IEC AUTOMATION WEEK, 16 NOVEMBER 2018

Digital Technologies for Reliable Operation and Maintenance of Measurement Devices

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Important Notices

This presentation includes forward-looking information and statements including statements concerning the outlook for our businesses. These statements are based on current expectations, estimates and projections about the factors that may affect our future performance, including global economic conditions, and the economic conditions of the regions and industries that are major markets for ABB Ltd. These expectations, estimates and projections are generally identifiable by statements containing words such as "expects," "believes," "estimates," "targets," "plans," "outlook" or similar expressions.

There are numerous risks and uncertainties, many of which are beyond our control, that could cause our actual results to differ materially from the forward-looking information and statements made in this presentation and which could affect our ability to achieve any or all of our stated targets. The important factors that could cause such differences include, among others:

- business risks associated with the volatile global economic environment and political conditions
- costs associated with compliance activities
- market acceptance of new products and services
- changes in governmental regulations and currency exchange rates, and
- such other factors as may be discussed from time to time in ABB Ltd's filings with the U.S. Securities and Exchange Commission, including its Annual Reports on Form 20-F.

Although ABB Ltd believes that its expectations reflected in any such forward-looking statement are based upon reasonable assumptions, it can give no assurance that those expectations will be achieved.

This presentation contains non-GAAP measures of performance. Definitions of these measures and reconciliations between these measures and their US GAAP counterparts can be found in the 'Supplemental reconciliations and definitions' section of "Financial Information" under "Quarterly results and annual reports" on our website at www.abb.com/investorrelations

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Penetration of digital technologies is fast paced

2005

Two days after pope John Paul II. died

2013

His successor Benedikt XVI. retired and a new pope was elected

~100% market penetration within **8 years!**

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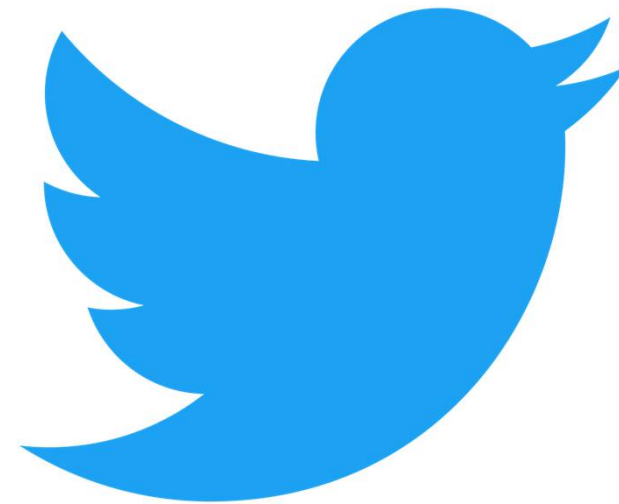# Mobile technologies change the way we interact and connect

