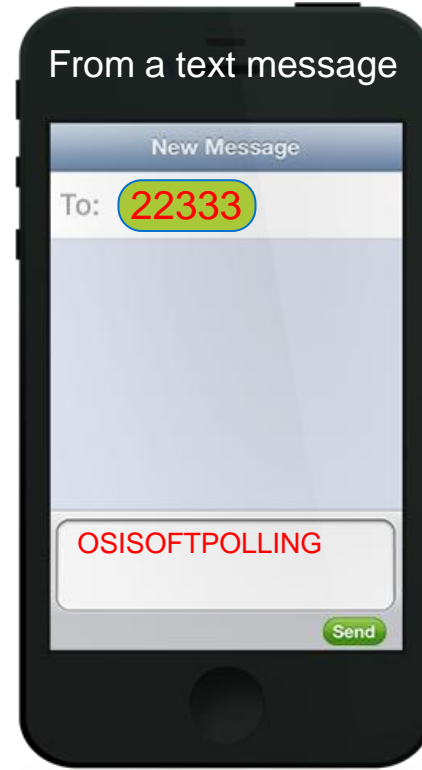




Predictive Maintenance with NI, PTC & RealWear

Presented by **Ian Fountain – National Instruments**
Manish Yashvant – PTC
Sanjay Jhawar - RealWear

Asking Questions via the web or text messaging

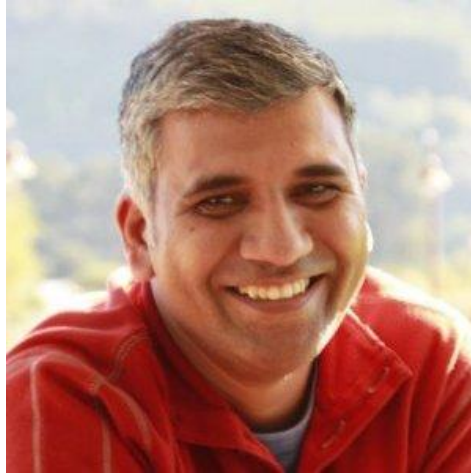


Feel free to add comments or questions to the panel.

When poll is active, respond at [PollEv.com/osisoftpolling](https://www.poll-ev.com/osisoftpolling)  Text **OSISOFTPOLLING** to **22333** once to join




Ian Fountain
National Instruments
Marketing Director



Manish Yasvant
PTC
Director, Strategic Alliances



Sanjay Jhawar
Realwear
President & Chief Product Officer



...Unscheduled shutdowns, coupled with poor maintenance practices, cost global process industries 5% of total production annually, equivalent to \$20B each year.

—Hydrocarbon Publishing Company

Maintenance Strategy Objectives

Increase Revenue

- Increase uptime and service offerings
- Optimize maintenance activities

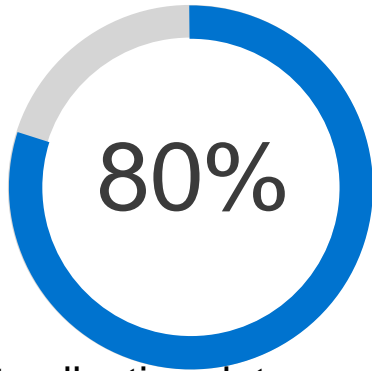
Decrease Cost

- Reduce frequency of unscheduled downtime
- Decrease warranty costs
- Optimize workforce

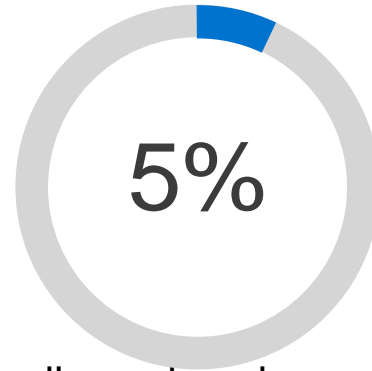
Reduce Risk

- Prevent failure and unscheduled outages
- Reduce worker contact with hazardous machines and environments

Data Collection and Analysis Challenge



Time spent collecting data



Data actually analyzed

It is difficult to **locate**, **hire**, and **train** new equipment specialists to **periodically** collect data who can **use their experience** to diagnose machine issues.

