ABB

—
For more information about

ABB Ability Connected Services
abb.com/ev-charging
Phone: +31 70 307 6200
E-mail: info.evci@nl.abb.com

ABB Ability Ellipse and Network Manager SCADA
abb.com/enterprise-software
E-mail: info.pges@abb.com

ABB Communication Networks
abb.com/communicationnetworks
Phone: +41 84 484 58 45
(Customer Support center)

OPTIMAX® PowerFit EVFleet
abb.com/power-generation
Phone: +49 621 381-3333
E-mail: contact.center@de.abb.com

Control room solutions
abb.com/control-rooms
Phone: +46 21 342155
E-mail: se-cgm-info@abb.com

Digital portfolio for electric buses

Making sustainable e-bus transport go further with ABB Ability™ and control technologies portfolio.

9AKK20180618-EN / Revision B - 25.10.2018

Across transportation sectors, operators are struggling with how to optimise asset management given what are often isolated systems and data storage.

ABB Ability™ provides the services and solutions that integrate systems. From collaborative operations to remote monitoring, motion forecasting and energy management, ABB Ability enables transport providers to know more do more, do better, together.

Contents

Mission Critical Communications
Providing digital connectivity for your electric bus network

ABB Ability enabling mission critical network solutions are industrial strength. They can be used to build a reliable, secure, manageable and scalable foundation that provides the performance required for Intelligent Transport Systems.

Transportation networks are entirely reliant on good communications; to know where vehicles comprising the network are, but also to monitor the equipment keeping the network moving. If you add the digitalization of many more equipment it can generate huge quantities of data at a high velocity, which must be transported over a robust communications network. That network needs punctuality, when the situation demands it, and redundancy to maintain connectivity in the face of critical events, all whilst ensuring high bandwidth and low latency in day-to-day operations.

Intelligent Transport Systems (ITS) is an umbrella term for a wide range of solutions that provide benefits to mass transit systems including buses. ITS applications for mass transit include transit signal priority, automated vehicle location, computer-aided dispatch, telemetry as well as passengers' infotainment.

___
Providing robust and reliable communications in a rapidly changing world takes ability - ABB Ability

Mission Critical networks are foundational, enabling ITS applications by providing two-way communication between sensors, controllers and people in the field, and software and supervisory personnel in the operations center.

Communication technologies also facilitate interaction among drivers, dispatchers, emergency responders and other personnel involved in transit and transportation operations.

Those networks cover the following characteristics:
• High reliability and availability including OT-like lifecycle
• Strong cybersecurity
• High bandwidth with low latency
• Ability to support multiple applications concurrently
• Cost effective to deploy and operate, with no dependence on high cost leased lines and cellular providers.

ABB Ability enabling mission critical communications network solutions are industrial strength, and can be used to build a highly reliable, secure, manageable and scalable foundation that meets the performance and capacity required for ITS communications systems. ABB offers a wide range of ABB Ability enabling network technologies – from the optical backhaul to the broadband wireless communications, point-to-point/point-to-multipoint, narrowband mesh, and cellular, that can be mixed and matched to build broadband wireless networks optimized for each situation in urban areas.