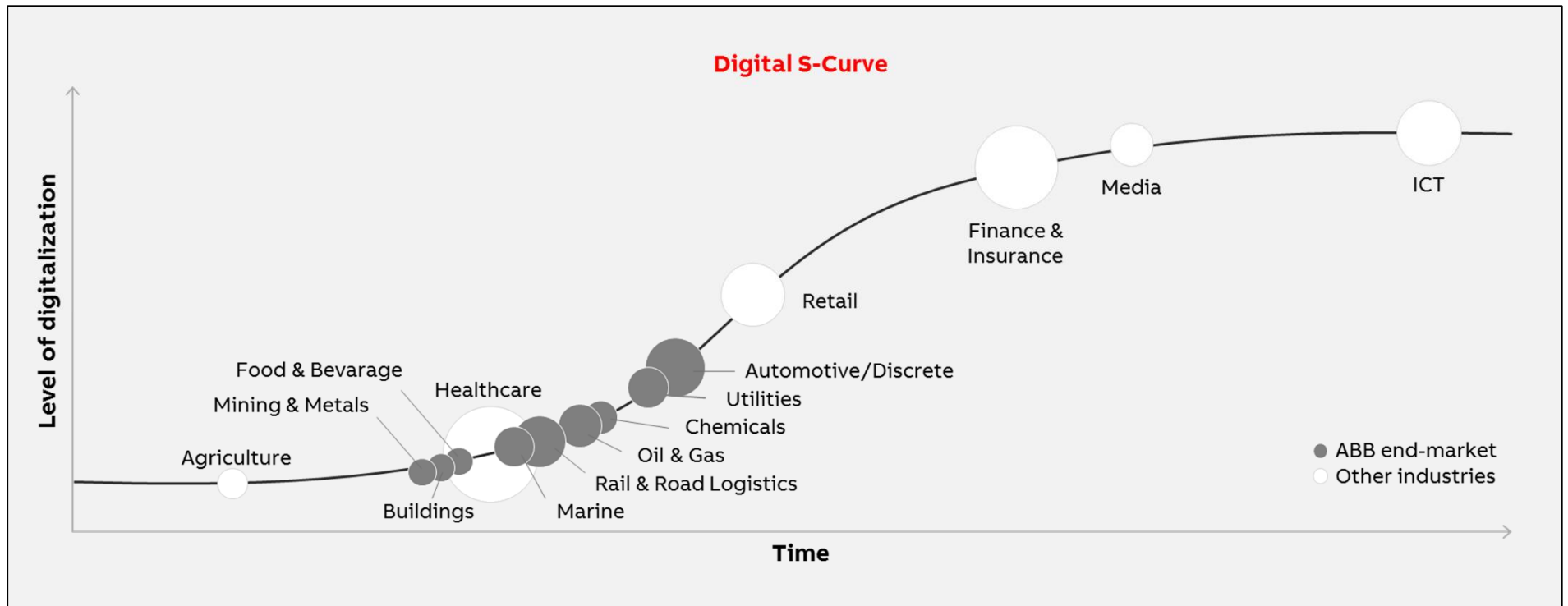| Radio	Twitter
It took radio **38 years** to reach 50 million users…	… it took Twitter **9 months**

