

Unlocking existing data from assets to make maintenance more plannable





OpenIndustry 4.0 Demonstration Project @ Flow Center of Excellence

Purpose:

Asses if compliance to OI4 publications provides a generic means to onboard devices/sensors and providing Northbound data communication

Evaluate what the advantages and disadvantages are of aligning to the OI4 publications

Show-case the demonstrator to industry and share lessons learned (industry and education)





Dordrecht – The Netherlands



Field to Cloud In a real process industry setting



Unlocking data from the field, 4-20mA + HART, HART IP, IO-Link, from pressure transmitters, flow transmitters, control valves, motors, pumps (brown and green field)

Also including hardware from other OI4 members: Endress+Hauser, Balluff, Hilscher, WAGO and non members such as Krohne, Honeywell

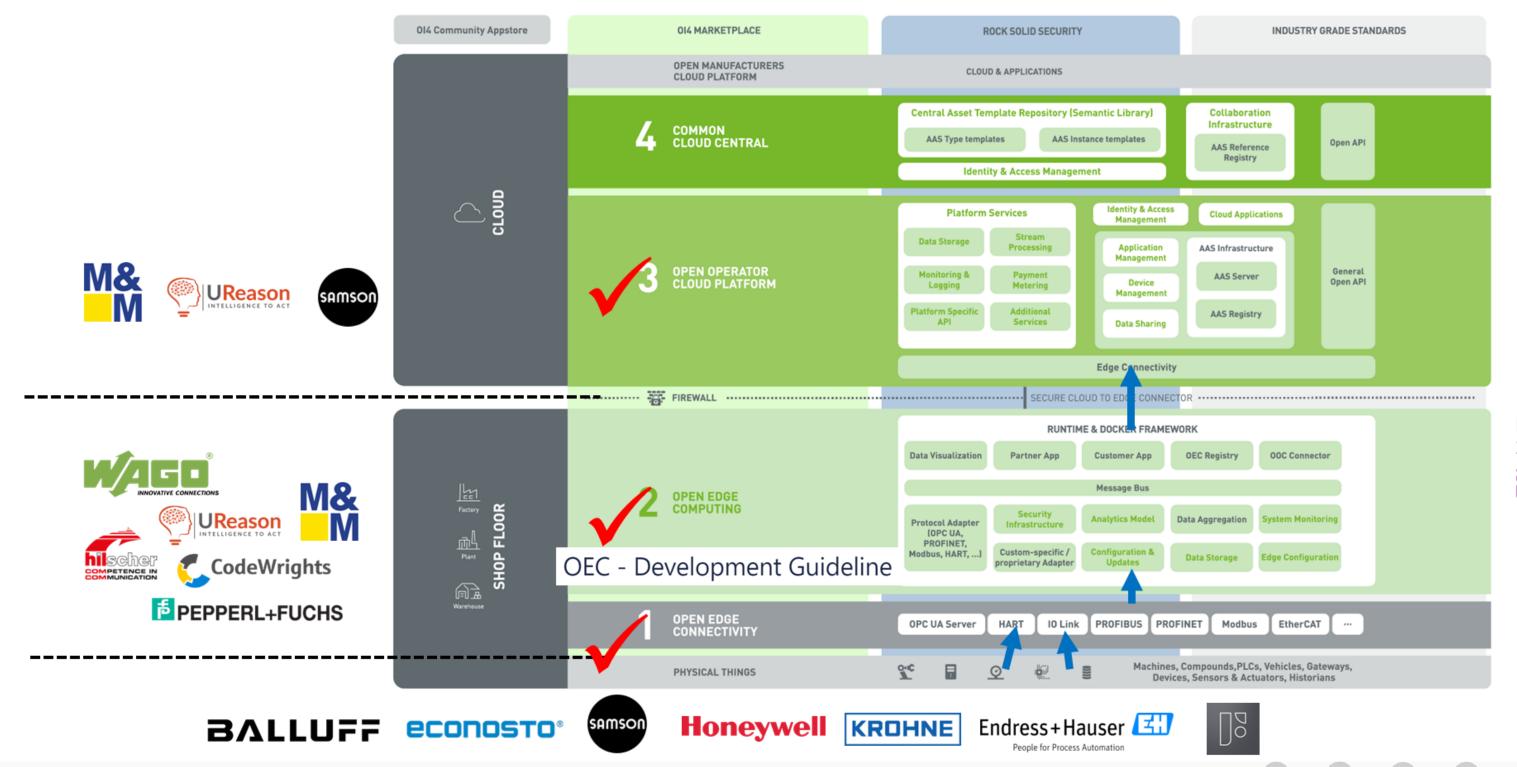




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Implementing the Reference Architecture

