

automationX

SCADA | HMI | PLC
MES | APC | APS | IMS
Alarm Management | Trend
Journal | Event Management
Data Representation | Reports
Helpdesk | Maintenance Management

www.automationX.com

automationX[®]

Distributed Control System

modular | scalable | universal



MORE FLEXIBILITY, BETTER RESULTS

automationX® is a scalable and modular designed DCS with a common platform for engineering, visualization, control and management of small plants up to distributed control systems.

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CONSISTENT OBJECT ORIENTATION WITH AUTOMATION CLASSES

- Automation Classes: Complete, Comprehensive and Reusable Software Modules for Application Configuration
- Easy-to-use Classes
- Neatly Bundle the Knowledge of Experts
- Clear User Interface

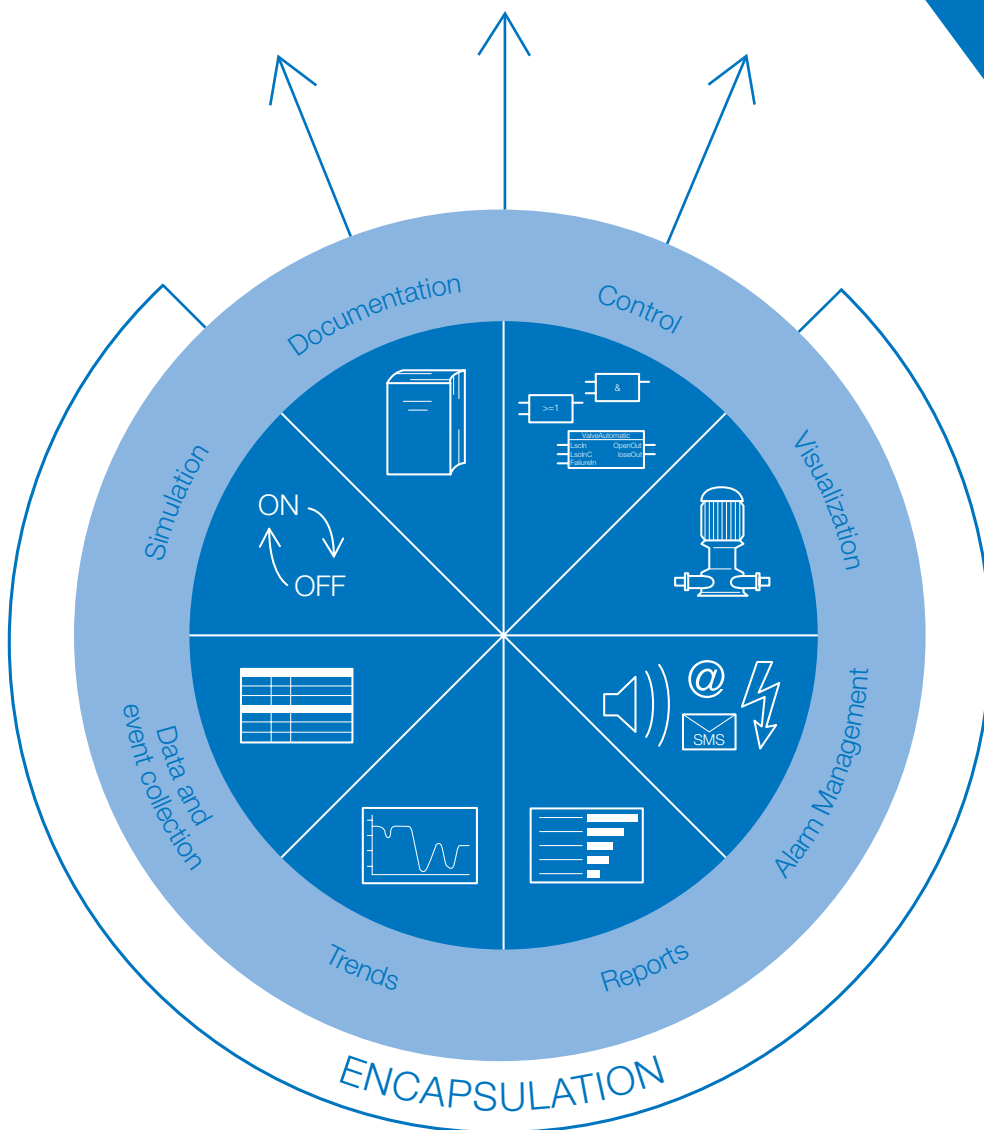
automationX is based on the concept of consistent object orientation. Although they are somewhat related, the implementation of object orientation in automationX should not be confused with techniques applied in high-level programming languages. automationX uses object orientation for application development or configuration of automation projects. It is this technique that allows applications to be constructed out of self-sufficient software modules known as „automation classes.“ The result: experts can neatly bundle their knowledge, hide confusing details and provide easy-to-understand interfaces into modules from which others can create their own applications.

Automation classes (also called objects) are powerful software modules that integrate all functionalities associated with devices that are operated with a modern automation system. A single class or object includes features such as regulatory and logic control, process visualization, automated alarm and interlock assistance, data history and trending, simulation mode for testing and training and much more. Applications are easily constructed by combining automation classes to create the final system. Application engineers just use class catalogues, which has the advantage that an object inherits any class functionality. No additional effort is required to integrate the different automation parts or to deploy different hardware platforms.

