OPC UA Business Value

Bill Lydon

- **Chairman of PLCopen North America**

PLCopen
for efficiency in automation

- **Editor of Automation.com & InTech Magazine**

Automation.com

ISA InTech

- **Automation Consultant**

OPC FOUNDATION

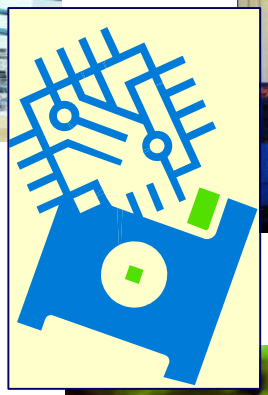
Bill Lydon Background

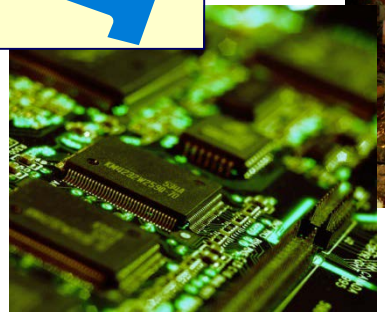
Hardware & Software Design

Entrepreneur

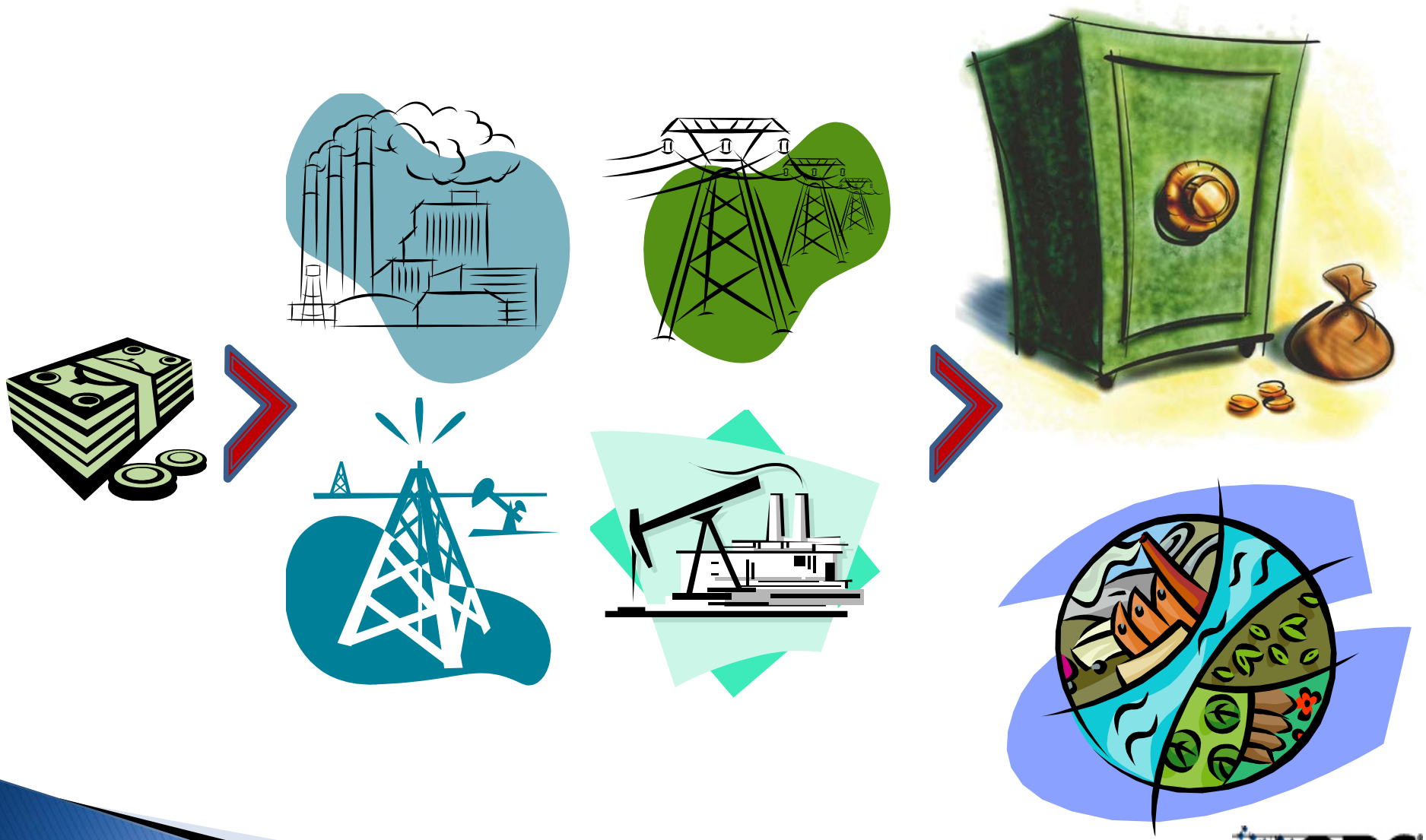
Applications

Controls &Automation

