

The standardized control of non-standard conveyor components

Presented by:

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Agenda

- What do conveyors systems look like right now
- What do we want them to look like
- How do we build and integrate them
- How far can I extend this
- Conclusions



Introduction

- **AMK** – Around since 1963; focused on machine automation
- **Tom Jensen** – A technology evangelist for 25+ years now leading AMK Automation in the US

Worked in these industries:

Machine tool

Packaging

Auto Production

Material Handling

Problem

In the years since the creation of industry standards like

- > ISA 88 – Modular Code Structure
 - > PackML – Machine Control and OEE
- Why has the complexity of integration not changed?
 - Why is data collection is still a goal and not reality?



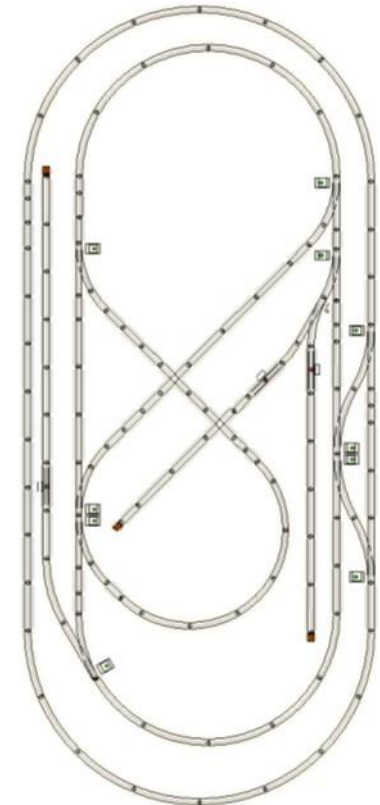
Solution

- It wasn't until recently that control platforms could actually provide a modular code approach to modular machines.
 - Economically
 - Programmatically
 - Conceptually



Concept

- The Idea – to have a box of “railroad track” that can snap together to make any conveyor cell
 - Modules with a given input and output
 - Modules with a single motor to move the module
 - Modules that are functionally identical (that doesn't mean physically identical)



Concept

Modules that don't fit this description – Ghosts

- Ghosts have –
 - Multiple axes
 - Complex Functions
 - Sophisticated Software

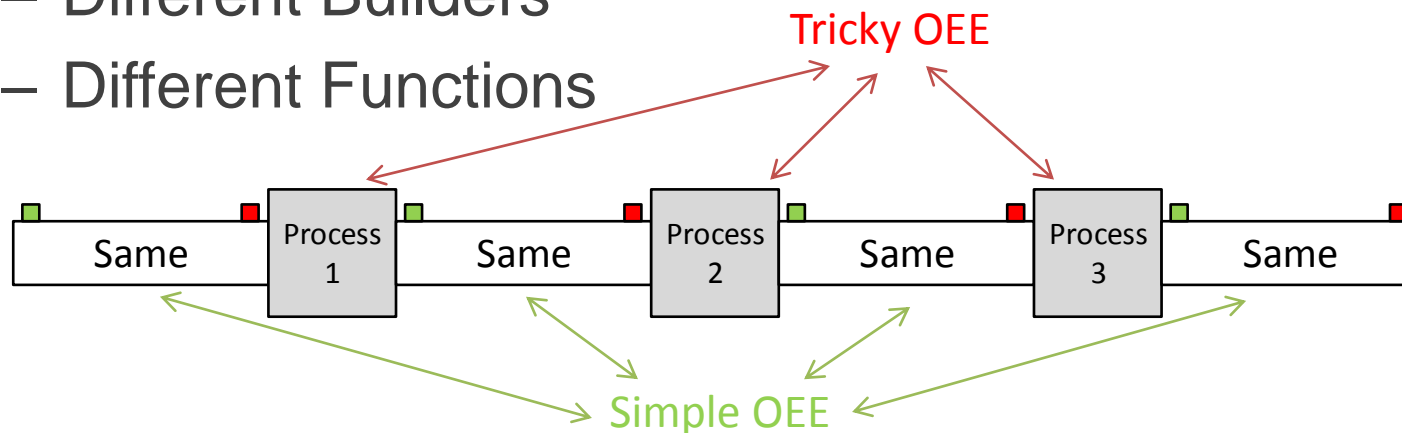
This is where the integration problem happens...