The object orientation feature automatically creates shorter and more intelligible programs. The result is much higher transparency. For automation engineering, this means a more understandable (intuitive) programming interface for application designers, process engineers, quality managers and the plant operator. Automation classes are re-usable software objects within automationX that contain everything necessary to establish a function, whether it be a device operated by the system, a communication task or an interface. All this functionality is neatly wrapped up into a single graphical icon that can be used as many times as desired, even within new and more powerful classes.

- / Intuitive Application Development
- / Process Transparency
- / Minimum Configuration Effort

AUTOMATION CLASSES
PUBLIC VARIABLES



A state-of-the-art development studio, the automationX IDE enables a transparent engineering environment. The requested function of a class is arranged and stored in system libraries. Pre-defined and branch-related libraries provide a collection of proven automation classes. Use drag & drop to place objects from your resource pool on the HMI screens or assign them to a logic controller for execution. Defined implicitly is the basic function, which

features several graphical representations, the operator interface, the logic program and maintenance information and simulation. They only need to be integrated to the process workflow by the application designer.

```
mirror_mod = modifier_ob.modifiers.new("mirror")
mirror_ob.object = mirror_ob
mirror_mod.mirror_object = mirror_ob

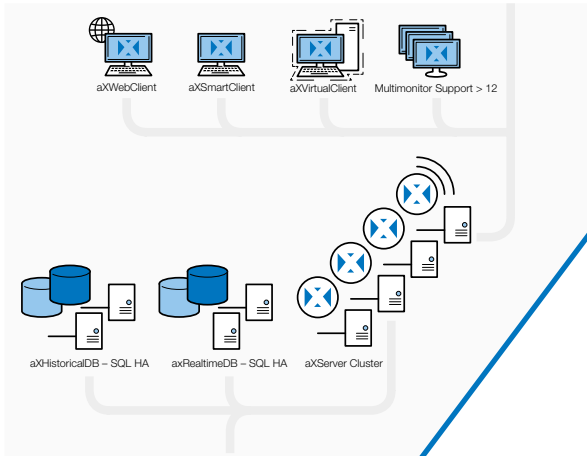
selection == "MIRROR_X":
    mirror_mod.use_x = True
    mirror_mod.use_y = False
    mirror_mod.use_z = False
selection == "MIRROR_Y":
    mirror_mod.use_x = False
    mirror_mod.use_y = True
    mirror_mod.use_z = False
selection == "MIRROR_Z":
    mirror_mod.use_x = False
    mirror_mod.use_y = False
    mirror_mod.use_z = True

# selection at the end -add back the deselected
mirror_ob.select= 1
modifier_ob.select=1
context.scene.objects.active = modifier_ob
print("selected" + str(modifier_ob)) # modifier
mirror_ob.select = 0
context.scene.objects[0]
context.scene.objects[one.name].select = 1

print("please select exactly two objects,")
```

OPERATOR CLASSES -----

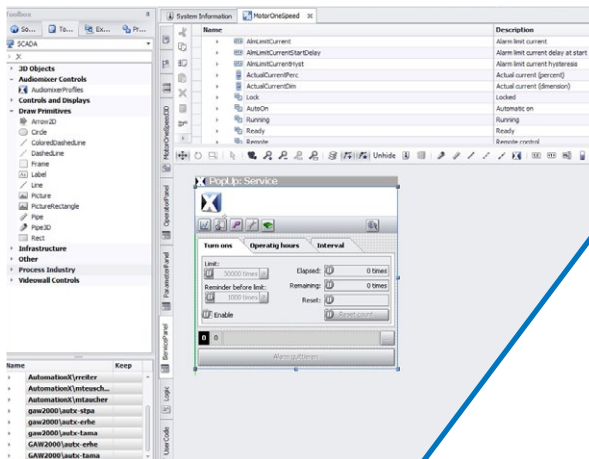
```
class Operator):
    """mirror to the selected object"""
    def mirror_mirror_x(
        self):
        """active_object is not None"""
```



aXFS - Framework Service

The foundation of all automationX projects. From a simple single-user solution on the premises to a distributed cluster solution in the cloud with minimal configuration effort!

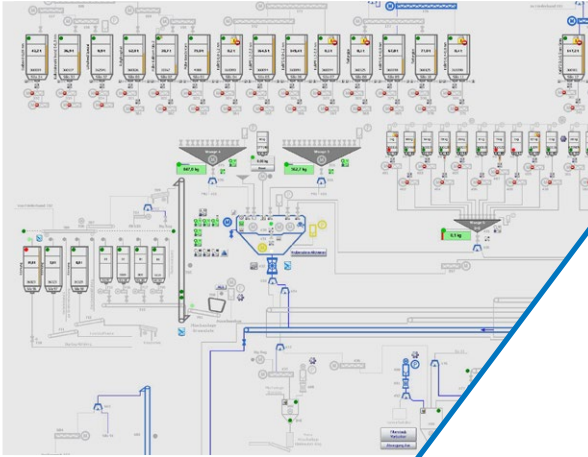
- Object-oriented class and library management
- Horizontal/vertical integration into existing IT landscapes
- Communication nodes including load balancing for optimal use of resources
- Stand alone for single-user solutions
- Redundant—no downtime for maintenance and service
- Hot standby
- Cluster support with active/active or active/passive for the greatest availability
- Installations physical and/or in a virtual environment
- Cloud support
- Broker/device communication (IoT) to connect and network many PLC devices
- Independent of hardware
- Integrated source- and version control with comparison and recovery options
- API support: C#, SOAP, REST, JSON, SQL, ODBC, etc.
- Maximum life cycle support—products available for at least 10 years



aXIDE - Engineering

Use one smart and unified engineering tool for your entire plant – start with the configuration of I/O cards, communications and PLC programs and design your HMI screens and operator guidance systems!