ABB communication networks products are aggregated by an enterprise-class network management platform, providing network wide visibility and simplifying operations and troubleshooting.
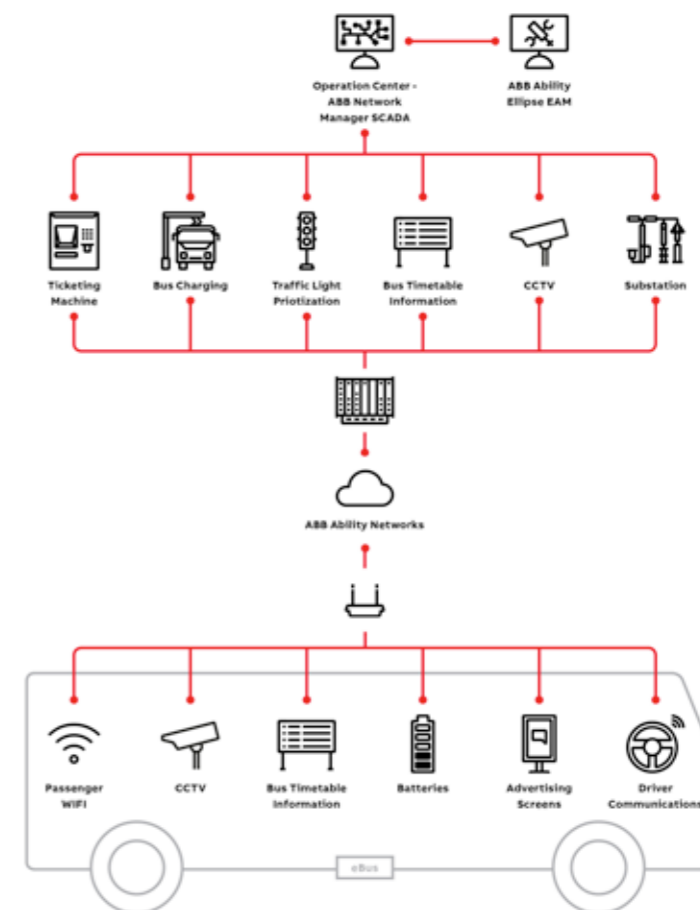
Network Manager SCADA
Monitoring and controlling the power network for your e-buses

Network Manager SCADA is part of the ABB Ability Network Manager portfolio. It is s a real-time platform for reliable and secure operation of electrical power networks, ranging from generation, transmission and distribution to railways, airports and e-buses.

Today, hundreds of ABB customers in the utilities, transportation and industrial sectors around the world rely on Network Manager SCADA to efficiently control and manage their power systems for optimal performance.

Monitor and control the power network for your charging stations and e-buses, maximizing availability and operational efficiency. Higher asset availability means less service interruption for your commuters and ensuring a higher return on your asset and infrastructure investments.

Features and benefits
- Scalable, high performance, high availability and cybers ecure SCADA platform
- NERC CIP 002-009 and ISO 2700x compliant
- Open architecture that allows integrations with other information technology and operations technology systems
- User interface designed with operator situational awareness as a top priority
- Ideal for both large and small control room environments running 24x7 operations
- Easy implementation of automated control sequences and custom applications
- Health and safety : Compliant with RNI norms and directives (ICNIRP)

TOSA -LINE 23

In Geneva, Network Manager SCADA system is used to monitor and control the power network for the charging stations and e-buses.

ABB Ability™ Ellipse®
Bringing you the next generation
of asset performance orchestration

Ellipse is ABB's connected asset lifecycle management solution that unifies world-class functionality for enterprise asset management, workforce management and asset performance management.


**From the field to the boardroom**
From the field to the boardroom the digital transformation is inevitable, and it will change the way business operates. Dubbed the "fourth industrial revolution," no area of business will see the performance enhancements more profoundly than operations. While the transition may seem futuristic, for those that begin today, the rewards are great – operations are improved, costs are reduced and safety is enhanced.

There is no better time to start the digital transformation journey than now, and no better software solution than ABB Ability Ellipse to help you get there.

Ellipse is ABB's connected asset lifecycle management solution that unifies world-class functionality for enterprise asset management (EAM), workforce management (WFM) and asset performance management (APM).
Ellipse facilitates the orchestration of priority, process and people across an organization, enabling the management of physical assets across the entire asset lifecycle. From strategy through execution, Ellipse is a robust and comprehensive business and technology solution.