Concept

Modules that don't fit this description – Ghosts

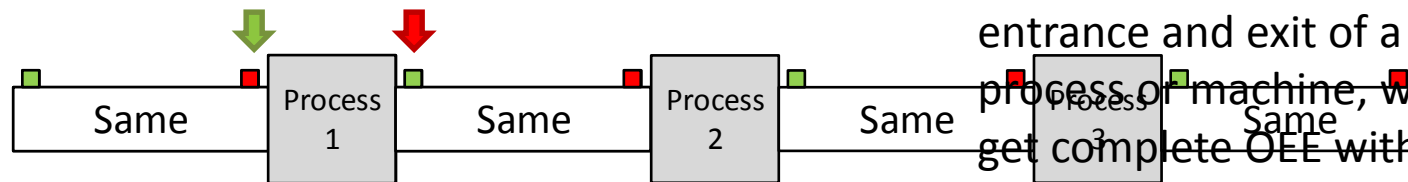
- All belts function the same, but the machines between don't always play nice...
 - Different Builders
 - Different Functions



Concept - OEE

Overall Equipment Effectiveness

- Running speed / Design speed
- Running time / Available Time
- Output products / Delivered products

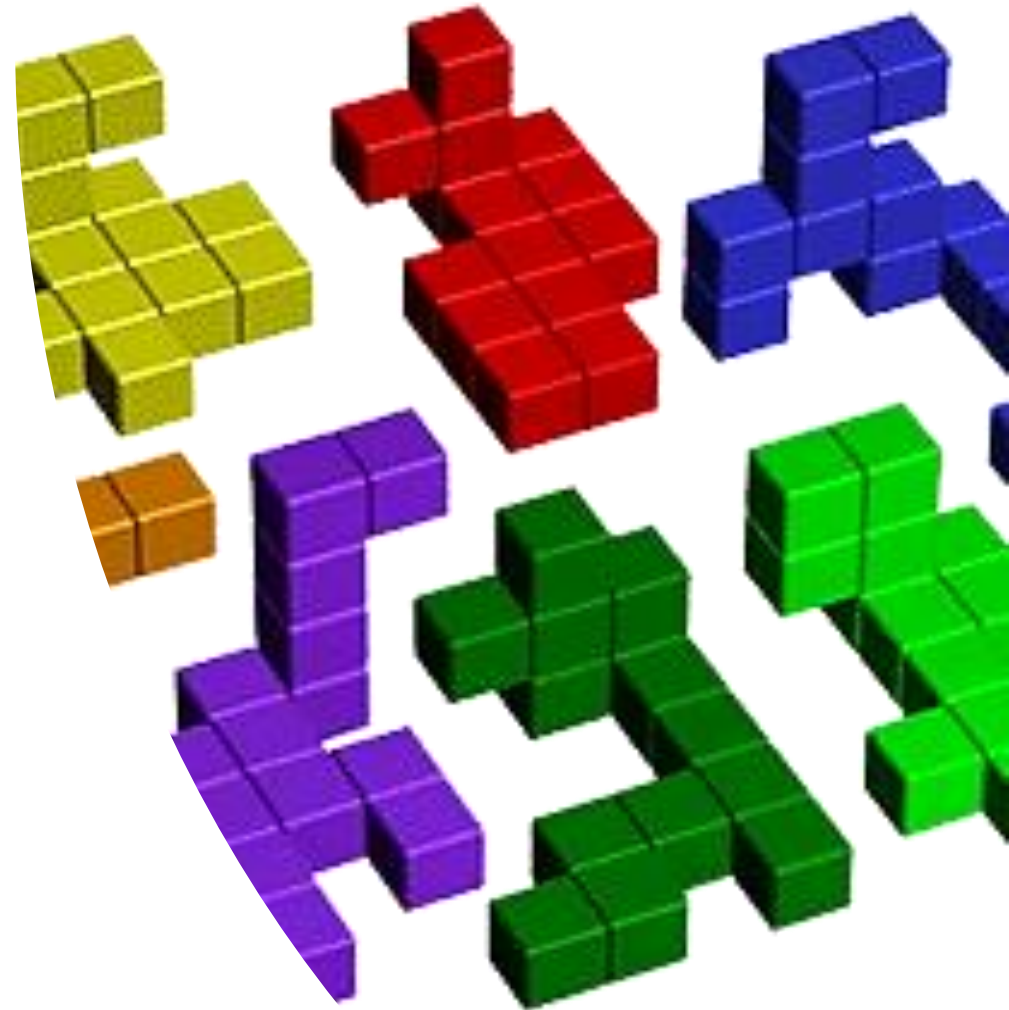


With 2 sensors at the entrance and exit of a process or machine, we can get complete OEE without digging into the OEMs machine code