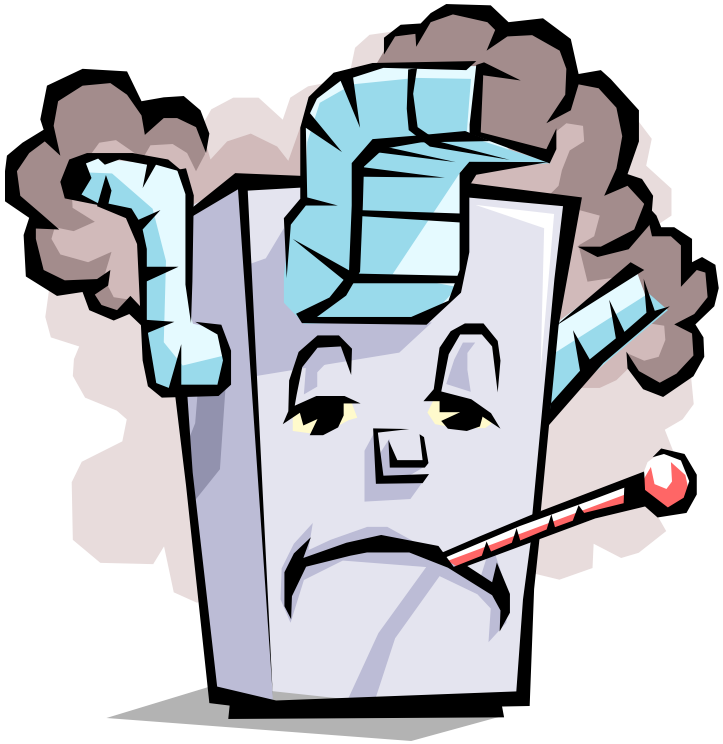




Business



business pressures

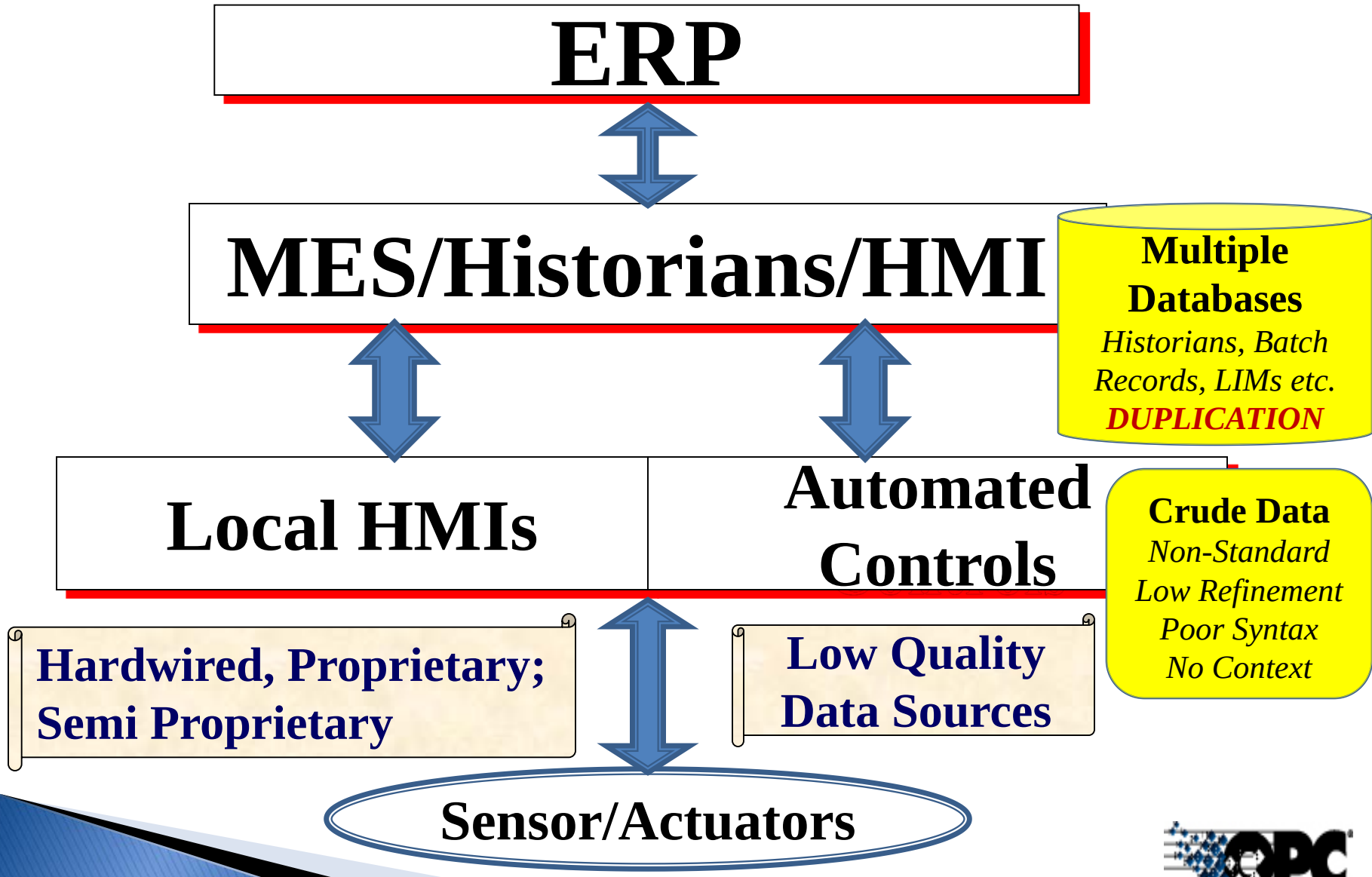


- Customer Responsiveness
- Profits
- Order Synchronization
- Supply Chain Synchronization
- Work In Process Tracking
- Genealogy & Traceability (TnT)
- WEB Visibility
- Compliance Documentation
- Paperless Systems
- Investment Justification?

Manufacturing systems NOT advancing at the rate of other business systems.