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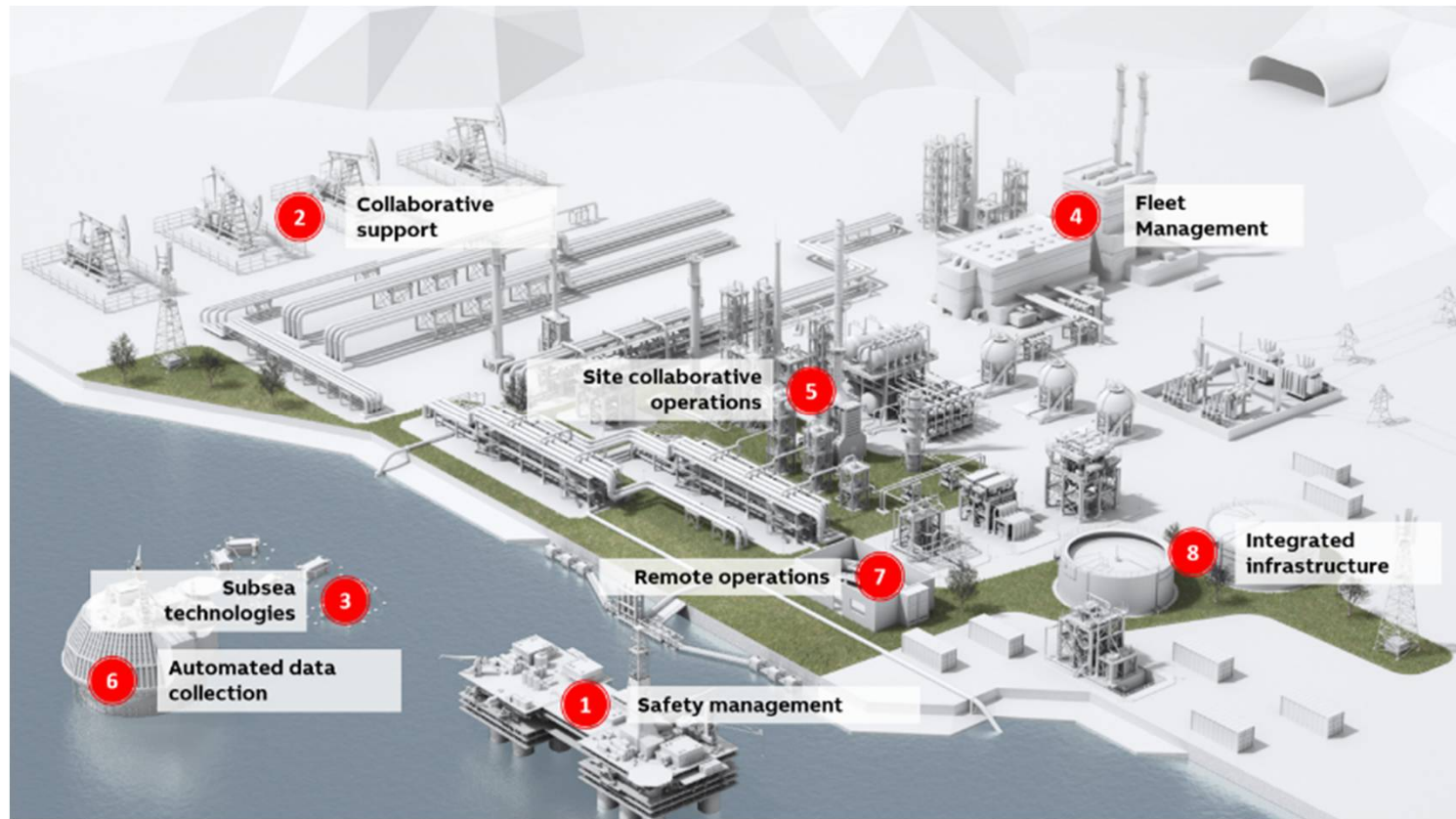
Digitalization in Industrial markets

