ABB Ability™ Asset Health for control systems
System Benchmark and Fingerprint: Customer Presentation
August 2018
ABB Ability™ Asset Health for control systems
Address customer challenges and needs with the service product portfolio for control systems
## Operating and maintaining the control system

What are the challenges today? Which ones are relevant to our customer?

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Availability and Asset Health</td>
<td>Minimize un-planned shutdowns and minimize the duration of the shutdown caused by equipment failures in the control system.</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Improve collaboration with vendors, channel partners, and within the company.</td>
</tr>
<tr>
<td>Aging work force and Skill gaps</td>
<td>Enhance the control system to be able to run the plant with less people for operation and maintenance.</td>
</tr>
<tr>
<td>Lifecycle management</td>
<td>How to upgrade or evolve the system as efficient as possible while keeping the investments in application and assets.</td>
</tr>
<tr>
<td>Cyber security and digitalization</td>
<td>How to improve the control system security and maintenance? How to increase digitalization while maintaining cyber security? How to enter the digital world? How to increase the level of digitalization?</td>
</tr>
</tbody>
</table>

**Source:** US Bureau of Labor Statistics
Operating and maintaining the control system with PG Advanced Services

Start with addressing the challenges from a control system perspective

**Challenges - which ones need attention?**

- Automation
- Cyber Security
- Cloud/Fog
- Data Analytics
- Artificial Intelligence
- Digital Twin
- Sensors
- PLCs
- Control Systems
- Motors & Drives

**Enabling Technologies**

- Cyber Security
- Artificial Intelligence
- Cloud/Fog
- Data Analytics
- Digital Twin
- Automation
How to address challenges with your service activities for control systems

What's the plan?
How to address challenges with your service activities for control systems

Here is the plan: Step 1 – Enter the digital world

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Step 1 – Support the customer to enter the digital world</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make yourself familiar with the value propositions</td>
<td></td>
</tr>
<tr>
<td>Register yourself and your customer in</td>
<td></td>
</tr>
<tr>
<td>– My Control System</td>
<td></td>
</tr>
<tr>
<td>– Application and Knowledge Store</td>
<td></td>
</tr>
<tr>
<td>Clean up the data in a joint effort, e.g. contact names, licenses, etc.</td>
<td></td>
</tr>
<tr>
<td>Scan the control system and generate a digital twin in the myABB/My Control System Cloud and in ServIS</td>
<td></td>
</tr>
<tr>
<td>Please get started. This step can be done for all Control System Customers.</td>
<td></td>
</tr>
</tbody>
</table>
How to address challenges with your service activities for control systems

Step 2 – Advanced Services to be mandatory for every control system

Challenges

Step 2 – Introduce Advanced Services to be mandatory for control systems

Make yourself familiar with the value propositions
Based on the System Scan...
Run the Benchmark monthly
- Addressing warnings and faults with a Fingerprint
Run the Fingerprint quarterly
- Explaining warnings and faults in details
- Providing recommendations for fixes => generate work orders
Start offering the above and add to the Power Generation Care agreement.
Digital services to enter the digital world

My Control System

### Plant assets
- Robots
- Motors & Drives
- Sensors
- Control Systems

### Enabling technologies
- Automation
- Digital Twin
- Data Analytics
- Cloud/Fog
- Cyber Security
- Artificial Intelligence

### New capabilities
- Makes use of new technologies
- Enables collaboration
- Enables new services
- Enables new business models

Monitors
Aggregates
Analyses
Understands
Controls

My Control System
Digital services to enter the digital world
Power Generation Care, My Control System / MyABB, Application Knowledge Store

- Managing the customers life cycle costs with subscription-based life cycle management program that provides services to maintain and continually advance and enhance ABB control systems (e.g. software upgrades, cyber security patches)

- 24/7 service portal for customers and ABB personnel with single point of online access to information, contacts and services such as Advanced Digital Services relevant for ABB control systems

- 24/7 forum for customers and ABB personnel to collaborate with the community to ask questions, find answers and share applications
Advanced Services to be mandatory for every control system
Advanced Services in the digital context

- Plant Assets
  - Robots
  - Motors & Drives
  - Sensors

- Enabling Technologies
  - Automation
  - Digital Twin
  - Data Analytics

- New Capabilities
  - System Scanning
  - Benchmark
  - Fingerprint
  - Application and Knowledge Store
  - Power Generation care
  - My Control System
System Benchmark and Fingerprint
Overview

