The challenge of device integration

Making sure “plug-and-play” equals “plug-and-work”

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The last decade has seen a sustained increase in the acceptability of fieldbus solutions for process automation needs. While the underlying reasons for this trend include rapid advancements in the fields of digital communication and microprocessor technologies, the end result is that the traditional boundaries between centralized control systems and devices in the field have disappeared. In the new process automation architecture paradigm, intelligent field devices and control systems form a single system, fused by a high-speed digital Fieldbus. Now, in addition to the process value, status, diagnostics and any other information embedded in a device, with its enhanced – and ever growing – ”intelligence“, can be transferred to the control system, making the device visible and usable from remote locations such as the process-automation level. Currently, PROFIBUS, HART and Foundation Fieldbus are the most commonly used fieldbus standards. ABB’s Device Integration Center tests hundreds of devices every year to ensure maximum intercompatibility of its control systems with devices from a whole range of vendors.

Fieldbus integration can provide many benefits to users, yet, despite compatibility standards, there are risks that a system will not work correctly with a given device. A key goal of open vendor independent fieldbus technologies is to integrate devices from multiple manufacturers into automation systems. Theoretically, the implementation of fieldbus standards allows “plug-and-play” connectivity between a device and its automation system. However, several factors make it difficult to achieve this ideal situation. These include:

- Different interpretation of standards among different designers and implementers, by both the device vendors and automation system manufacturers.
- Changes and updates in the standards.
- Differences in the speed with which adaptations to standards are implemented by the automation systems supplier and the device vendors. Frequently the typical lifecycles of devices and automation systems differ, resulting in multiple versions of devices and automation systems being on the market at any one time.
- Attempts to exploit infrequently used standards to provide product differentiators.

ABB’s Field Device Integration Center

In 2004, ABB decided to establish a Field Device Integration Center (FDIC), to ensure that devices and ABB Systems would work together. The goal of FDIC is to provide tested solutions for all the commonly used field devices on the market, when used in conjunction with ABB automation systems.

The DIC is made up of two main centers: Minden in Germany, and Bangalore in India. The activities at these locations are assigned according to individual areas of expertise and technical strengths.

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The Fieldbus product management team in Minden focuses on identifying and defining the devices that need to be tested for integration, based on regular interactions with sales and marketing staff, and customers. The targeted devices are prioritized and assigned for integration according to factors such as physical availability of hardware/software and overall market demand for the particular device type. The FDIC web page, accessible via www.abb.com, provides a list of all devices that have undergone integration testing.

The integration team in Bangalore performs basic connectivity as well as advanced integration tests for field devices. The lab is well equipped with dedicated and standardized test benches to carry out integration tests with the latest released versions of ABB’s control systems including 800xA, Melody/AC870P and Freelance 800F.

The integration lab has been modeled on the concept of the software production line. The key features include:

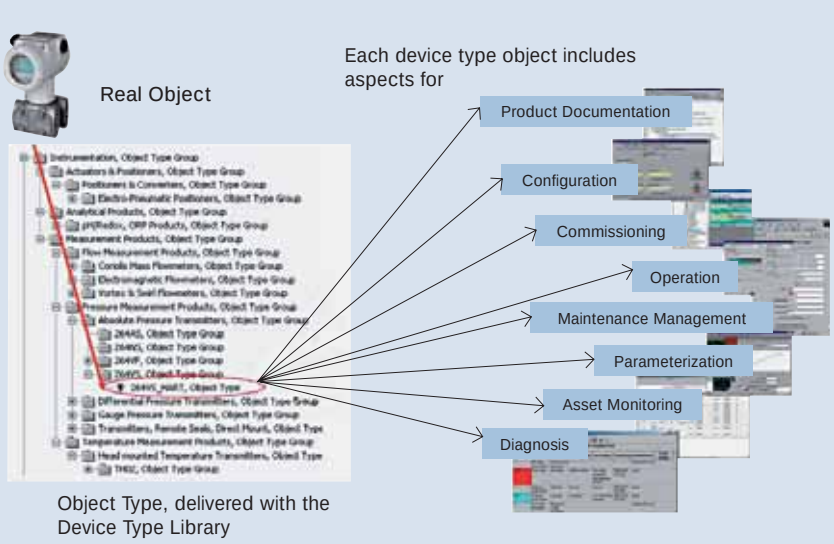
- Standardized software development and test processes, updated with the latest release of standards and specifications
- Inspection of hardware and software to filter out those devices that have a high chance of failing detailed integration tests
- Standardized and strict quality checks for all phases of development, test and release
- Close cooperation with the Fieldbus R&D team in Minden