Computing + connectivity + cloud + analytics set to unlock value

Digital S-Curve

Level of digitalization

Agriculture

Mining & Metals

Food & Bevarage

Healthcare

Buildings

Marine

Rail & Road Logistics

Oil & Gas

Chemicals

Utilities

Automotive/Discrete

Retail

Finance & Insurance

Media

ICT

● ABB end-market
○ Other industries

Time

Note: relative size of industry for advanced economies
Source: ABB analysis
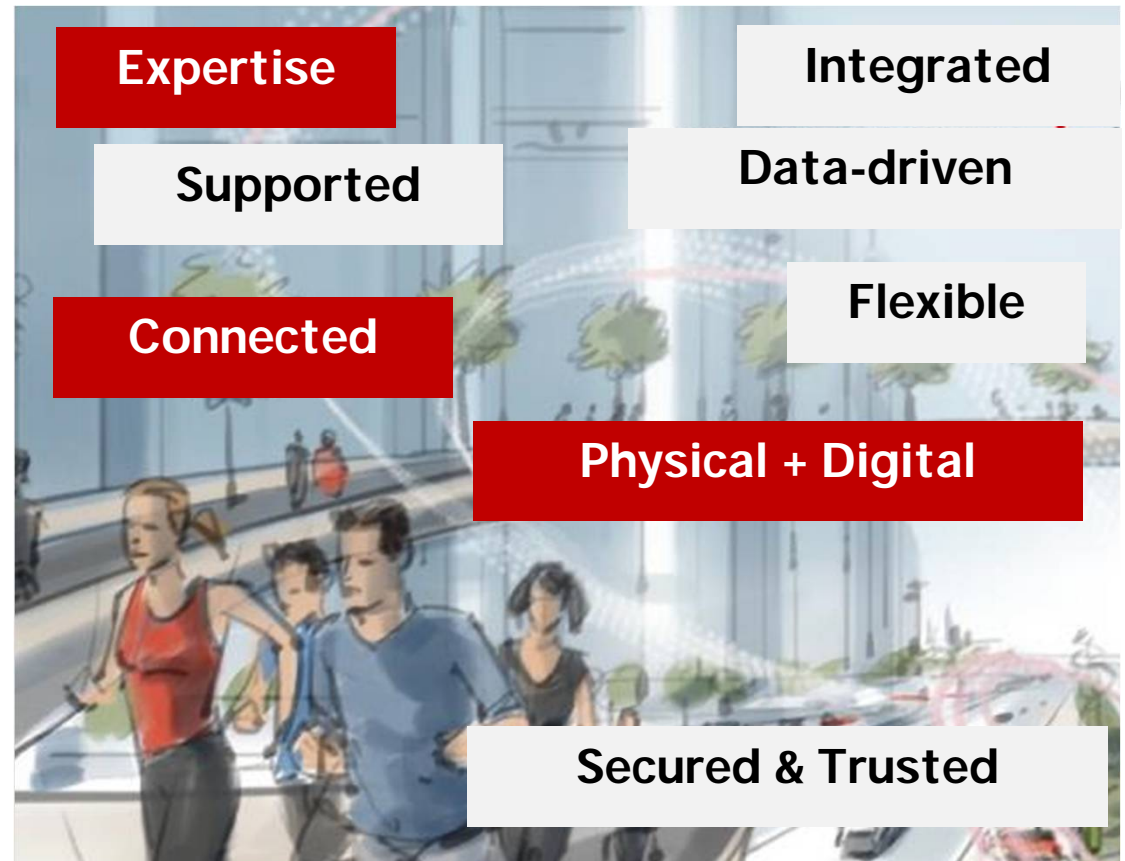
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Upstream → Downstream

Digital opportunities

What is ABB Ability™

Our unified, cross-industry digital capability, from device to edge to cloud
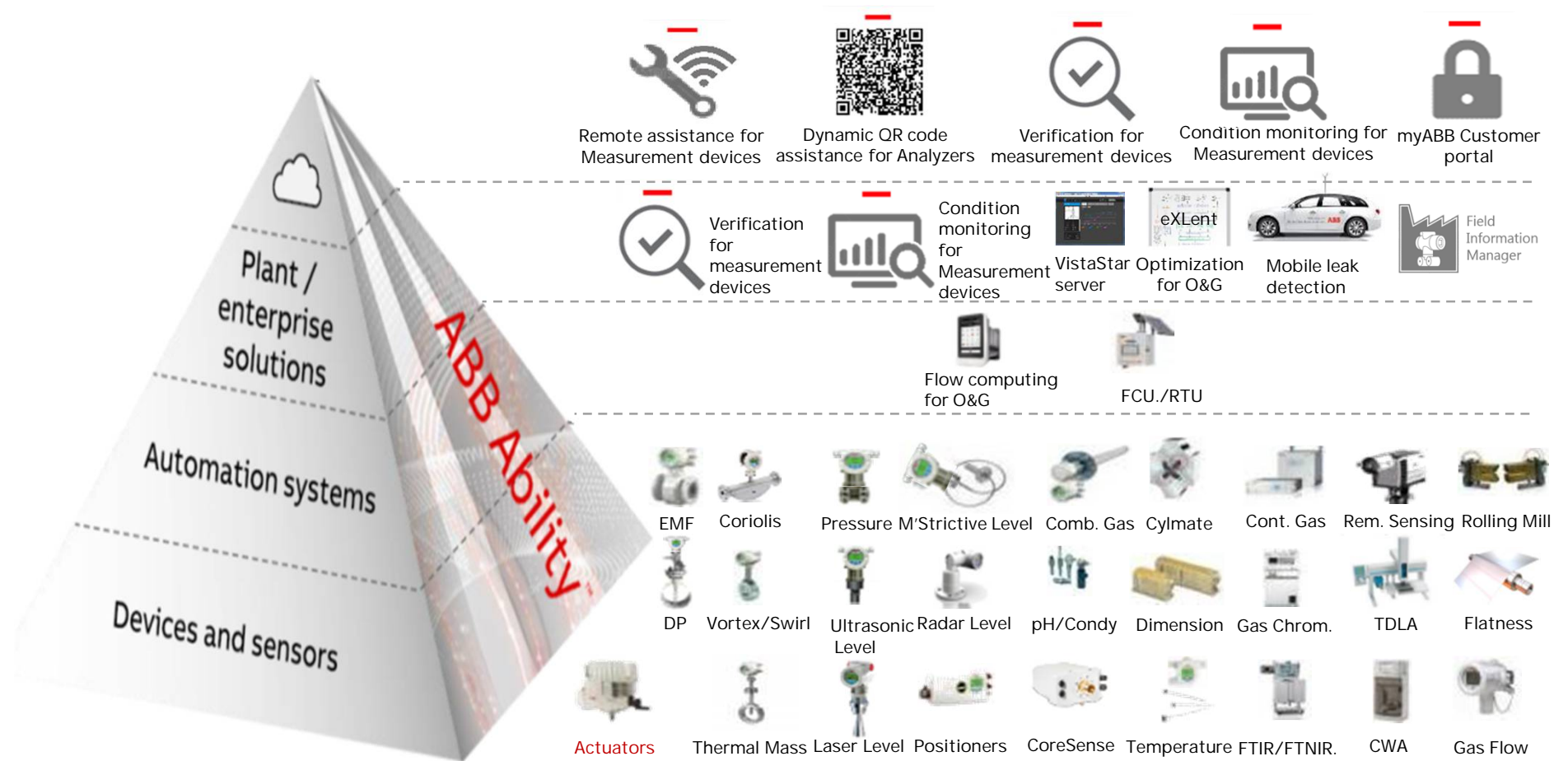
What does it include?