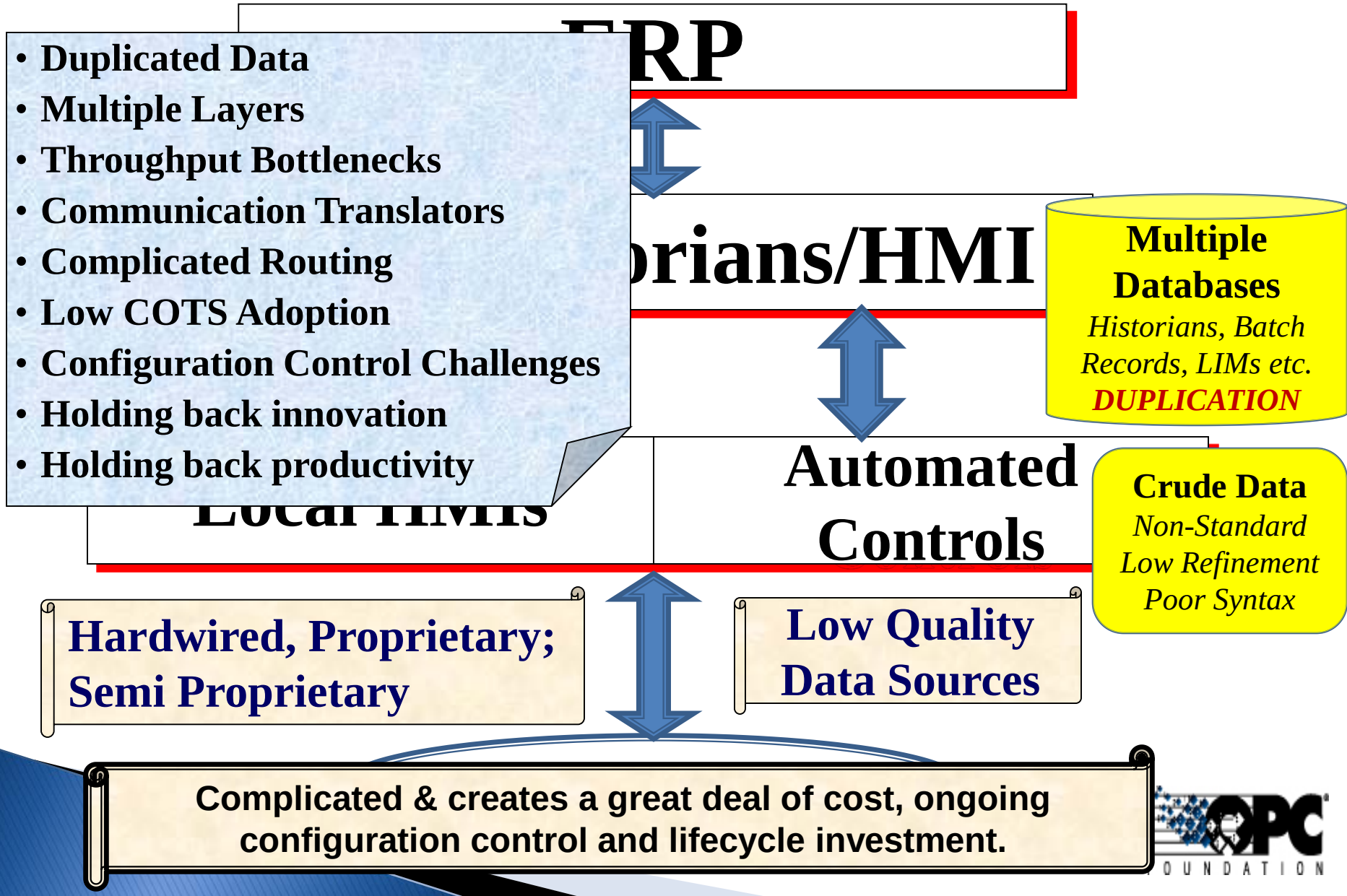
OPC FOUNDATION

Cumbersome & Slow Architecture

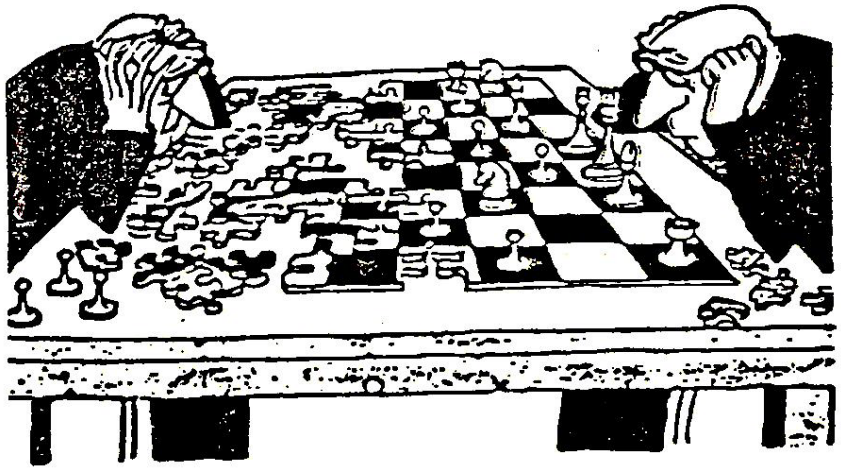


OPC FOUNDATION

Cumbersome & Slow Architecture



Industry 4.0 ♦ Smart Factory ♦ Industrial Internet
Manufacturing IoT ♦ Intelligent Manufacturing



Striving for Manufacturing Success
Creative & Innovative Automation

Low labor cost is not a winning manufacturing strategy…

OPC FOUNDATION

The Big Ideas: Real-time Digital Factory

continuous real-time business optimization

Synchronize: Customer, Supply Chain; Manufacturing

Make to Order Manufacturing

Increase Factory Throughput

Increase Quality

Frictionless Communication

Reduce Application Engineering Time

Simplify Enterprise Software Interfaces

Precision & Efficiency

Increased Computing & Communications

Increased Computing & Communications

Embedded Computing - Sensors , Actuators, Pumps, Flow Sensors, …

Control & Automation Driving to the Edge

"the internet of things"

32/64 bit CPUs, Integrated Communication (Wired & Wireless),
Embedded Real-time Operating System, Web Server, Email, Web Services

OPC FOUNDATION

Analytics

Methods Understood - Model Based Control * Model Free * Self Learning

Limiting Factors – Processing Power, Communications, & Weak Software Platforms

Wider Application Possibilities

Machine • Multi-Process • Multi-plant • Supply Chain • Energy

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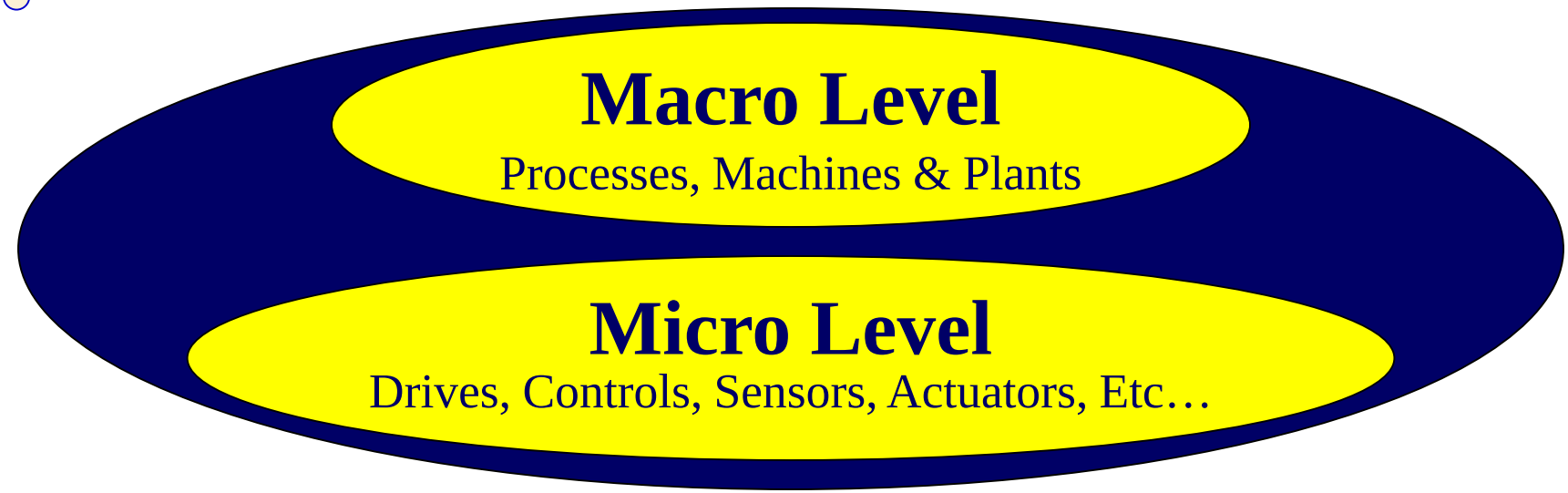


