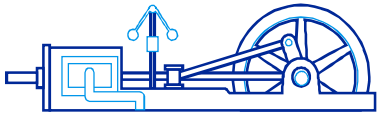
Remo Luetolf, Managing Director, ABB Switzerland Ltd.

Internet of Things, Services and People

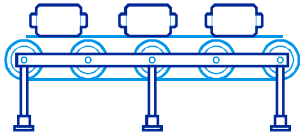
Opportunities for Advanced Services

The Internet of …
Global trend – 4th industrial revolution

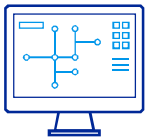
Industry 1.0 – 1712
First practical steam engine



Industry 2.0 – 1870
First elevated conveyor belts



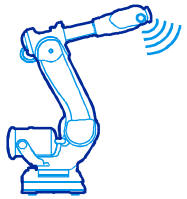
Industry 3.0 – 1969
Electronics / software based control

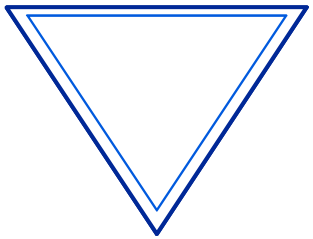


Industry 4.0 – today and tomorrow
Internet of …

People

Things





Services

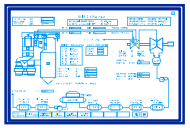


ABB leads proactively with new connected offerings

The Internet of Things
ABB things

Things

The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data [1]

The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure [2]