Features and benefits:
• Reduced downtime and improved reliability
• Increased workforce productivity
• Cross-functional visibility
• Process standardization and maturity
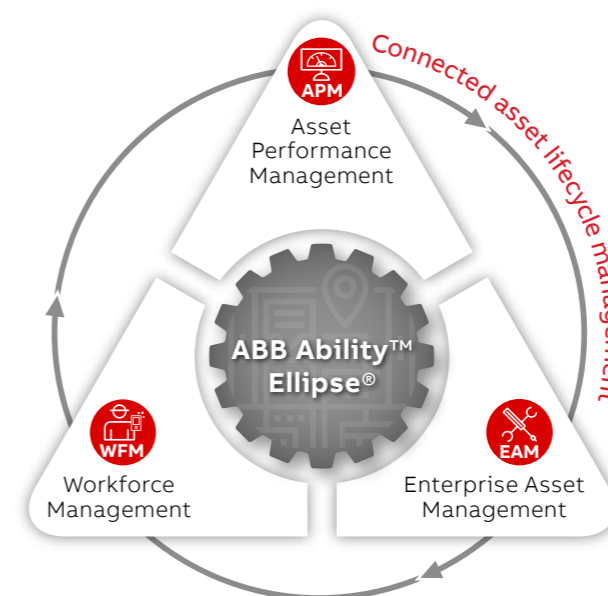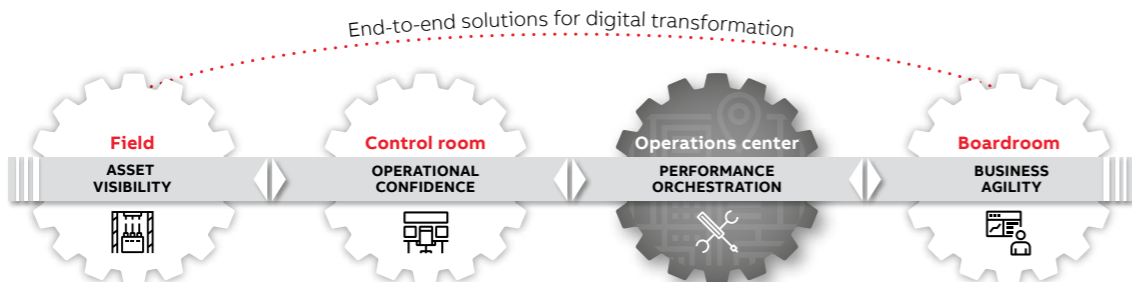
—
Working together to work better. Communication and connection between the three cornerstone functions of Ellipse drive continuous, successful operations.

ABB Ability Ellipse EAM – Process optimized
ABB Ability Ellipse Enterprise Asset Management (EAM) is a purpose-built EAM and enterprise resource planning solution that delivers business outcomes at a sustainable and superior cost of operations and capital investment. Ellipse EAM is designed to support the largest and most complex operational environments with highly robust functionality.

Combining built-in best practices in asset management and industry-specific expertise, Ellipse EAM enables peak operational performance and continuous process improvement in line with ISO 55000 recommendations. Ellipse EAM is available as a SaaS solution or as an on-premise deployment.

ABB Ability Ellipse WFM – Work optimized
ABB Ability Ellipse Workforce Management (WFM) is a highly scalable and intuitive inspection, maintenance and repair application. Designed for asset-intensive environments like substations, Ellipse WFM equips mobile users to execute work orders in the field with optimal efficiency.

Thousands of mobile technicians and dispatchers rely on ABB's mobile workforce management

solutions every day to solve their toughest field challenges. The net effect of their feedback is a comprehensive solution proven to increase productivity, reduce costs and contribute to better asset reliability. Ellipse WFM is designed specifically to extend the efficiency of the EAM process directly to the assets it supports, and drive asset management fieldwork productivity and worker safety.

ABB Ability Ellipse APM – Performance optimized
ABB Ability Ellipse Asset Performance Management (APM), formerly known as Asset Health Center, monitors asset health by comparing conditional readings with asset-specific data modeling to provide a comprehensive view of fleet performance. Ellipse APM uses advanced machine learning technology to predict, prescribe and prioritize asset maintenance, management and investment decisions based on performance indicators. The solution ensures that "maintain, repair or replace" decisions are soundly based on actual asset conditions and their criticality to operations.

End-to-end solutions for digital transformation

Field	Control room	Operations center	Boardroom
ASSET VISIBILITY	OPERATIONAL CONFIDENCE	PERFORMANCE ORCHESTRATION	BUSINESS AGILITY

Control room solutions
Driving productivity with operator-focused control room design

Control room operators make hundreds of decisions every working day – decisions that have a great impact on productivity, quality, and safety.