Concept

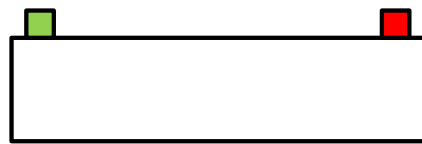
Machine Module

- Mechanical – the OEM’s mastery of the physical world
- Electrical – adding the muscle to the mechanical concept
- Software – tying the mechatronic solution together

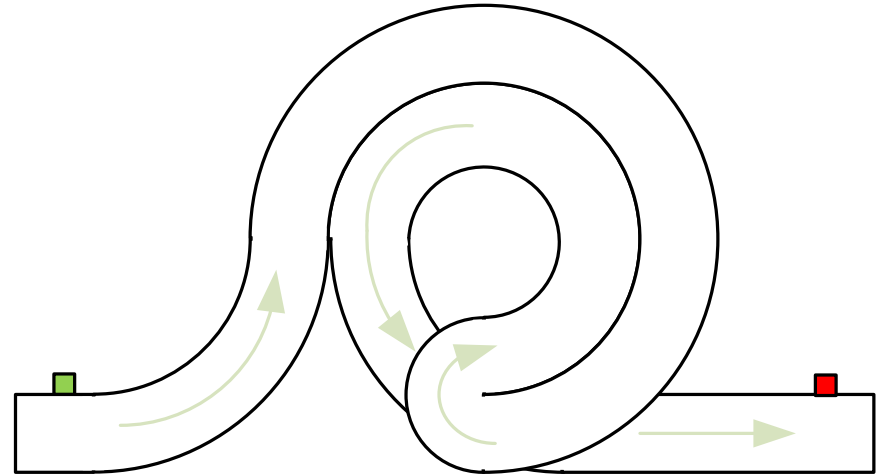


Mechanical

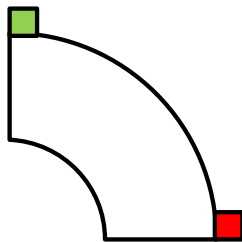
- The Build



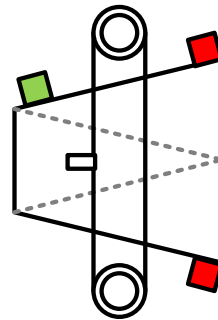
Straight Conveyor



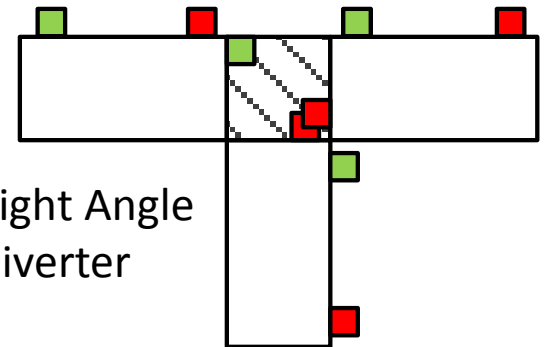
Accumulating Conveyor



Curved Conveyor



Diverter



Right Angle Diverter

Electrical

- Concept – The standardization of hardware is key.