Smart, communicating devices by ABB

Robots

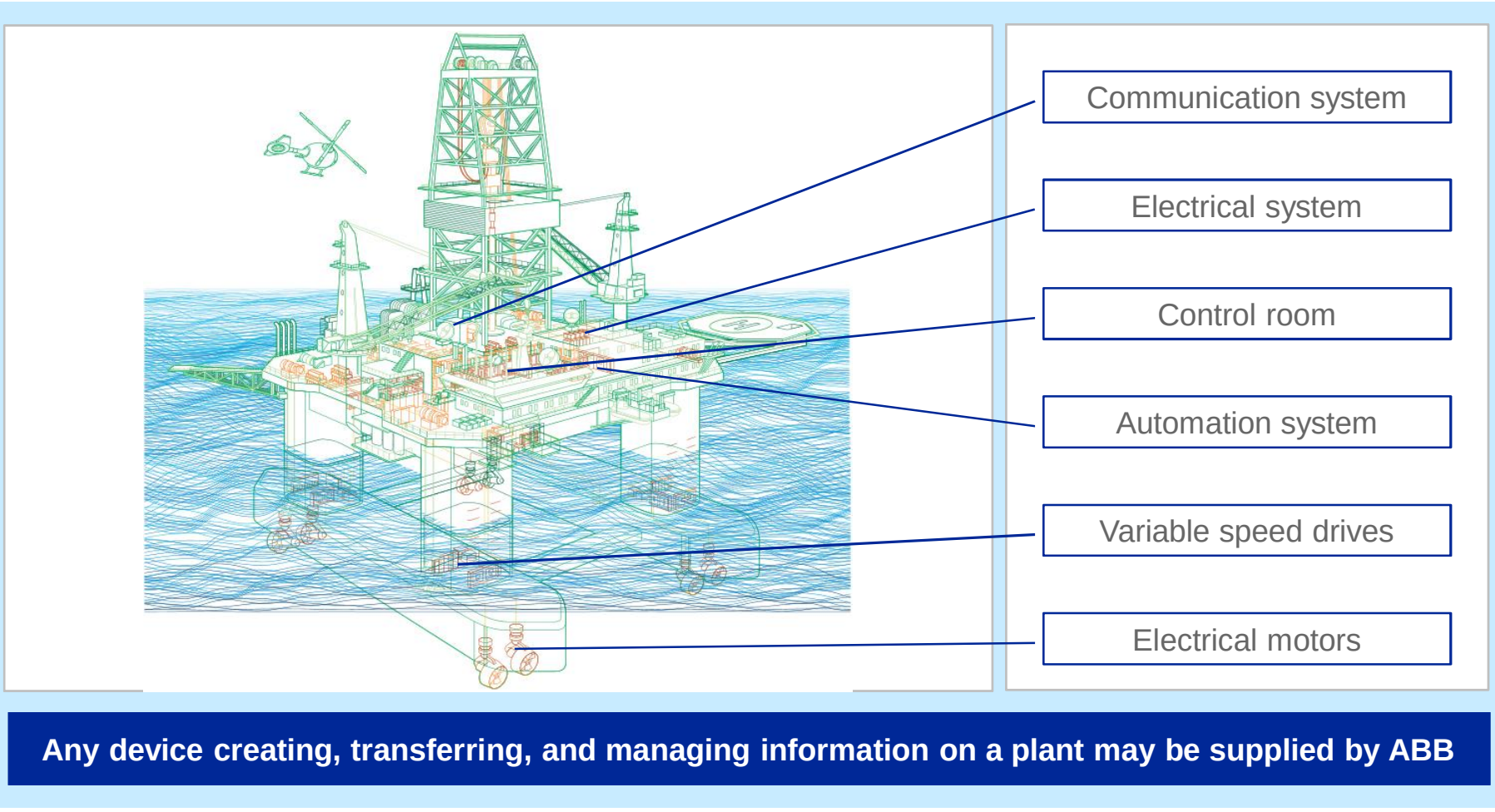
Motors

Switchgear

Controllers

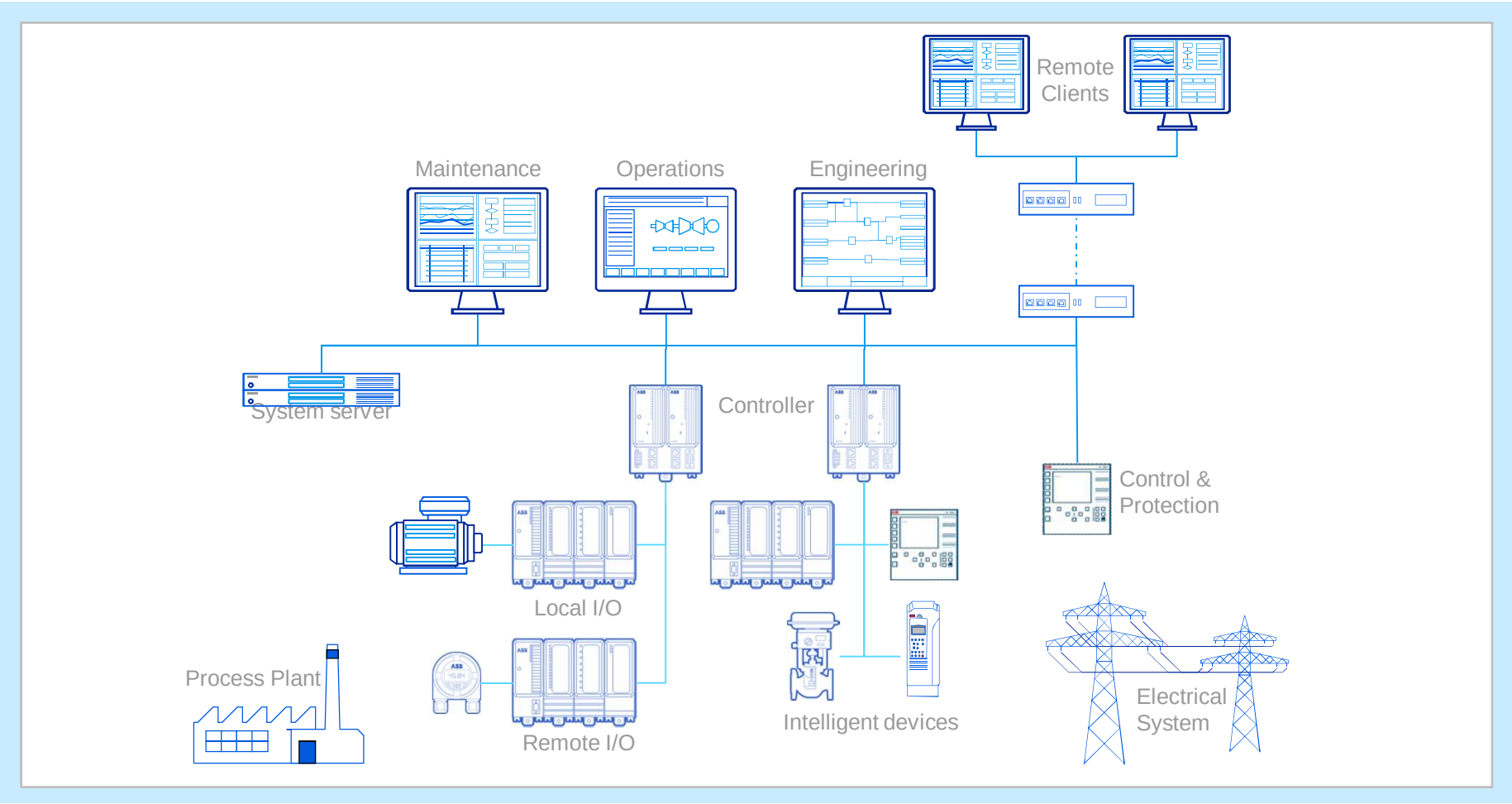
[1] "Internet of Things Global Standards Initiative“,
[2] https://hbr.org/resources/pdfs/comm/verizon/18980_HBR_Verizon_IoT_Nov_14.pdf

Industrial production infrastructure
Interacting things

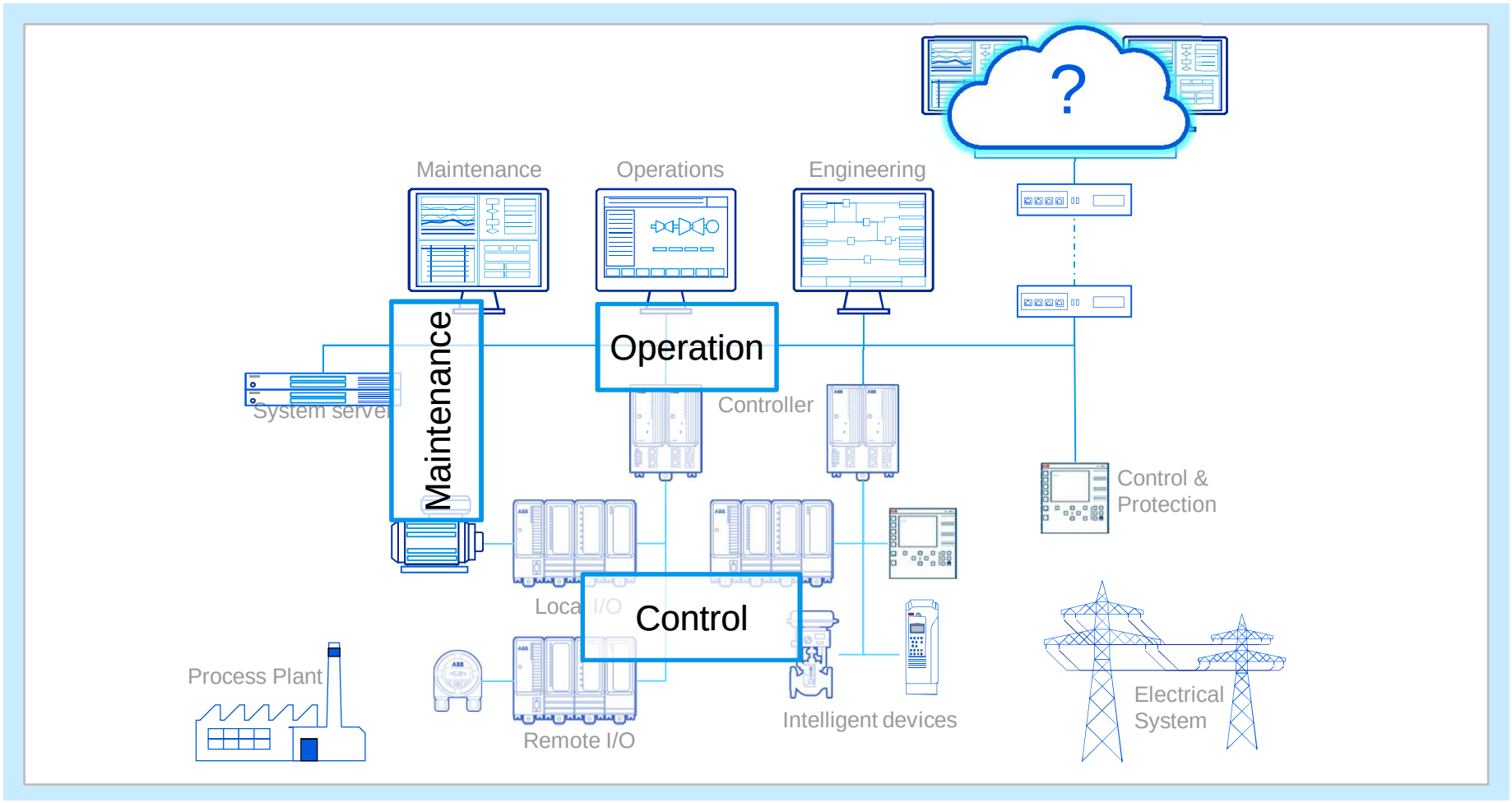


Any device creating, transferring, and managing information on a plant may be supplied by ABB