—
Operator well-being is a key success factor for safe, productive and reliable operations - ABB-designed control rooms drive efficiency and cut costs.

The more alert, stimulated and harmonious operators are, the better the decisions they make. For plant and control room managers, the key question is thus how to create and maintain operator well-being at levels that ensure their very best performance. An attractive and higly functional environment will not only attract much sought after new-generation's operators, it will also reduce human errors and improve plant productivity.

The way to achieve this goal is to embrace control room form, function, layout, workflow, lighting and acoustics to create a design that empowers operators to optimally handle and safeguard mission-critical processes. Such designs are now available and in use – in the form of ABB Control Room Solutions.

Huge productivity gains to be made
The yearly losses in global production due to human error are huge, and they can often be put down to badly-planned control rooms and poor operator working conditions; sub-optimal information handling and ergonomics simply result in operator fatigue. It's thus time to raise control room environments to levels where operator well-being is regarded as an essential success factor for safe, productive and reliable operations.

The 4th industrial revolution
The 4th industrial revolution and Internet of Things (IoT) will provide ever-growing amounts of process data that will be analyzed in real time by fewer but highly-educated operators in a 24/7
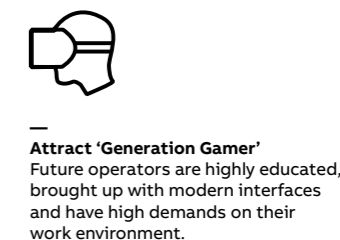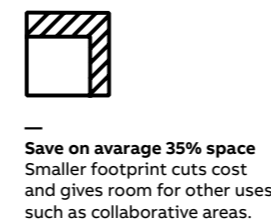
working environment to give fault-free operation and high productivity. That's the theory. But this will only happen when human factors are given as much attention as technical specifications and features. When collaboration and information interaction is prioritized, operators stay alert and motivated.
Focusing on operator alertness is the key to profitability. An operator environment designed with human factors in focus can convert potentially dangerous fatigue and distraction into proactive alertness that extracts the very best from every individual – in both routine operations and critical situations.

To continuously improve the control room solutions, we work with universities and partners

on operator environment improvements and its effects. We actively continue research on areas such as ergonomics, light, sound, noise reduction, etc. This drives implementation of improvments to our features and settings that are used in the Extended Operator Workplace (EOW) platform control system. These are all integrated with the touch interface and we are proud to give you the best operator environment, now and in the future.

By offering services that focus on each individual operator and their preferences with alternate working positions; we can also improve the awareness of a healthy working environment and tailor the functionality for the operators.

5%
On average global annual production is lost due to unscheduled downtime.

80%
of unscheduled shutdowns are preventable...

40%
of which are caused by humans.

—
Save on avarage 35% space
Smaller footprint cuts cost and gives room for other uses such as collaborative areas.

—
Boost collaboration
Optimized control-room layouts with ergonomic furniture induce collaboration and teamwork.

—
Attract 'Generation Gamer'
Future operators are highly educated, brought up with modern interfaces and have high demands on their work environment.

OPTIMAX® PowerFit EVFleet
Optimizing and managing the power of your fleet

With ABB Ability™ OPTIMAX® PowerFit EVFleet, ABB provides a digital solution that uses model predictive control to manage vehicle charging and discharging whilst regarding technical restrictions, forecasts and energy costs.

OPTIMAX® PowerFit EVFleet ensures that the vehicle will reach the required state of charge until it has to leave.

Within the time the vehicle is plugged in the optimization decides automatically when to charge and discharge in order to achieve most economic operation using available flexibilities.

The optimization uses price forward curves, forecasts for renewable power production and load as well the bus schedule.

The main target is to shift or extend the charging period while the vehicle is connected in order to use the resulting flexibility for following cases:

Maximize renewable power usage
Charging flexibility enables major energy contribution from volatile renewable energy generation units.