>180 Industrial Internet solutions

– Digitally connected devices, systems & digital-enabling services

– Industrial Internet technology platform & cloud infrastructure

  • Open, globally available, digital-industrial ecosystem leveraging Microsoft Azure

Digital capabilities as one unified offer

Expertise

Supported

Integrated

Data-driven

Flexible

Connected

Physical + Digital

Secured & Trusted

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ABB Ability™ for Measurements

Know More, Do More, Do Better

Remote assistance for Measurement devices

Dynamic QR code assistance for Analyzers

Verification for measurement devices

Condition monitoring for Measurement devices

myABB Customer portal

Verification for measurement devices

Condition monitoring for Measurement devices

VistaStar server

eXLent Optimization for O&G

Mobile leak detection

Field Information Manager

Flow computing for O&G

FCU./RTU

Plant / enterprise solutions

Automation systems

Devices and sensors

ABB Ability™

EMF Coriolis Pressure M'Strictive Level Comb. Gas Cylmate Cont. Gas Rem. Sensing Rolling Mill

DP Vortex/Swirl Ultrasonic Level Radar Level pH/Condy Dimension Gas Chrom. TDLA Flatness

Actuators Thermal Mass Laser Level Positioners CoreSense Temperature FTIR/FTNIR. CWA Gas Flow

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Effective gas leak detection is critical

Explosion in California | 8 fatalities | 38 houses destroyed

Traditional methods can't keep up

– Slow survey speeds
– Labour intensive
– Poor range; Walk near pipe
– Misses dangerous leaks
– Paper based