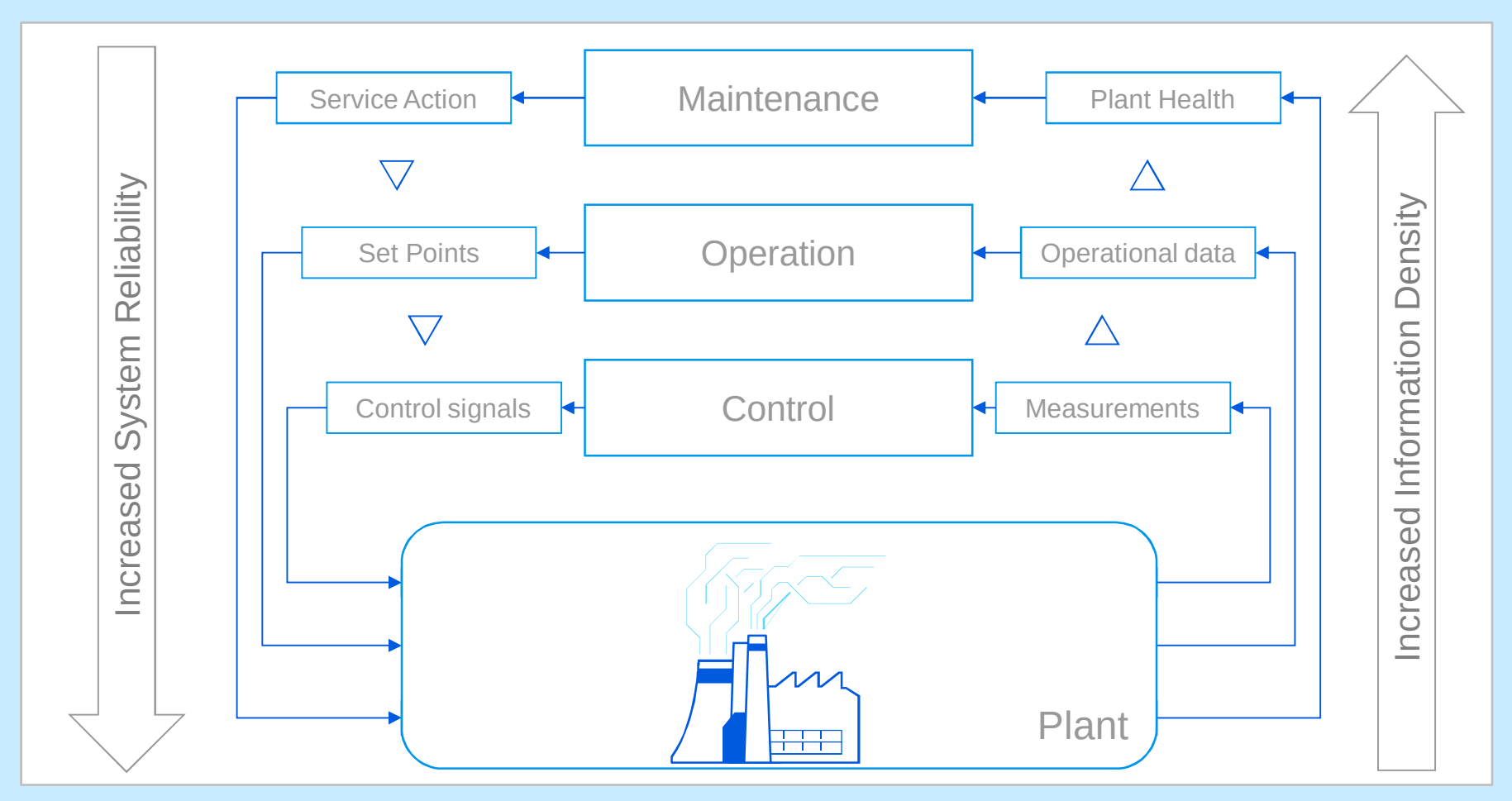
Automation systems
The Intranet of Things



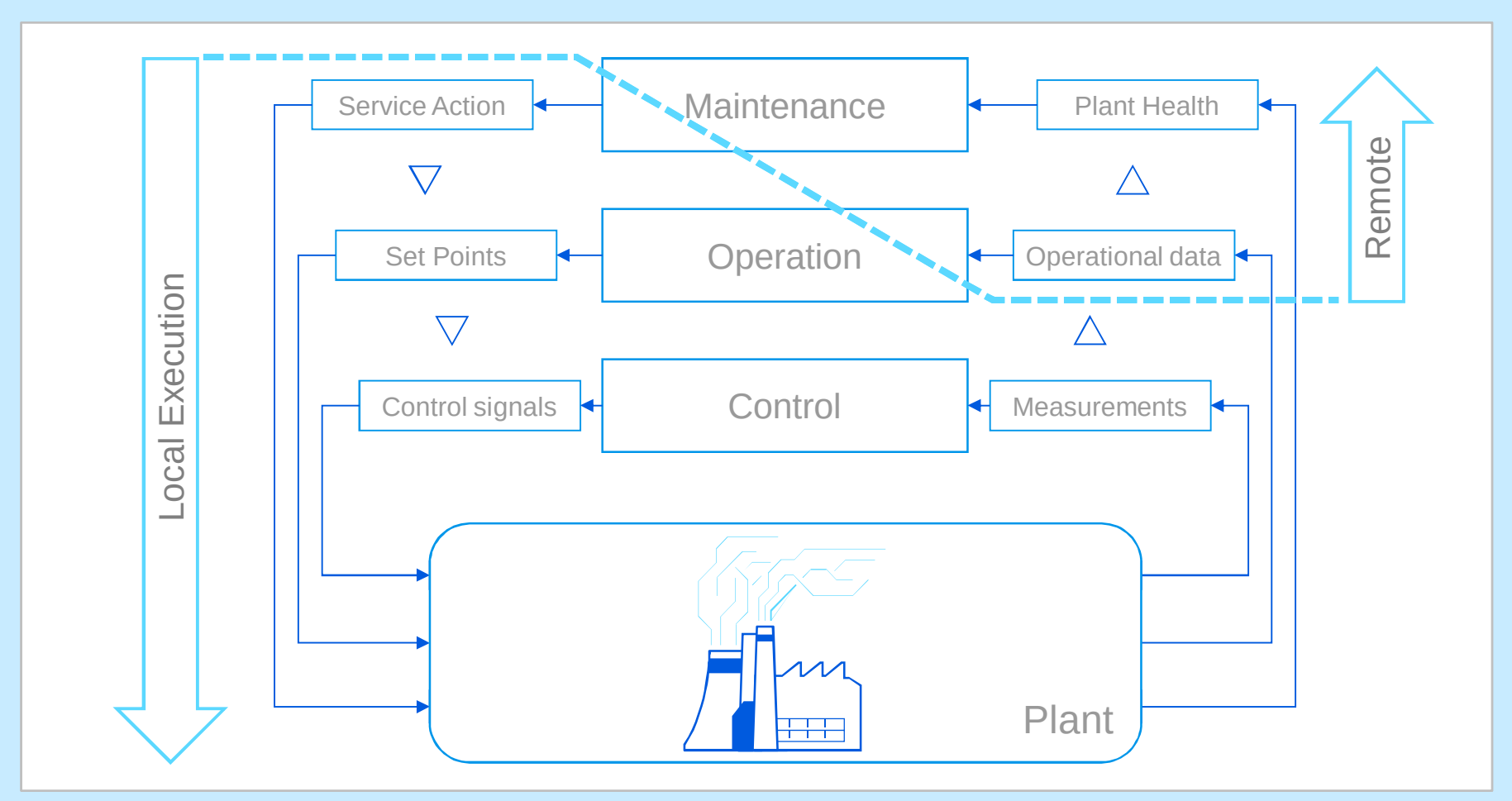
Automation systems
The Intranet of Things



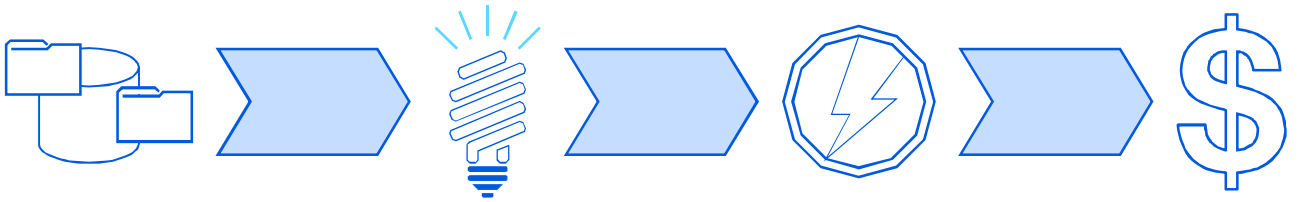
Information management
Reliability vs. information density