- Host based data management and shared libraries
- Online engineering and multi-user management
- Multiple graphical representations of automation objects (also depending on zoom levels)
- Object references and compositions (sub-classes)
- Documentation management with references to classes and instances
- Import function (equipment lists, I/O assignment, speech text)
- Mass data handling
- Access control based on rules and object protection
- Integration of .NET libraries and C# / VB code
- Dynamic process screen generation via GEO Information
- Integration from external applications and ActiveX Controls
- Active Directory support

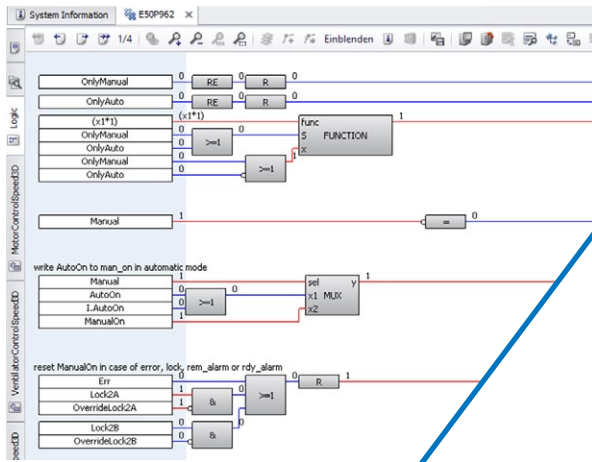


aXHMI - Visualization

Visualize your plant on different hardware and use layer and zooming techniques as well as embedding of external objects for user-friendly information representation!

- Multi-monitor stations and video walls
- Redundant operator stations and tracing of operator actions
- Profiles and layout design
- Multi-lingual (incl. Asiatic, Cyrillic and Persian character sets)
- Screen-in-screen views
- Playback manager
- Individual configuration of HMI sets for all client stations
- ActiveX objects, video stream and Live-cam integration
- Cross references to I/O cards and to PLC programs
- Integrated authority control logic between different control rooms or client stations
- Online data monitor and logic monitor
- Web visualization
- GEO informationen
- GIS maps integration
- Zooming, decluttering, panning, layer techniques
- Highlight of object references and display of logic conditions





aXPLC - Logic Programming

Create logic programs for several hardware systems and have them communicate with each other!

- IEC 61131-3
- Redundant architecture with hot-standby
- Several hardware platforms
- Operating systems (Windows, real-time Linux)
- Small resource requirements (ARM9 support)
- FBD programming
- C-Code execution
- Multiple PLC tasks

- Force of all variables
- Real-time data collection and time stamps
- Real-time data connectivity between PLC controllers
- HTTP interface
- User-defined add-on processes with real-time execution
- C-API, C#-API, PHP-API
- Event matrix for configurable logic execution

Instance Description	Prio	Count	Count	Elapsed Time	Elapsed Time
Check limits of online values	20	19	45,2 %	11,4 min	2,8 %
Result Data	1	5	11,9 %	1,5 h	21,7 %
SC_System - CheckDiskVolume	21	3	7,1 %	1,8 h	26,6 %
Result Data	1	3	7,1 %	8,9 min	2,1 %
Dosing Line MT101 to Mixer 1 - Phase C	10	2	4,8 %	54,0 s	0,2 %
Dosing Line MT101 to Mixer 1	21	2	4,8 %	41,0 s	0,2 %
Overview of Processindustry Plant - Time	20	1	2,4 %	9,2 min	2,2 %
Runtime Production Report	20	1	2,4 %	3,0 h	43,8 %
Result Data	1	1	2,4 %	0,0 s	0,0 %
Dosing Line MT111 to PRE1 - Phase Cor	10	1	2,4 %	10,0 s	0,0 %
Dosing Line MT111 to PRE1	21	1	2,4 %	0,0 s	0,0 %
Plant 1	10	0	0,0 %	11,0 s	0,0 %
Plant 2	10	0	0,0 %	12,8 days	0,0 %
Plant 3	10	0	0,0 %	13,0 days	0,0 %
Check and add SPC point	20	0	0,0 %	9,0 days	0,0 %
		Σ=42		Σ=100	

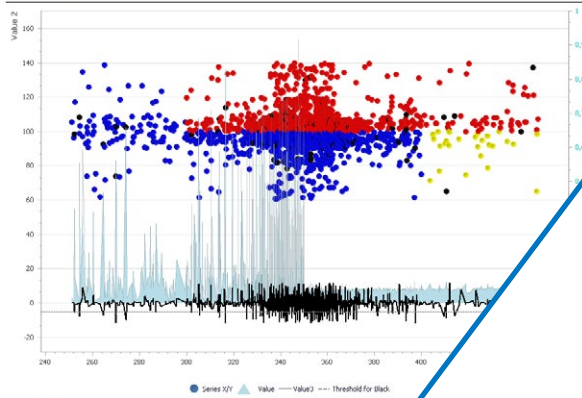
aXEvent - Alarm- & Event Management

Let the system automatically create summary alarms and highlight the location of alarms on your HMI screens!