Benchmarks and Fingerprints are services aimed to assess the health and status of a system

**Data Collection:**
Tool for system data collection, installed on-site

The data collection files are transferred to My Control System (MCS) on MyABB

**Analysis & Reporting:**
- Benchmark - Show the system status and highlight deviations and potential risks
- Fingerprint - Provide a comprehensive analysis of the current system availability and reliability and recommend corrective actions as needed

MCS provides the customer web portal for easy access to system information as well as reports
ABB Ability™ Asset Health for control system - Assessing and Tracking

Portfolio Overview

Advanced Services save time, reduce risk and lower costs

The System Scan connects the control system to the digital world

Benchmark and Fingerprint show 40-100 KPIs

- Provide fully featured cloud enabled system diagnostics
- Generate a digital twin of the DCS configuration

This will reduce maintenance cost to the benefit of both the customer and the service provider.

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1. Scan

ABB Ability™
Quarterly
Automated collection
Upload to My Control System for analysis

Control system scan with pie chart summary

2. Benchmark

Listing #

Control system check with results presented in “traffic light” format

3. Fingerprint

All details

Detailed system analysis with findings, impact recommendations and background information
Advanced Digital Services for Control Systems

ABB Ability™ Asset Health for control system - Scan, Benchmark and Fingerprint

Scan - Data Collection (on site)
- Using SPDC Software
- Remote execution possible via RAP connection

Upload
- To My Control System
- To ServIS
- Manually by ABB Personnel

System Status
Available for all customers with valid SID for free

Benchmark
License needed, license included for systems on purchase of Power Generation Care contract

Fingerprint
License needed, license sold on discounted price for Power Generation Care customers

Review & Provide Recommendations
- Supported by Collaborative Operation Center (COC)

Generate Work Orders

With Expert Advice
Fingerprint
Available for all customers with valid SID for free
Collaborative Operations turns data into money at single plants and across enterprises

- **Ops support**
  - Operations and Technical Support
  - Analytics and Visualization
  - Simulation

- **Analytics**
  - Analytics and Visualization
  - Simulation

- **Optimization**
  - Emission Monitoring
  - Energy Optimization
  - Performance Optimization
  - Alarm Management

- **Predictive maintenance**
  - Condition Monitoring
  - Asset Health
  - Predictive Maintenance

- **Cyber and safety**
  - Cyber Security
  - Safety Management

- **Control**
  - Control Centers

Customer Operations Center/HQ

Customer assets e.g. turbine, boiler, vessels

ABB Collaborative Operations Center
Collaborative Operations is a completely new business model
Comprising four key components

**People**
- Connects the customer’s staff with ABB technology and process experts

**Places**
- Connects customer’s sites with ABB Collaborative Operations Centers

**Platform**
- Combines ABB Ability™ and Microsoft Azure cloud into a powerful technology platform

**Profitability**
- Helps customers to optimize operations, increase productivity, and reduce costs
# Expert Profiles

Collaborative Operations requires both **DCS** and **Process** experts. Below is the high level profile of the experts staffed within Collaborative Operations Centers

<table>
<thead>
<tr>
<th>Expert</th>
<th>Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical</td>
<td>An electrical engineer with expertise in power systems, transmission and distribution networks, power generation nodes, and control and protection principles and devices.</td>
</tr>
<tr>
<td>Process Simulation</td>
<td>Responsible for process representation in terms of mathematical models for scope of engineering, testing, and training of customer personnel.</td>
</tr>
<tr>
<td>Process performance &amp; diagnostics</td>
<td>Responsible for customer support in terms of performance analysis and identification of troubles root cause analysis in cooperation with equipment expert.</td>
</tr>
<tr>
<td>Field Service Technicians</td>
<td>A service engineer with expertise in field commissioning activities such as corrective maintenance and preventive maintenance interventions.</td>
</tr>
<tr>
<td>Remote Diagnostics</td>
<td>Responsible for setting up the remote connection that enables customer data to be transferred to the cloud.</td>
</tr>
<tr>
<td>Automation</td>
<td>Expert of ABB's automation systems – includes knowledge of the following components - HMIs, controllers, logic, etc.</td>
</tr>
<tr>
<td>Cyber Security</td>
<td>A cyber security specialist with deep knowledge of industry standards and experience implementing security best practices</td>
</tr>
<tr>
<td>Switch Board</td>
<td>An electrical engineer with the expertise on MV and LV switchboards design and components</td>
</tr>
<tr>
<td>Equipment</td>
<td>Expertise in equipment design, installation, and operations</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>A control engineer with the expertise on instrumentation used to monitor and control systems, machinery, and processes.</td>
</tr>
<tr>
<td>Excitation</td>
<td>An electrical engineer with the expertise on power electronics, converters and rotating electrical machines.</td>
</tr>
<tr>
<td>Data analytics</td>
<td>Expert in qualitative and quantitative techniques and processes used to enhance productivity and business gain.</td>
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</tbody>
</table>
Advanced Services to be mandatory for every control system