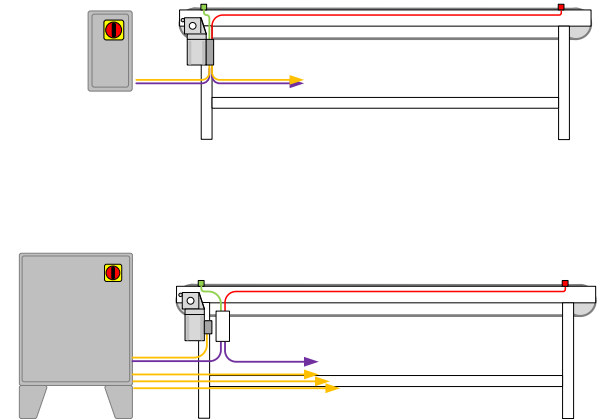
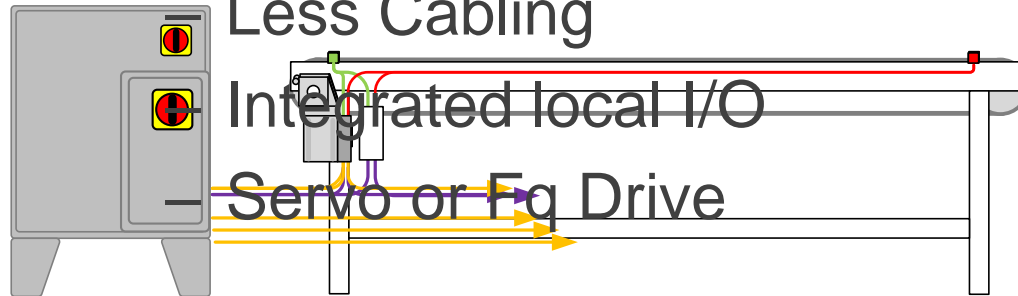
Decentralized Pros

- Small

- Less Cabling

- Integrated local I/O

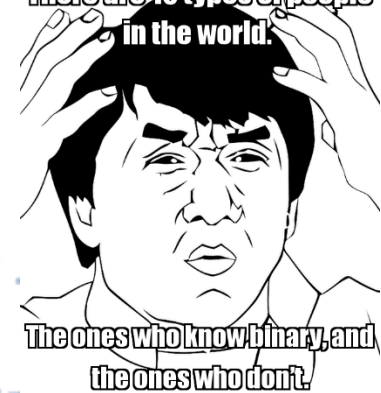
- Servo or Fq Drive



Software

- Goals
 - No programming environment
 - Configure from HMI
 - Configure from spreadsheet
 - Have the local control auto configure
 - Account for all layout objects

There are 10 types of people
in the world.

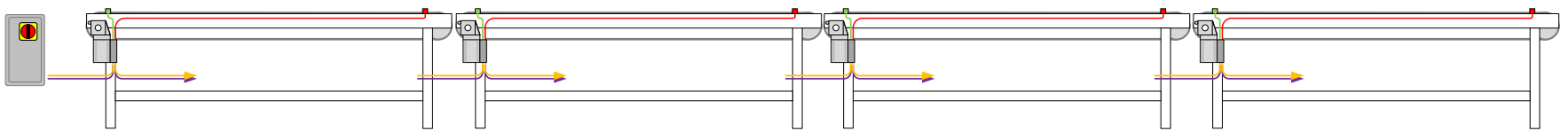
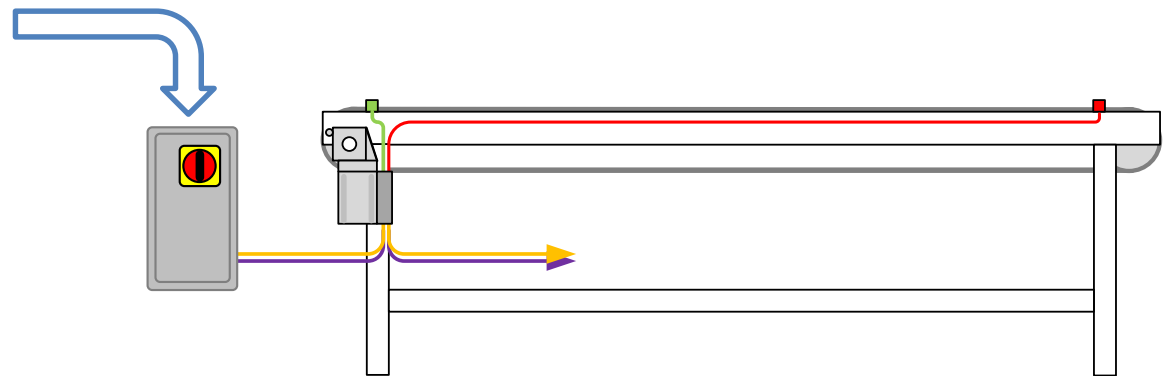


The ones who know binary, and
the ones who don't.

Software

What's in the box?