Source: NI customers and the International Data Corporation (IDC)



IoT Sensing & Monitoring with National Instruments

The World of Converged Devices



More capability defined in software



Functions change rapidly



Increasingly complex to design and test



ONE-PLATFORM APPROACH



MATLAB® is a registered trademark of The MathWorks, Inc.

NI Modular Hardware Allows Easy Customization

We equip engineers and scientists with systems that accelerate productivity, innovation, and discovery



Complete I/O Coverage
With More Than 600 Modules



Parallel Measurement Execution
With Latest Multicore Processors



Hardware platforms for Test & Measurement,
Smart Grid and Condition Monitoring



Real-Time Measurements
With Timing and Synchronization



Software-Defined Instruments



Measurement Acceleration
With User-Programmable FPGAs

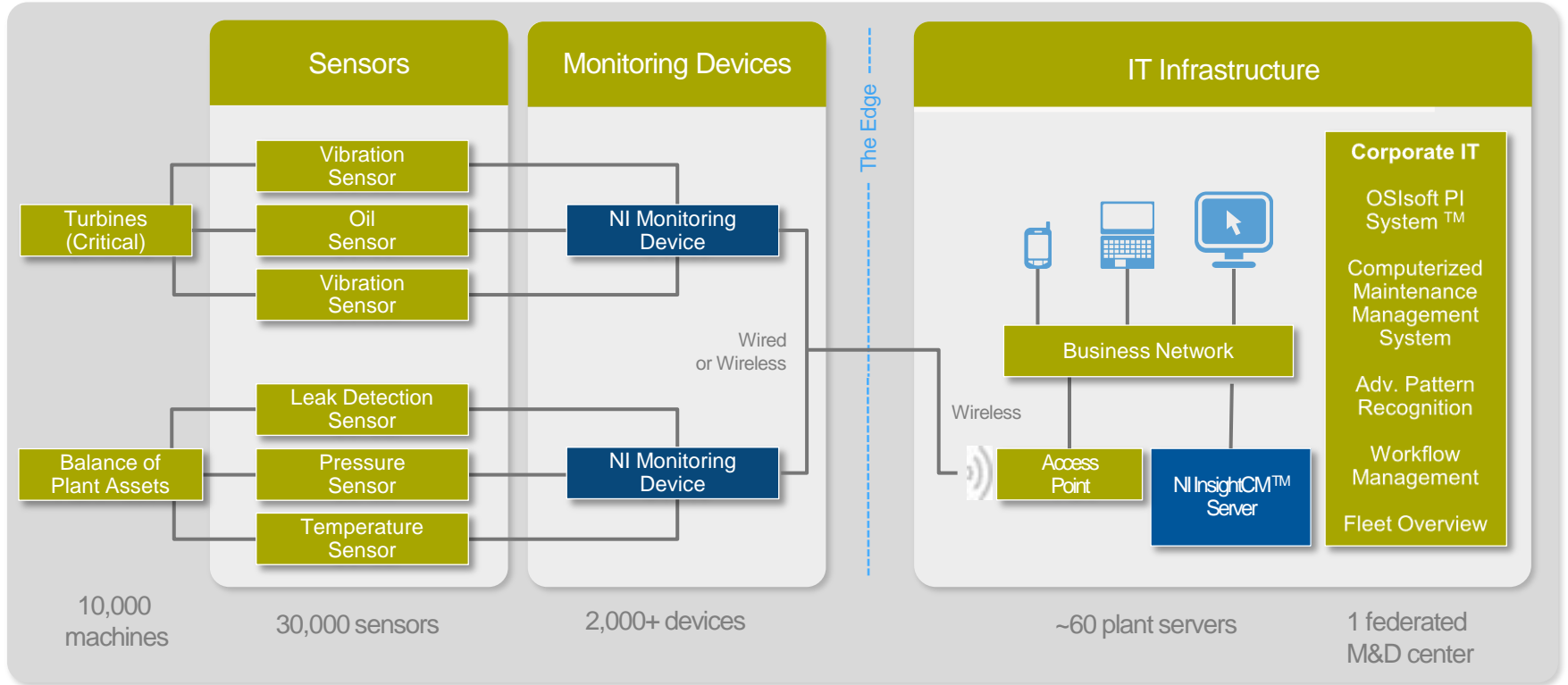


Largest Power Generation
Holding Company in US

38 GW Fossil Generation
Capacity



Fossil Power Plant Monitoring



NI Monitoring Devices Installed at Edge





IoT Applications Enablement with PTC ThingWorx



Customers



Employees



Partners

Applications, Solutions & Business
Systems

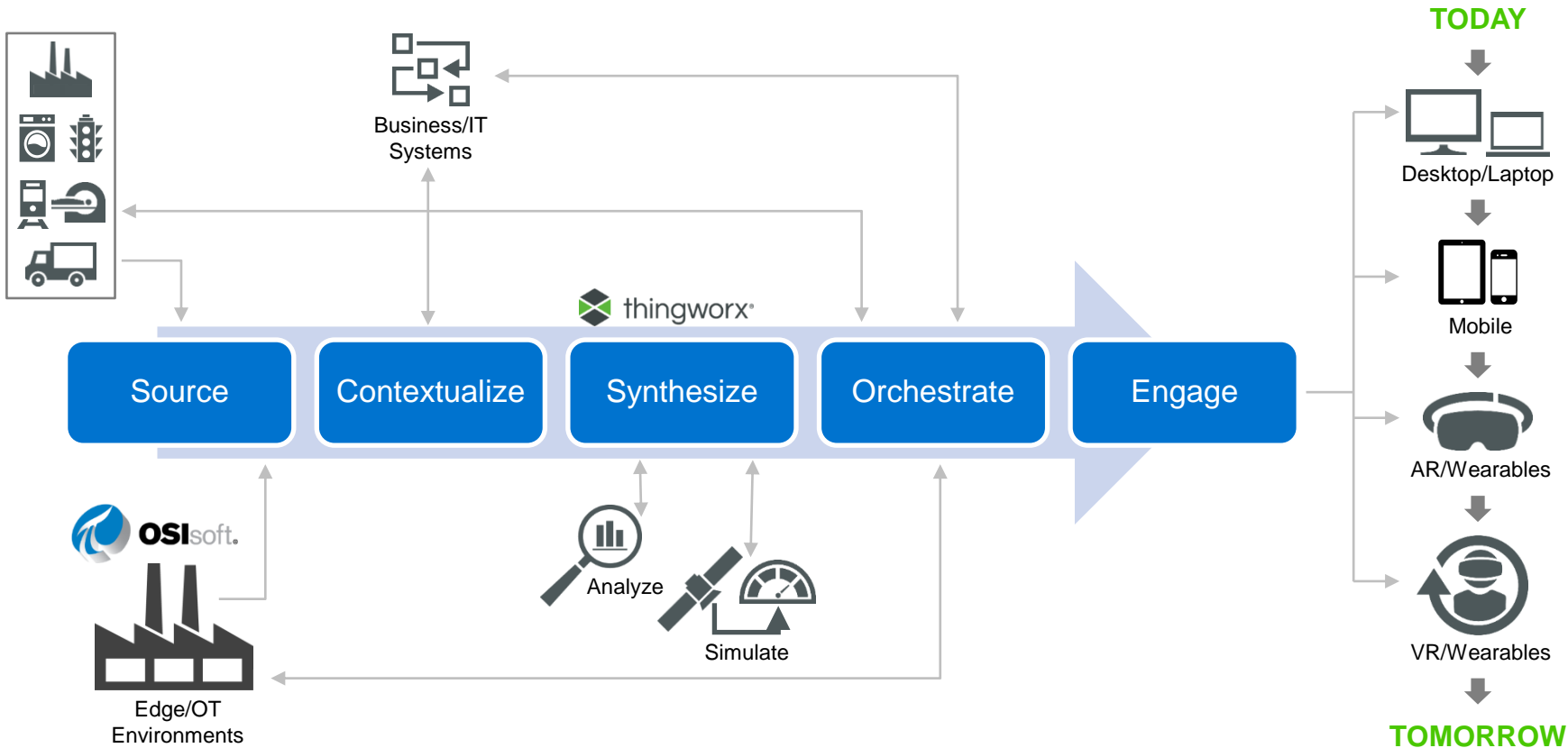


ThingWorx[™]
A PTC Business

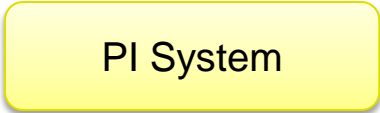
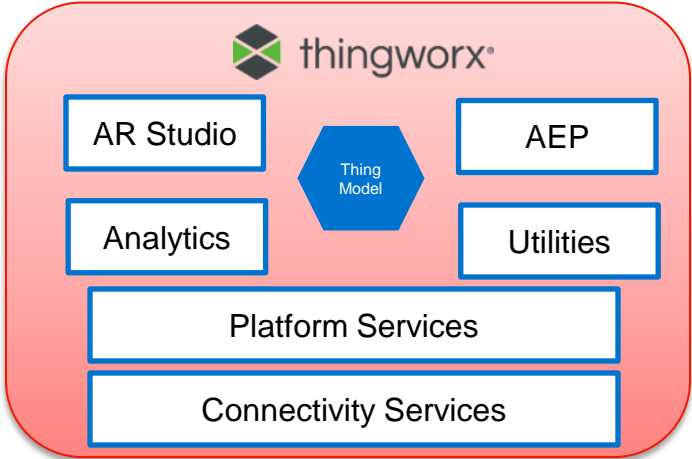
Connect | Analyze | Create | Experience



