

NSF Engineering Research Center for
Reconfigurable Manufacturing Systems



***Welcome to the 4th Annual
Network Performance Workshop:***

***Wireless Networks for Automation in Manufacturing:
Leveraging Analysis and Experimentation to Develop Robust Solutions***

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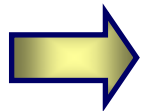
May 13, 2009



The University of Michigan, Ann Arbor

Outline

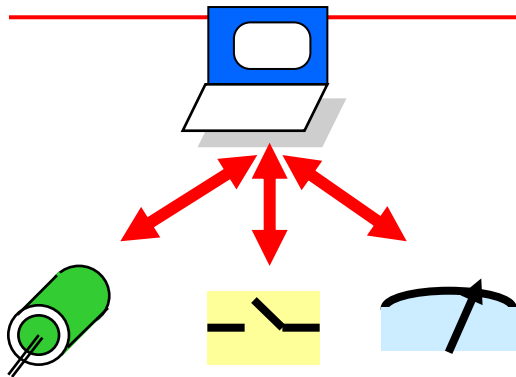
- Introductions



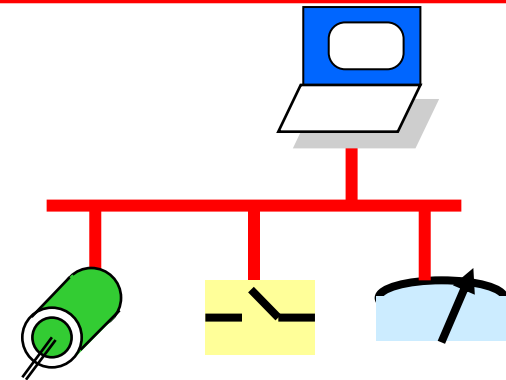
- **Background**
 - Networks and the ERC
 - The Network Performance Workshop
- Introduction to this year's Workshop
 - Scope
 - Goals



Advantages of Moving to Networks



Centralized point-to-point



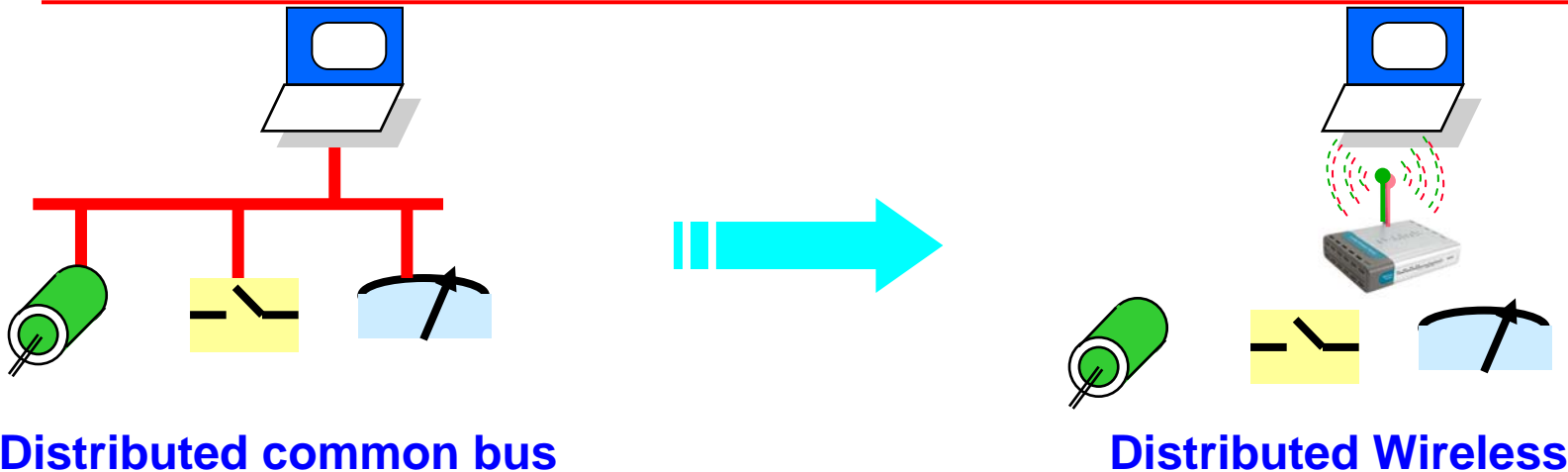
Distributed common bus

Advantages of Distributed Common Bus

- Decrease wiring/maintenance cost
- Expand flexibility of control architecture
- Expand diagnostic capabilities
- Increase reliability
- Increase reconfigurability
- Increase interchangeability



Advantages of Moving to Wireless



Move to Wireless

Advantages

- Further decrease wiring cost
- Increased physical flexibility
- Increased reconfigurability