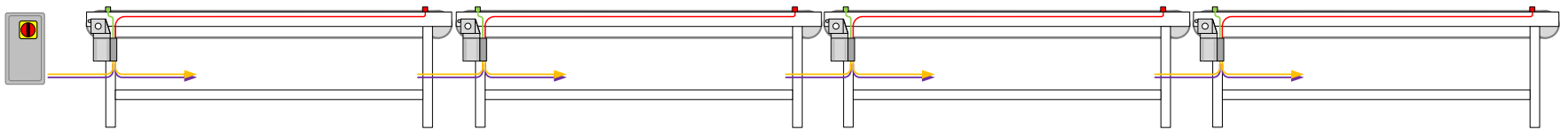
- Controller
- +24VDC
- Motor Power
- STO
- Multiple Communication protocols



Software

What does the PLC code look like? Who cares!

- Code that auto configures for discovered modules
 - Always 1 motor
 - Always 2 sensors
- Code that can take in a CSV or similar
- Code that can talk to a higher system



Software

A list of available modules identified by the conveyor control

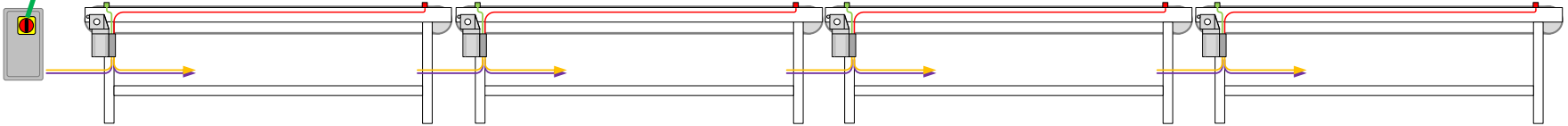
What Action you want the module to do

With a spreadsheet, the entire cell can be configured, saved as a CSV file and dropped into the conveyor cell control.

