

15 May 2018

# ExxonMobil's Open Process Automation (OPA) Program: Platform for High Availability and Fast DMC Applications

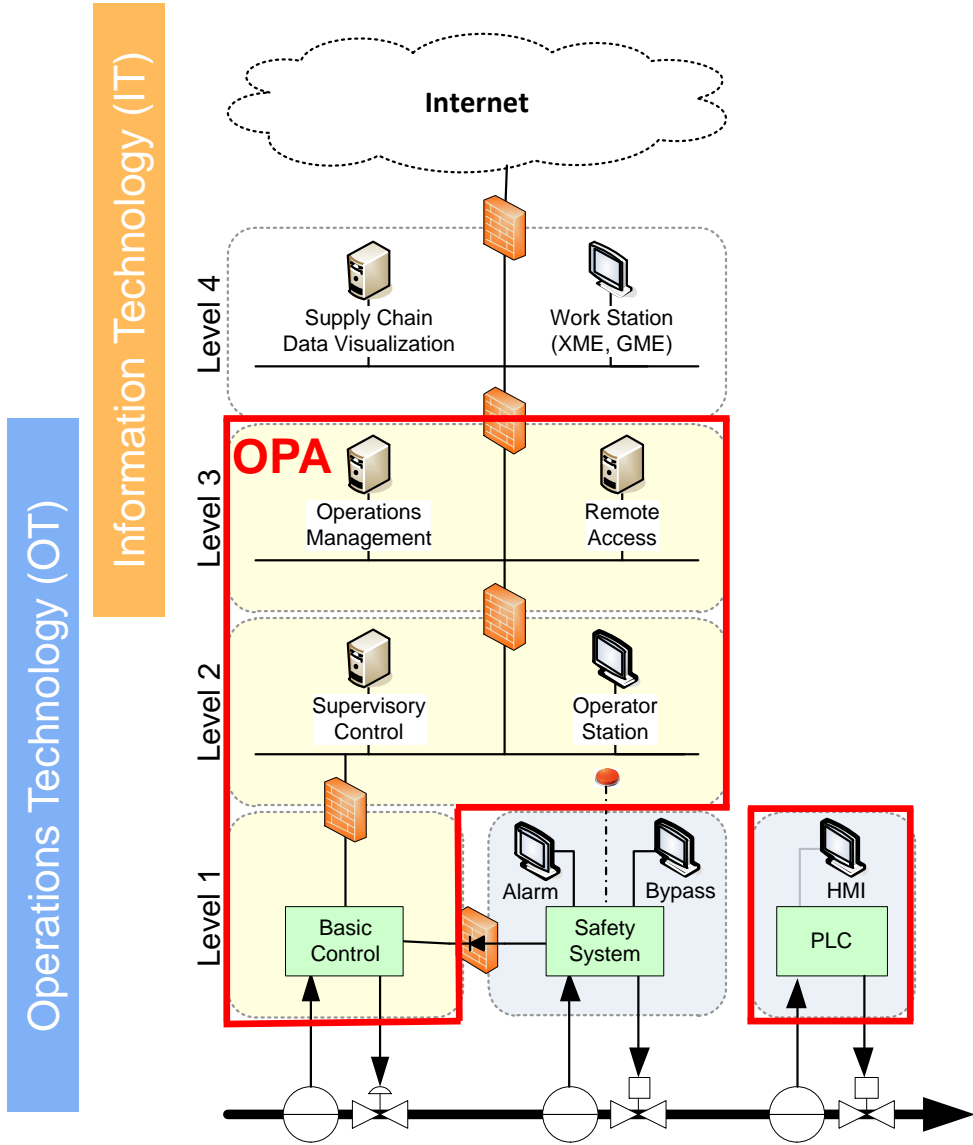
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OPA Program Manager

## Outline:

1. The business challenge and vision for the future
2. Highlights of current R&D
3. Focus on platform for DMC applications
4. Opportunities to participate