Information management
Local vs. remote potential



Business value of data
Perception of risk



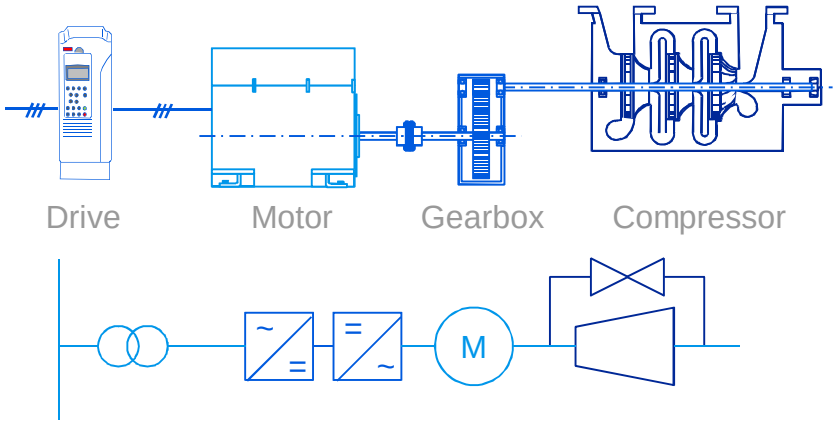
Risk and reward have to be balanced, there is no reward without a risk, and there is a cost for reducing risk

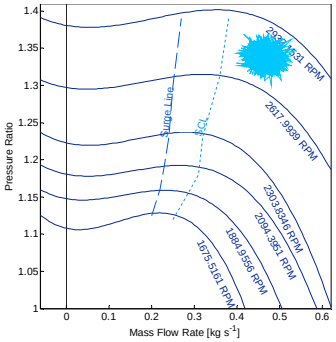
Risk can be reduced by increasing knowledge:

- Experience, trained personnel
- Gained from design and collected data

Business value is generated by a differing perception of risk

Package monitoring
Monitoring and diagnostic potential



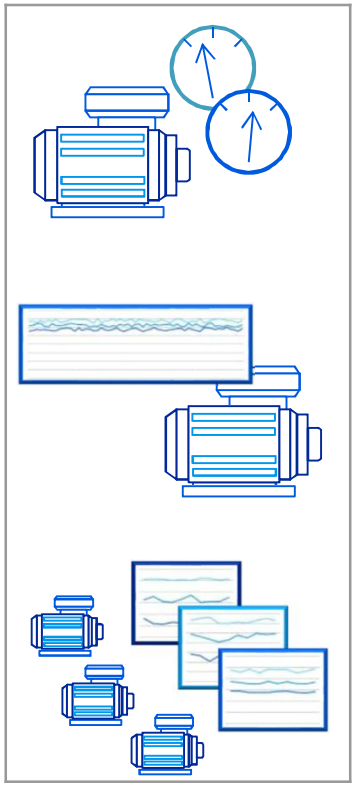


Device health and performance is derived from the analysis of the devices diagnostic data collected

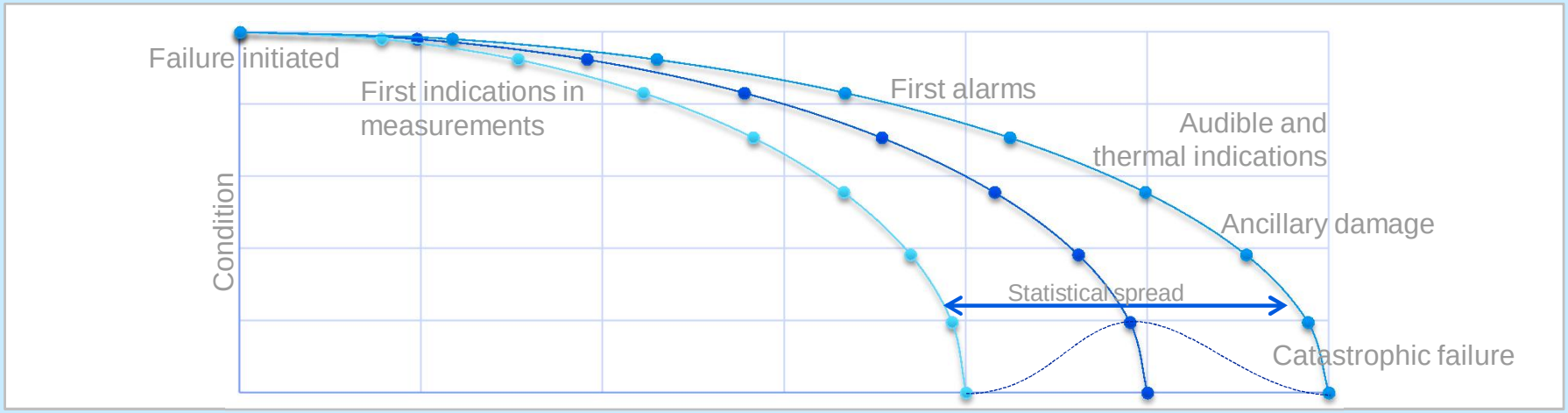
Health or performance can also be observed in measurements from devices along mechanical, electrical, or control connections

Integrating monitoring data from all sources in the plant including electrical and control systems provide thorough information

Fleet management
Monitoring and diagnostics potential

Scope	Analytics	Use case
	Physics of Failure Monitoring device performance and health measurements	Reactive Maintenance
	Model-based prognostics Health and performance parameters calculated from device historic data	Predictive Maintenance
	Statistics-based Fleet Analysis Benchmarking and predictions based on statistical analysis of the fleet	Fleet Management