Multi vendor, multi protocol



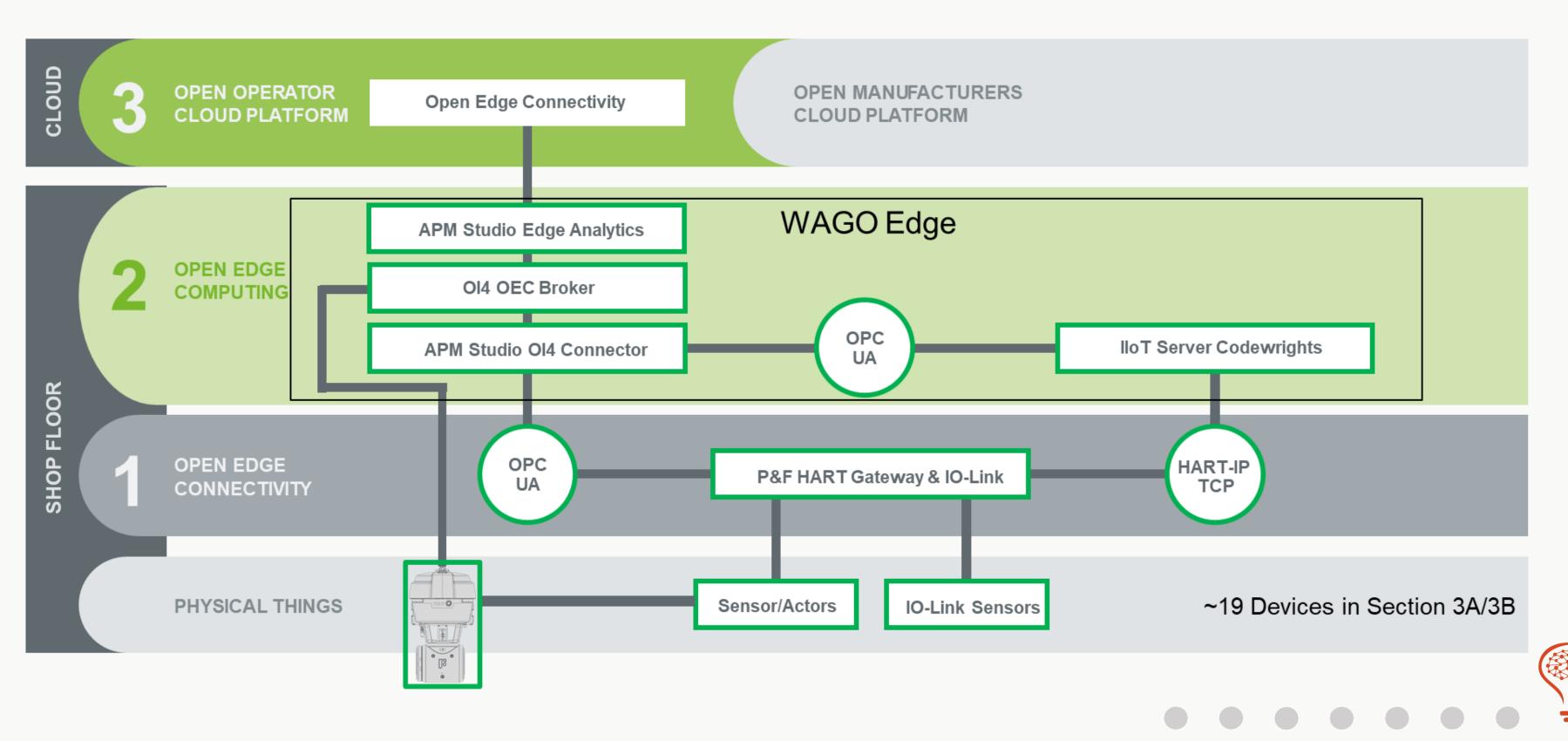
ISO/IEC 20922:2016



DIN SPEC 27070.