# The Business Problem



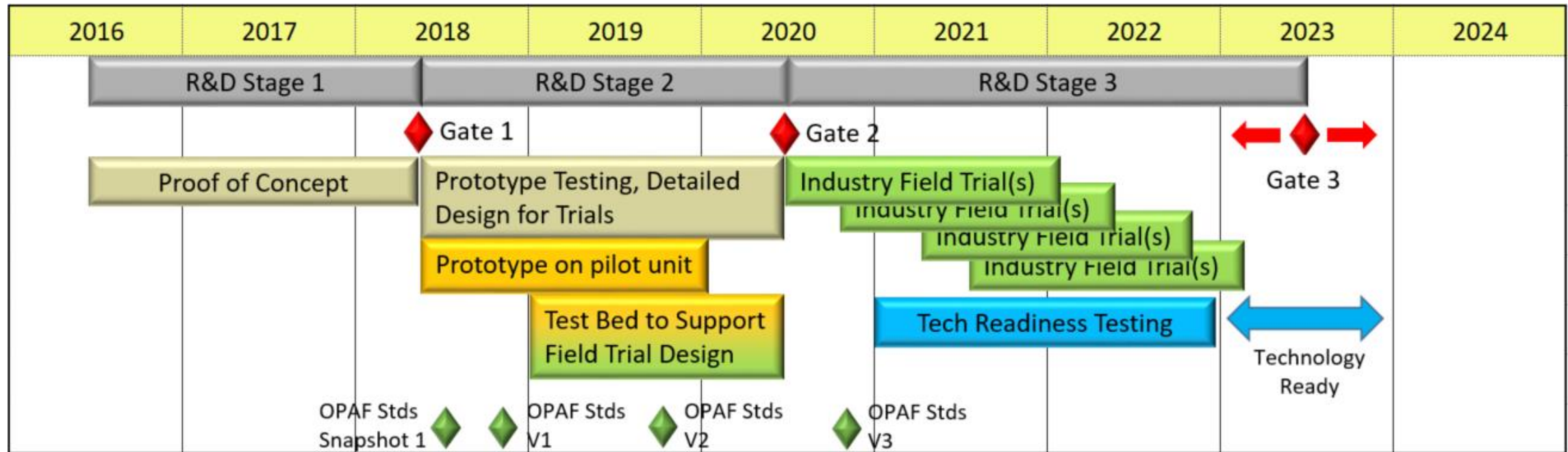
- Must replace obsolete Refining/Chemical DCS fleet
- Want more marketplace competition, lower barriers to innovation, lower lifecycle costs and greater profitability
- Why not simply replace with a state-of-the-art DCS?
  - High cost of technology refresh constrains compute resources
  - Expensive to integrate third-party components
  - System components are bundled versus best-in-class
  - Does not scale economically
  - Security model is not intrinsic; bolted-on, not built-in
- Root causes are both technical and commercial

# Two Parallel Activities Underway to Address Business Problem

- ExxonMobil guided and funded R&D
  - Establish technical readiness via multi-year, gated R&D program
  - Lead industry by creating proof of concept and prototype systems to demonstrate possibilities
  - Ultimate R&D goal is one or more field trials in ExxonMobil facilities to support technical readiness
  - Utilize Lockheed Martin as Complex System Integrator and leverage learnings from avionics industry
  - Engage other end user companies as collaboration partners
    - Create industry demand for OPA compliant components
    - Reduce time to achieve technical readiness via parallel field trials
- Open Process Automation Forum (OPAF)
  - Industry organization to support the development and use of industry standards to create a next generation distributed control system (DCS)
  - Board industry representation to transform DCS landscape (end users, suppliers, system integrators)
  - Issued “Business Guide” to define desired future eco-system for control systems
  - Working towards first release of industry standards for OPA components by year-end 2018
    - Initial focus on interoperability