Sell the flexibility to the power reserves market
Enables additional benefit by trading flexibility for the customer. Flexibility can be sold as secondary reserves and tertiary reserves to the market.

Charge vehicle during low price periods
If the energy price varies during the day or the municipal transport service company has variable tariff contracts, the optimization can shift the charging to low price periods.

More charging flexibility without infrastructure changes
If the installed charger power is higher than the grid connection capability, the optimizer considers this limitation and automatically reduces the charging power.

—
The OPTIMAX® PowerFit EVFleet can be seamlessly integrated in large power pools for energy optimization with OPTIMAX® PowerFit.

—
Optimized power pool: coordination of all flexible generation and load units to maximize benefits.

| Control system | Bus schedule | Generation forecast | Price forecast |

| Bus depot | Energy storage | Wind farm | Power Plant | Biomass Power plant | Industrial site | Hydroelectric power | Solar energy | Electrical power grid |
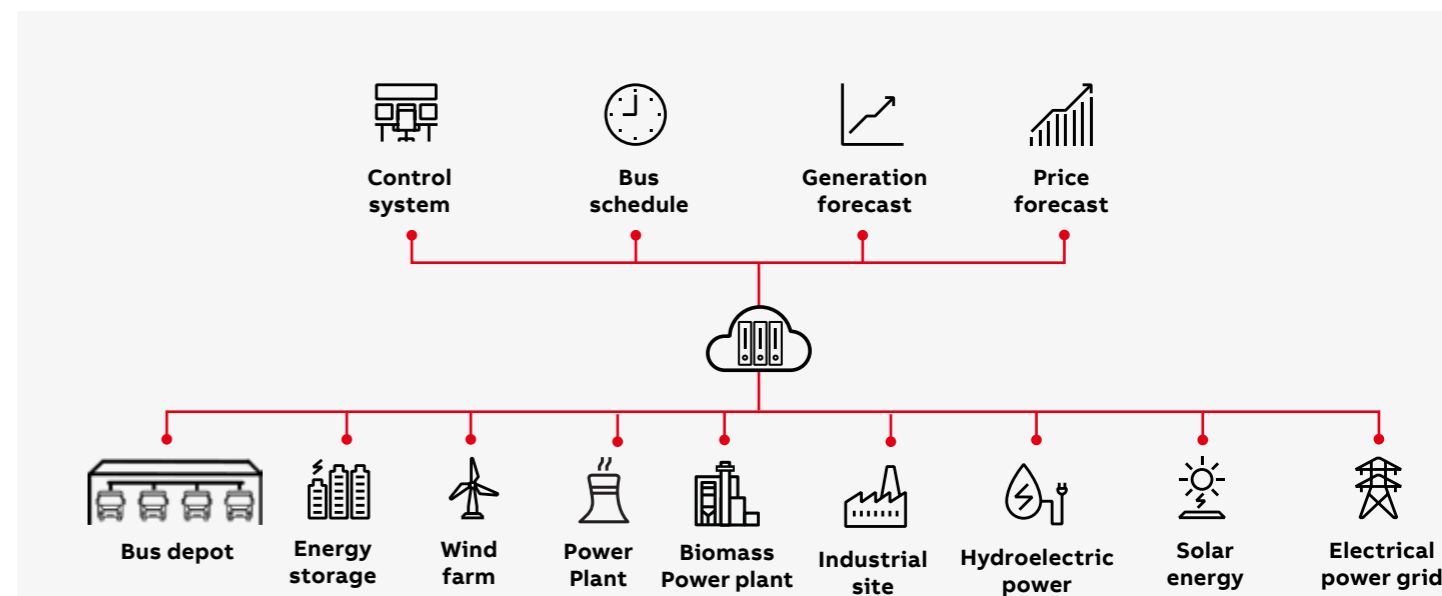
ABB Ability™ Connected Services Platform
Enabling your charging operation

Choosing ABB as a supplier for charging infrastructure means having access to best in class Connected Services to maximize the availability of chargers while ensuring seamless integration at minimal cost.

The ABB Ability™ Connected Services Platform
The core of ABB's Connected Services offering is a cloud-based platform to which chargers are connected, and from which digital services are offered.