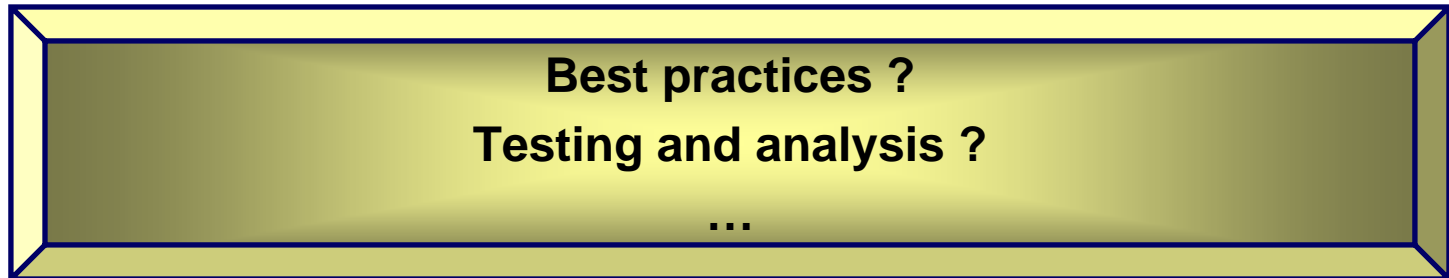
Disadvantages

- Reduced performance possible
- Reduced noise immunity
- Reduced security
- More “unknowns”



Dimensions of the Wireless problem

- Which technology to use ?
- Interference from barriers, reflections, noise sources, etc
- Coexistence
- Security
- Factory Floor vs. IT
- Wired vs. wireless, move to wireless
- Time synchronization and wireless
- Etc....



ERC-TA2 Networking Projects: *Summary*

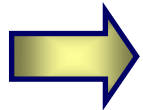
- **Enterprise industrial networking solutions (2001 – present)**
 - ERC core activity with Reconfigurable Factory Testbed
 - Control, Diagnostics and Safety multi-tier networks
- **Network performance evaluation (2003 – present)**
 - **Wireless networking in manufacturing best practices (partnering with USCAR)**
 - Industrial Ethernet best practices
 - Partnership with GM, completed
 - Technology trade-offs, and performance analysis
- **Industrial network time synchronization (2005 – Present)**
 - IEEE 1588, approaches, benefits, current issues with implementation
 - Partnership with NIST
 - Factory network traffic simulator for semiconductor manufacturing
- **Network partitioning for safety, control and diagnostics (2003 – 2007)**
 - Network Return-On-Investment cost calculator
 - Partnership with Pilz Automation, completed

**For additional information,
refer to two-page summaries in catalog handout**



Outline

- Introductions
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 - Networks and the ERC
 - The Network Performance Workshop



- **Introduction to this year's Workshop**
 - **Scope**
 - **Goals**



1st Network Performance Workshop: April 2006

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 - Consensus on practical network system performance metrics
 - Identified ways in which the ERC can contribute to improving network system best practices
- **2nd Network Performance Workshop: May 2007**
 - Explored considerations and challenges in moving to industrial ethernet
 - Identified details of need for best practices in industrial wireless implementation
- **3rd Network Performance Workshop: May 2007**
 - Determining best practices for deploying and evaluating wireless networks in an industrial setting
- **Output Reports Available for Each Workshop**



4th Annual Network Performance Workshop:

Scope of This Year's Workshop

- **Focus: Determine How to Best Leverage Analysis and Experimentation to Develop Robust Industrial Wireless Solutions**
 - Performance of wireless control networks on the factory floor
 - What are the dimensions of performance of wireless ?
 - What do we see in wireless performance to-date in these dimensions ?
 - What are the most important issues that should be addressed in order to accelerate the adoption of wireless technologies ?
 - What can the universities do to help from an analysis and testing perspective ?

- **Approach**
 - **Presentations** from wireless practitioners and researchers
 - **Panel discussion**
 - Determine the top five issues hindering the deployment of wireless in manufacturing
 - Identify how suppliers are addressing these issues
 - Identify what challenges remain, especially those that can be addressed through University applied research and testing



Workshop Agenda:

How We Plan to Achieve These Goals

Time (pm)	Description of Events
12:00 – 01:00	Lunch - Pierpont Commons, Boulevard Room
12:30 – 01:30	Keynote: "Applying Wireless Technologies to Industry Automation," <i>Penny Chen, Yokogawa IA Global Marketing Center</i>
01:30 – 01:45	Welcome/Introductions, <i>James Moyne, UM-ERC</i>
01:45 – 02:15	"Wireless Safety," <i>Pilz Automation U.S.A</i>
02:15 – 02:45	"Performance of Wireless Networks Validated via Testing and Simulation," Dhananjay ('DJ') Anand and Deepak Sharma, <i>UM-ERC</i>
2:40 p.m.	Panel Logistics, <i>James Moyne, UM-ERC</i>
2:50 p.m.	Break
3:00 p.m	Panel Discussion: Wireless Networks for Automation in Manufacturing: Determining Issues Hindering Deployment and Role of University Applied Research Panelists: <i>ABB, Pilz Automation, Siemens, USCAR</i>
3:45 p.m.	Consensus/Conclusions
4:00 p.m.	Workshop Concludes