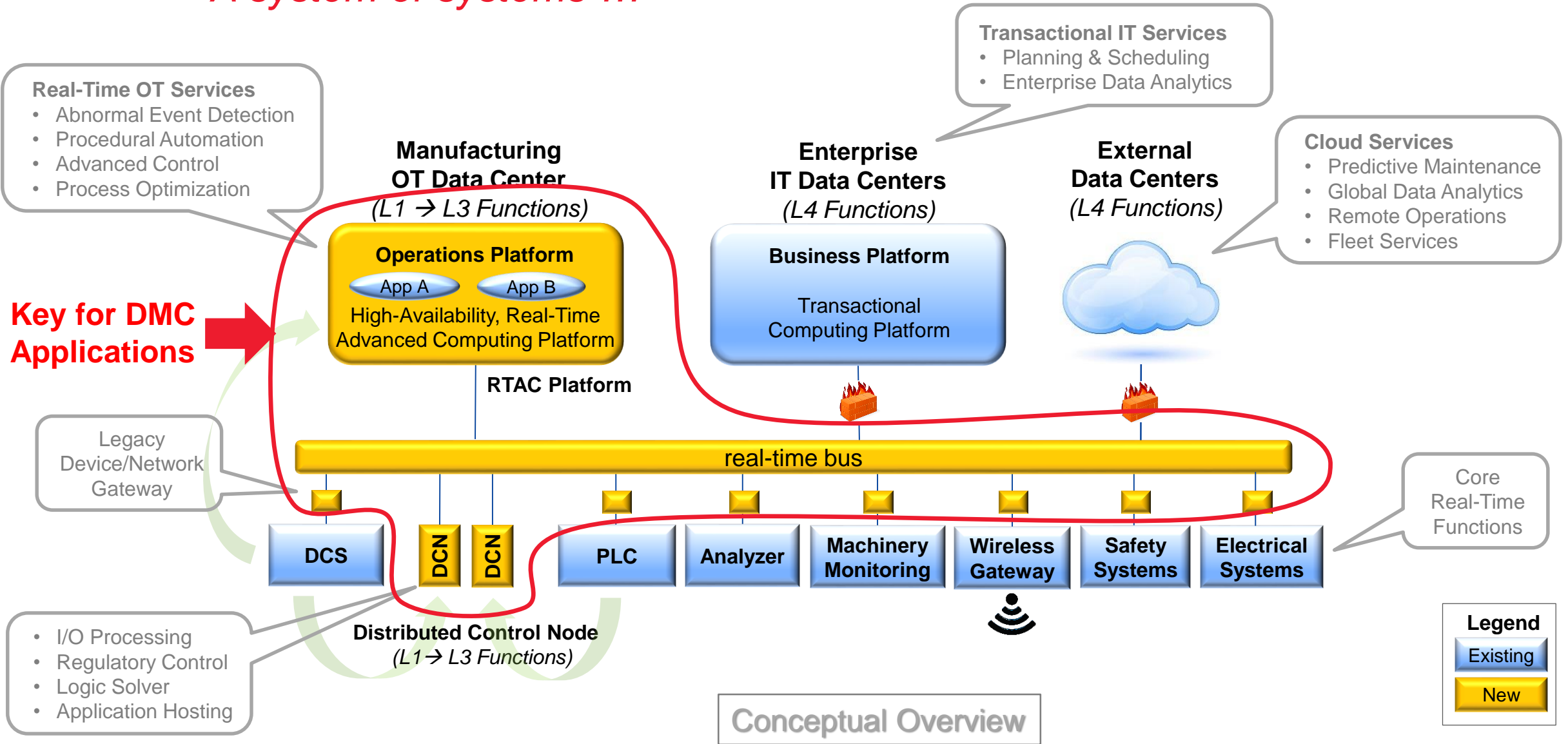
# ExxonMobil's Open Process Automation Program Overview



