DeviceNet

Presenter: Elahe Mortazavian

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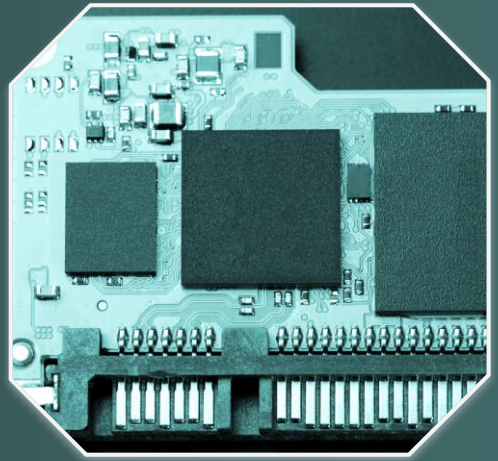
01 Introduction

What is DeviceNet?

- An industrial network protocol based on CAN (Controller Area Network) technology.
- Part of the CIP (Common Industrial Protocol) family
- Used in manufacturing automation for control, diagnostics, configuration, and data collection



Advantages

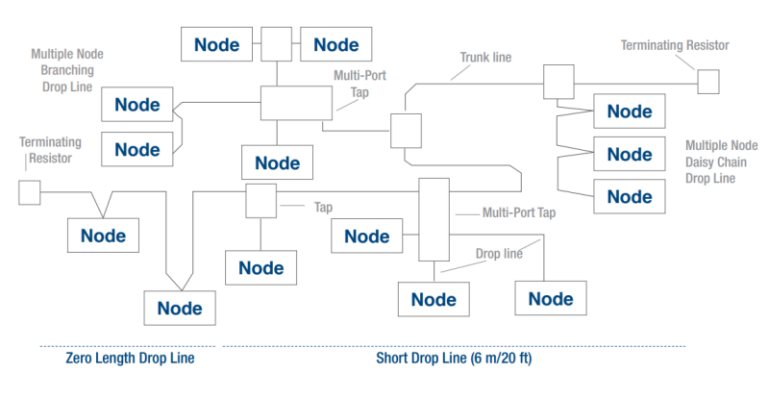
Some advantages of DeviceNet are as follows:

- Control & data exchange over a single network
- Supports up to 64 nodes and baud rates up to 500 kbps
- Robust in industrial environments with flexible topology
- Power & signal on the same wire

02 OSI Model

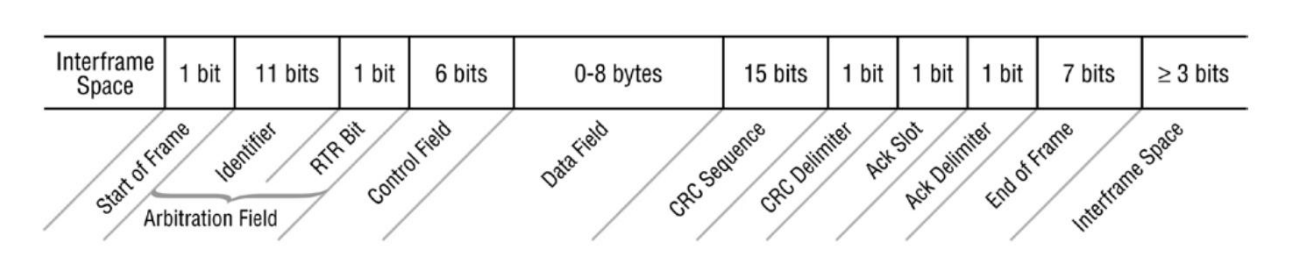
Physical Layer

- Incorporates a trunkline-dropline topology
- Use of separate twisted pair buses for both signal and power distribution
- Supports three possible data rates
- Using shared bus in order to save space and reduce wiring complexity



Data Link Layer

- uses standard, unmodified CAN
- DeviceNet uses primarily only the data frame



Network and Transport Layer

- DeviceNet is a connection-based network
- Using a Producer-Consumer model
- DeviceNet supports two types of messages: Explicit and Implicit
- Utilizing DeviceNet Fragmentation for data bigger than eight bytes.