- User defined alarm attributes (e.g. priority, colour, acknowledge behaviour, debouncing)
- Alarm monitor, screen- and group alarms, alarm panel
- Alarm highlighting (arrow, border or icon)
- Automatic blank-in of alarmed objects (because of layer settings)
- Automatic creation of summarization alarms
- Cascading of alarms
- Hide or mute alarms of a process section
- Messaging (text to speech, SMS, e-mail)
- User-defined alarms (personnel alarms)

- Tracking of operator actions
- Step-by-step operator guidance through critical or complex situations
- Definition of trouble tickets
- Cross references between events and alarms
- Automatic assignment of e-mail correspondence
- Electronic shift book and maintenance management
- Documentation of events inclusive attachments

X/Y Chart and Trend Line



aXTrend

Track the chronological sequence of data points and define your own data sets!

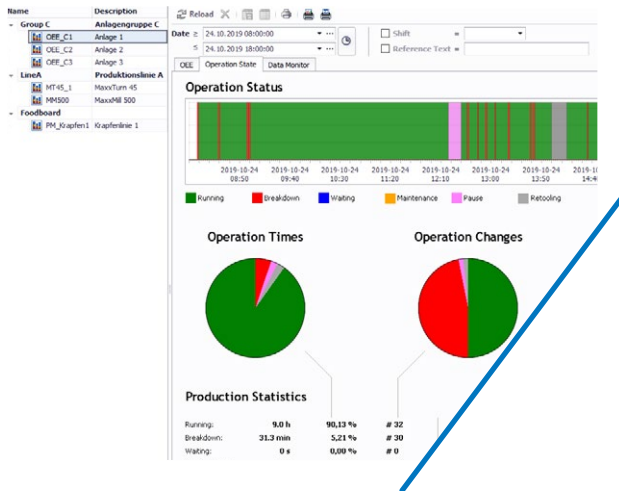
- Online trends and historical trends
- Multiple time and value axis
- User-defined data-acquisition grid (level, time, event)
- Real-time data collection in PLC
- Data buffering in the event of communication failure
- Configurable recording methods per trend variable
- Actual value and statistical evaluations
- Class-, instance- and user-defined trend sets
- Documentation of data points with substitute value input
- Zooming and measurement
- Adding trends of different objects with drag & drop
- Trend archives and data compression
- Data export



aXTraffic - Media/ Traffic Management

Integrate video walls, large screens and audio systems and use the excellent alarm management system!

- Integration of emergency equipment, video and telephony
- Free configuration of video wall cubes in different (alarm) regions
- Master / Slave redundancy support
- Automatic alarm intrusion
- Drag & drop activation and positioning
- Stretching objects over multiple regions
- Scenario support
- Display of process pictures, video streams and live cameras
- Integration of video routes
- Traffic program editor

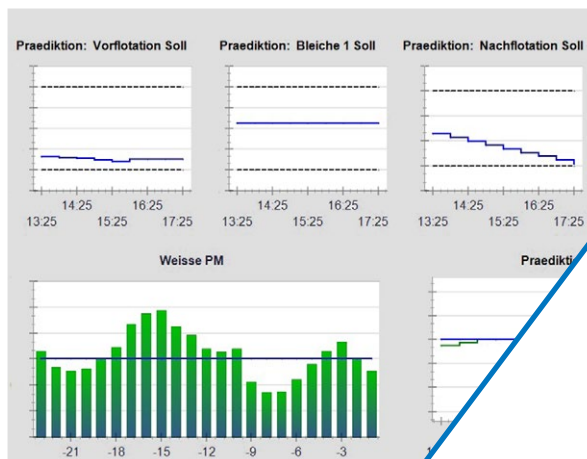


aXIMS - Information Management

Design your own data views and charts and embed them in your HMI screens!

- Tabular display of database and file system information
- Graphical charts with lines, columns, radar plots, segments etc.
- Automatic validation of data
- Calculation and validation methods
- SPC analysis
- OEE and VDI3423 report
- Report generator (Class based Reports and drag & drop configuration)

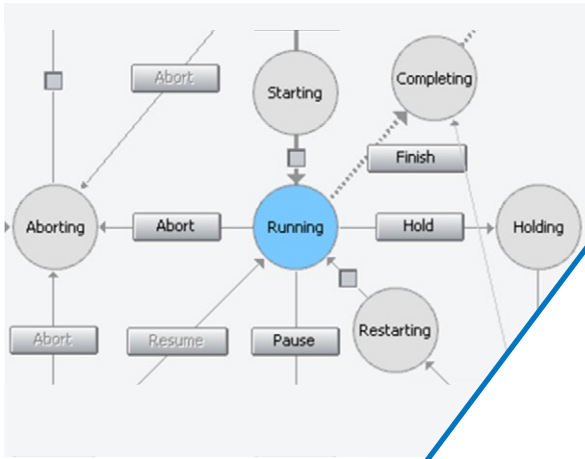
- Data Monitor and formatted data input
- Master / detail layout
- Execution of SQL queries and methods
- Cascading Execution
- Dynamic Filter functions
- Embedded in HMI screens
- Time and event based reporting and archiving
- Automatic archiving and sending of reports



aXAPC - Advanced Process Control

Control your plant predictively and map your processes as mathematical models!