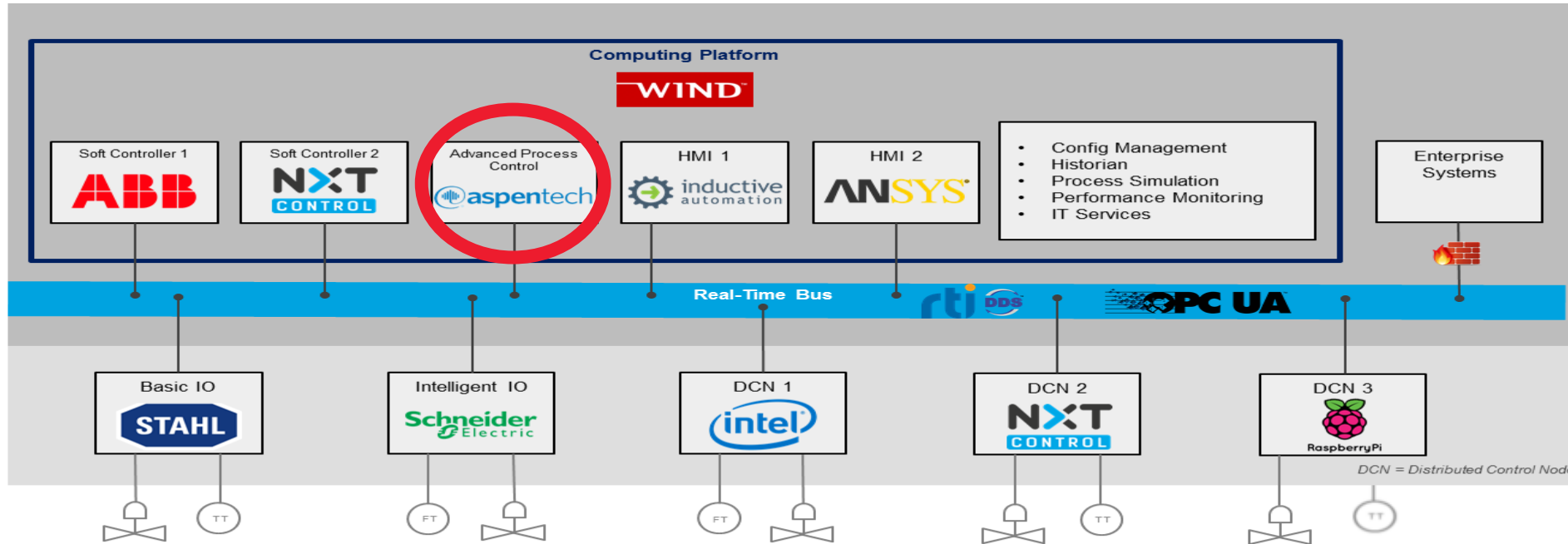
- A standards-based, open, secure, and interoperable process control architecture that promotes innovation and value creation
  - Addresses both technical and commercial root causes of problems with current DCSs
  - Leverages experience of adjacent industries – avionics, telecommunications
- Applicable to brownfield and greenfield facilities
- Robust system with broad marketability; not ExxonMobil-only

# Open Systems Architecture Vision

## A system of systems ...



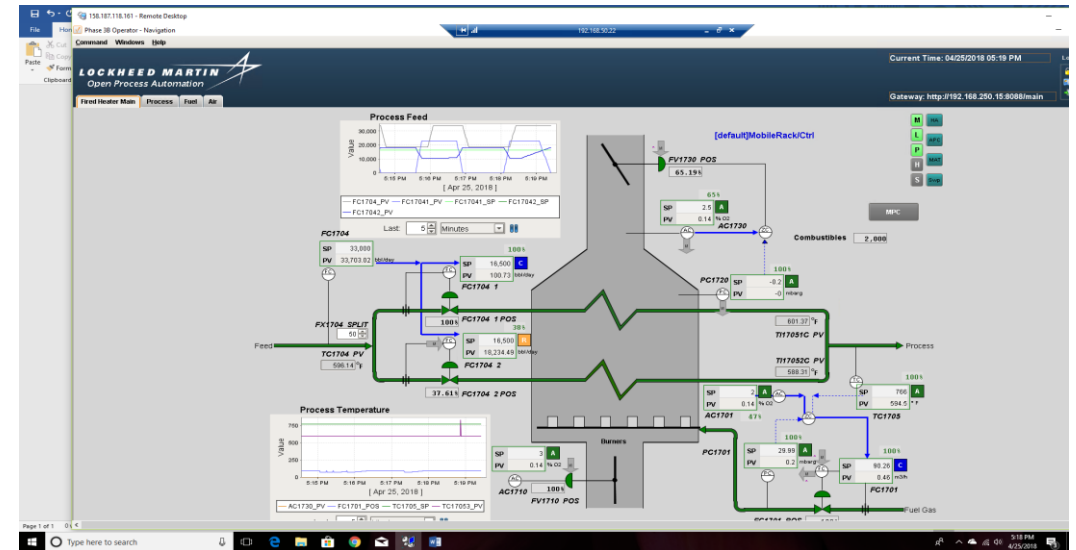
# Addressed Key Technical Feasibility with Proof of Concept System



- EM worked with Lockheed Martin to successfully create a test system
- Demonstrated basic desired functionality using components from 10 suppliers
  - Direct communication between components from different vendors
  - Utilization of available standards to construct an integrated system
  - Functionality moved between components
- Encouraged by supplier responses and continued support for testing new concepts
- Confirmed a key value mechanism with simulated DMC control at 1 second frequency
- PoC establishes starting point for Prototype planned for on-process use in a pilot unit