Fleet management
Predictive maintenance potential



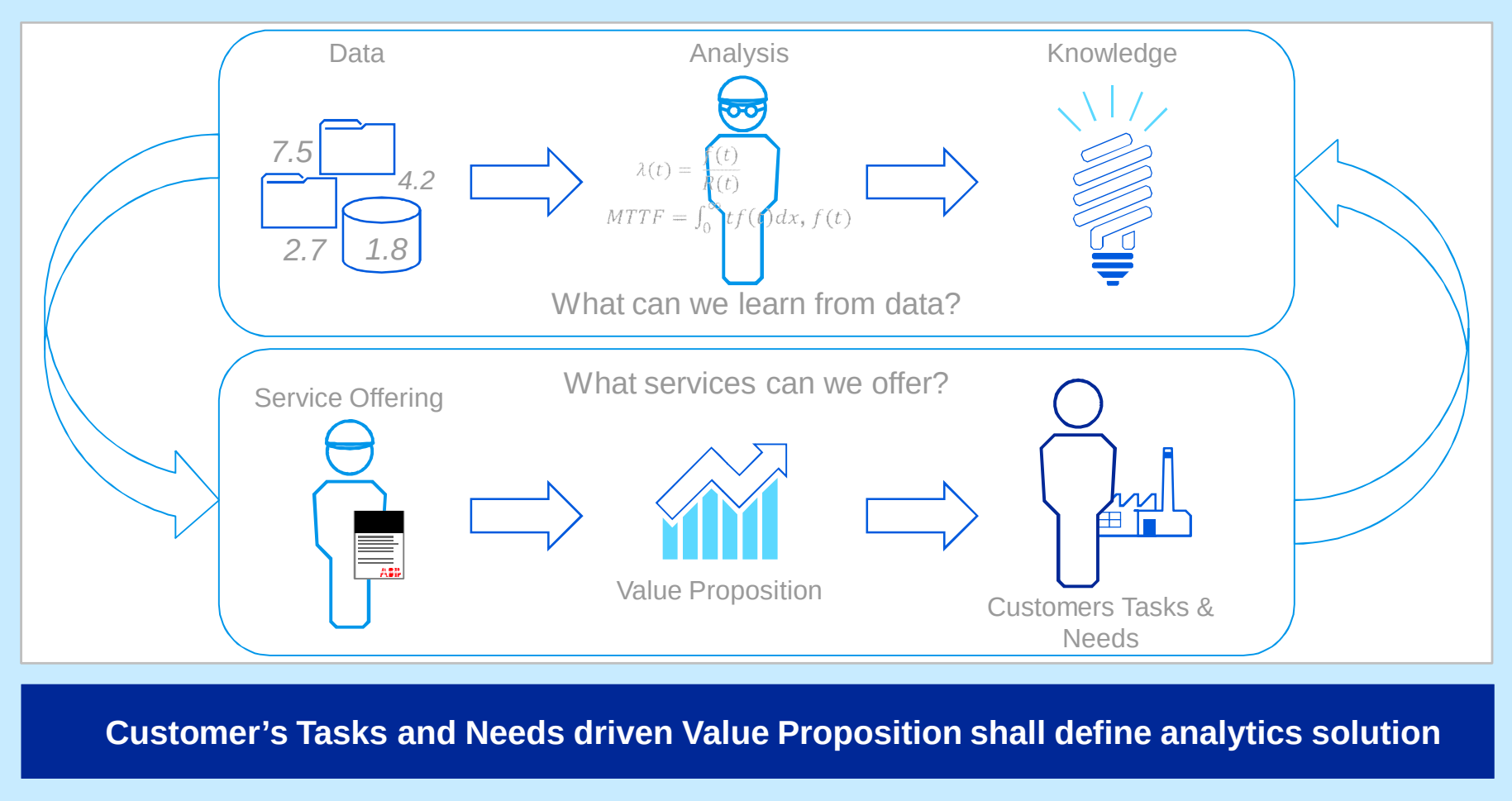
Good statistical knowledge important for accurate predictive maintenance

Time to react increased with improved predictive methods

Failure patterns observed in the fleet can be identified early in measurements

Integrating and analyzing monitoring data from a variety of installations of the same device type throughout the industry is essential

Remote services
Data driven services



Customer's Tasks and Needs driven Value Proposition shall define analytics solution

Remote access infrastructure for service
Cloud-based remote service benefits

- Remote services
  - Availability
    - Fast resolution of issues by remotely connected expert
  - Health & Safety
    - Reduced personnel exposure in hazardous / remote areas
- Cloud-based infrastructure
  - Cost structure
    - Move from capex to opex
  - Analytics
    - Big benefits from better software tools for diagnostic analytics
  - Distributed organization
    - Better overview over corporate fleet of assets
- Common platform benefits
  - One single interface to ABB remote access
  - Proven back-end technology across all ABB offerings
  - Common T&C for remote service infrastructure

Remote services
Opportunities for cloud-based services

Data Aggregation	If data from different contexts are combined, new insights may be found (e.g. measurements, weather, sales)
Statistical Analysis	Random effects (ageing, fatigue) can be tracked by analyzing a large number of devices
Demand Scalability	Infrequent need for high computing power that is not available locally, or that is more effectively shared between users
Geographical Distribution	Plants are geographically distributed, data experts need global access to data from different sites
Cross-organization collaboration	To get the full picture, people from different organizations (internal, external) have to cooperate and contribute their expertise

Remote access infrastructure for service
Customer concerns

IT capabilities

Security

Concern to compromise plant security through remote access connections

Privacy

Concern to make data available for undefined use

OT capabilities

Interoperability

Data cannot be easily accessed across differing application systems

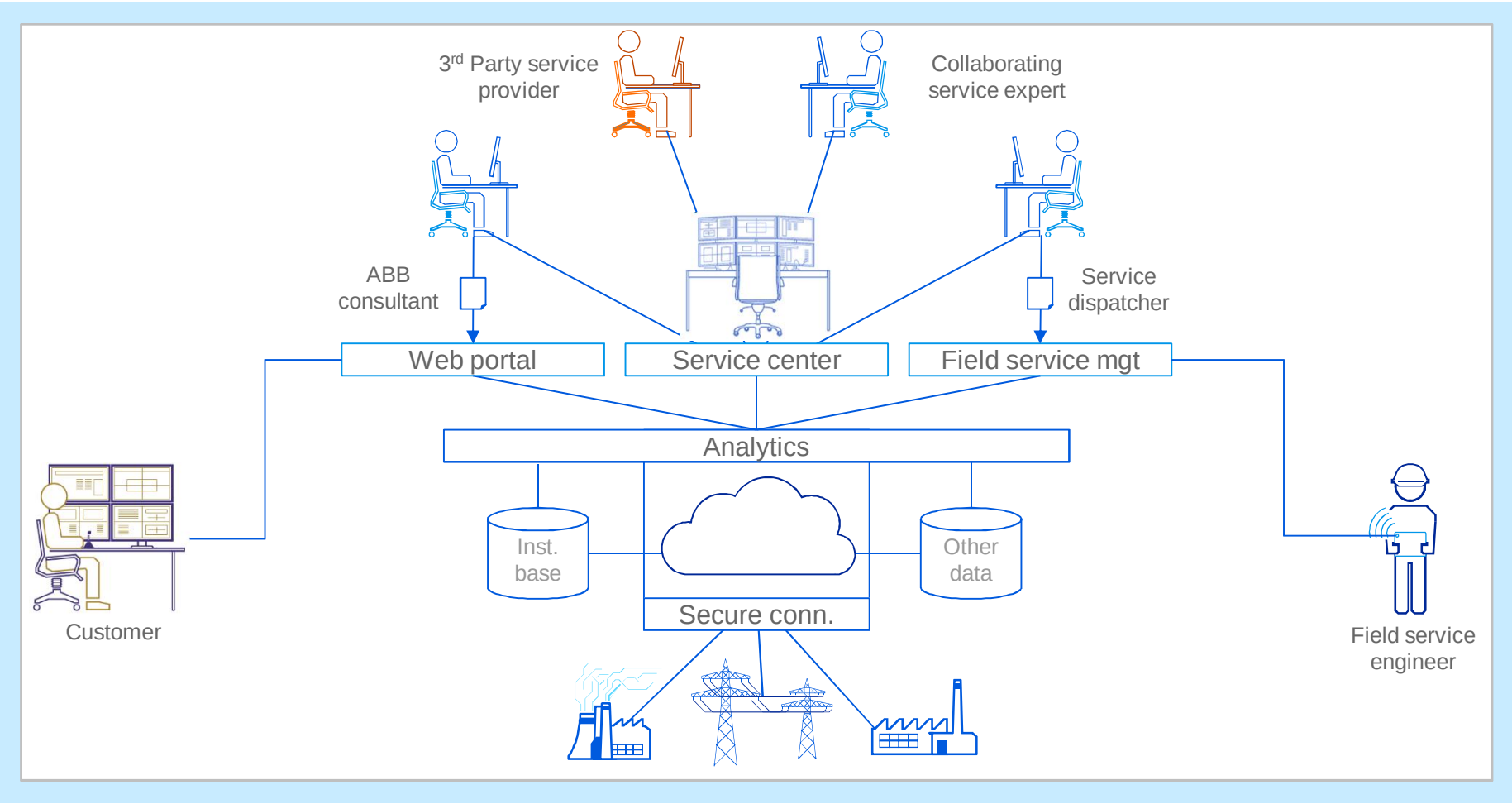
Reliability

Customers expectations are driven by experience with operations system

Investment protection

Existing operation critical infrastructure can not be exchanged to support IoT, plant lifecycle is much longer than IT infrastructure