- Bandwidth control
- Soft sensors
- Nonlinear model predictive control
- Nonlinear optimization
- Regressive modelling – steady state and dynamic
- Hard- and soft-constraint handling
- Consideration of tailor-made cost functions
- Real time optimization
- Operator training simulation (OTS)
- Process condition monitoring
- Cost optimizer
- Integrated data analysis and modelling tool

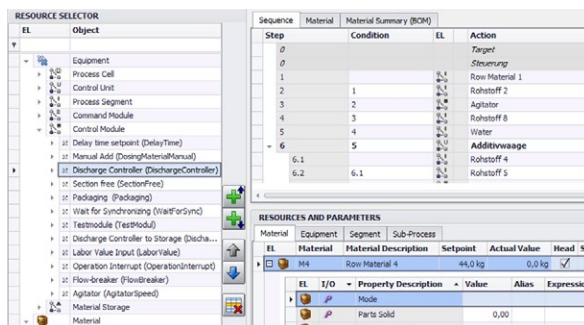


aXPM - Production Management

Define and control batch-oriented production or discrete processes and let them be an integral part of your system!

BASIS

- Production control and planning based on ANSI/ISA S88/S95
- Batch-oriented charges (campaign)
- Discrete inspection and production processes
- Phase interface to equipment modules
- Embedded in process visualization screens
- Standardized ERP Interface



PROCESS DEFINITION

- Flexible recipe- or process definition
- Version management
- Double-check mechanism
- Product- and facility related process definition
- Start conditions of steps
- Jump commands and loops
- Inline definition of sub-processes
- Definition of header parameters
- Late binding of steps (allocation of resource just before start of step)
- Compute of set-points in runtime
- BOM-recipes (Bill-of-Material, overload of template recipes)
- Support of calculation modes (solid content, scaling, water admission etc.)
- Export- and import tool
- Document management (link of work instruction to production step)
- Cost and effort calculation

Step	Material	Material Summary (BOM)	Condition	EL	Preselected / Used	Action	Material	Setpoint	Actual Value	Start Time	End Time	Phase
1						Raw Material 1	M1	200.0 kg	200.0 kg	13:42:56	13:43:56	OK
2	1			S1		Rohtstoff 2	M2	100.0 kg	98.8 kg	13:43:37	13:43:37	OK
3	2			S2		Agitator	F467	Fast	Fast	13:43:38	13:43:41	OK
4	3			S3		Rohtstoff 3	M3	50.0 kg	50.0 kg	13:43:42	13:43:48	OK
5	4			S4		Water	M5	30.0 kg	30.0 kg	13:43:50	13:43:56	OK
6	5			S5		Controller PRE1	M6	230.0 kg	52.1 kg	13:43:58		OK
6.1				S6		Rohtstoff 4	M4	40.0 kg	40.0 kg	13:44:01	13:44:08	OK
6.2	6.1			S7		Rohtstoff 5	M5	100.0 kg	135.9 kg	13:44:10		OK
6.4	6.3			S8		Delay time setpoint		3 s				OK
7	5			S6		Controller PRE2	M7	130.0 kg	71.1 kg	13:43:58		OK
7.1				S7		Rohtstoff 2	M2	80.0 kg	80.3 kg	13:44:01	13:44:09	OK
7.2	7.1			S8		Rohtstoff 3	M3	70.0 kg	71.0 kg	13:44:01		OK
7.3	7.2			S9		Discharge Controller	M8					OK
8	6.1 & 5 & 2			S1		Raw Material 1	M1	30.0 kg	8.3 kg	13:44:00	13:44:10	OK
9	6 & 7 & 8 & 10			S2		Discharge Controller to Storage	M9					OK
10	6			S3		Controller	M6	44.0 kg				OK
10.1				S4		Rohtstoff 4	M4	44.0 kg				OK
10.2	10.1			S5		Discharge Controller	M5					OK

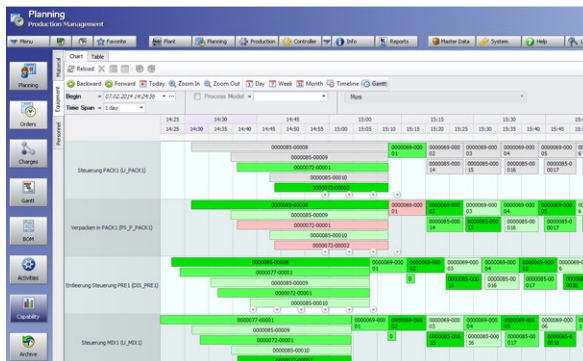
PROCESS EXECUTION

- Runtime view with inline modifications
- Flow control and pre-stop value calculation for material dosing steps
- Pre-production management (precommissioning)
- Parking and unloading of charges
- Bulk data collection (e.g. data of an individual pack)
- Report of manual operator actions
- Report of material movements