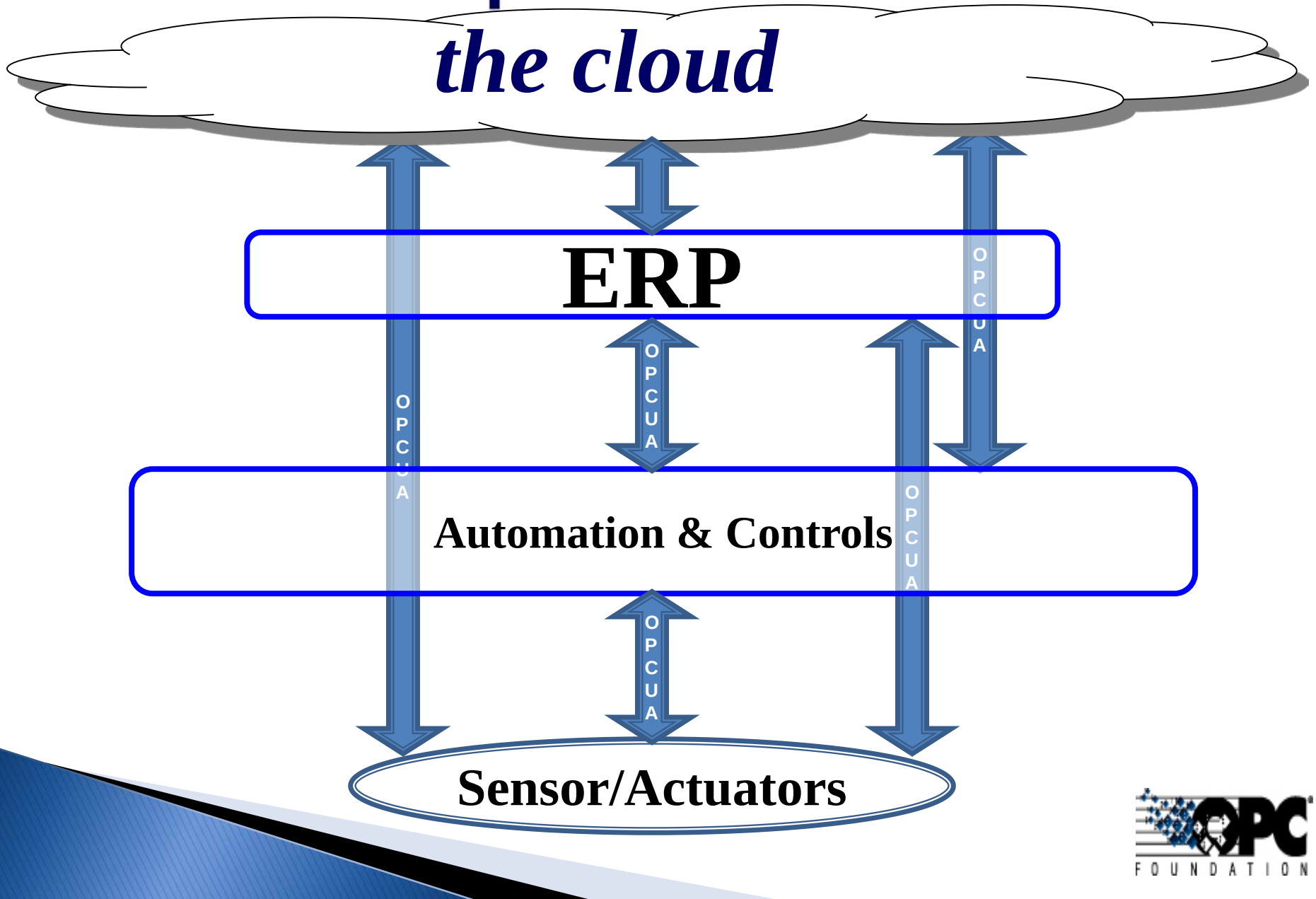
Embedded Computing - Sensors , Actuators, Pumps, Flow Sensors, …