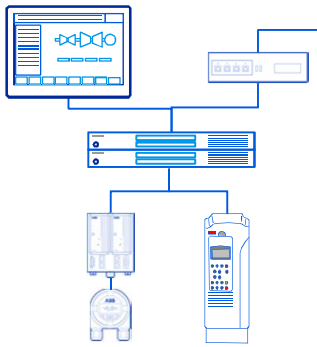
Services and applications
Collaboration in the data driven ecosystem



Plant-side installations

Industrial Internet of Things – connecting devices to the cloud

System connection



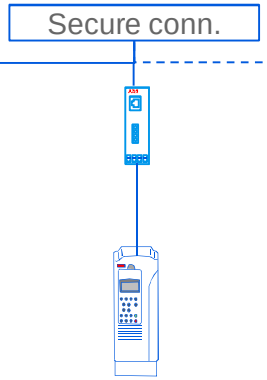
Data concentrator (DCS, Historian, SCADA) available on-site

Transferring data from system data concentrator

Tunneling monitoring data from devices through system connector to RAISE

Standards required in case of non-ABB systems

Internet connected device



Connecting intelligent device

Communication device to connect on-site individual devices to RAISE (3G or wired internet connection)

Data concentrator capabilities for limited number of devices

On-demand or time-based transfer of collected data

Wireless connected device

Connecting device lacking sensors

Low-end sensing solution for rough health indication

Local wireless to data collector (modem) wireless solution to collect sensor data and transfer to RAISE

Smartphone to collect data through built-in sensors or Bluetooth connection, upload by local user

Services and applications
Internet of People - service effectiveness and collaboration

Opportunities

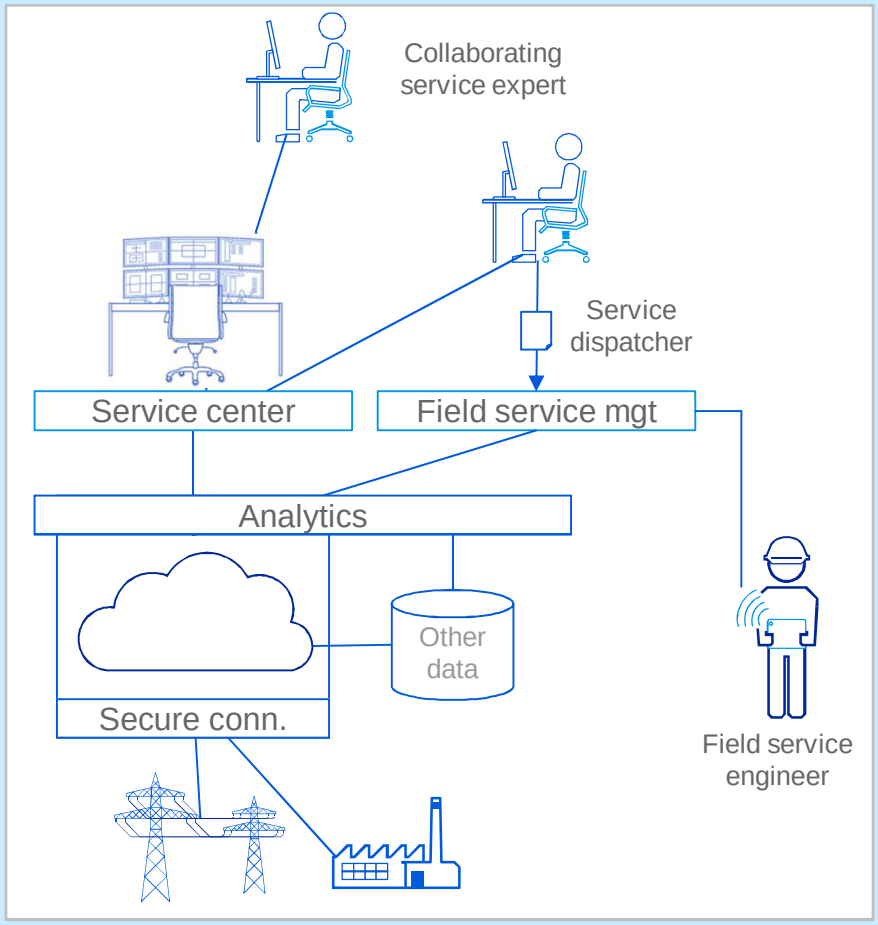
Common access to collected data

- Complementing services analyzing data in fleet context vs. plant context
- Collaborating experts from different units cooperating on solving a customer issue

Targeted field service dispatch

- Remote diagnostics allow for immediate dispatch of the right person with the right tools and spare parts
- Remote service expert can support field service technician on-line and observe improvement through measured KPIs

Fast and efficient resolution of issues



Services and applications
Internet of Services - external ecosystem and partnerships

Opportunities

Integration of 3rd party service provider

- Partners that can offer services based on measured data, e.g. sub-suppliers, OEMs, channel partners