Material	Material Description	Dim	SpcWr	Solid	Capability Check	Modified date
S1	Special Sale 1	kg	3,23kgf	99,12 %		18.11.14 11:44:39
M990	Dark Water	kg	1,10kgf	100,00 %	Yes	08.08.13 14:19:10
M1000	Anderer Rohstoff 5a	kg	1,10kgf	100,00 %	Yes	22.01.15 12:15:59
M1003	Anderer Rohstoff 5a	kg	1,10kgf	100,00 %	Yes	22.01.15 07:31:14
HF1	Semifinished 1	kg	1,10kgf	73,00 %		22.07.15 10:51:09
HF2	Halb-fertigprodukt 2	kg	1,10kgf	73,00 %		22.07.15 10:51:10
HF3	Halb-fertigprodukt 3	kg	1,10kgf	73,00 %		22.07.15 10:51:10
HF4	Halb-fertigprodukt 4	kg	1,10kgf	74,00 %		22.07.15 10:51:10
HF5	Halb-fertigprodukt 5	kg	1,10kgf	75,00 %		22.07.15 10:51:10
HF10	Semifinished 10	kg	2,00kgf	100,00 %		22.07.15 10:51:10
HF120	Dilution Product 20%	kg	1,09kgf	20,00 %		22.07.15 10:51:10
HF130	Dilution Product 30%	kg	1,11kgf	30,00 %		22.07.15 10:51:10
M1	Row Material 1	kg	1,39kgf	14,41 %	Yes	23.06.15 11:07:51
M2	Row Material 2	kg	1,10kgf	82,20 %	Yes	10.08.13 14:21:51
M3	Water	kg	1,09kgf	5,00 %	Yes	10.08.13 14:22:09
M4	Row Material 4	kg	1,41kgf	84,40 %	Yes	10.08.13 14:22:48

MASTER DATA

- Material-, equipment and personnel data administration
- Process segment definitions (facility related segments)
- Material lot administration
- User-defined properties
- Cross references and usages
- Warehouse Management



PLANNING AND SCHEDULING

- ERP connection (master data, customer and vendor data, recipe, production order, feedback, capability information etc.)
- Order planning
- Order combination and splitting (merge and split) of semi manufactured goods
- Order based and optimized production quantity over all process steps (e.g. bulk pack in pieces, single product in pieces, semi-manufactured goods in kilograms)
- Detailed scheduling of production steps
- Resource allocation and capability check (material, equipment and personnel)
- Ad-hoc orders
- Rescaling and postpone functions
- Material requirements planning
- Gantt charts

Material	Description	Produced	Consumed	Balanced	Produced	Consumed	Balanced	Total Balance	Dim
HF5	Halb-fertigprodukt 5	12246,0	0,0	12246,0	15990,8	0,0	15990,8	294,7	kg
M1	Row Material 1	0,0	-2940,0	-2940,0	0,0	-2882,0	-2882,0	-58,0	kg
M2	Row Material 2	0,0	-1400,0	-1400,0	0,0	-1300,9	-1300,9	-99,1	kg
M3	Water	0,0	-420,0	-420,0	0,0	-396,5	-396,4	-23,6	kg
M4	Row Material 4	0,0	-1132,0	-1132,0	0,0	-967,1	-967,1	-164,9	kg
M5	Row Material 5	0,0	-853,0	-853,0	0,0	-755,6	-755,6	-97,4	kg
M6	Row Material 6	0,0	-3733,0	-3733,0	0,0	-3410,0	-3410,0	-323,0	kg
M7	Row Material 7	0,0	-1686,0	-1686,0	0,0	-1628,8	-1628,8	-57,2	kg

DATA COLLECTION AND REPRESENTATION

- Process statistics
- Product tracking
- Material consumption (BOM)
- Comparison of productions
- Charge tracking
- Report of regulations on packaging
- Gantt charts
- Equipment output chart
- Performance analyses (e.g. OEE, VDI3423)
- Quality management
- Maintenance management (based on runtime, switching operations, periods, external requests)
- Customized reports
- Material flow tracking