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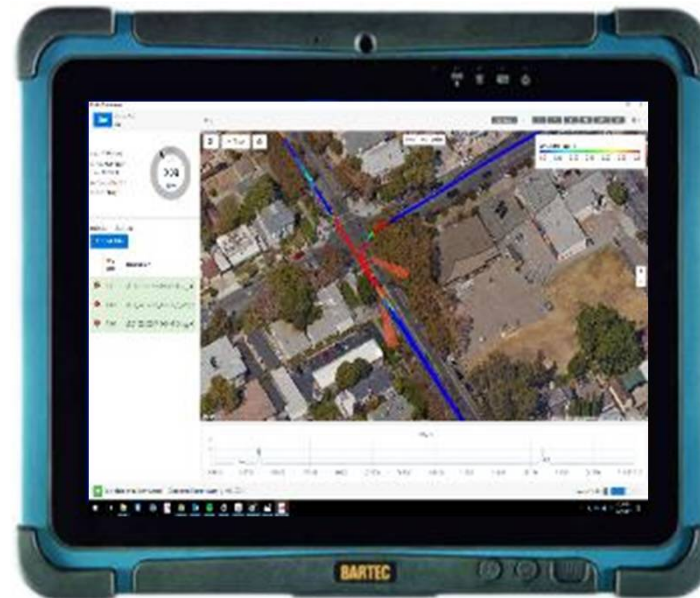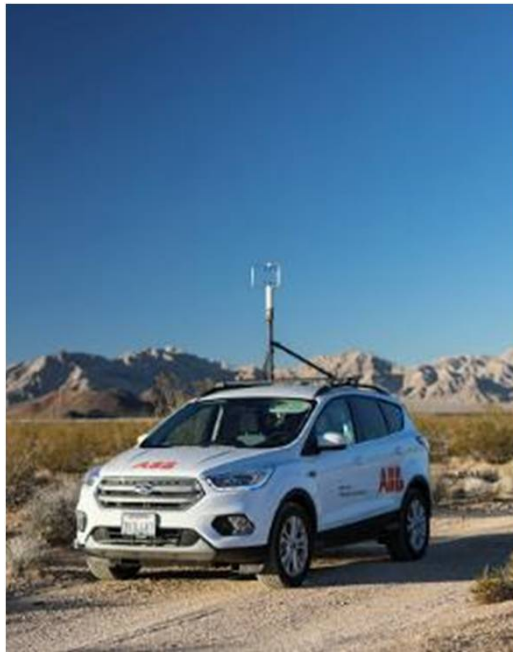
ABB Ability™ Mobile Gas Leak Detection System

Mobile Gas Leak Detection System

Real-time Google mapping, up to 500′ | 150m range, Eliminates false positives, Less labour, 2x to 10x less expensive

User interface (HMI)

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Flow Computer for Custody Transfer

Accurate, Traceable, Secure and Functional

Flow metering system
- Measures liquid or gas quantities traded between companies
- Also known as fiscal metering

Flow computer
- Corrects the measured value to an accurate value
- Calculates the quantity at reference conditions.
- Legal metrology (approvals)

Mismeasurements in Custody Transfer

A big financial risk …

- <u>Loss of money</u> for either the seller or the buyer.
- Direct relation with revenues (0.1% error = 0.1% loss)

… often not in control

- Many errors are left unnoticed or unhandled
- In 2017 a single system in South-East Asia **$4,000,000** of <u>unhandled</u> errors.

Managing Mismeasurements

Joint IP between Petronas and ABB

Why not taken care of?

- Too many potential issues to process manually
- Analysis requires scarcely available expert knowledge

ABB's solution

- MisMeasurement Management (MMM) software
- Automated issue processing
- Patented correction method with highest possible accuracy

ABB Ability™ Verification for Measurement devices

What is verification?

An on-site, in-situ condition monitoring tool for checking product accuracy and health

- Tests performed determine if instrument circuitry is functioning within design parameters

Verification is not Calibration

ABB Ability™ Verification for Measurement devices

Next generation of verification

Verify a range of flow meters

- VortexMaster
- SwirlMaster
- WaterMaster
- ProcessMaster

Basic health check

Licensed software test providing accuracy statement, certificate, data trending, storage options…