IDENTIFIER BITS											HEX RANGE	IDENTITY USAGE
10	9	8	7	6	5	4	3	2	1	0		
0	Group 1 Message ID				Source MAC ID						000 – 3ff	Message Group 1
1	0	MAC ID						Group 2 Message ID			400 – 5ff	Message Group 2
1	1	Group 3 Message ID			Source MAC ID						600 – 7bf	Message Group 3
1	1	1	1	1	Group 4 Message ID (0-2f)						7c0 – 7ef	Message Group 4
1	1	1	1	1	1	1	X	X	X	X	7f0 – 7ff	Invalid CAN Identifiers
10	9	8	7	6	5	4	3	2	1	0		

03 Common Industrial Protocol

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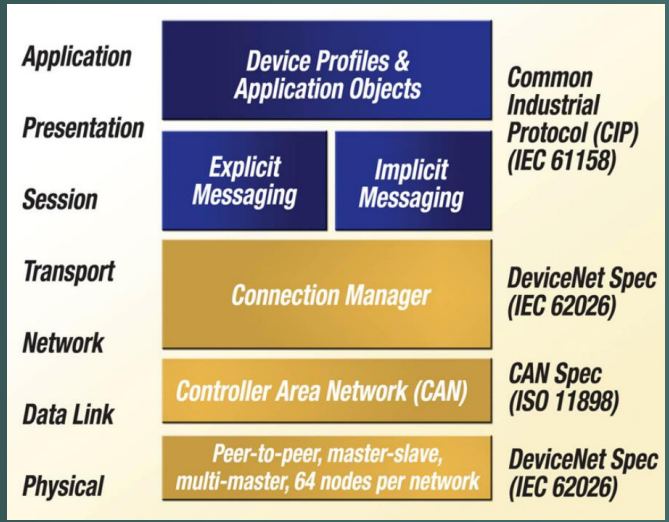
Common Industrial Protocol

- Used in upper layers
- An object-oriented protocol
- A producer-consumer communication model
- Includes device profiles
- Seamless bridging and routing



04 Controller/Device Connection

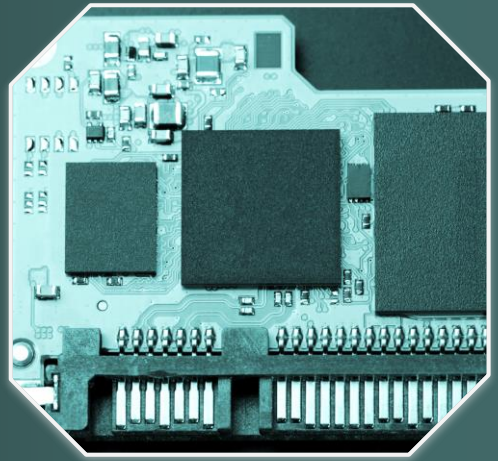
Predefined Controller/ Device Connection Set

- Simplifies the packaging and the movement of data contained in the I/O messages
- Provides connection objects that are almost entirely configured at the time the device powers-up
- The message type used is determined based on how the device is configured and the requirements of the application
- Types of I/O messages: Polled, Cyclic and Change-of-state

05 Conclusion

Conclusion

- DeviceNet is a proven, flexible, and efficient industrial network
- Enables real-time communication in manufacturing environments
- Still widely used despite the rise of industrial Ethernet solutions



References

https://scadahacker.com/library/Documents/ICS_Protocols/ODVA%20-%20DeviceNet%20-%20CIP%20on%20CAN.pdf

https://www.embien.com/industrial-insights/a-comprehensive-guide-to-odva-devicenet-protocol

https://www.odva.org/wp-content/uploads/2021/05/PUB00026R5_Tech-Series-DeviceNet.pdf

https://www.rtautomation.com/technologies/devicenet/?srsltid=AfmBOor9PYyAzcOueZ2aIAmgdghhdzgZNiKAi_S6VT4y_wUexdJtf230

https://www.odva.org/technology-standards/key-technologies/common-industrial-protocol-cip/

https://www.rtautomation.com/rtas-blog/what-is-cip/?srsltid=AfmBOooS4oUYnexu3ZchB5GXZzQVU8PDs1VNa2vAju7zC8L2ws2oOiPc

Thank You!