Scalability and flexibility
By using ABB's modern cloud platform as a connection point, operators limit the cost and risk related to designing and operating a scalable IT setup that must be capable of connecting large numbers of chargers with highest reliability. ABB's expertise in connecting thousands of chargers and managing IoT (Internet of Things) platforms is a great benefit to customers, who can thus avoid building up their own operations and infrastructure for such services.

Minimize investments in IT infrastructure
The platform approach allows operators to focus their back office applications on network monitoring and offering innovative e-mobility services such as driver access management, billing and fleet management. Advanced remote diagnostics and troubleshooting features, which are by nature hardware specific and require ex-

tensive expertise, can be minimized and are covered by ABB's services and Web tools.

Best in class service and support
Next to our offering of industry standard protocols such as OCPP, ABB can additionally provide very detailed real-time diagnostic data. This enables the best possible remote services, considerably reduced operations cost, and first-time right on-site support.

High uptime and reliability of Connected Services
The ABB Connected Services Platform is based on leading cloud technology with four redundantly operating server environments on two different geographical locations in Europe. It complies with the highest security standards. Privacy is guaranteed as ABB only processes technical charger data and anonymous user data. Advanced encryption technology ensures that data on the charger and on the platform is safe. The Platform is monitored 24/7 by the ABB Network Operation Center (NOC). This ensures professional and prompt action in case of network or platform issues.

Operator back office, B2C applications

API based OCPP Integration

Web tools customer

ABB EVCI platform

Web tools ABB service
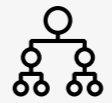
ABB managed connectivity with extended protocol
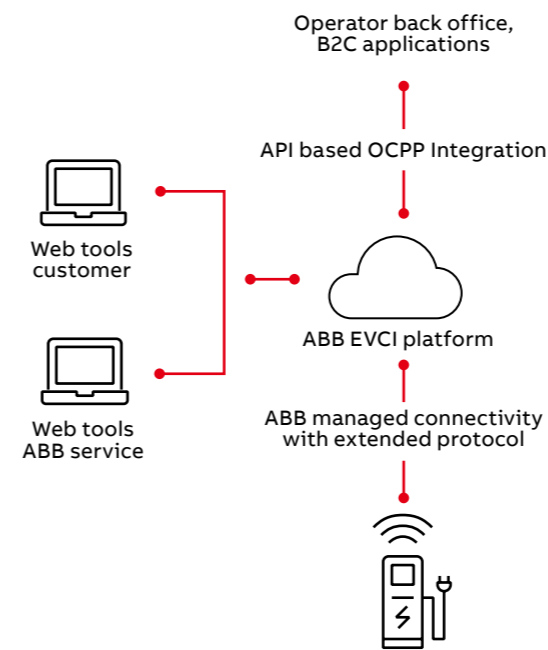
The ABB Connected Services offering comprises of four main parts:
1. **Charger Connect** giving access to the ABB Ability Connected Services Platform.
2. **APIs** for back office integration.
3. **Web tools** for monitoring and basic management of the network by simply using an Internet browser.
4. **Charger Care Service Level Agreements** for remote monitoring and diagnostics by ABB. A separate product brochure is available with more details about the ABB Charge Care offering.

Charger Connect forms the basis of all Connected Services. Customers then select from our offering of APIs, Web tools and Charger Care SLAs to best fit their needs.

Charger connect
The basis for all connected services

Reliable connectivity

24/7 network monitoring by NOC

Software updates

Activation in ABB Service Tools

+

Elective APIs, Web tools and SLAs
Enabled by the ABB Ability Connected Services Platform and tailored to the needs of the customer

APIs
for back office integration

OCPP
OCPP API

Service API

Demand – response API

Web tools
Browser based tools for real-time charger access

Driver Care

Payment

Charger Care

Charger Care Service Level Agreements
for remote monitoring and diagnostics by ABB

Remote Condition Monitoring

Remote Diagnostics & Troubleshooting

Other Services (Maintenance, spares, training, etc)

A separate leaflet is available for Charger Care