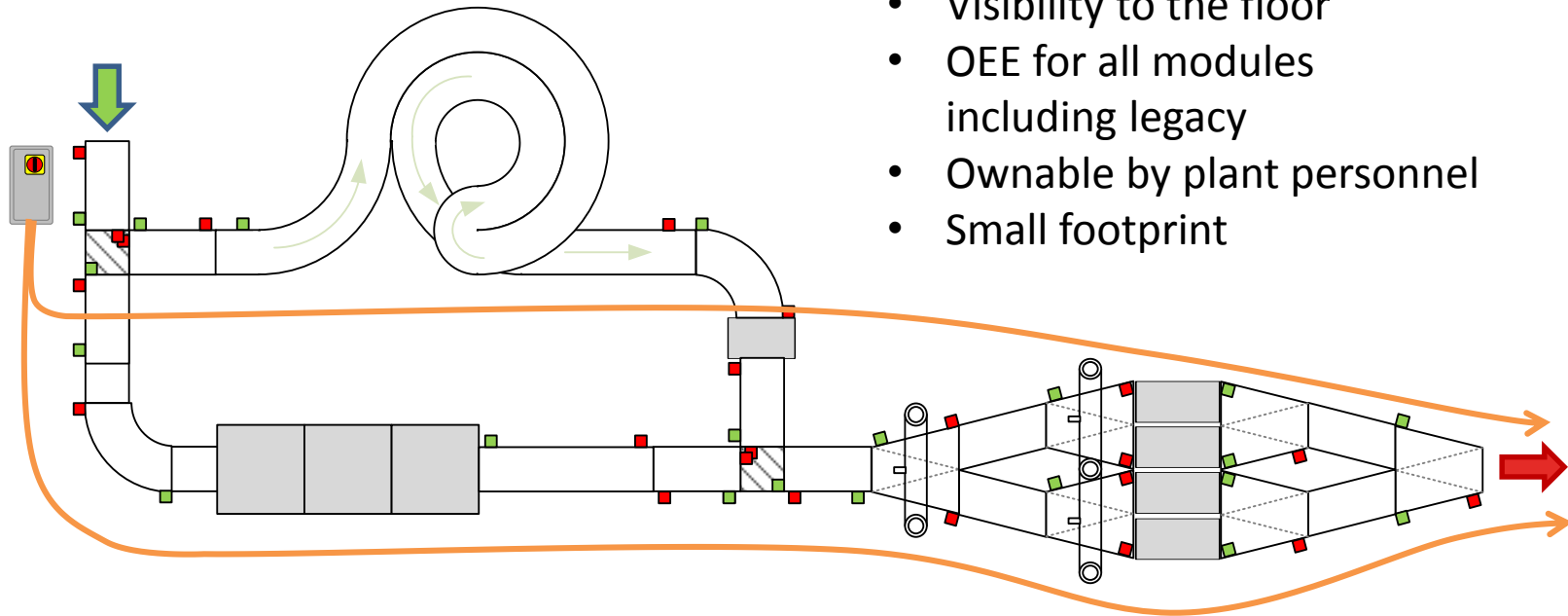
From a predefined drop down list

Saved as a CSV, and put into the controller

Conveyor Number	Action	Instruction 1			Instruction 2			Instruction 3			Instruction 4			Special Functions			
		Type	Value	Function	Type	Value	Function	Type	Value	Function	Type	Value	Function	FCT1	FCT1 #	FCT2	FCT2 #
88	PAUSE	CONVEYOR	88.1	AND	CONVEYOR	1	AND	PLC	3				NOT		TON	tr25	Pause if Conv. 88.1 is not running
	FORWARD	TRUE								PLC	OR						
	REVERSE																
	OUTPUT_ON																
		PLC	89														Run Signal from Dual Block Ejector (89)
		CONVEYOR	90														Pause if Conv. 90 is not running



What does it look like...



We have;

- Visibility to the floor
- OEE for all modules including legacy
- Ownable by plant personnel
- Small footprint

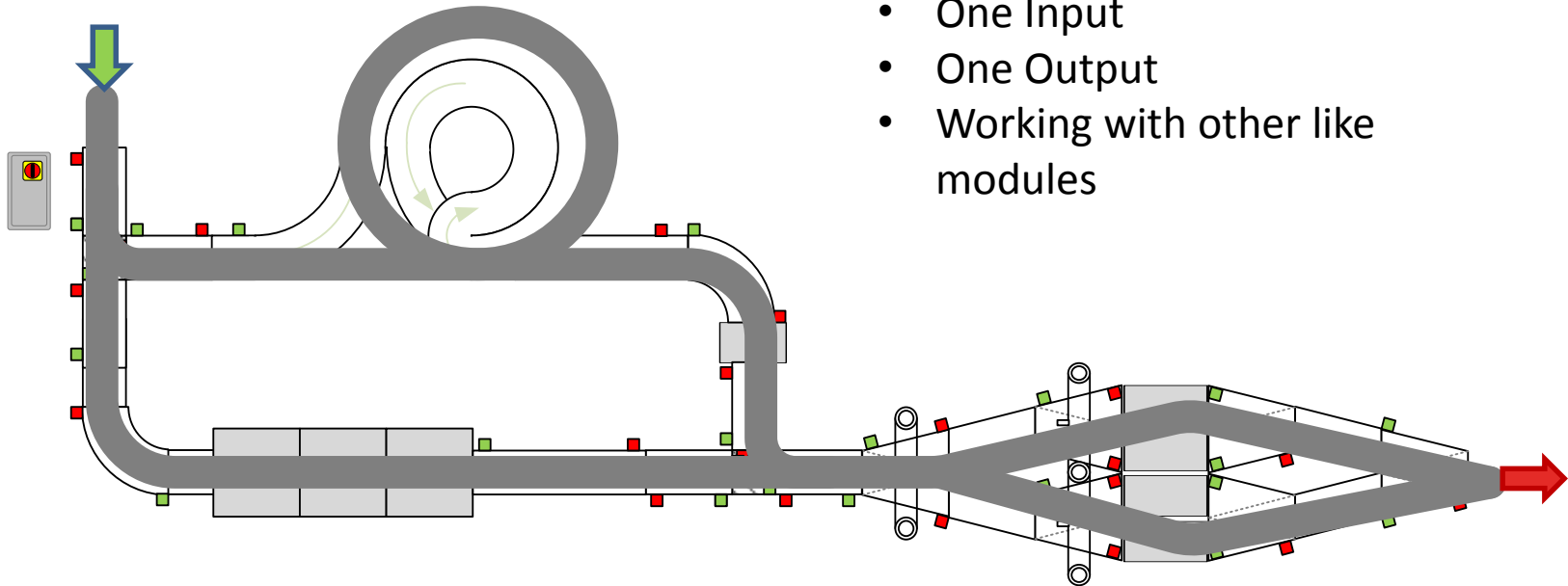
Extend the Concept

- Is there any difference to the definition for a conveyor module or a cell?
 - Functionally Identical
 - Inputs and Outputs