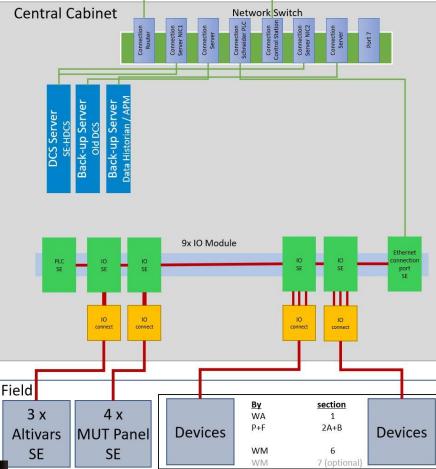


Experience the Openness ! Live demo



Live Demo

	Base Backplane	LB9023BP08110.1	2 2	This is a base backplane for several different IO cards as well as a gateway and a power	
	Power supply	LB9006C		supply.	
	rower suppry	LBJ000C		This is the power supply that belongs to	
Pepperl+Fuchs				the backplane.	
				This IO card can read several analog or	
	Universal	LB7104A	6	digital input values. It fits on the backplane	
	Input/Output card			and enables to read and write HART	
				commands.	
	Gateway for		2	This is the gateway that fits on to the backplane. It	
	PROFINET	LB8122A.1.EL	2	enables Profinet communication as well as a separate	
			4	HART-IP port.	
	IO-Link master	ICE2-8IOL-K45S-RJ45	1	This IO-Link master can connect to any IO-Link device, communicating via OPC UA	
				This specific software acts as a HART-IP client and can	
				publish the data on an OPC UA server. It automatically	
CodeWrights	IIoT Server	Not Available	1	detects devices and reads all available data from them.	
				This software is still in development and therefore not	
				commercial available.	
				This is the edge controller on which all data streams are	
Wago	Edge Controller	752-8303/8000-002		combined. It runs a docker instance on it, which has	
			1	several containers.	
Ū	Controller DEC	750 0310	1	This is the controller PLC which is connected to different	
	Controller PFC	750-8210		module cards. On it runs a PLC program which reads the	
	2 Channel Analog	750-482	4	different HART and IO-Link data. This module card is connected to the controller PLC. It can	
	module	130-402	4	read a total of 2 different HART channels.	
	IO-Link-Master	750-657	2	This module card is connected to the controller PLC. It can	
	module			read a total of 2 different IO-Link channels.	
M&M	OPC UA &	Not Available	1	M&M provided software to connect the OPC UA	
Software	Cloud connector	NOT AVAIIADIE	1	server of the PLC to the edge computer and also a	
				e	
	Flow Meter	OPTIFLUX 4300	3	4	
				c.	-
Krohne				to	and the
	Temperature			T	-
	transmitter	OPTITEMP TRA-S11	2	h	
				SI	
	Pressure				-
	Transmitter	OPTIBAR PC 5060 C	2		
	Self Regulating Valv	<u>م</u>			P
50000 511	Sell Regulating valv				
FOCUS-ON	Sell Regulating Valv	Focus One	1		1
FOCUS-ON			1	c < c ← Δ-CII X ≤ CEB	1
FOCUS-ON UReason	APM Studio		1	c < c ← Δ-CII X ≤ CEB	Ĵ
		Focus One			
UReason	APM Studio Condition Monitoring	Focus One Not Available	1		
	APM Studio	Focus One		C A T e	
UReason Balluff	APM Studio Condition Monitoring Sensor Temperature	Focus One Not Available BCM R15E-001-DI00-01	1 3		
UReason	APM Studio Condition Monitoring Sensor	Focus One Not Available	1	C A T e	