Fingerprint technology

Maintenance made easy
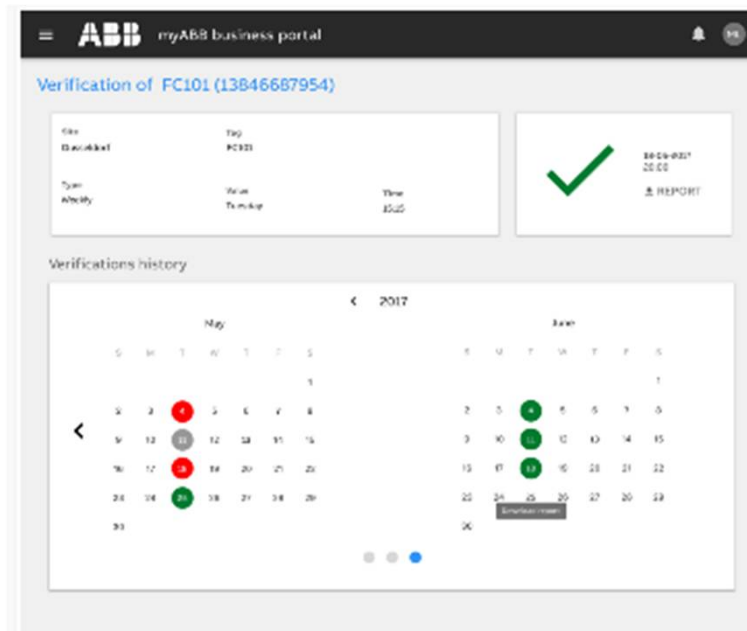
ABB Ability™ Verification for Measurement devices

Cloud-based Verification

– Cloud or edge based (on-premise) software solutions

– First app developed is verification; More apps to follow in future

– Pilot at Imperial College London

Connectivity is key!

myABB customer portal Dashboard

Fleet Reporting

Device data

Predictive Analytics

ScanMaster
Report

Device data

ABB Ability™ Gateway*

Diagnostic Data

Measurement Data

800xA

Non-ABB DCS

Field Devices

ABB DCS
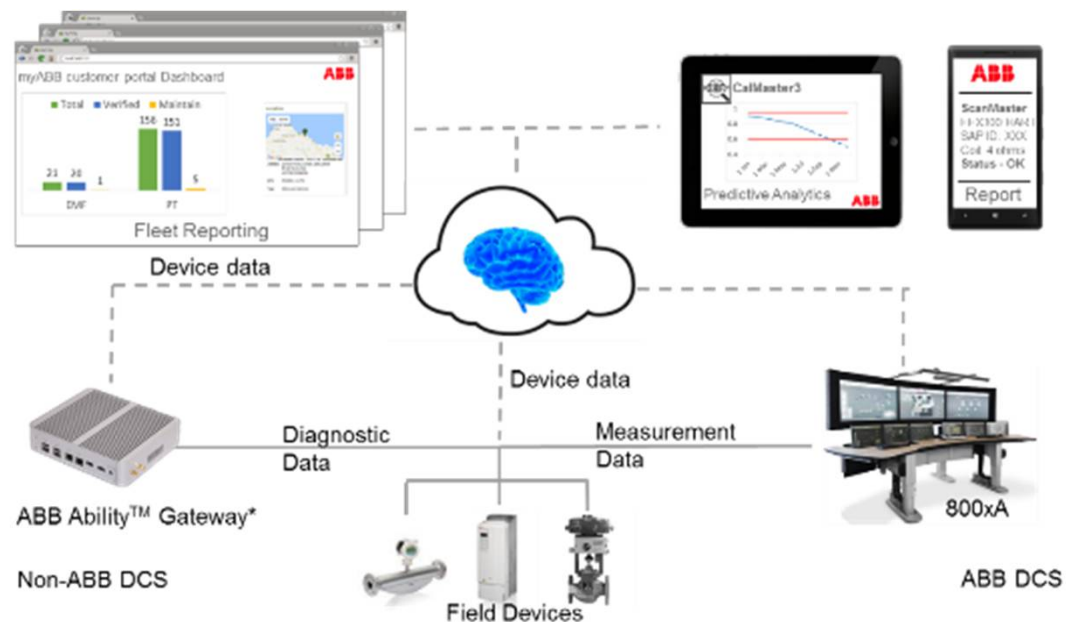
ABB Ability™ Verification for Measurement devices