Control & Automation Driving to the Edge

Refinement ♦ Analytics ♦ Web Server ♦ Email ♦ Web Services ♦ OPC UA

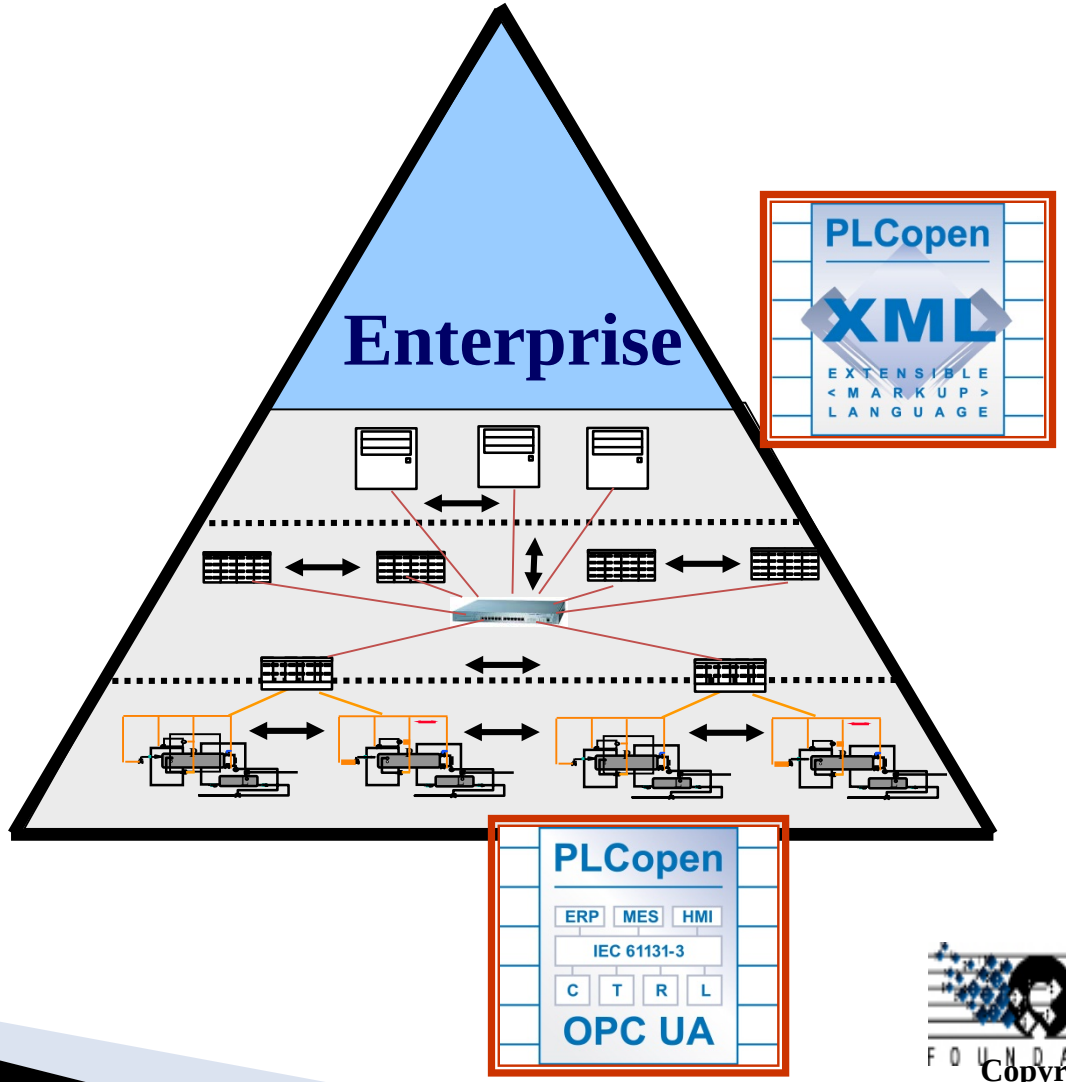
OPC FOUNDATION

Lean & Responsive Architecture



Open Standards Deliver Interoperability
Device to Device and Device to the Enterprise

- ISA-95
- ISA-88
- B2MML
- IEC 61131
- MTConnect
- PackML
- OPC UA
- OPC UA ADI
- OPC UA - WITSML



IEC 61131-3 Global Standard

IEC = International Electrotechnical Commission

Founded in 1906 ♦ Over 50 participating countries

Common Industrial Control Programming Standard

PLCopen

Founded in 1992 ♦ Worldwide

Vendor Independent ♦ Not for Profit

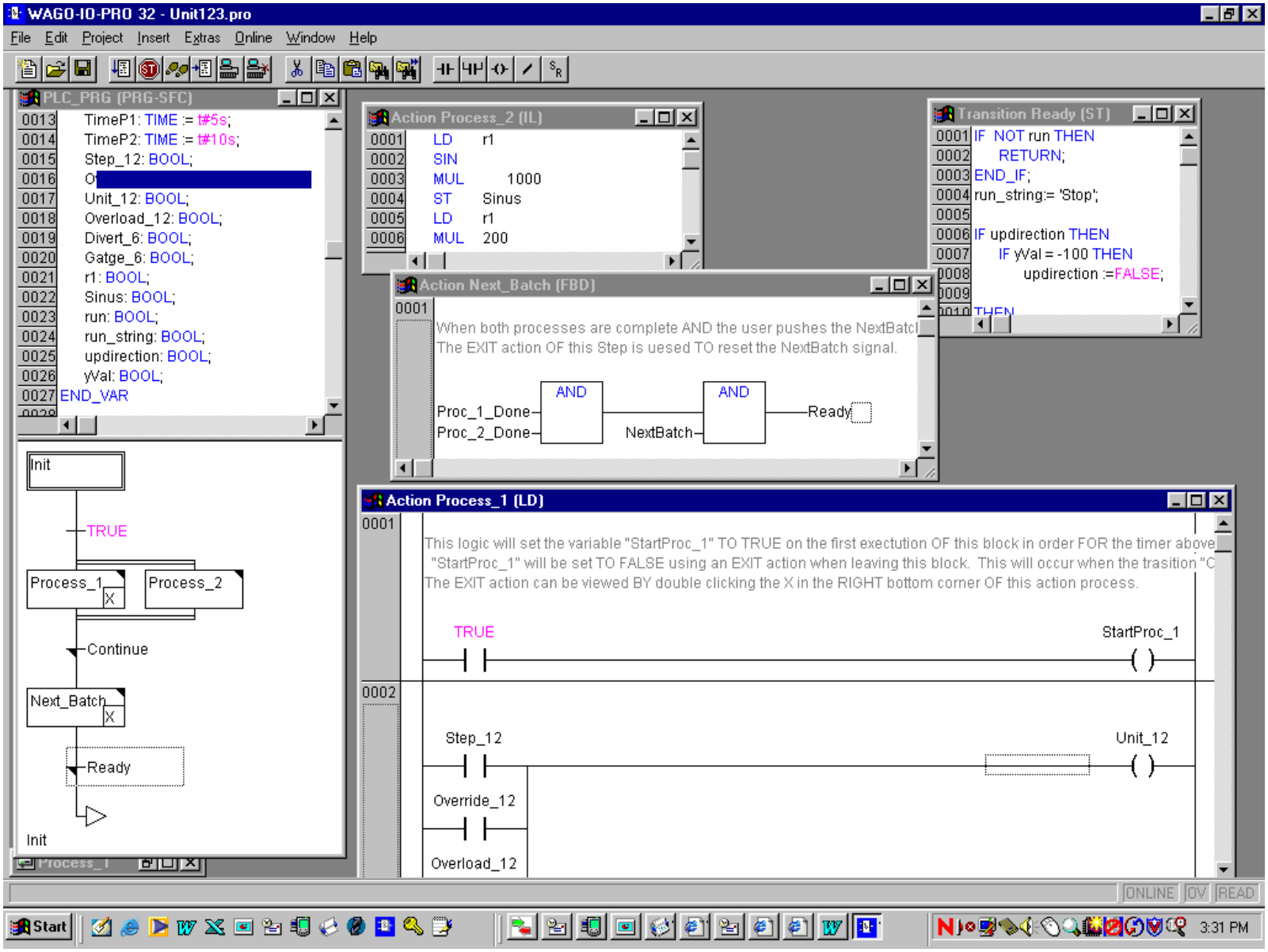
Focus – Open Architecture Controls Programming

OPC FOUNDATION

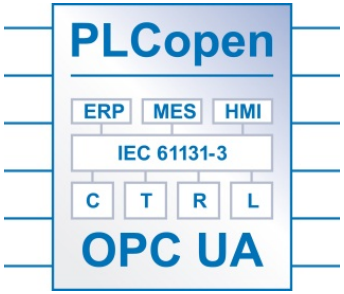
Open Controls Programming Standards

STRONG DATA TYPES

- **Ladder Diagram** (LD)
- **Function Block Diagram** (FBD)
- **Sequential Function Chart** (SFC)
- **Structured Text** (ST)
- **Instruction List** (IL)