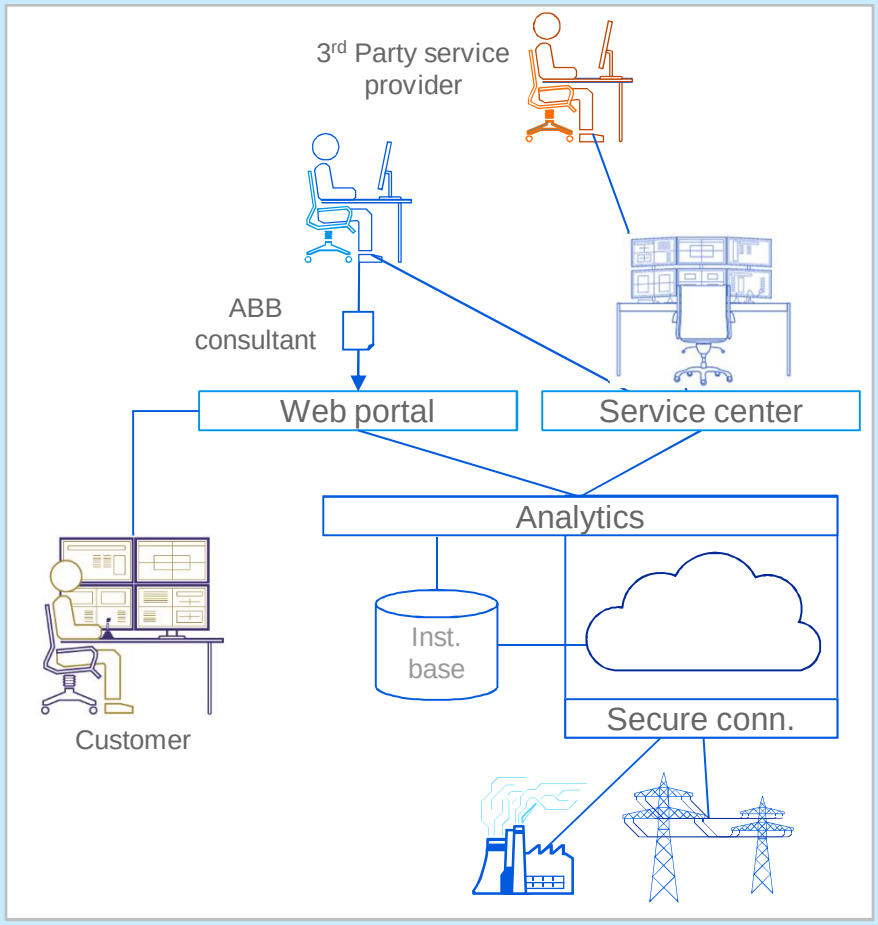
Data analysis for advanced services

- Analyzing usage data across customers to propose operational improvement

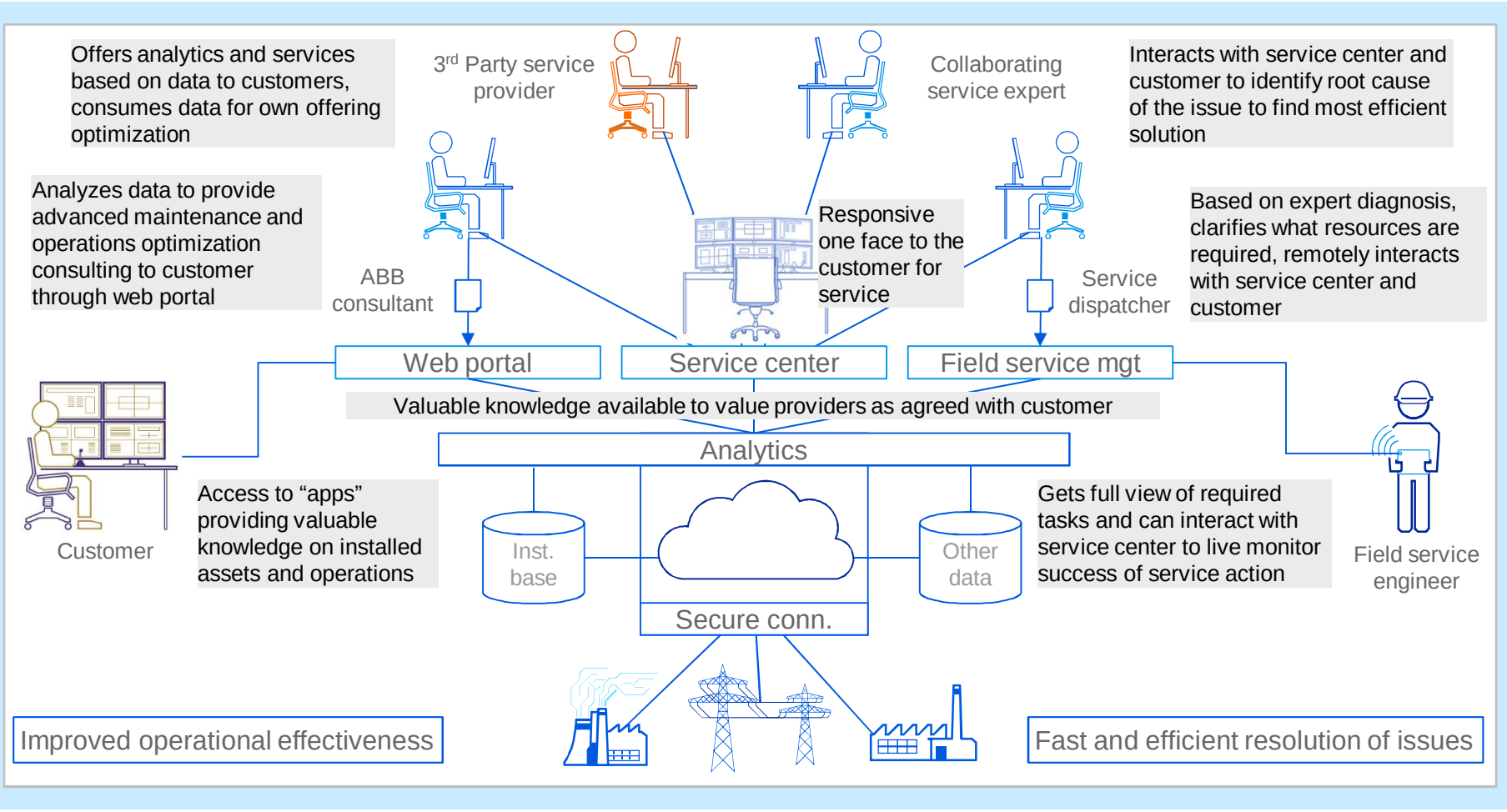
Self-service and dashboards for customers

- Web portal dashboards to present asset status, operational reports, and other reports based on measured data

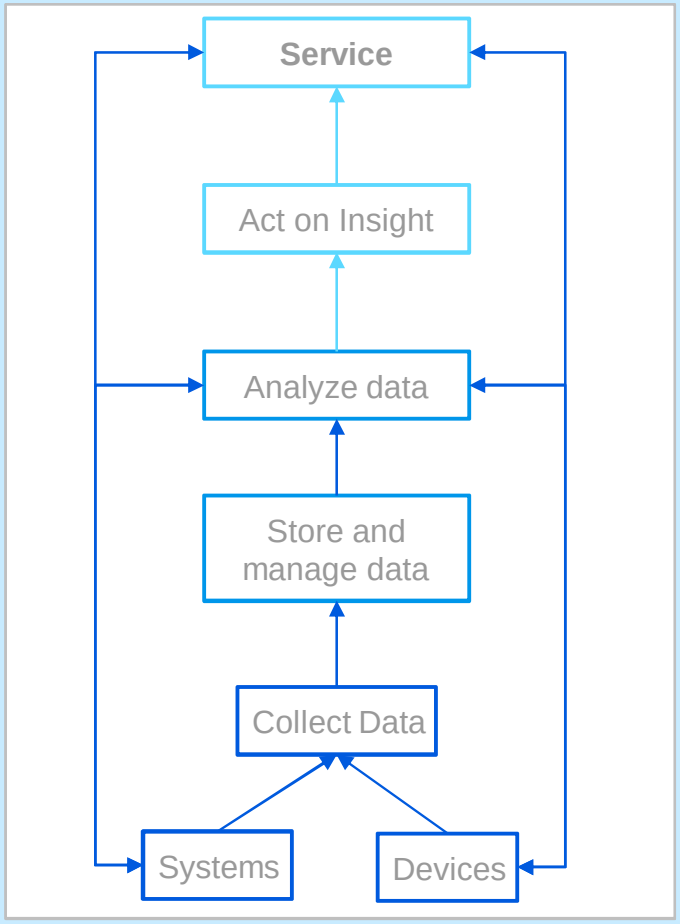
Increase operational effectiveness



Services and applications
Collaboration in the data driven ecosystem



IoT and Big Data
Internet of Things as a service delivery tool



IoT and Big Data

- Data collection and storage does not provide value if it's not properly analyzed
- Data analysis does not provide value, if no action is taken on the discovered insight

Differentiation through Service

- Action taken is service, and requires service capabilities

Further Optimization

- Service can be improved systems and devices support service functions (e.g. diagnostics capabilities)
- Systems and devices can be improved by feeding back data from analytics and service

Application example: Robotics
Remote service center

People

Clients can access actionable information from smartphones and tablets

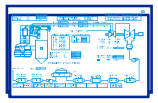
The information is available at any place, any time

Things

Intelligent and connected robots

Sending data to cloud servers for back-up, reporting, diagnostics, and benchmarking

Services



Central service unit remotely monitoring robots to support clients 24/7

Provides analytics to optimize robot usage and predict maintenance needs

Internet of Things, Services and People in action

Application example: Marine
FPSO*) Yùum K'ak'Náab, Gulf of Mexiko

"The Remote Diagnostics Services provided by ABB is excellent. The process of solving problems between ABB and on-board personnel has been excellent, inclusive response time, reporting and auditable trail of problem solving process".

