



Setting the Standard for Automation™

Machine-to-Machine Interfaces in Factory Automation

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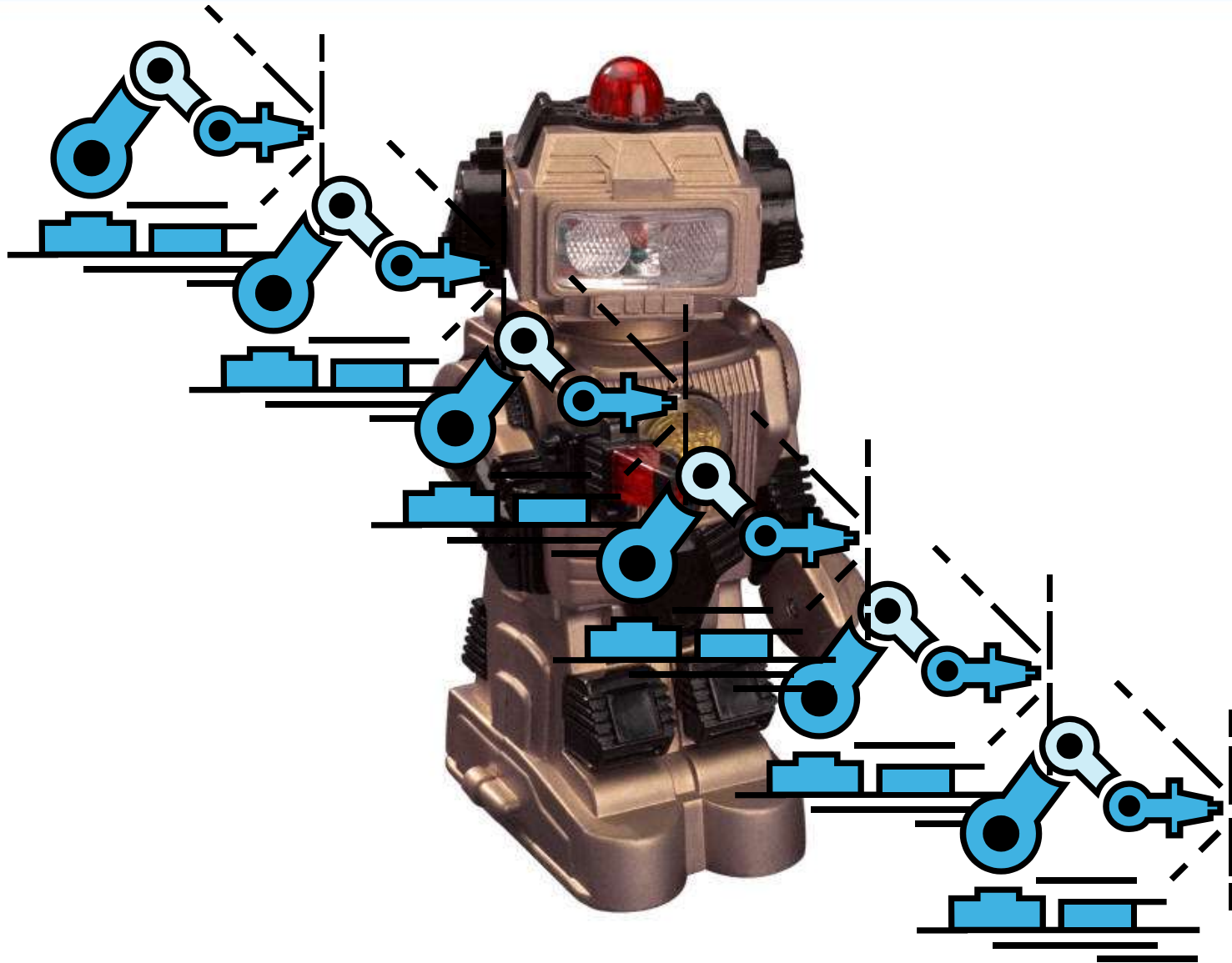
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- Factory Automation
 - Often referred to as Discrete and/or Hybrid Automation
 - Functional and technical requirements that place unique demands on control and communication systems
 - Different needs, different challenges
 - Higher speeds
 - Tighter spaces
 - Larger quantities
 - High density of devices



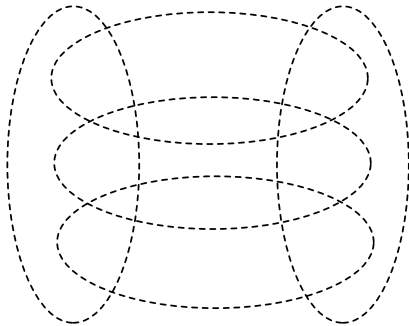
When I think of Factory Automation...



Vehicle welding operation



Node Density



Each ellipse represents a cluster of nodes. The above diagram shows five clusters in an overlapping arrangement.