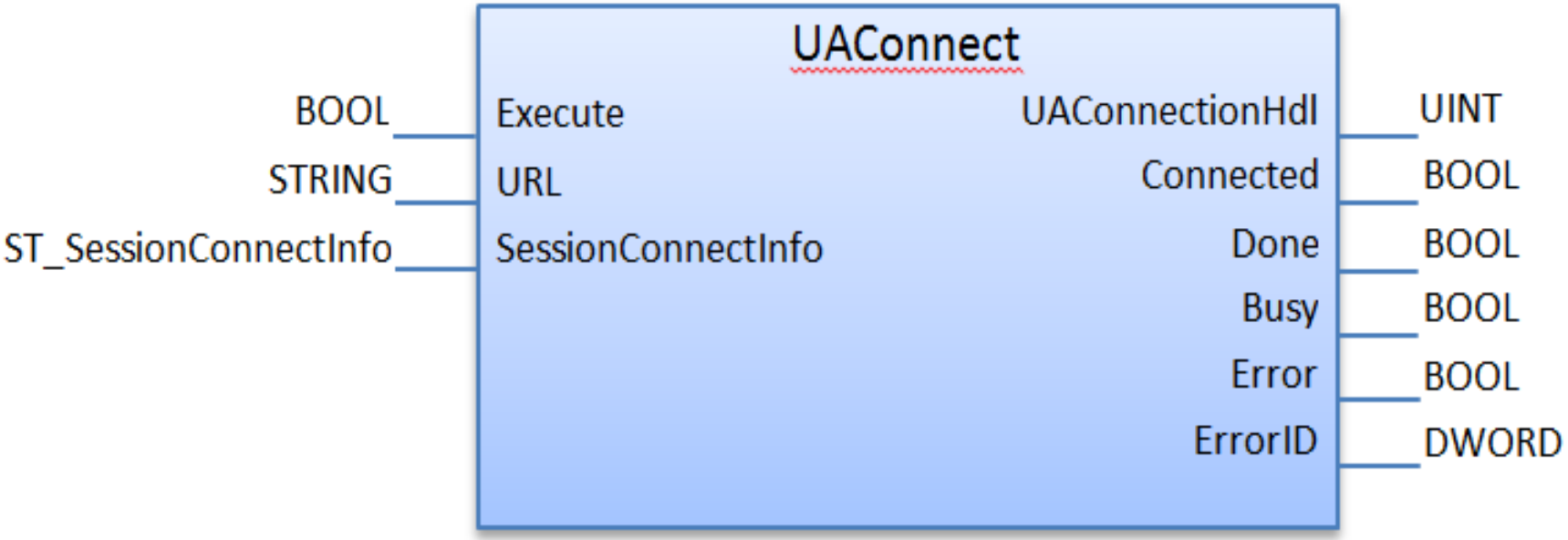

WAGO-IO-PRO 32 - Unit123.pro
File Edit Project Insert Extras Online Window Help
PLC_PRG (PRG-SFC)
0013 TimeP1: TIME := t#5s;
0014 TimeP2: TIME := t#10s;
0015 Step_12: BOOL;
0016 O
0017 Unit_12: BOOL;
0018 Overload_12: BOOL;
0019 Divert_6: BOOL;
0020 Gatge_6: BOOL;
0021 r1: BOOL;
0022 Sinus: BOOL;
0023 run: BOOL;
0024 run_string: BOOL;
0025 updirection: BOOL;
0026 yVal: BOOL;
0027 END_VAR
Init
TRUE
Process_1
X
Process_2
Continue
Next_Batch
X
Ready
Init
Action Process_2 (IL)
0001 LD r1
0002 SIN
0003 MUL 1000
0004 ST Sinus
0005 LD r1
0006 MUL 200
Transition Ready (ST)
0001 IF NOT run THEN
0002 RETURN;
0003 END_IF;
0004 run_string:= 'Stop';
0005
0006 IF updirection THEN
0007 IF yVal = -100 THEN
0008 updirection :=FALSE;
0009
0010 THEN
Action Next_Batch (FBD)
0001
When both processes are complete AND the user pushes the NextBatch
The EXIT action OF this Step is uesed TO reset the NextBatch signal.
Proc_1_Done
Proc_2_Done
AND
NextBatch
AND
Ready
Action Process_1 (LD)
0001
This logic will set the variable "StartProc_1" TO TRUE on the first exectution OF this block in order FOR the timer above
"StartProc_1" will be set TO FALSE using an EXIT action when leaving this block. This will occur when the trasition "C
The EXIT action can be viewed BY double clicking the X in the RIGHT bottom corner OF this action process.
TRUE
StartProc_1
0002
Step_12
Unit_12
Override_12
Overload_12
ONLINE OV READ
Start
3:31 PM

