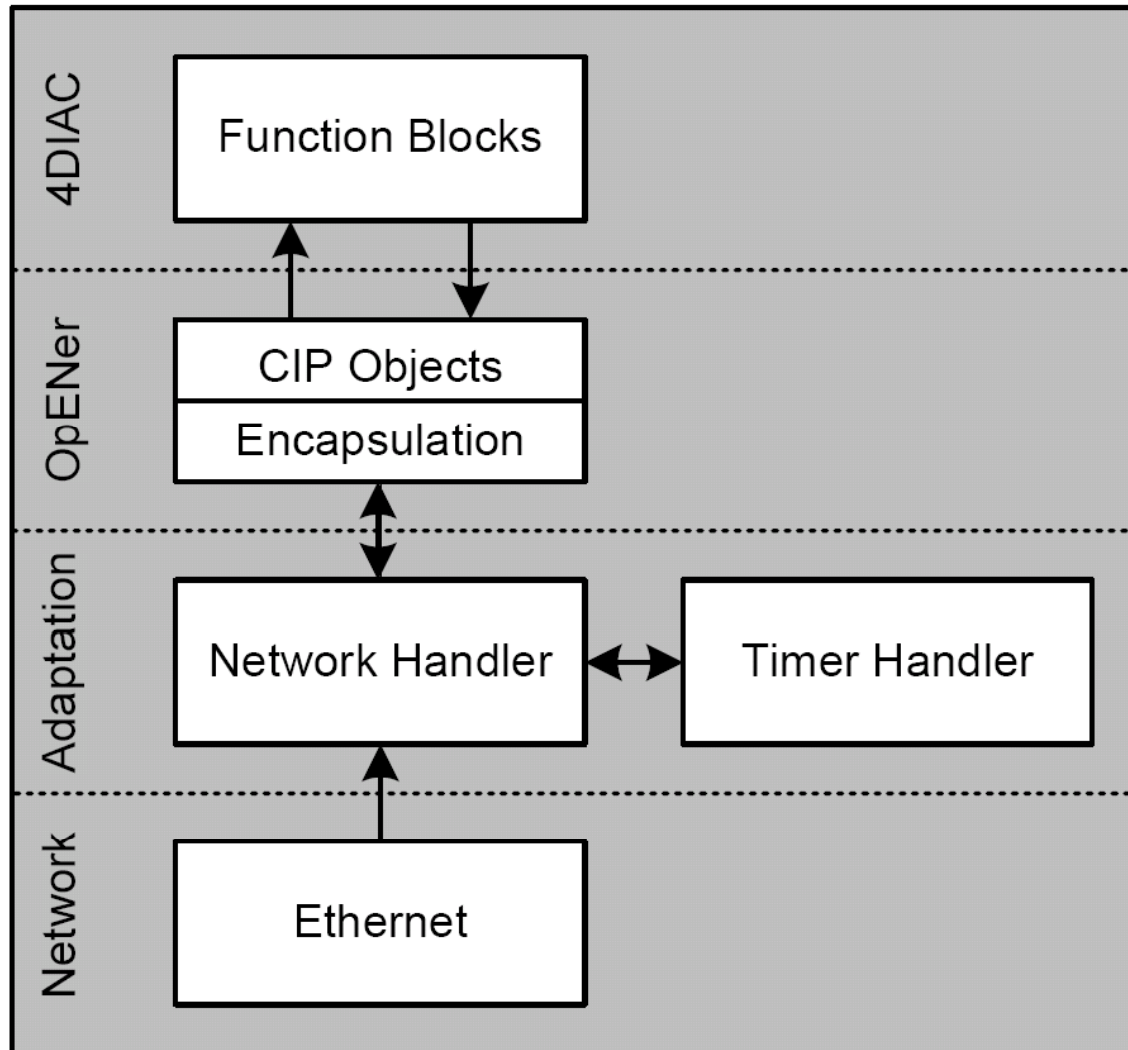


■ Communication between IEC 61499 devices

- Unidirectional communication data flow
- FBs need to establish connections independent from start-up order
- OpENer maintains and monitors connection (e.g., time-out detection)

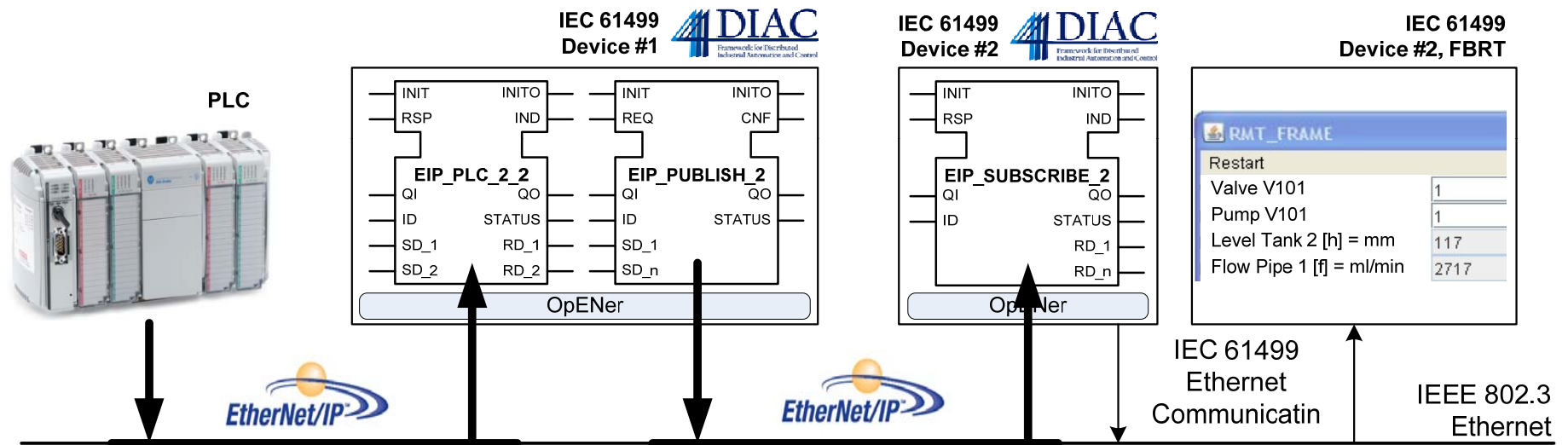


Integration into FORTE



Old communication infrastructure

Application Test



Conclusion Outlook

- Investigation on EtherNet/IP as industrial Ethernet infrastructure for IEC 61499
- Identification of 3 communication scenarios
- Development of communication Function Blocks
- Extension with multi-master operation
- Next Steps
 - Migrate to
 - Latest 4DIAC communication infrastructure (especially for peer-to-peer communication)
 - Latest OpENer version with application connection types
 - Optimized packet handling in devices
 - Investigate on application triggered EtherNet/IP connections for peer-to-peer communication

EtherNet/IP as Communication Infrastructure for Distributed Control Applications

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