Benchmark Report versus Fingerprint Report – a complementary offering

- The same summary tables are used in Benchmark and Fingerprint.
- The scope, i.e. no of KPIs of Benchmark and Fingerprint is identical.

Common

Benchmark Report
- KPI violations as short text only.
- Just as overview, without technical details.

Fingerprint Report
- KPI violations with detailed description.
- Short text
- Explanation
- Impact
- Recommendation
- Document references
- Allows for customization

Computer Result Overview

<table>
<thead>
<tr>
<th>Module</th>
<th>Source</th>
<th>Date</th>
<th>Result</th>
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</thead>
<tbody>
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</tbody>
</table>

System Disk Utilization Error
- This system drive usage is critical.

| Error Description | System Drive Usage
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Critical</td>
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</tbody>
</table>

Explanation
On some systems, the disk usage is above 75%. There should be at least 10% free disk space for proper disk performance.

Impact
Disk fragmentation may slow down or even halt if available disk space is too low, resulting in performance loss. The system operating system runs into service problems when there is no free disk space.

Recommendations
Delete unnecessary files on this disk. If possible, then replace the disk or disk partition by a larger one.

Reference
[ABB User Manual - System Management]
[Section: Disk Management]
[Procedure: Replace Disk or Partition]
**ABB Ability™ Asset Health for control systems**

**MyABB/My Control System and SPDC**

**MyABB / My Control System**

- Lifecycle management platform for ABB control systems accessible via the web
- Benchmark and Fingerprint report generation are web services on My Control System
- Customers and systems (SIDs) need to be registered on My Control System

**Service Products Data Collector (SPDC)**

- Easy to use tool for automatic data collection on-site
- Creates file with collected data for upload to My Control System

Data Collection Tool SPDC, for on-site use
ABB Ability™ Asset Health for control systems

Workflow – Benchmark and Fingerprint Report generation

**Benchmark Report**

1. Data collection using SPDC
2. Data upload to My Control System
3. Benchmark generation
   - Benchmark Report is published to customer on My Control System

**Fingerprint Report**

1. Data collection using SPDC
2. Data upload to My Control System
3. Fingerprint generation
4. Fingerprint customization
5. Introduction to Customer
   - Fingerprint Report is published to customer on My Control System
ABB Ability™ Asset Health for control systems

Case study
Operator couldn’t fully access the system anymore

Reduced system availability

Root Cause Analysis

The CPU time of two domain controllers drifted very slowly.

After 2 years the deviation of CPU time between both domain controllers reached the limit of 5 minutes.

This stopped the synchronization of domain controllers.

Correct Microsoft Windows login was no more possible.

Incident

A plant operator could not acknowledge alarms and could not operate parts of the plant after operator newly logged in to the system.

Prevention

Frequent domain controllers diagnostic checks would have avoided this critical situation.
Operator couldn’t fully access the system anymore

Reduced system availability

Root Cause Analysis

The system database was partly inconsistent and destroyed.

The failure was caused by a hard disc defect.

Either the product defect was caused by aging of the hard disc or by an incident like temporary power interruption.

Incident

Certain plant equipment was seldom used, but not accessible for the operator when needed after a longer stand-by period.

Prevention

Frequent hard disc and database consistency checks could have discovered this failure before the issue occurred.
Operator couldn’t fully access the system anymore
Reduced system availability

Root Cause Analysis

Within a segment of the system network the performance was very poor.

Incorrect configuration of a network switch had caused the performance problem.

A switch was replaced after a defect and the new switch was not configured correctly.