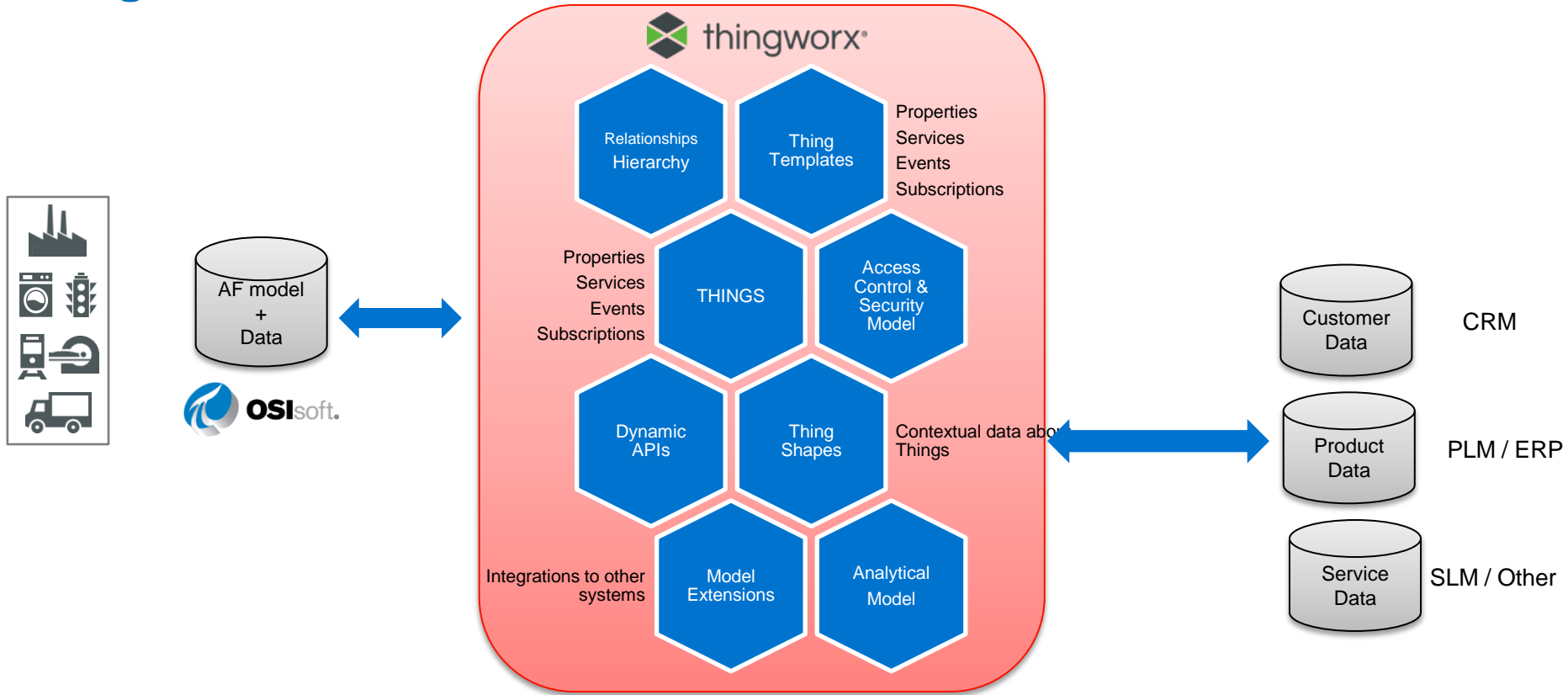
IoT orchestration with thingworx



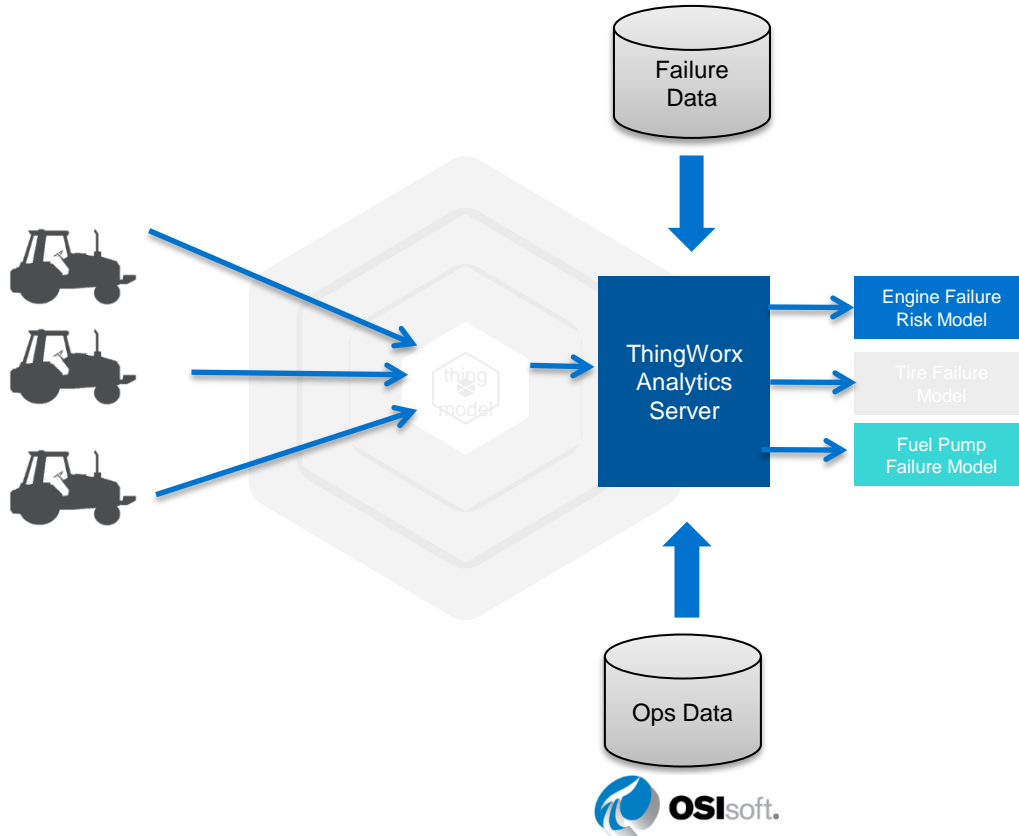
PI System integration



Thing model



Predictive Analytics



PTC Predictive Service

Asset Risk Analysis	Asset Risk Analysis	Asset Risk Analysis
High Risk 2 PTC-CSLMP.PS.Demo.Assets.Pump0 Model: 0700 Serial #: C817K0217 Location: Opaoka, GA 4 days to failure Service Status: View	Risk Summary Voltage A: 48.56 V Flow Rate: 2873 gpm Voltage B: 252.8 V Current A: 73.11 amp	Service Information #MSP: 278 Days Last Service: 41 Days Committed Service: 98% availability
Low Risk 0 PTC-CSLMP.PS.Demo.Assets.Pump2 Model: 0811FD Serial #: L21147CF0R0102 Location: Boston, MA 7 days to failure Service Status: View	Risk Summary Suction Pressure: 25.8 psi Vibration Bearing: 0.02 m/s ²	Service Information #MSP: 278 Days Last Service: 41 Days Committed Service: 98% availability
Normal Operation 9 PTC-CSLMP.PS.Demo.Assets.Pump10 Model: 0811FD Serial #: C817K022 Location: Houston, TX Normal Operation Service Status: View		Service Information #MSP: 278 Days Last Service: 41 Days Committed Service: 98% availability
Disconnected 0 PTC-CSLMP.PS.Demo.Assets.Pump11 Model: 0700 Serial #: C817K023 Location: Houston, TX Normal Operation Service Status: View		Service Information #MSP: 278 Days Last Service: 41 Days Committed Service: 98% availability