Verification Status

Periodic (typically monthly) Report

24x7 Monitoring through Cloud

Dynamic QR Code

Remote Assistant for Analyzers

Information as service

Integration of dynamically generated QR Codes on existing analyzer display

– Possible in all locations (GP and Ex)

– without additional hardware

QR Code includes 2 sets of information:

– Static information:
  • Target: correctly identify of analyzer system

– Dynamic information
  • Target: secure accurate diagnosis and provide qualified support

Compatible with

– Standard QR Code Readers
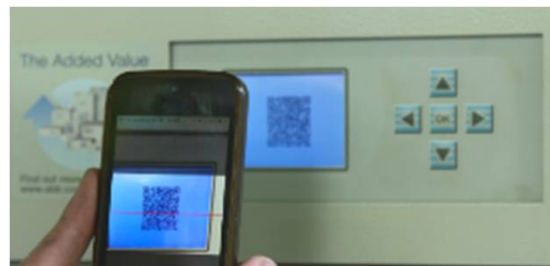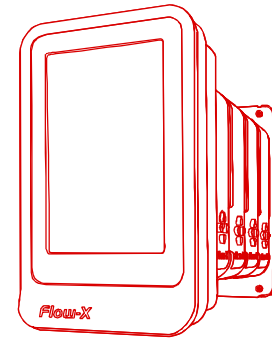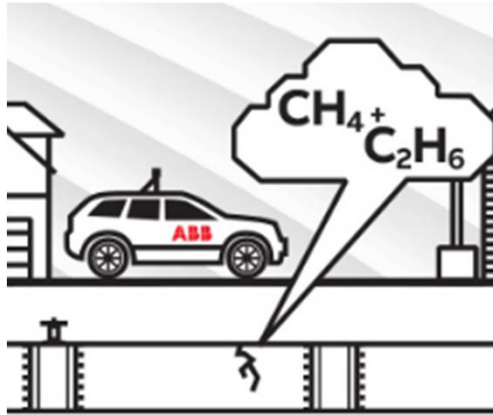
– ABB MyIB app

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Augmented Reality

- Super-imposition of computer generated image on user's view of real world

- Product/Service related information can be super-imposed to enrich experience

- Many consumer applications available (Remember Pokemon Go?)
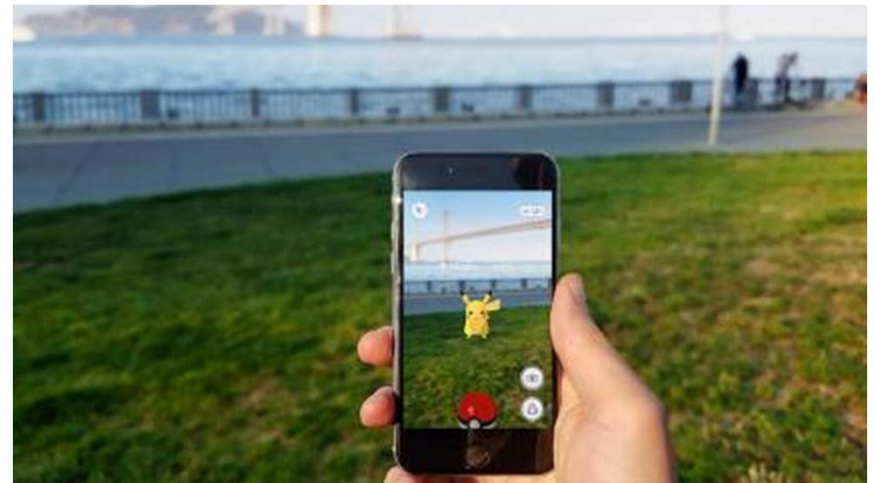
Simplifying Maintenance of Field Instruments using Augmented Reality

Digitalization is changing operation & maintenance of measurement devices

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