# High Availability and Fast Platform for DMC Applications

- Performance demonstrated in Proof of Concept
- DMC control of a simulated fired heater
  - Running at 1 second frequency in RTAC
  - 5 MV, 1 FF and 11 CVs
  - Most I/O via CIM-IO with some OPC-UA directly connected to fired heater simulator
- Open Process Automation vision provides:
  - High Availability platform required to match reliability only available at Level 1 in today's DCS
  - Data throughput and computing power to achieve very fast cycle times
  - Openness and use of standards should support scalability
- New capabilities unlock opportunities for wider use of DMC applications



Application	Testing	Settings	Last Run
● FIREDHEATER_V3 6M53 On	Control	Robust 0.000	2/23/2018 5:47:39 PM

Independents											
Name	Description	Critical	Combined Status	Service Request	Loop Status	Measurement	Operator Low Limit	Steady State Value	Operator High Limit	Current Move	
FUEL	F140ICSP	No	Normal	On	On	72.125	5.000	73.026	90.000	0.002	
INLETDAMPER	INLETDAMPER	No	Normal	On	On	34.309	20.000	34.984	100.000	-0.011	
STACKDAMPER	STACKDAMPER	No	Lo Limit	On	On	45.364	45.000	45.000	100.000	-0.004	
FEED1	F101ICSP	No	ROC Down	On	On	12146.014	11000.000	12126.014	18000.000	0.000	
FEED2		No	Normal	On	On	17405.848	10000.000	17711.547	18000.000	1.111	
CITFURNINLET	CITFURNINLET	No	Normal	On		612.574		612.574			

Dependents											
Name	Description	Critical	Combined Status	Service Request	Operator Low Limit	Measurement	Steady State Value	Operator High Limit			
OUTLET_TEMP	COT	No	Lo Limit	On	760.000	759.326	760.000	770.000			
COMBUSTIBLES	COMBUSTIBLES	No	Normal	On		10.086	-5.078	800.000			
STACKO2	STACKO2	No	Lo Limit	On	4.000	4.252	4.000	21.000			
FIRE_BOX_P	FBP	No	Out Srv	Off		0.019	-0.723	0.000			
FURN_TEMP	BWT	No	Normal	On		1510.701	1516.767	1600.000			
FGFLOW	FGFLOW	No	Normal	On	10.000	71.230	72.934	95.000			
TOTAL_FEED	F101ICPV	No	Hi Limit	On	1000.000	28883.955	29000.000	29000.000			

# Opportunities to Contribute to OPA Development

- Critical need for end user company participation in OPA Forum activities
  - Multiple subcommittees working both business and technical issues
  - Currently seeking Use Cases which will drive Requirements
  - Building consensus on user needs to balance supplier positions
  - Refining scope and timing for first release of standards
  - Defining approach for compliance certification
- Collaboration with ExxonMobil on prototype and field trial
  - Dow, Georgia Pacific and Praxair have signed Letter of Intent
  - Also working with other companies
  - Targeting to have signed Collaboration Agreements to guide activities in June
  - Opportunity to engage Lockheed Martin and utilize Test Bed to evaluate potential components
  - Sharing of information to support industry field trials
    - Control systems performance information and feedback on OPA standards
    - How system is used and applications remain company proprietary