Isak Arne Stensaker
Maintenace Supervisor, FPSO Yuum K'ak'Naab

Customer's situation:

- Drive tripped due to component failure.
- Reduced cargo transfer capacity lead to delays in production.
- On-board personnel not able to determine root cause of fault.

ABB solution:

- Remote connection was requested.
- Viewed historical data from time of fault.
- Based on alarm and events participating crew was instructed to perform physical tests on specific parts related to the fault.
- In cooperation the faulty part was detected and replaced with on-board spare part.
- ABB remotely monitored initial start-up after part replacement.

Problem solved within 5 hours

*) FPSO: Floating Production Storage and Offloading vessel

Application example: Marine
Energy management advisory suite for entire AIDA fleet

Customer's situation:

AIDA, German-based cruise operator, sets high demands in the environmental friendly solutions it deploys onboard the vessels:

to improve the environmental footprint of its fleet

to minimize the overall energy costs for the entire fleet

ABB solution:

Equip entire AIDA cruise fleet with:

SEEMP-compliant energy monitoring and

EMMA energy management system and decision-support tool to minimize the overall energy costs for individual vessels and entire fleets

All data generated onboard transferred to a cloud-based application for vessel benchmarking.

Provides management onshore with full visibility of energy consumption across the entire fleet.

Extensive ABB analytical services, including simulations, helps customer on future business case analysis

Application example: Mining
Gearless mill drive monitoring

Customer's situation:

ABB receives an automatically generated e-mail indicating a problem with a gearless mill drive

Data analysis shows that the device will probably fail within 8 days

ABB solution:

Based on the data analysis, the customer was advised to immediately interrupt production for <30 min to clean dust filters to survive operation until next planned outage

At next planned outage, resolution of the problem by replacing components that were organized in time by the service organization

Outage could be kept at a minimum, avoiding unplanned production loss of ca. 1.4MUSD

Application example: Renewable power
PV solar plant monitoring & operation

Customer's situation:

Minimum resource requirements for operating and maintaining a photo-voltaic solar power plant

ABB solution:

A remote monitoring solution provides secure and efficient access to an increasing amount of data, collected from multiple remote plants

Automated analysis tools and applications transform the data stream into useful actionable information

Web portal provides easy access to dashboards and reports to users

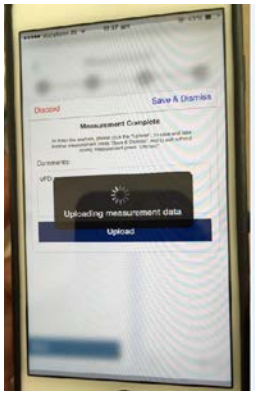
Benefits:

Service experts have better access to data and can easily connect to a remote site, resulting in reduced response time and cost

This enables customers to:

- Improve their O&M strategies
- Increase performance and availability of their assets

Application example
Integration of mobile measurement



Challenge:

Cost: fixed installation of diagnostic sensors too costly, they may be too expensive, or too rarely used to justify the investment

Age: Installed equipment was installed at a time when these sensors were not available (30-50 years ago)

ABB solution:

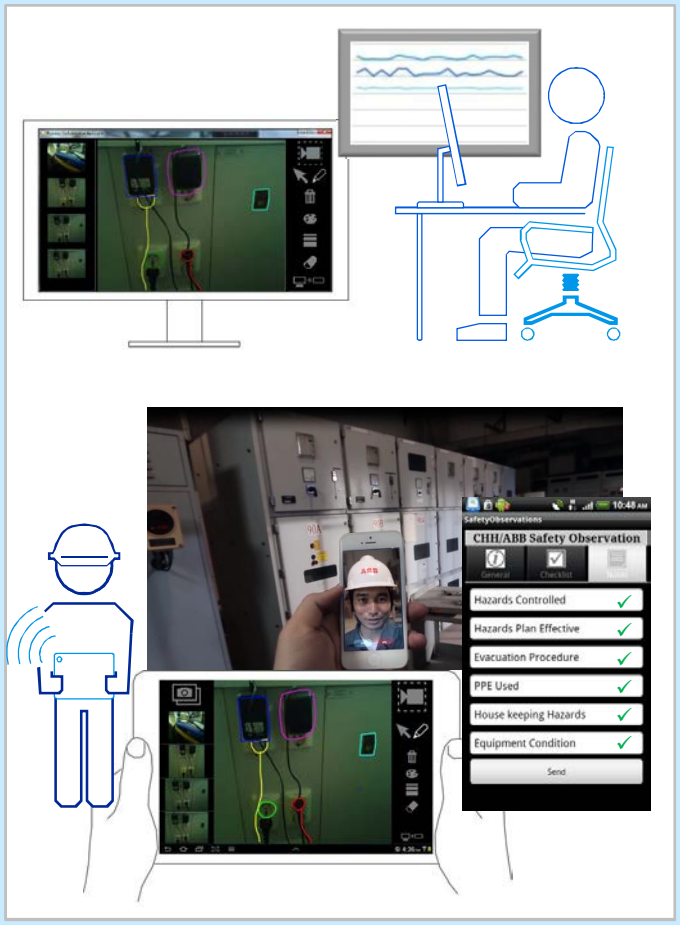
Use of mobile phone sensors to diagnose equipment ad-hoc

- Accelerometer for vibrations
- Compass for magnetic field
- Microphone for noise

Quick health indication sufficient to initiate further actions:

- Store device fingerprint and detect trends
- More precise measurements
- Service technician intervention

Application example: Safety support
Interactive collaboration



Challenge:

Remote Analytics allows experts to remain remote, but actions still have to be executed locally

ABB solution:

Video support for field engineer, interacting with the remote expert

Interactive advice drawn on screen to indicate actions or to request information (meter reading, switch position, etc).

Remote interactive safety advice and mobile safety checklist for safe working environment

Remote interaction for safe working environment:

- Interacting with the expert on service and safety questions
- Mobile app support for safety checklists and documentation

Internet of Things, Services and People
Conclusions

Intranet of Things – Internet of Things

- Intelligent devices equipped with sensors are providing large amounts of data that is today used in the controls system
- Today's essential requirements remain valid (safety, reliability), cyber security and data privacy become more important for all players along the value chain

Internet of People

- People will not be obsolete in the future context, as they remain in control of the production process. People will be the decision makers

Internet of Services

- Services will become more advanced through the use of data analytics. If the analytics results are not turned into improvement actions, customer benefits remain low. Opportunities for new service models that build on collaboration with partners and customers will evolve.

Power and productivity
for a better world™

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