- XML Interchange Standard



- Transparent Access
- Transparent Communication

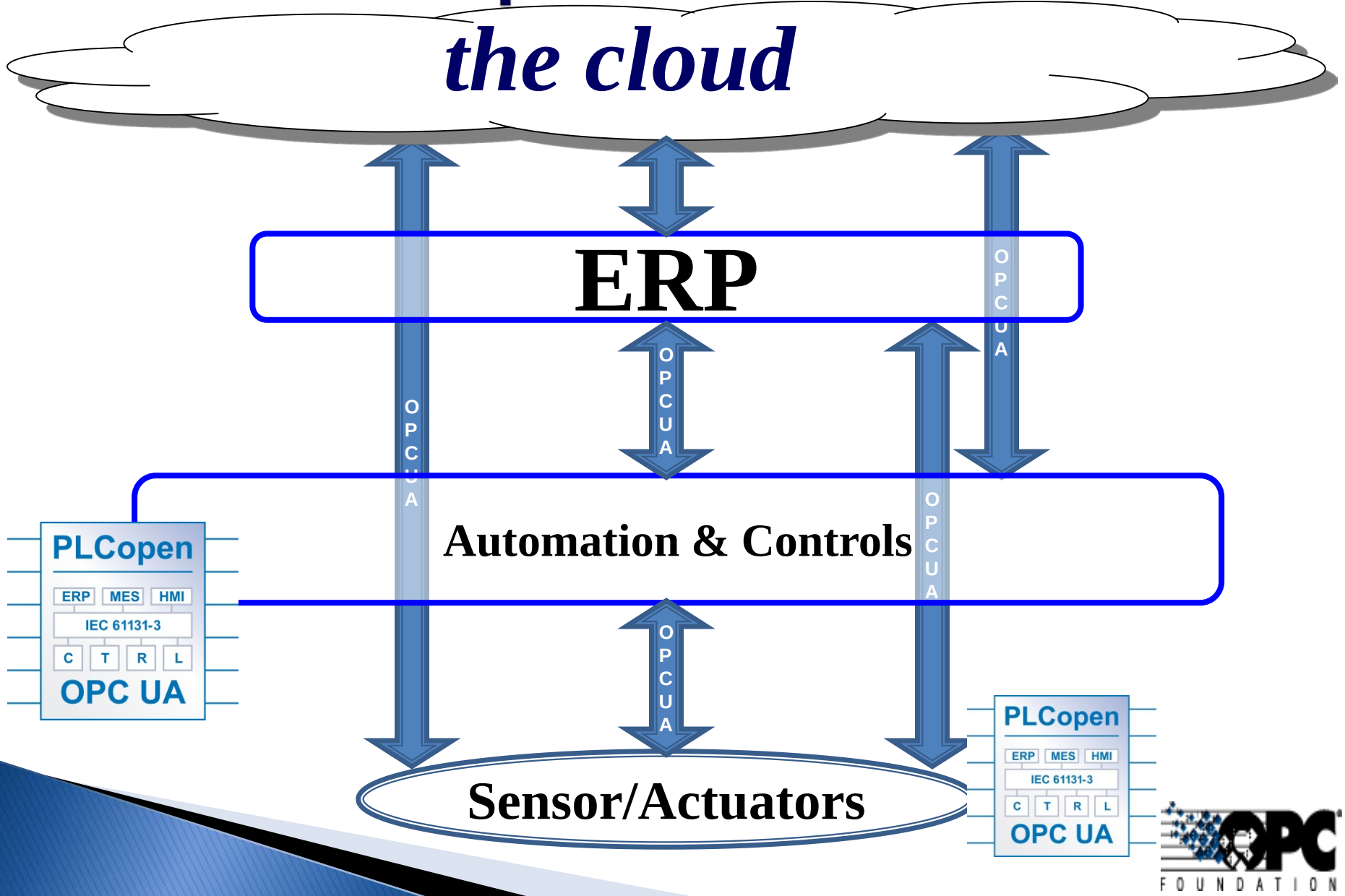
Controller-to-Controller Communication



Goal: to define a set of FBs for UA Client communication

Basis for Machine-to-Machine communication

Lean & Responsive Architecture



The Big Idea: Real-time Digital Factory

continuous real-time business optimization

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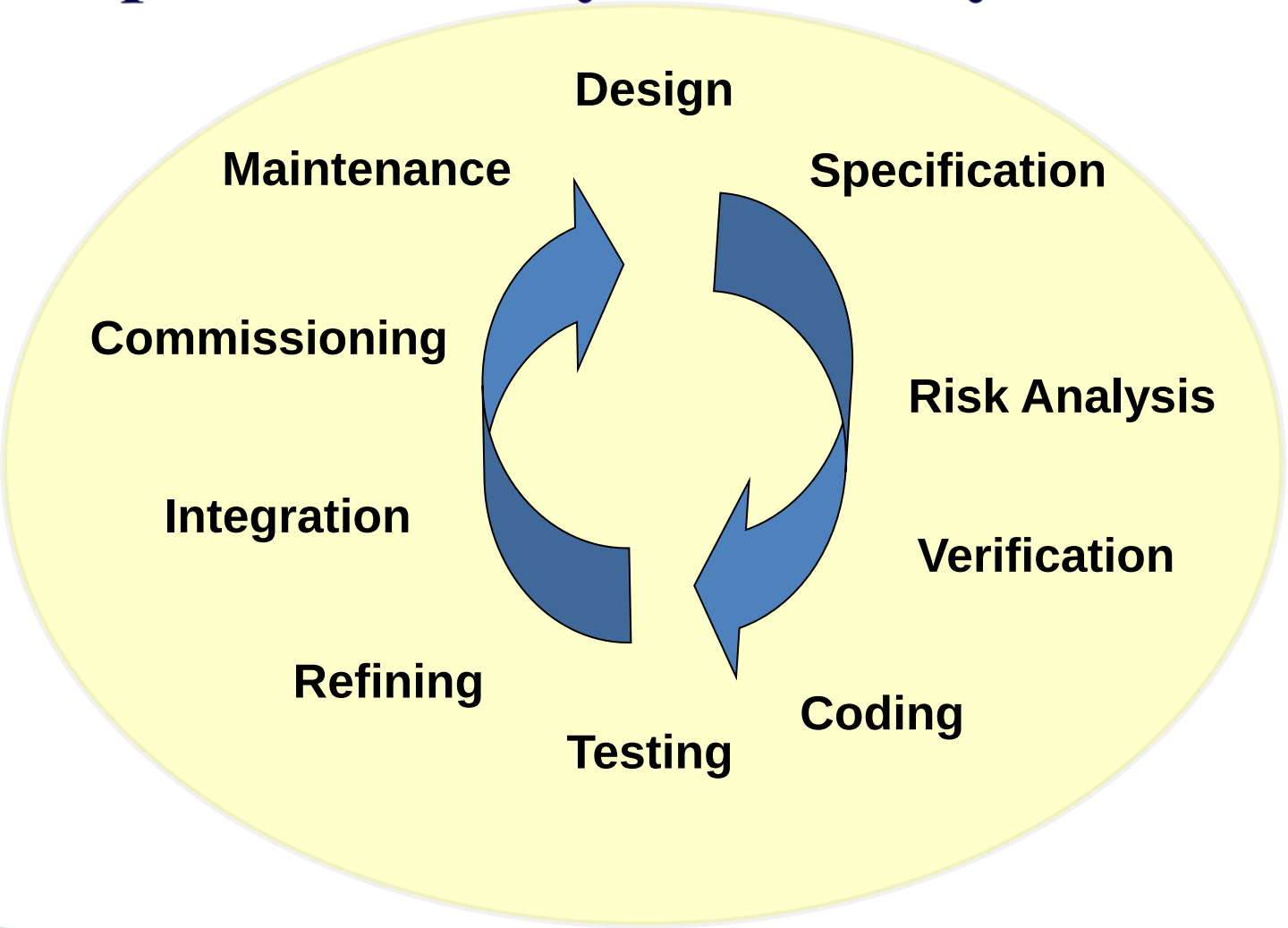
Precision & Efficiency