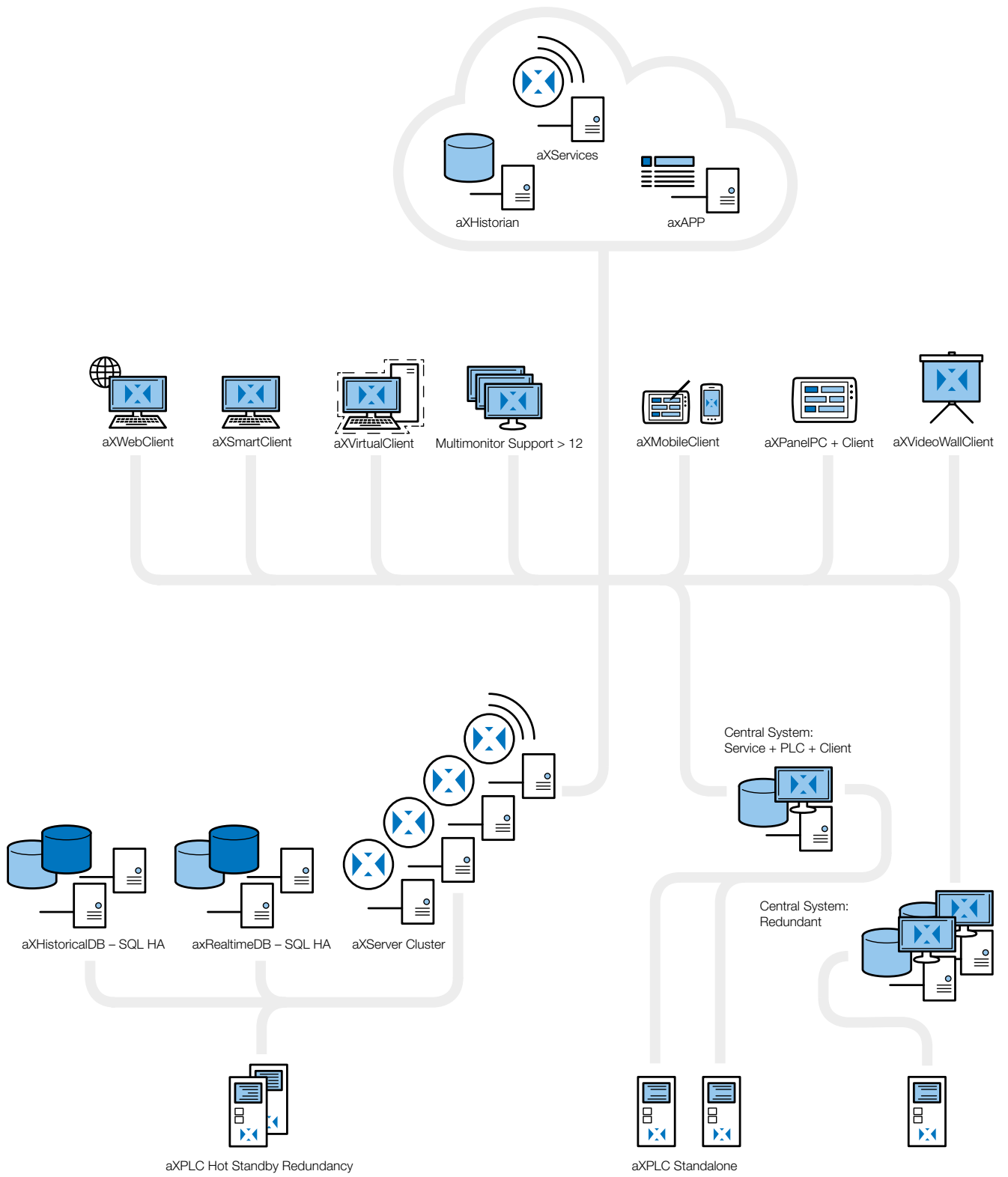
System Architecture

- Utilization of Distributed Hardware Resources
- Centralized System Monitoring
- High Availability and Data Integrity through Clusters, Redundancy and Field-Bus Concepts

automationX is a distributed control system for miscellaneous applications. The framework establishes a central communication node that provides a comprehensive platform for subsystems deployed on different hardware components. automationX is scalable, which means that all functions for a simple plant are handled by one single server station. This station contains the framework and all applications required by the subsystems. Large and distributed plants are equipped with an automationX load-balancing procedure for the framework that distributes the load among several server stations (clustering). In addition, the subsystems are deployed on external and autarkic hardware. With IEC 61131-3 control systems in particular, the hardware resources and I/O cards of different manufacturers are integrated to form a unique overall system. Only one engineering tool is required: automationX IDE. If the logic controller or, for example, the

Profibus system is designed redundantly (hot-standby), only a few mouse clicks are required – automationX has already implemented these features in the core system, guaranteeing the high availability of the system. The data exchange between logic control units is handled by a direct TCP/IP link while HMI applications and other subsystems exchange data via the framework.