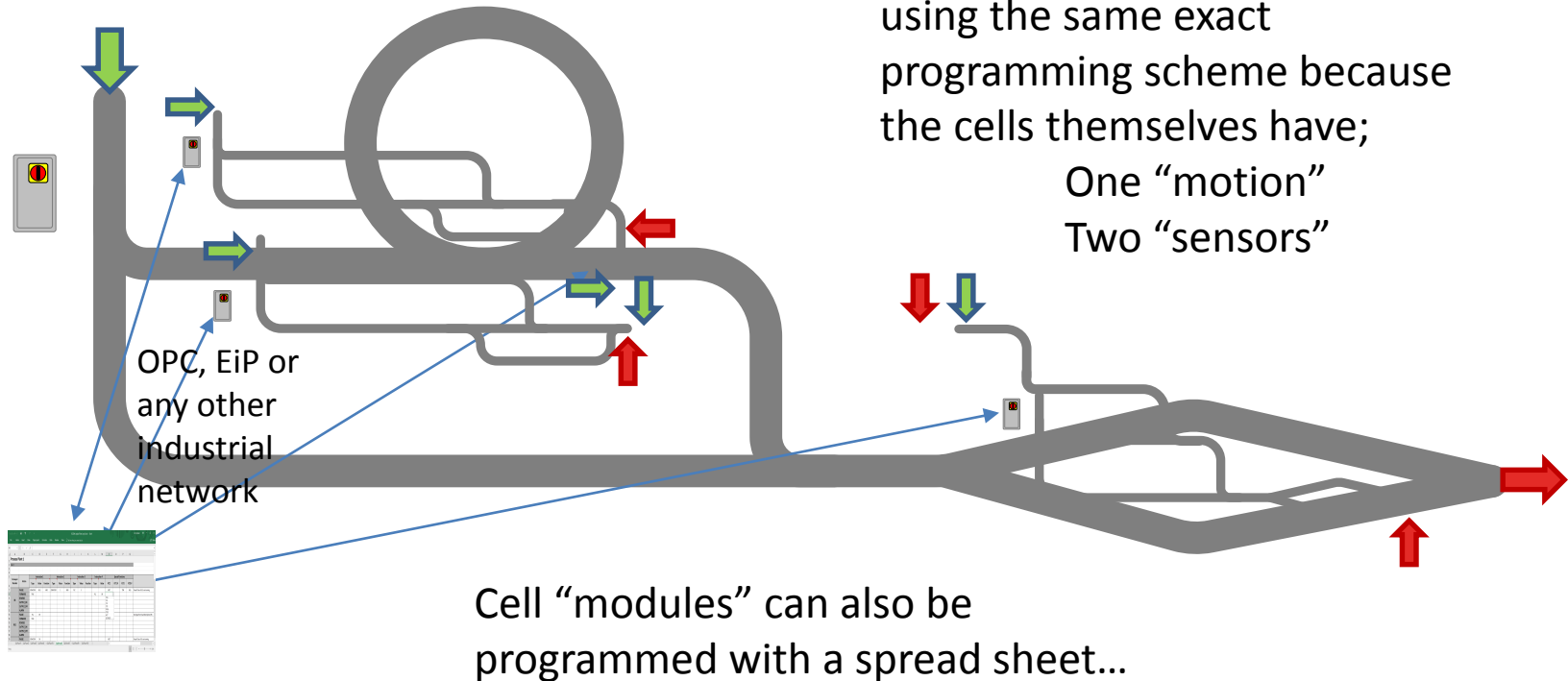
What does it look like...

We have;

- One Input
- One Output
- Working with other like modules



What does it look like...



Results



Lower Inventory across all disciplines

- Standard modules means standard components
- Design from the catalog

Normalized OEE across the line

Plant personnel own the solution

- If they can use a spread sheet

Cautions

- The concept allows the standardization and integration of like modules, and data collection based on modules
- Your operations may need more comprehensive package routing. If so, the data collection scheme becomes the operations check on performance.
- Modules can be added for rework points (rejects, bad products) as part of OEE



For More Information:

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and visit us at booth **B1163**