The Field Device Tool (FDT)/Device Type Managers (DTM) technology is fully integrated with ABB’s control systems.The DTM is either generic, working for a family of devices, or specific to a single device. The device-specific DTM is cognizant of all instrument rules, including configuration, diagnosis and maintenance. It has a simple intuitive user interface that allows project engineers to access all device functionalities. A key task for FDIC is to subject DTM’s to extensive testing to reduce the risk of losing functionality while using DTM’s in ABB’s control system. The report for each device tested and released by FDIC carries information about the functioning of DTM in the target ABB control system.

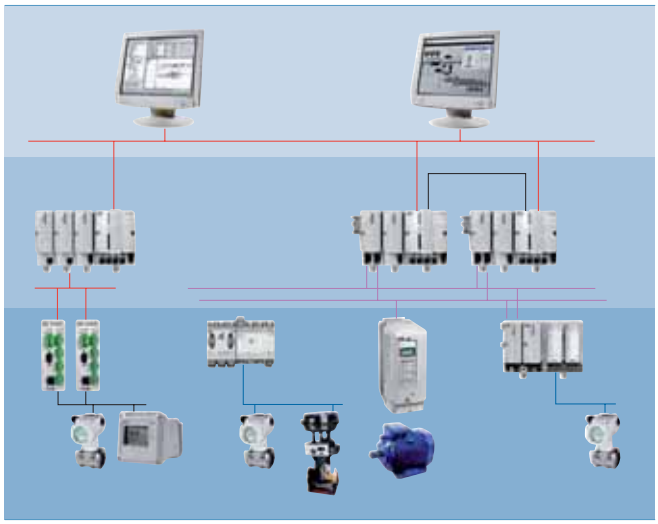
The Integration Cycle

The integration test cycle is typically 12 weeks long and results in a portfolio of integrated devices that is continuously expanding. The integration tests are performed on devices that are available on the open market. A typical integration cycle includes

1 ABB’s Extended 800xA automation system integrates the three major fieldbus protocols in a single structure



2 Device integration components in a single structure



basic connectivity tests, to verify cyclic data transfer between the device and the automation system, and detailed tests with DTMs to verify the device features including parameters, configuration, diagnostics etc. Detailed tests are also carried out to ensure device asset monitor functionality, which include the assessment of the performance of other higher-level applications such as calibration management, computerized maintenance management, device interoperability, bus master and other key features (applicable to Foundation Fieldbus).

All deviations detected during testing are recorded in a formal defect tracking system and analyzed in consultation with Fieldbus R&D. Depending on the severity of the observed deviation, device software is either released for general use via the ABB Solutions Bank, or rejected. If the device software has been rejected for release, the cause of rejection is informed to device vendor so that necessary improvements can be done for a re-test and release at a later date.

Cooperation with device vendors

Cooperation with device vendors is crucial to the overall success of device integration. The FDIC receives information from device vendors in advance of new releases, including the key inputs required for Device Specific Asset Monitors. It shares results regarding the integration performance of devices with vendors and discusses any failures observed during integration tests. Feedback from the FDIC often results in improvements in device software and, in some cases, firmware.

Commitment to device lifecycle support

Since it began in 2004, the FDIC has played a key role in making fieldbus solutions easy to implement and efficient to maintain over the device life cycle.

The primary benefits to the end customer include:

- Verified inter-operability
- Re-use of proven solutions
- Reduced engineering and commissioning effort
- Support, via ABB's standard support organization, including access to integration experts.
- Possibility of continuous improvement as FDIC takes care of releasing updated versions of devices
- Reduced risk and improved safety of the manufacturing plant

Since the end of 2005, the FDIC has worked on a standard throughput of 120 devices per quarter. The total number of integrated devices approved each year is approximately 425, from more than 50 device vendors. However, if the FDIC was to evaluate its throughput by the measures used by some of its competitors (who count sub-variants of devices, eg different operating voltage ranges, separately), then the total number of integrated devices tested would probably be in the region of 1000 per year and the number of devices in the integrated portfolio would exceed 2000.

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The FDIC is a single point of contact for all fieldbus integration needs, covering the whole suite of ABB's control systems for process automation. It performs an essential service, maintaining ABB's reputation for reliability and intercompatibility of its control systems.

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