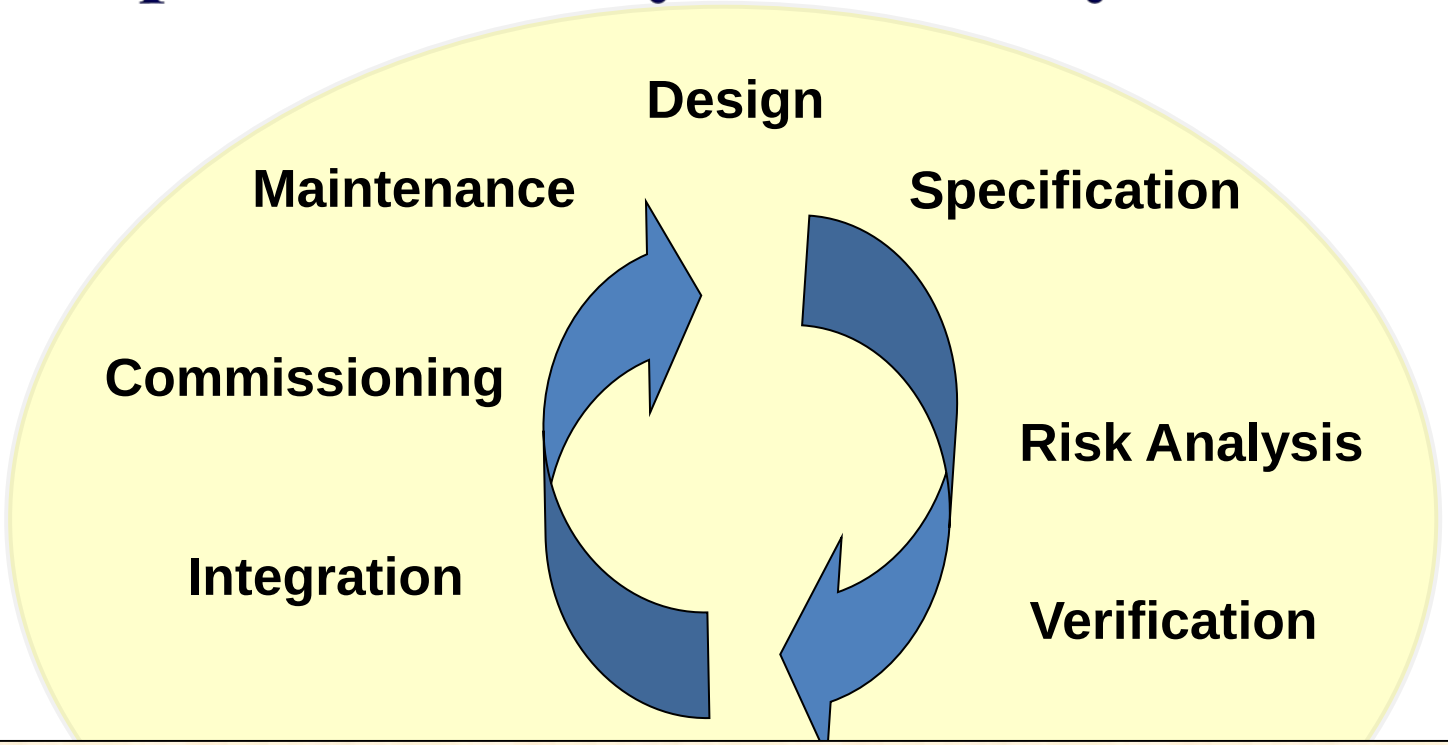
OPC & PLCopen

Improves Utility & Life Cycle Cost



OPC & PLCopen

Improves Utility & Life Cycle Cost

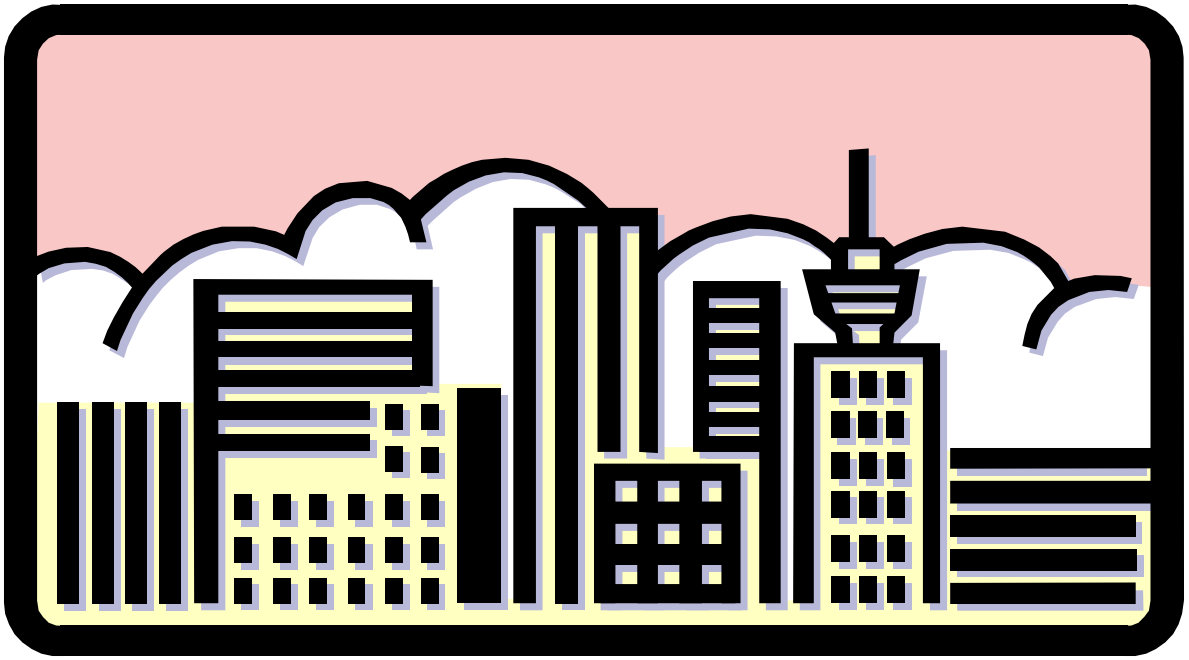


Open Standards Simplify Automation

(Just as it has in other applications.)

OPC & PLCopen

Building Automation



Mapping between BACnet and OPC-UA Building Automation Function Block Libraries

Use Case: Building Automation

Microsoft Headquarters, Munich, Germany

- Standard IEC 61131 Programming
- 230 Beckhoff BC9000 Controllers
- HMI: Webpage/Internet Explorer
- Ethernet TCP/IP I/O
- 27,500 I/O Points
- Room Control via Internet

Courtesy of OPC Foundation/PLCopen Member Beckhoff

OPC UA Business Value

Building Blocks

Real-time Digital Factory

continuous real-time business optimization

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