ID = 4242		12%	2%	72%
ID = 1101		32%	13%	6%
ID = 9993		5%	72%	6%



FLOWSERVE

16,000 Employees

5 Billion Annual Revenue

220+ Years in Business

Faster time to market with ecosystem partners



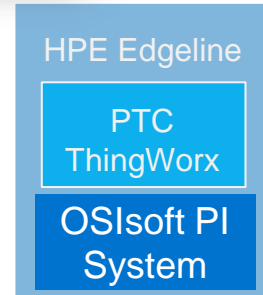
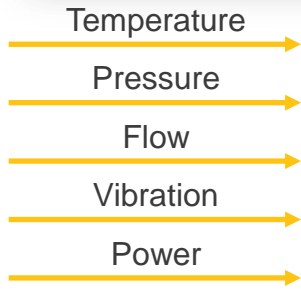
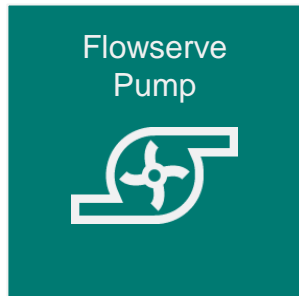
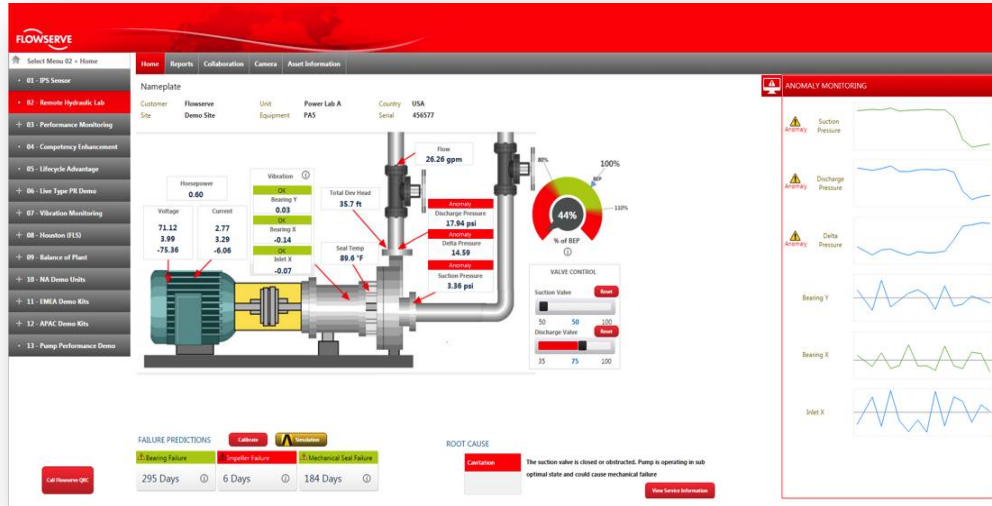
Asset
Health
Monitoring