Backup

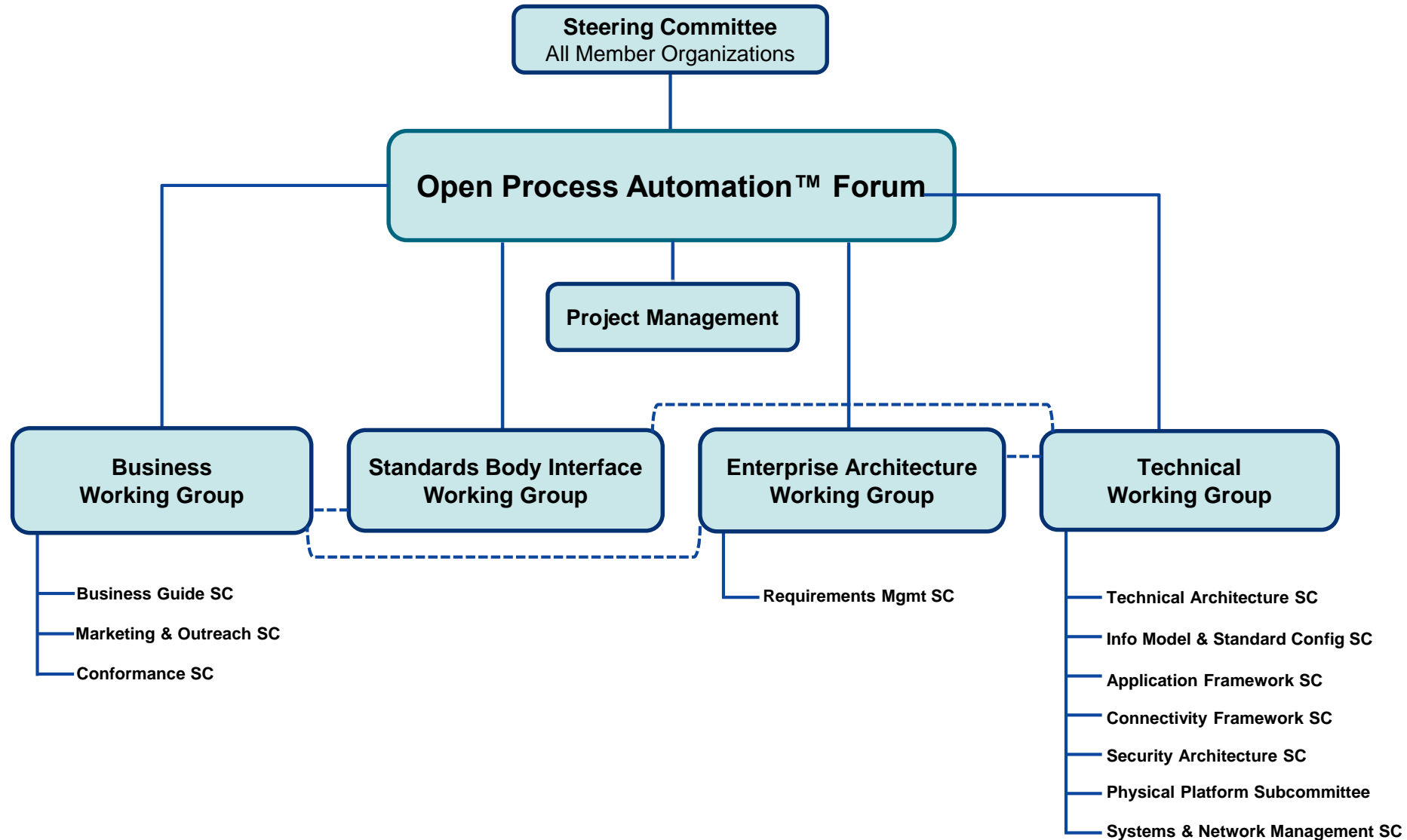
# Open Process Automation Forum Members (Mar. 2018)

End Users	Suppliers					System integrators	Other
	DCS vendors	DCS adjacents	Hardware	Software	Other		
Aramco Services	ABB	Azbil	Cisco	AspenTech	AltKom Akademia	Accenture	ARC
BASF	Honeywell	GE	Fujitsu	Beeond	ATE Enterprises	Capgemini	LNS Research
BP	Rockwell	HIMA	Hewlett Packard	Cape Software	Avistar Consulting	Ernst & Young	OPC Foundation
Chevron	Schneider	nxtControl	Huawei	Cplane Networks	EA Principals	Hargrove Controls	
ConocoPhillips	Siemens		IBM	Enterprise Transform. Partners	Conexiam	Jemmac	
Dow	Yokogawa		Intel (Wind River)	Esterel Technologies	MITRE	Lockheed Martin	
Dupont			Phoenix Contact	Inductive Automation	Real IRM	Radix	
ExxonMobil			Relcom	Kelvin Intelligent Control	Regis	Tata Consulting	
Koch Industries			Softing	Kongsberg Maritime	Shift Technologies	Wood Group	
Merck			Voith	Mocana	XUENN		
Merck KGaA			Waterfall Security	Oracle			
Praxair			Wellware	PAS			
Reliance Ind.				Process Systems Enterprise			
Sabco				RTI			
Shell				Semantic Designs			
Statoil				Veracity Security			
Total							
Vopak							
Woodside Petro.							

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26-Mar-18

# Open Process Automation Forum Organization



SC = Sub Committee

# Heterogeneous System: Physical Design