Incident

In a critical process situations the system response time was slow and did not provide information timely as needed for secure plant operation.

Prevention

Frequent measurement of network throughput would have identified a network area with poor performance.
Why ABB?
Cost reduction, performance optimization and risk reduction
Values of Asset Health for control systems

For Customers

Cost Reduction
Relevant for all customers
Improved efficiency
• Reduce cost of corrective maintenance
• Optimal utilization of maintenance services
• Unplanned downtime can be reduced
• Optimize maintenance schedules based on priorities
• Prevent budget overruns from unexpected maintenance

Performance Optimization
Relevant for almost all customers
Improved availability
• Unavailability of system functions can be reduced
• Poor performance (like response time) can be improved
• Strange system behavior can be eliminated

Risk Reduction
Relevant for most customers
Increased reliability
• KPIs drifting towards critical limits are detected
• Indicating system events and alarms are properly detected and interpreted
• Implemented features like redundancy, network protection, etc. are functioning
• Continuous execution of predictive maintenance processes to keep system robust and tolerant towards occurring issues

Advanced Services discover deviations from defined benchmark with impact on the performance of the plant operation.

20k to 40kUSD *

+30 to +50%

Advanced Services make sure that production will go on with minimum interruption and minimum risk to operation.

~ 0.5 MUSD *

KPIs drifting towards critical limits are detected

Indicating system events and alarms are properly detected and interpreted

Implemented features like redundancy, network protection, etc. are functioning

Continuous execution of predictive maintenance processes to keep system robust and tolerant towards occurring issues

Experience shows that Advanced Services lower overall expenditure on maintenance and upkeep

For typical customer
Annual revenue - $100m
Operating - 24x355
# of operators – 5
# of HMI stations – 4
# of servers – 8
# of controllers – 8

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July 31, 2020
ABB Ability™ Asset Health for control systems relies on a modern diagnostic analysis of the performance of ABB control system.

While System Benchmark service analyzes and shows the status of a system, the System Fingerprint service interprets the findings and gives further recommendations in order to reach maximum system performance.
Overview

Uncover issues that limit current system performance

System Benchmark

First overview of the actual system status with ‘traffic light’ KPI report:

The System Benchmark Report is available on myABB web-platform within minutes after data upload and can then be downloaded as PDF document.

System Fingerprint

Control System Fingerprint determines the control system performance and parameters and compares them against KPIs. ABB outlines and recommends an improvement plan in a detailed report:

The System Fingerprint is available on MyABB after a review by ABB experts. Then the next steps can be discussed with the customer.
Overview
Uncover control system lifecycle status

Control System Life Cycle Status

A Control System Fingerprint identifies the installed SW and HW.

This installed base is compared against the life cycle information.

The analysis determines when the individual components will undergo a life cycle change.

Limited and obsolete components suffer from no or limited ABB support: SW upgrade or new HW components are needed.

This allows efficient
- Lifecycle management
- Investment planning

The Inventory: Life Cycle Status

Comprehensive Life Cycle Report indicates need for investment:
- in: new HW
- In: appropriate PG care level

Control System Status 2018

<table>
<thead>
<tr>
<th>Type Designation</th>
<th>Product Family</th>
<th>Amount</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCF 1..</td>
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<tr>
<td>PM 877</td>
<td>Symphony+</td>
<td>8</td>
<td>Active</td>
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</table>
## ABB Ability™ Asset Health for control systems

Solution to provide visibility of the Lifecycle status and Performance for ABB control systems

<table>
<thead>
<tr>
<th>Features I</th>
<th>Features II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated data collection to determine Asset Health status and performance status</td>
<td>System performance evaluation</td>
</tr>
<tr>
<td>Works for control systems based on</td>
<td>– SW installation check</td>
</tr>
<tr>
<td>– S+ Operations</td>
<td>– Performance analysis</td>
</tr>
<tr>
<td>– 800xA Operations</td>
<td>– settings and status of network components</td>
</tr>
<tr>
<td>– Harmony Rack</td>
<td>– capturing error logs</td>
</tr>
<tr>
<td>– Melody Rack</td>
<td>– etc.</td>
</tr>
<tr>
<td>– AC800M</td>
<td>Visualization and analysis of Key Performance Indicators</td>
</tr>
<tr>
<td>– Advant/Mod</td>
<td>Detailed improvement plan can be derived</td>
</tr>
<tr>
<td>– Freelance</td>
<td>Access to ABB experts</td>
</tr>
<tr>
<td>– ……..tbd</td>
<td></td>
</tr>
</tbody>
</table>
The value – Asset Health for control systems
Solution to provide visibility of the Lifecycle status and Performance for most ABB control systems