High End
Edge
Computing

Predictive
Analytics

Data
Infrastructure

Solution architecture





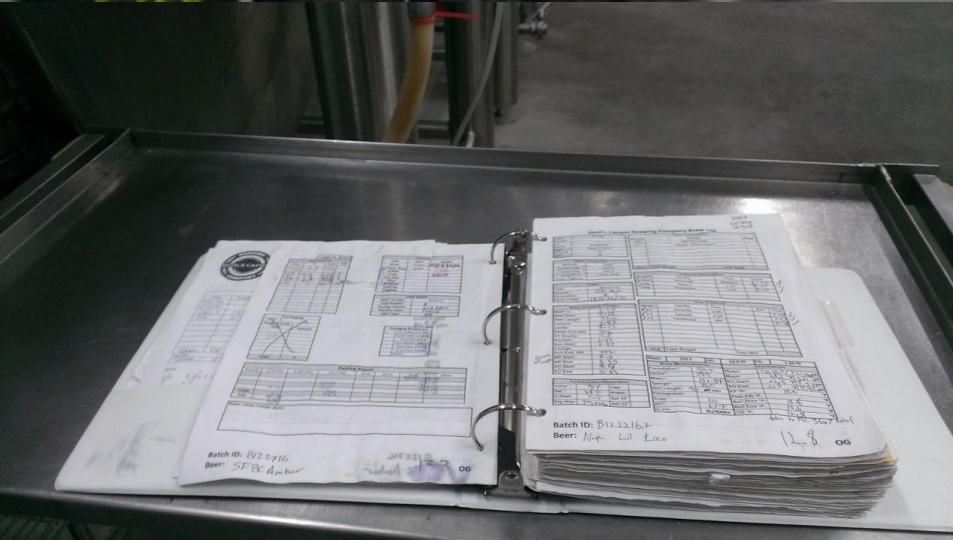
realwear

Industrial grade wearables for PI Vision™ data visualization - Hands-Free, Head-Mounted Tablets



Crafting Beer,
Building Community.





Excel Online

Shared • 2017 Brewing Schedule

2017 Daily Lab Results

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
	Batch ID	Brewery	Beer	Batch Size (BBL)	Calculated EFF. (%)	Actual Eff (%)	Target OG (°P)	Target Final Gravity (°P)	Target Gravity	Target Final Gravity	Target ABV% (Equati on A)	Target ABV% (Equati on B)	Measur ed OG (°P)	Curren t Gravity (°P)	Measur ed OG	Measur ed FG	Actual ABV (Eq. A) (%)	Actual ABV (Eq. B) (%)	Attenuat ion (%)	1-	
1																					
2	1	B010317	DCBC	Full Boar Scotch	64	86	86.19%	18.20	4.80	1.075	1.019	7.8	7.4	18.1	3.9	1.074	1.015	8.2	7.8	78.4	
3	2	B010417	DCBC	Coconot Porter	30	86	97.37%	14.90	3.30	1.061	1.013	6.5	6.3	16.1	3.9	1.066	1.015	6.9	6.6	75.8	
4	3	B010517.1	DCBC	Abbey Tripel	40	86		20.77	4.40	1.086	1.017	9.8	9.1	18.4	3.0	1.076	1.012	8.9	8.4	83.7	
5	4	B010517.2	DCBC	3xIPA	40	86		31.33	6.85	1.136	1.027	16.7	14.2	22.1	9.0	1.092	1.036	8.2	7.4	59.3	
6	5	B011117.1	PSB	Atom Splitter	32	86	91.54%	11.00	1.80	1.044	1.007	4.9	4.9	11.2	1.9	1.045	1.007	5.0	4.9	83.0	
7	6	B011117.2	PSB	Pocket Rocket	30	86	88.58%	16.70	3.50	1.068	1.014	7.5	7.2	16.7	2.0	1.068	1.008	8.3	8.0	88.0	
8	7																				
9	8	B011817.1	SWS	Wort	40	87	88.95%	14.00	14.00	1.057	1.057	0.0	0.0	14.3	14.3	1.058	1.058	0.0	0.0	0.0	
10	9	B011817.2	DCBC	Amber	30	87	91.17%	13.05	2.93	1.053	1.011	5.6	5.4	13.9		1.054	1.000	7.2	7.1	100.0	
11	10	B012317	SFBC	Double IPA	30	86		20.97	4.01	1.087	1.016	10.1	9.4			1.000	1.000	0.0	0.0	#DIV/0!	
12	11	B012417	DCBC	Scotch	64			18.17	4.76	1.075	1.019	7.8	7.4			1.000	1.000	0.0	0.0	#DIV/0!	
13	12	B012517	DCBC	Rum Barrel 2	30			20.97	4.01	1.087	1.016	10.1	9.4			1.000	1.000	0.0	0.0	#DIV/0!	
14	13										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
15	14										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
16	15										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
17	16										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
18	17										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
19	18										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
20	19										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
21	20										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
22	21										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
23	22										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
24	23										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	
25	24										1.000	1.000	0.0	0.0		1.000	1.000	0.0	0.0	#DIV/0!	

