

# A Survey of Available Field Buses

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# Introduction

- What is a field bus?
- Some examples and comparison
- A field bus simulation

# What is a Field bus?

- Smart devices
- Determinism
- Small amounts of data
- Fault Tolerance
- Noisy environments
- Low cost

# Advantages over traditional process control

- Simplification of wiring
- Reduced cost of wiring
- Faster installation and debugging
- Improved maintenance and fault tolerance
- Higher reliability

# ISO Protocol Layers

- Layer 1: Physical medium
- Layer 2: Data link
- Layer 3: Network
- Layer 4: Transport
- Layer 5: Session
- Layer 6: Presentation
- Layer 7: Application

# A Long List

- Controller Area Network (CAN) \*
- Local Operating Network (LON) \*
- Profibus \*
- Seriplex \*
- AS-I
- Interbus
- ControlNet
- ARCNet \*
- Foundation Fieldbus

# Physical Media

- Balanced twisted pair: CAN, Profibus, LON
- Fiber optic: Profibus, LON
- Coaxial: ARCNet, LON

# Data Rates

- CAN: 1 Mbps at 40m
- LON: 1.25 Mbps at 500m
- Profibus: 12 Mbps at 100m
- Seriplex: 100 kbps at 100m
- ARCNet: 2.5 Mbps at 100m



# Topologies

- Bus (multi-drop): Profibus, CAN, LON, Seriplex, ARCNet
- Star: LON, Seriplex, ARCNet
- Ring (distributed star): ARCnet

# Media Access Characteristics

- Token based: Profibus, ARCNet
- CSMA: CAN, LON
- Circuit based: Seriplex

# Determinism

- CAN: bit wise collision arbitration, RMA
- LON: collision detection, priorityslots
- Profibus: Token
- Seriplex: dedicated bandwidth
- ARCNET: Token

# Host support

- CAN: ISA, VME, PC/104
- LON: ISA, VME, PC/104
- Profibus: VME, cPCI, ISA, PC/104
- Seriplex: ISA, VME, PC/104
- ARCNET: ISA, VME

# OS Support

- CAN: VxWorks, OS/9, DOS, pSOS, NT, Linux, Solaris, QNX
- LON: VxWorks, OS/9, DOS, NT, Solaris, QNX, LNS
- Profibus: DOS, NT, OS/2, QNX, SCO
- Seriplex: NT
- ARCNET: VxWorks, NT, QNX

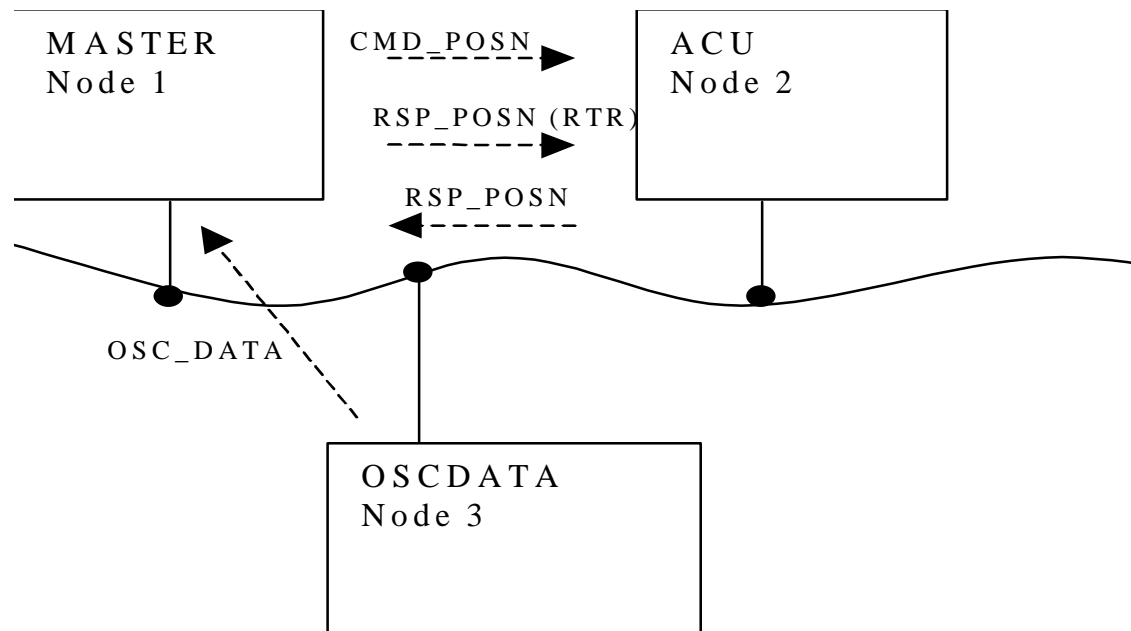
# Devices available

- CAN: Philips, Intel + more
- LON: Echelon, Toshiba
- Profibus: Bosch, Siemens + more
- Seriplex: Square D, Turck + more
- ARCNET: SMCS

# A CAN Simulation

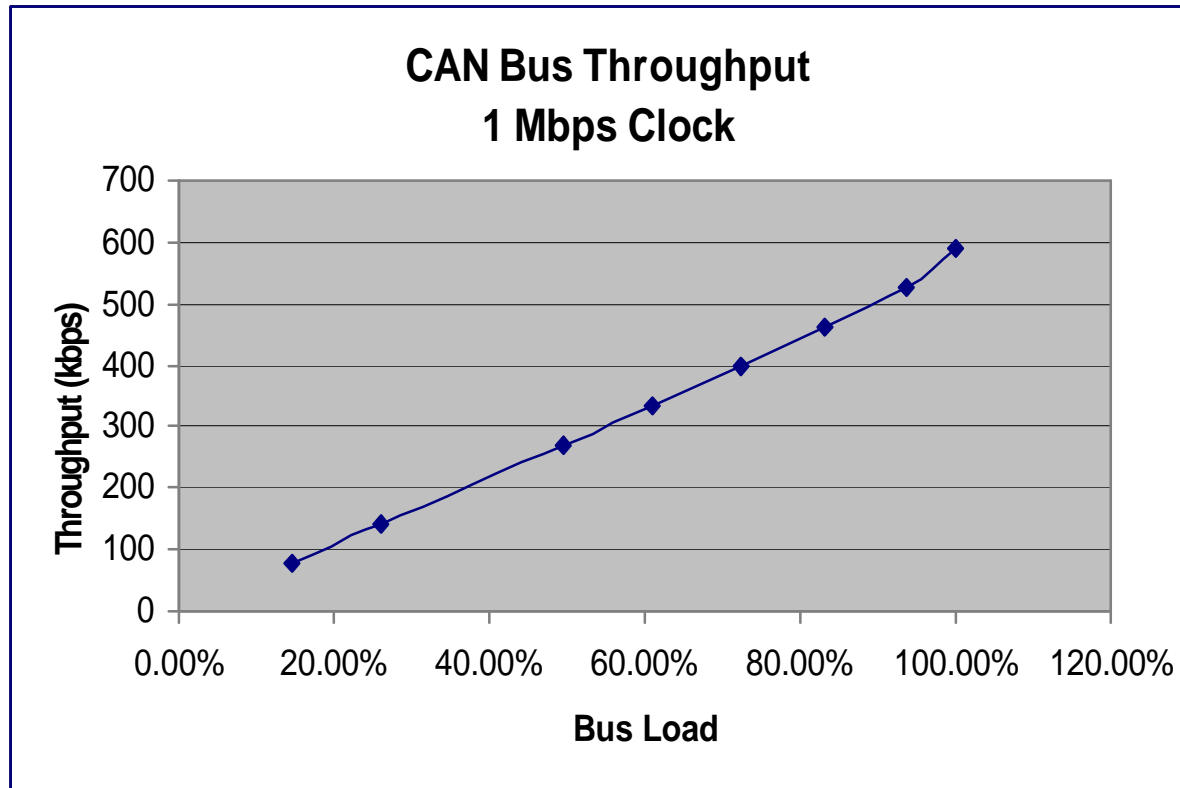
- Simulation of CAN using queuing theory
- From I+ME commercial CAN simulator
- Three node network

# Simulated CAN System

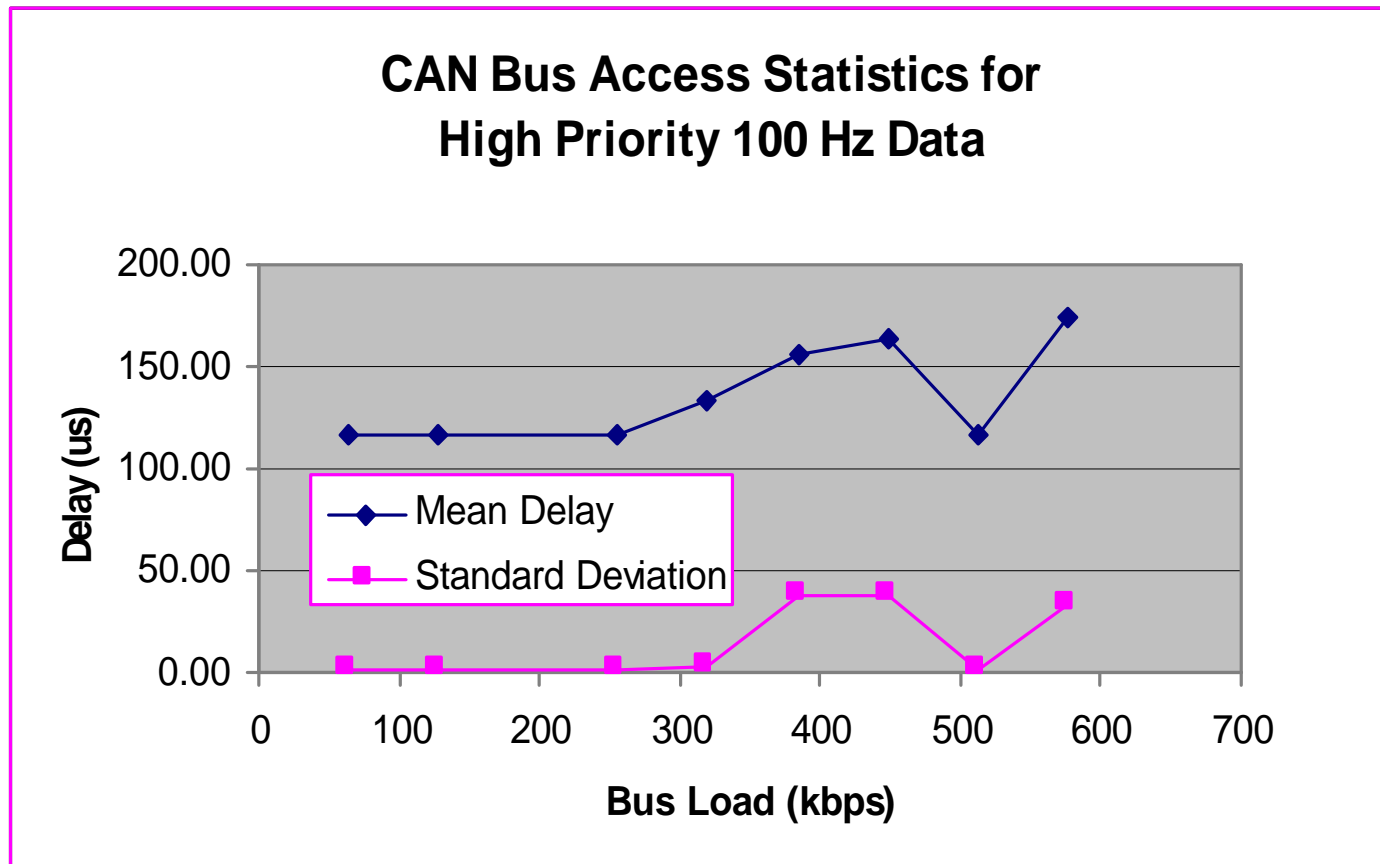




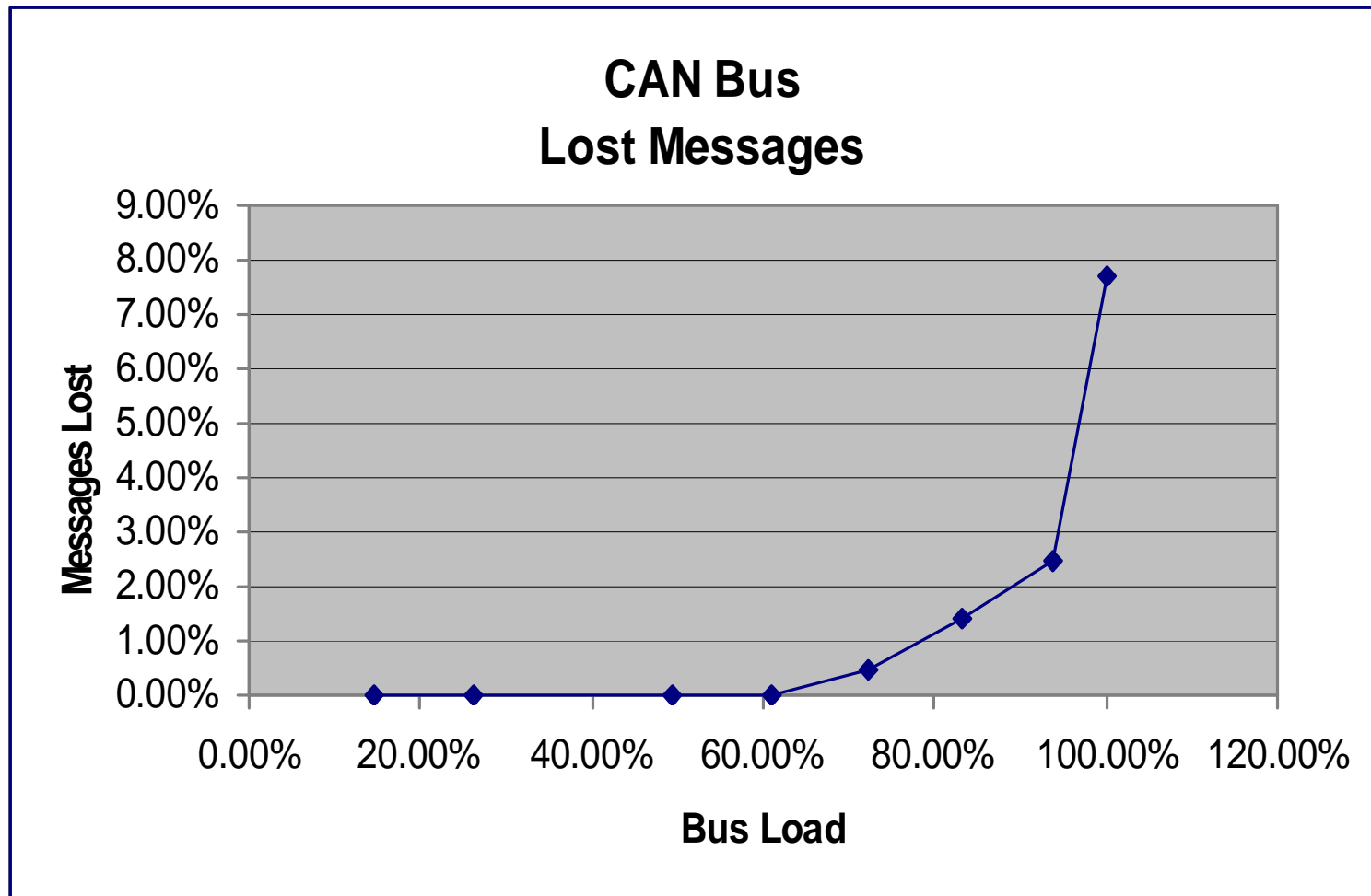
# CAN Throughput



# Message Latency Statistics



# Lost Messages



# Summary

- Large numbers of industrial sites
- Cheap interfacing
- Built-in fault tolerance
- Development support tools
- Predictable response times