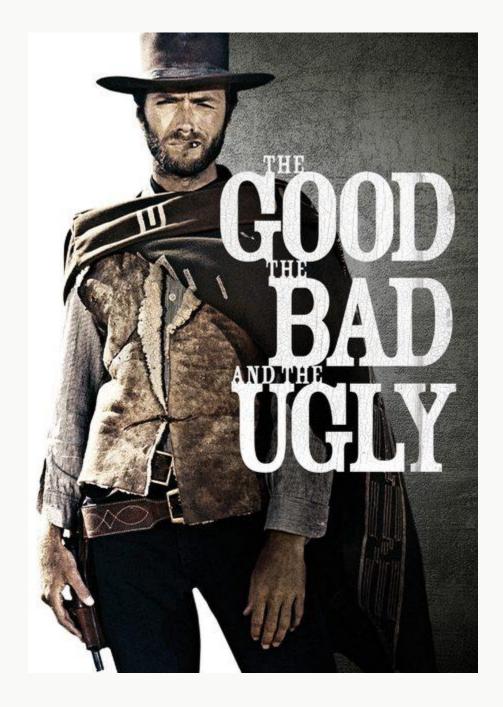
APM Studio <	Data Access / Oi4Comms [Select	ct] 👻			
→← Data				DATA OVERVIEW	DATA C
Classes	C → DeviceValues [2] → InputA2 [2] → InputController [2] → InputDensCurve [2] → InputPoff [2]	Data Overview			
品 Model	→ InputPoff[2] → OutputA2[2]	IOPoint ElectronicsTemperature	CurrentValue 330.07	LastUpdate 2022/05/11 09:58:26:74	Obje
Alarms	→ ⁻ OutputController [2]	Viscosity	0.0010016	2022/04/22 12:26:22:20	60 Medi
	- → OutputDensCurve [2] - → OutputDiagnostics [2]	Temperature Low Limit 2 Temperature Low Limit 1	233 233	2022/04/20 10:46:58:22 2022/04/20 10:46:58:22	20 P1T1
KPIs	-⁺ OutputPoff [2]	Estimated Vapour Pressure FlowSpeed	1.1049540955529515 0.0012989144306629896	2022/05/11 09:53:52:63 2022/05/11 09:58:30:65	
	OutputProcessValues [3] OutputValve [2]	VolumeFlow AmbientTemperature	0.016206634063564707 295.98999999999995	2022/05/11 09:58:30:65 2022/05/11 09:58:29:05	
Processing	- □DCS input → ⁺ PressureSP input [2]	Calculated Pressure 1 Density	29177.316401511005 998	2022/05/11 09:58:30:77 2022/04/22 12:26:22:2	
and Bow Ties	→ ⁺ ValvePositionSP input[2]	Calculated Pressure 2 Temperature 1	41934.66602036399 295.1199951171875	2022/05/11 09:58:30:77 2022/05/11 09:53:51:94	
	→ VolumeFlowSP input[2] — □DeviceSetting	SNR Calculated Flow	33 13.817750418720024	2022/05/11 09:44:51:65 2022/05/11 09:58:30:77	
Decision	→ ⁻ ApmVersion <i>[2]</i> → ⁻ Control - Remote/Local <i>[2]</i>	Temperature 2 Vapour Pressure	295.1700134277344 2338.8	2022/05/11 09:00:12:8 2022/04/22 12:26:22:20	
≡ , Test	Control - Type [2]	SupplyPressure VelocityOfSound	403110.0000000006 1497.9700927734375	2022/05/11 09:58:30:34 2022/05/11 09:58:30:65	12 Valve
Dashboard	→ [⊷] DeviceSettings[2] → [⊷] Object - Medium[2]	Driving Air Pressure Pressure 2	45180 29177.310546875	2022/05/11 09:58:29:68 2022/05/11 09:58:30:34	56 Valve
E Chat	→ ⁻ UaaVersion [2]	Pressure 1 Vapour Pressure Temperature	41842.5078125	2022/05/11 09:58:30:65 2022/05/11 09:58:30:65 2022/04/20 10:46:58:22	52 P1T1
	→ CDEmulation → A2 Test	CalculatedDensity	4501.769596976309	2022/05/05 15:17:22:2	87 Medi
	-≁ CSV logs -≁ MQTTSendAllData	Viscosity Temperature ValvePosition	293.15 99.93	2022/04/22 12:26:22:20 2022/05/11 09:58:29:54	12 Valve
	→ ⁺ MQTTTestIn	Namur Status Estimated Viscosity	1 NaN	2022/04/20 10:47:05:9 2022/04/20 10:47:16:11	13 Medi
	→ • Oi4Comms	Calculated Flow Variance Density Temperature	0.1 293.15	2022/04/20 10:46:58:22 2022/04/22 12:26:22:2	
	- DProcessState	Gain	36	2022/05/10 11:15:41:6	16 UFM
	→ FOCUS State [2] Definition Log				







Lessons Learned The Good, The Bad The Ugly



The Good:

- □ OI4 OEC Guidelines work! No Integration Hassle
- Plug and Play, Achieve Openness and Interoperability in hours
- □ Realize Condition Monitoring/Predictive Maintenance at Edge and Cloud (SAP & Ultimo)

The Bad: ③ None!

<u>The Ugly</u>: Time delays .. Electronics shortages





Next Steps? It does not stop here!

<u>AAS</u>: Implementing the OI4 reference implementation of the Asset Administration Shell (AAS). This is used to describe an asset electronically in a standardized manner. Its purpose is to exchange asset-related data among industrial assets and between assets and production orchestration systems or engineering tools.

<u>APL</u>: Implementing the IEEE 802.3cg-2019 (10BASE-T1L) standard using Ethernet over the process industry's last mile – providing connectivity with broadly distributed, two-wire, loop-powered field instruments

SECURITY: Investigating attack possibilities/vulnerabilities in converged IT/OT networks using anomaly detection techniques on network data and sensor data

5G and CLOUD: Set-up of Hybryd Cloud solution using the Micro Data Center on the roof of the DZHF and integrating with SAP IOT and SAP PAI





Come Visit?! Experience the OI4 Demonstrator in Dordrecht















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