Solution Architecture



CompactRio



CONFERENCE 2017



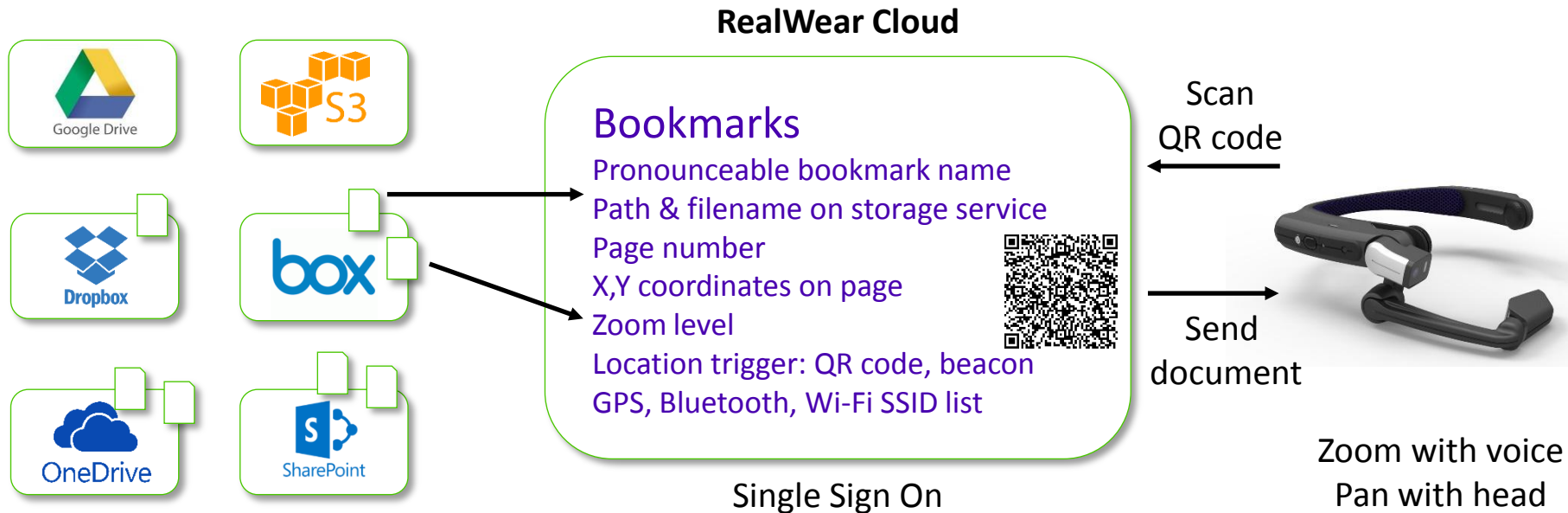
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Document Navigator

A cloud solution from RealWear



RealWear HMT-1

LONG SHIFTS

Hot swappable
full shift battery

DISPLAY

854x480 pixels appears like 7
inch tablet

BOOM ARM

Adjusts for any head size or
eye relief. Flips display out of
way when not in use

TRACKED

GPS, gyros, digital compass
& Bluetooth beacons

STAY PROTECTED

Clips on to hard hats.
Works with safety glasses

CONNECTED

Wi-Fi + Bluetooth LE.
Tethers to cellular devices
for LTE access

POWERFUL

Android 6.0 Qualcomm
Snapdragon 625 platform.
2GB RAM / 16GB Flash

INTRINSICALLY SAFE

A model coming with
FMC1/D1 & ATEX Zone 1

RUGGED

IP66 – dust proof &
waterproof – 2 meter drop
test onto concrete

CAMERA

16MP, high
performance & image
stabilized

ALL EARS

4 mics & advanced noise
cancellation

100% HANDS-FREE

Local speech recognition in
95dB of noise

LOUD & CLEAR

91dB speaker and audio
jack for use with hearing
protection



PI Vision™ Visualization on RealWear Head Mounted Tablet

COMPANY and GOAL

Independent craft brewery with growing output seeks employee productivity, production efficiency and consistent quality through batch process control



CHALLENGE

Non-connected PLC panel required manual paper based data logging and spreadsheet analysis done away from the wet and chemical environment

- Analytics inconsistent, not real-time – leads to completed batches occupying fermenting capacity and batch quality variation

SOLUTION

In-situ IoT data visualization in real time on hands-free head mounted tablet wearable, leveraging PI Vision™

- Live data in context of each fermenter while manual tasks are simultaneously performed
- Text alerts notify head brewer when critical fermentation thresholds are reached

RESULTS

Better asset utilization increases capacity. Timely analytics ensures consistent quality.

Employee operators are more productive, avoiding increased staff costs as output grows.

감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado