

# ABB's software is everywhere

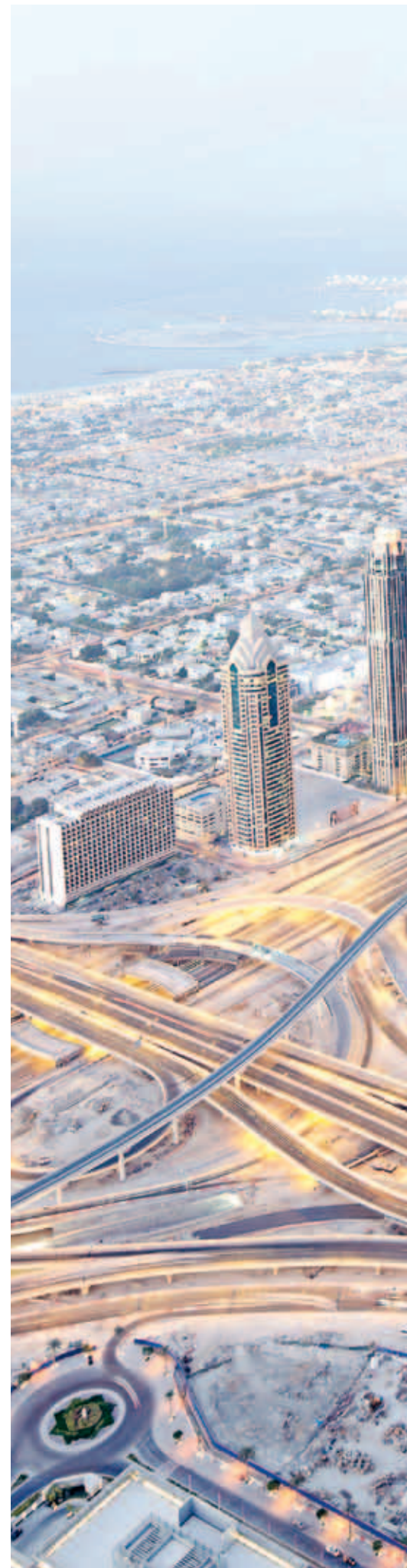
Why ABB is a software company

MARTIN NAEDELE – ABB has been called “the biggest company that nobody knows”. Its products – though essential for the quality of life of hundreds of millions of people – do not target the consumer market. In a similar way, ABB's software activities can be considered an aspect of the company “that nobody knows”. The assumption that software is at best peripheral to ABB's business could not be further from the mark. With around 3,000 software developers in 40 countries worldwide and impacting about one quarter of ABB's revenue, there is no doubt that ABB is a major software company.

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#### Title picture

Software is one of the most overlooked ingredients of modern products and services, and one that the casual observer can easily fail to recognize. Similarly, it is not immediately obvious to what extent ABB has become a software company, and the role software now plays in its products and activities. The picture on this spread shows Dubai.









Through recent acquisitions, ABB has become more visible as a major vendor of “pure play” enterprise software. The company is now one of the top three vendors globally in the area of enterprise asset management.

1 Much of ABB’s software is included in products such as these.



a) process instrument



b) robot



c) control system



d) comfort panel for the home

In the past, ABB’s software activities have often been overlooked as most of the company’s software was sold as part of hardware products. These included IEDs (intelligent electronic devices) for substation automation, process instruments, robots, or even transformers, or as part of a mixed hardware and software system, such as the company’s 800xA and Symphony+ automation and process control systems → 1, → 2.

However, following ABB’s recent acquisitions of the companies Ventyx and Mincom, ABB has become more visible as a major vendor of “pure play” enterprise software<sup>1</sup>, for example in the area of enterprise asset management, where ABB is now one of the top three vendors globally<sup>2</sup>. These acquisitions and the expansion into the enterprise IT space that goes beyond ABB’s traditional CPM solutions<sup>3</sup> position ABB as a leader in the trend towards what some consultants like to call convergence of OT (operational technology, automation systems) and IT (information technology, enterprise information systems).

With this expansion of the company’s portfolio comes a change in business model. Many products, including software, were traditionally sold “by the meter” and for a one time charge. Atti-

tudes, are evolving and customers are increasingly moving away from thinking of software as an “install once and forget” asset. They desire that their systems evolve and benefit from ongoing improvements. This is reflected in a shift from a “buy once” approach to a service-oriented model, granting customers access to the continuous stream of additional features, usability improvements, and adaptations being developed by ABB.

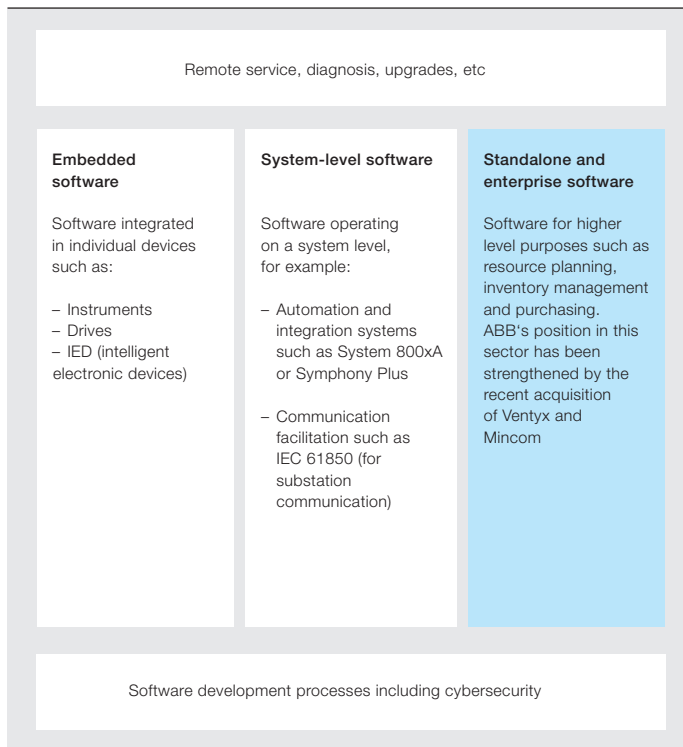
### Security

While on the topic of software updates, one area that cannot be ignored is security and the associated issue, painful to users and vendors alike, of security-related updates. While one might naively expect that a well-written piece of soft-

### Footnotes

- 1 Enterprise software is software for use in organizations such as businesses or government. Possible features include online purchasing, inventory management and resource planning.
- 2 Source: ARC Advisory, EAM Solutions Worldwide Outlook 2011
- 3 CPM (collaborative production management) is a term used to collectively describe the tools and processes used to support collaboration between a company’s production activities and the areas with which it must closely interact (such as purchasing, inventory management and controlling structures).

## 2 ABB has strengthened its position in the enterprise software sector



## 3 Comparison of code sizes of various embedded software products.

DCS 1980s	DCS 1990s	DCS 2000s
~200-300 KLOC	~1'500-3'000 KLOC +OS, DB, Graphics	~20'000 KLOC +OS, DB, Graphics Office Suite, other components
For comparison		
<b>F22 Raptor</b> 1'700 KLOC	<b>Boeing 787</b> 6'500 KLOC	<b>ABB 800xA</b> 6'500 KLOC

ware is not vulnerable to any attack, experience has shown that in the real world it is not possible to write software that anticipates and prevents all kinds of future attacks. The key is to find the right balance between security requirements and what price users are willing to pay in terms of money and discomfort in operation. That said, security is not a new trend that ABB is joining. For example, security for automation systems has been a topic in ABB's labs for more than a decade. The company has driven security-related development of standards, for example in the standards commissions IEC and ISA, and today ABB is home to one of the leading research groups in control system security. Security teams from across the company are furthermore coordinated by the Group Head of Cyber Security, a new function created in 2011 to ensure that security of ABB products and systems is implemented at a consistent level across all parts of the company and in accordance with customer needs and emergent regulatory requirements (ABB's activities in cyber security are described more fully on pages 64–69 of this edition of *ABB Review*).

Security concerns for automation systems have arisen mostly due to the fact that today's control systems are increasingly also communication systems, often

with global reach and connected to customer intranets and the Internet. Modern communication protocols in power and industrial automation – earlier more concerned with electrically representing bits on a wire – have evolved to complex software applications in their own right, representing in their sophisticated functional and information models the full complexity of the systems between which they transfer data. ABB has been at the forefront of this development, having been a key driver of both IEC 61850 in the power industry<sup>4</sup> and OPC-UA in the process industry.

### Software development

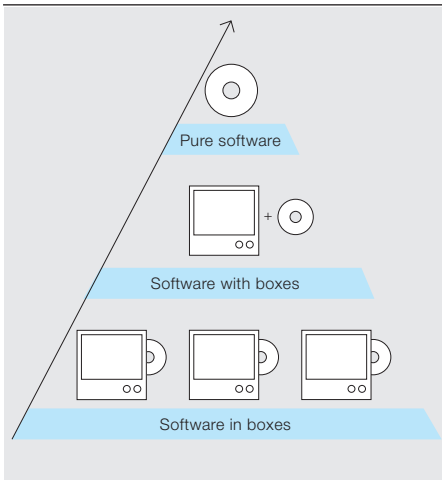
A modern process control or asset management system can easily extend to 10 to 20 million lines of code. This is comparable in magnitude to the code in a passenger airplane, a modern jet fighter, a computer operating system or a car → 3. The creation and maintenance of software systems of such size requires not only a highly qualified workforce of software developers, who are at home both in software and in the requirements of the various application domains, but also professional tools and mature devel-

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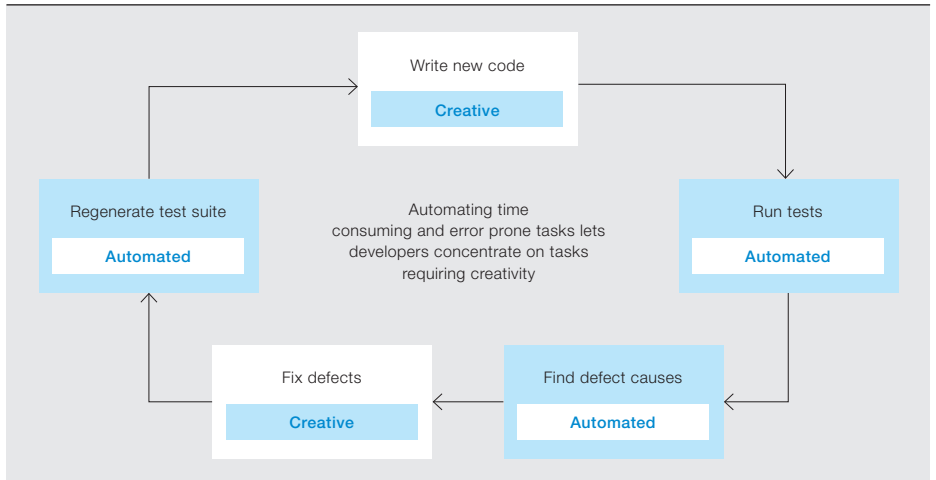
#### Footnote

<sup>4</sup> For more information on IEC 61850, see ABB Review Special Report IEC 61850.

#### 4 Automation pyramid



#### 5 Automated unit testing tool chain



While ABB is already collaborating with a number of universities on various software-related research projects, the company is seeking to extend its reach and invite further research groups from all over the world to participate.

opment processes. As ABB systems and solutions help customers to increase productivity and improve the quality of their production processes, ABB also strives internally to adopt state-of-the-art software development methods and tools and to improve the efficiency of its software development teams. One example of the achievements of the ABB Software Development Improvement Program (SDIP, see also pages 59–63) is the recent transition of all software development units across the globe to one common set of tools for requirement, code, and test management. This was not a trivial change for a traditionally decentralized organization such as ABB, which is furthermore both growing organically and integrating newly acquired companies. This common toolset is also the basis for making available to all of the company the advanced software-engineering tools that are coming out of ABB's Corporate Research centers – tools that are created in collaboration with leading academic software engineering researchers worldwide and that are automating those parts of software development that do not require human creativity and ingenuity → 4.

Examples for such tools are:

- Static analysis for certain coding errors (a kind of “spell checking” for code).
- Automated transformation of code (a very sophisticated, context sensitive search and replace function that can reduce person months of effort to hours).
- Automated creation of regression test suites → 5.
- Automated impact analysis.

While ABB is already collaborating with several universities on various software-related research projects, the company is seeking to extend its reach and invite further research groups from all over the world to participate. For this purpose the ABB Software Research Grant program was initiated in 2011, in which ABB invites submissions of research proposals for funding in a number of broadly defined areas of interest.<sup>5</sup>

#### The user interface

Many of ABB's customers are facing a challenge. Experienced operators are approaching retiring age, and fresh hires drawn from the generation of so-called “digital natives”, ie people who have grown up with computers and smartphones, are setting different usability requirements for industrial products. Whereas today's user interfaces typically emulate the displays and dials of the pre-computer age, today's users increasingly expect a user experience on par with their latest home consumer communication and entertainment devices. At the same time, the user interface must support the learning process for new operators through innovative tutorial and guidance functions, task oriented interaction schemes and safety features that prevent common errors and maloperations. ABB is meeting these challenges by integrating user-centered design principles in its product development process, conducting studies with end users both

#### Footnote

- <sup>5</sup> Detailed information about the company's research and about the grant program can be found at [www.abb.com/softwareresearch](http://www.abb.com/softwareresearch)



at customer sites and in its state-of-the-art usability and user experience lab facilities. The company is also collaborating with universities such as MIT and participating in the Center for Operator Performance<sup>6</sup>, the leading forum for advancing the state-of-the-art in industrial and control system usability.

#### Software in the cloud

Another important aspect of ABB's growing software portfolio are the applications that are no longer installed at customer sites, but instead hosted and operated by ABB on behalf of the customer. This usage model, some years ago called Application Service Provisioning and more recently relaunched as "cloud computing" offers various advantages: For some applications, customers only have to pay for those functions and instances that they actually use (known as "pay per use" model), and do not need to worry about hardware or software maintenance or updates as this is all taken care of by ABB. Initially, such application hosting was used for business information systems such as payroll system, enterprise resource planning (ERP), customer relationship management (CRM), asset management etc., as well as for optimization and diagnosis applications. However, ABB realizes that in the classical automation space there are also applications where customers appreciate not having to deal with managing a full control or SCADA system. An example for ABB's hosted automation system offering is the Neptuno irrigation solution, which is successfully deployed in Spain serving more than 60'000 farmers who can fully monitor and control the

irrigation of their fields using a web browser on a mobile device → 6. Hosted solutions are also offered for enterprise asset management, where ABB combines the management of data for all installed ABB devices, including their updates and spare parts needs and service requirements. Such solutions use innovative diagnosis and service intelligence methods to permit a critical asset condition to be recognized and treated before it fails, so preventing costly unplanned downtime.

#### Data centers

From social networks such as Facebook and LinkedIn over search engines and media distributions sites to the growing "software in cloud" market mentioned earlier, the demand for data centers all over the world is soaring<sup>7</sup>, and with it the associated thirst for electrical power. ABB has long been a supplier of the equipment that powers the computers inside data centers. More recently, the company recognized that managing not only the power supply, but the entire operation of hundreds of thousands of servers in a data center is a task for which no good integrated solutions are offered by classical IT companies, but for which ABB's products and experience could be adapted. ABB has long supplied the systems to manage and optimize operations in complex industrial plants such as oil drilling platforms or refineries, containing several hundred thousands of sensor and actors. These systems have also integrated different parts of the operation (power supplies and management, process data, diagnostics) into a single control system. In a

way, the release of the ABB Decathlon data center enterprise management (DCEM) solution in 2011 marks ABB's step from industrial automation to post-industrial automation<sup>8</sup>.

#### The software company everybody ought to know

From being a company that traditionally created software purely for the internal needs of its own devices, ABB is rapidly becoming a company at the forefront of developing a far broader range of software products and services, touching the needs of everyday life and human activity in many ways and enabling many types of activities from smart grids and smart management of the information superhighway to greater comfort in the home.

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#### Footnotes

- 6 [www.operatorperformance.org](http://www.operatorperformance.org)
- 7 <http://investor.digitalrealty.com/file.aspx?IID=4094311&FID=12899535>
- 8 Recent developments in ABB's offerings for data centers are to be discussed in an upcoming issue of *ABB Review*.