Benefits for customers

- **Reduce labor, downtime and risk** by identifying and fixing deficits within the control system at once
- **Customers’ service management can create a solid service budget** plan for the future based on the outcome of the report
- **Keep control system status optimal** by allowing Asset Health check service to be done repeatedly
- **Increases control system performance, availability and reliability**
  - Minimizes risk of system upsets
  - Lowers maintenance cost
  - Improves system maintainability
  - Reduces risk of component failures

Customer imperatives

- **Power generation and water/water treatment must be reliable**: process control systems are key assets.
- **Power utilities today can suffer from low utilization grades**: System Fingerprints are efficient in maintaining the reliable operation of such “forgotten systems”.
- **Lifecycle aspect**: Control Systems must not have any SW/HW products, which are not fully supported by ABB (can cause long and unplanned down times).
- **System Fingerprints are the ideal and cost efficient means to maintain the Asset Health**.
Project execution
Pricing, ordering and typical project execution flow
System Benchmark and Fingerprint – Licensing, Pricing and Ordering

Software → ordered by a LBU and delivered by the global Feeder Factories (FF)

Delivery → SaaS model

 Licenses

Dependent upon system size (# of concurrent users) and consists of:

- SPDC data collector/ S+ Harmony data collector is free of charge: generates the encrypted system data file
- 1 yr. System Fingerprint license: will decrypt the system data file and generate the report
- System Scan can be done to understand the higher level Performance and Lifecycle status of system and it is free of charge for all customers.
- Benchmarks can be executed free of charge if active Power Generation Care contract exists (based on the system data file)
- Without active Power Generation Care contract the Benchmark is NOT free of charge
- Fingerprint license will be provided at Good discounted price for Power Generation Care customers

Pricing & Ordering

Ordering a System Fingerprint license:

- Pre-condition: the customer shall have an active subscription to Power Generation Care contract
- By SoFa and BOL for a SID; license will be added to the SID
- Ordering System Fingerprint → IT FF orderbox: orderbox.it-ff-software@it.abb.com.
Almost all customers accept and appreciate this service delivery.

Cloud Services **WITHOUT remote connection**, but manual upload:

- Running data collection from memory stick
- Manual uploading of collected data to My Control System
- About 1000 KPIs (for 800xA and S+ System performance)

Collection and Upload can be done by Customer

- No hardware
- No installation
- 1 hr. for system scan
- The collector software can be copied to the system and frequently scheduled
Service Delivery with Notebook on-site

Customer perceive this service a local delivery, but appreciated seeing the results on the web-portal.

- No hardware
- No installation
- 1 hr. for system scan
- The collector software can be copied to the system and frequently scheduled

---

- Running data collection from memory stick
- Importing data to Service Application on Note Book
- Synchronization of Service App with My Control System

B includes A

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On premise Services WITHOUT local installation
Cloud Services and On premise Services

Overview

- No hardware
- No installation
- 1 hr. for system scan
- The collector software can be copied to the system and frequently scheduled

Cloud Services WITHOUT remote connection, but manual upload

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On premise Services WITHOUT local installation

- Running data collection from memory stick
- Importing data to Service Application on Note Book
- Synchronization of Service App with My Control System
- B includes A
System Benchmark and Fingerprint – Project execution

Activities

Day 1 commissioning

Periodic tasks...

Contract in place

Register in MyABB / MCS

Make sure that the end customers’ email as “End User Technical Contact” is entered in SoFa

Order Fingerprint license 2018 via Wizard

Follow the instructions to execute data collection

Upload of data in MyABB and generate Benchmark/Fingerprint Report

MyABB decrypts the data and the results are displayed graphically in MyABB and a Benchmark/Fingerprint Report is generated simultaneously.

Every quarter run data collector and collect data

Based on scope of Service contract address KPI deviations

In case of KPI deviations found in BM report request ABB Service Point of Contact to generate FP report, review FP report with ABB expert

Upload collected data to MyABB

Benchmark report gets generated and published automatically, review the Benchmark report and understand current Performance & Lifecycle status