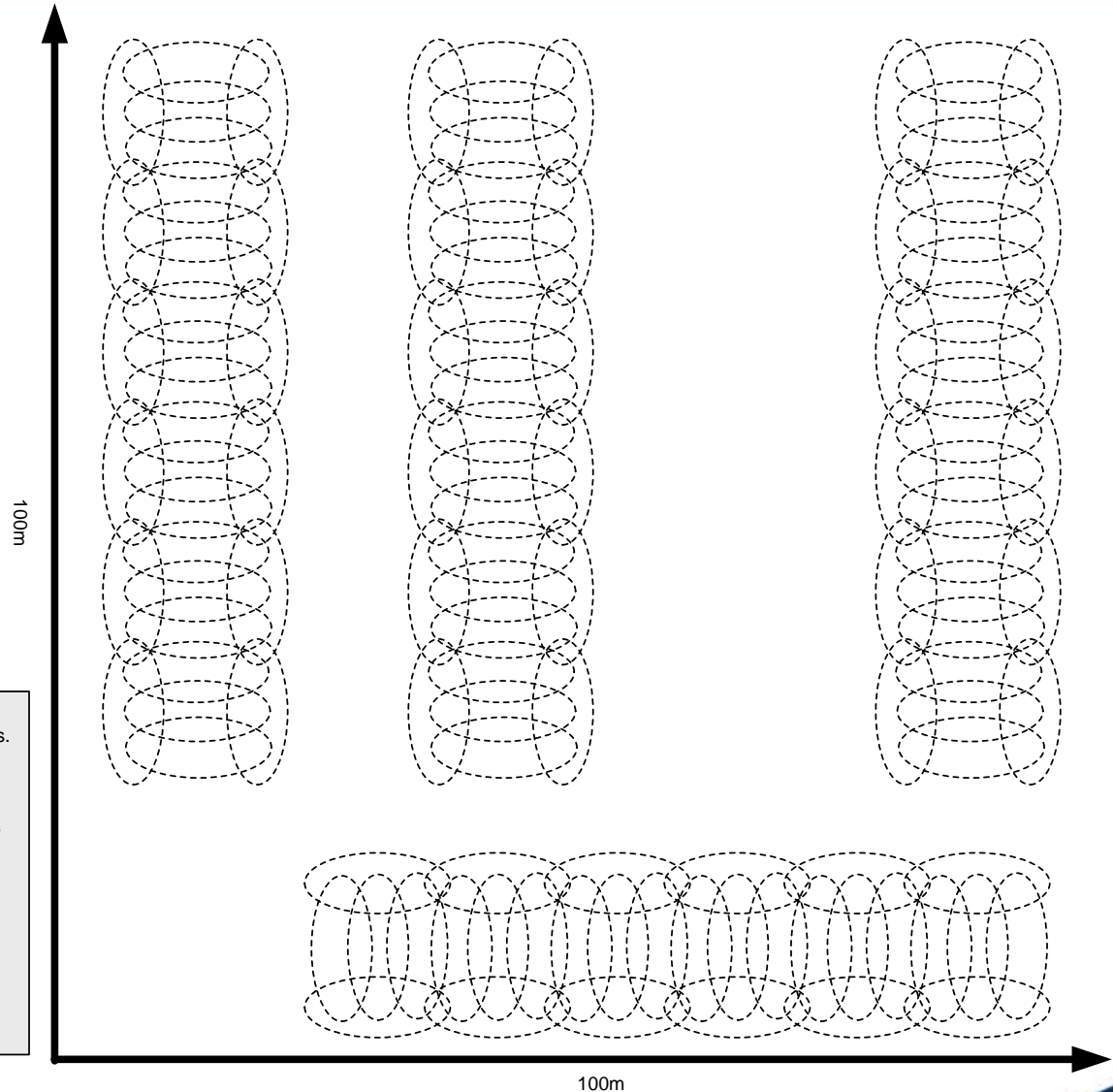
In this factory automation example, a factory is 100m by 100m in size and has four (4) automation lines, each representing a group of clusters.

Node density for this factory is calculated as follows:

Total clusters = 5 clusters/group x 6 groups/line x 4 lines = 120 clusters per 10,000m²

Assume 13 to 50 nodes per cluster.

- 13 nodes per cluster = 1,560 nodes per 10,000m²
Node density = 0.156 nodes/m²
- 50 nodes per cluster = 6,000 nodes per 10,000m²
Node density = 0.6 nodes/m²



- **Most prevalent** in higher latency, non-deterministic monitoring applications
 - Temperature
 - Flow
 - Vibration
- **Attractiveness** stems from
 - Standard interfaces to well-established industrial network protocols (e.g., EtherNet/IP, PROFINET)
 - Field-based devices for wireless interrogation and data translation
- **Challenges** arise when speed is important

What if...



What if machines could report...



...their “health”?

- vibration of rotating equipment
- motor winding temperature
- oil or lubricant temperature or quality



What if machines could report...

...their production?

- good parts or batches
- substandard parts or batches
- scrap or waste
- consumable materials used
- energy or utilities consumed



What if machines could report...



...their “inventory”?

- mechanical components
- electrical components – including those inside control cabinets
- changeover parts
- spare part requirements



What if machines could report...



...their “location”?

- work cell name
- work cell unique identity
- physical location inside the plant
- operational status
- safety status
- upstream and downstream interfaces



Summary



- Passive wireless sensing has promise for Factory Automation applications
- The challenge is competing for mindshare with other wired and wireless technologies, and “the way it’s always been done”
- Standards play a role by exposing user and technical requirements that can challenge our industry to advance our efforts to meet those requirements that are currently unmet



Innovation will drive proliferation!



Setting the Standard for Automation™

Thank you!

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