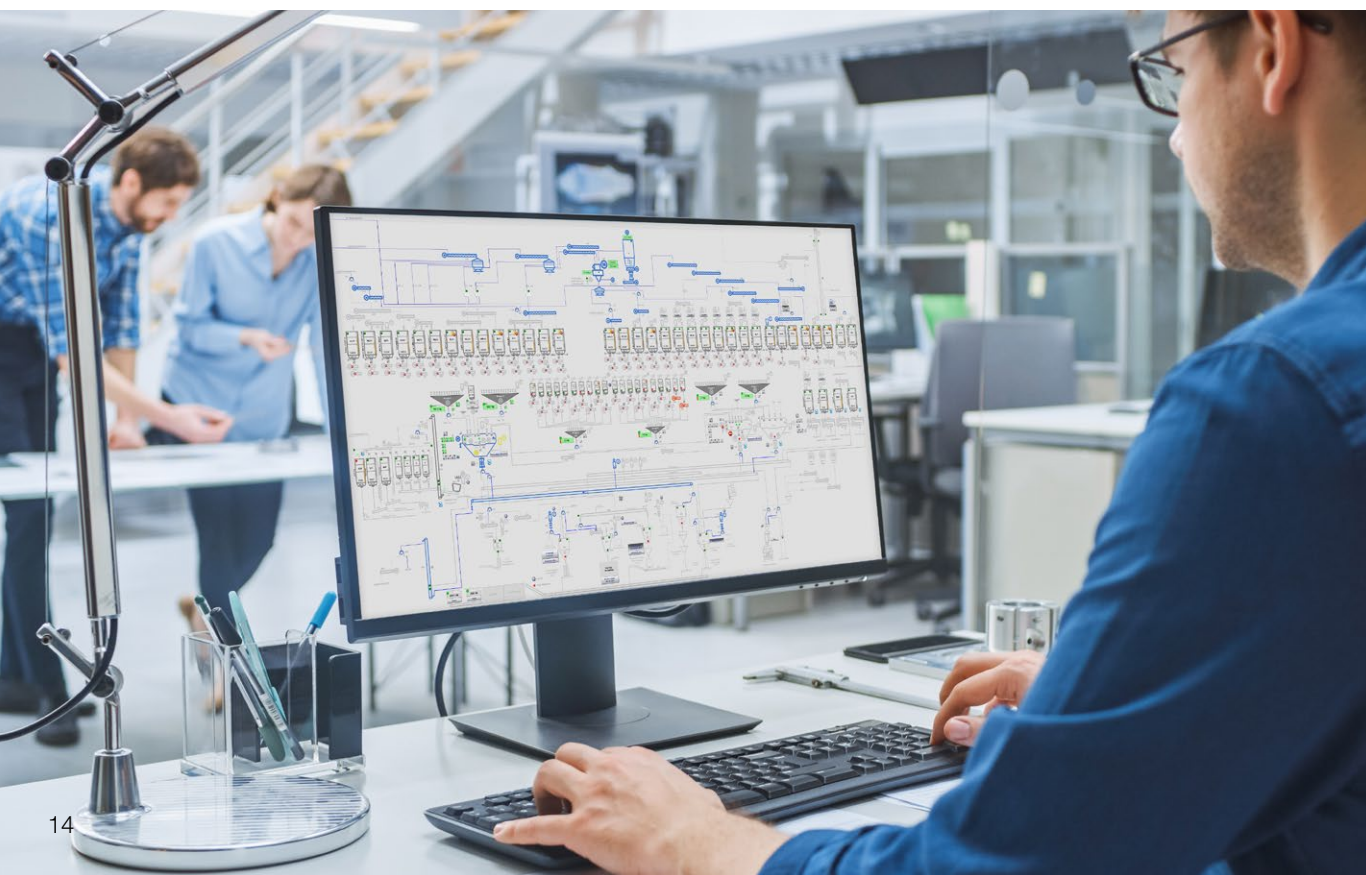
The Smart Client stations use their own resources and automatically upload the required application programs. The hierarchical architecture starts with the automation classes and their clear interfaces and continues in the individual plant, which is represented as a standalone site or embedded in a multi-site environment. Each site provides data to other sites in the same way that classes provide data to the process sequence.



Distributed Systems (Multi-Site Architecture)

- Autarkic sites (location, production unit)
- Centralized and decentralized engineering
- Shared libraries with automatically update
- Standardized communication protocols between sites
- Drag & drop engineering of global overview screens
- Centralized and decentralized archives and reports
- Centralized diagnostics and alarm management

Sites are decentralized and autarkic units that control, visualize and collect data. They are usually part of a complete system managed by a central control room. automationX fulfills the integration requirements with multi-site architecture in which applications are developed on-site or from a central station and third party systems are linked up through standardized communication protocols. Class and instance libraries can be shared and are updated automatically. Superior visualization and management tasks are carried out by simple drag & drop operations without substantial engineering effort. The multi-site architecture is an integral part of the automationX core system and can also be deployed in existing projects.





Connectivity

- Open architecture
- Standard interfaces
- Support from standard industrial hardware and automationX hardware for specific applications

The open architecture of automationX integrates the DCS into existing infrastructure by making use of available standardized interfaces and industrial field-bus systems. Based on license points, the automationX system can be expanded online step by step. APIs ensure the integration of customized applications and data processing functions. The ongoing development of automationX (e.g., for PROFINET and IEC61850) and the practical use in our own projects make automationX a state-of-the-art system with a unique integrity and transparency.

- | | |
|---------------|-----------------------|
| - Profibus | - IEC 60870-5-101/104 |
| - Profinet | - TLS |
| - Modbus | - SNMP |
| - ODBC | - ISO on TCP |
| - OPC, OPC UA | - EtherCAT |
| - XML Moris | - Client Web-API |
| - IEC 61860 | - Corba |
| - BACnet | - Active MQ |
| - CANBus | - SOAP Server/Client |
| - MBus | - etc. |

AutomationX

We are a technology company of the GAW Group that focuses on developing and implementing modular, industry-specific hardware and software solutions for production planning, control and optimization. Thanks to our focus on the sectors food, building materials, manufacturing and infrastructure, we have detailed knowledge of your requirements. Our development team incorporates new features into the product very quickly. Whether you wish to undertake extensive projects from production planning and optimization to system control or partial solutions – take advantage of our years of experience with successful international projects.



Contact

AutomationX GmbH
Lauzilgasse 13, 8020 Graz
Austria

office@automationX.com
T +43 (316) 2704-700
F +43 (316) 2704-708

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