

WHITEPAPER

evon XAMControl

1 XAMControl

1.1 Evolution in Automation

Now, for the first time, there is software available that covers all areas of industrial automation. The software, XAMControl, employs all the possibilities that modern software tools and high-level languages offer.

XAMControl as a system covers the spectrum from visualization to the field, including PLC on standard controllers. Some of the highlights of XAMControl are direct-X visualization, XML standardization, a modern user interface, 100% object orientation and the simple extension capability.

The system has been conceived as a redundant process control system for large, fail-safe systems. The high performance, the PLC programming in IEC-61131-3 and/or a high-level language and the automatic networking of the PLCs provide the foundation for fast and efficient engineering.

1.2 The virtual PLC

The so-called virtualization of the PLCs, or more precisely, of the automation functionality, permits a previously unattainable abstraction of the automation hardware.

In this manner, the total project is completely decoupled from the field hardware and can be developed, tested and simulated on the laptop or PC. Only when this work is complete, are the virtual PLCs distributed to the real runtime environment, i.e. hardware.

The system manages the necessary data routing between the distributed units, thus allowing the application developers to dedicate themselves completely to the real focus of their work: process control and monitoring.

Furthermore, the virtualization permits the easy and temporary relocation of a defective PLCs functionality to another hardware component within the total system.

A wide variety of hardware platforms that are readily available on the market are used as realtime environments.

1.3 Technology

XAMControl's software concept is based on the latest, nevertheless standardized, technologies, such as Microsoft .Net Framework 4.0 and Microsoft SQL Server 2008. This provides a number of advantages compared to conventional systems.

1.3.1 Central Administration and Programming, Decentralized Execution

The complete application is created and managed centrally on a single system. At runtime, the functions are distributed to the decentralized hardware units.

1.3.2 PLC-Programming in IEC-61131-3 and/or High-Level Language

System programming is carried out based upon the PLC Standard IEC-61131-3 function block diagram. If extensions are required that are not provided for by the standard, then an experienced programmer can simply use C# and express their creativity there.

1.3.3 Automatic Networking of all PLCs

The system supports the distribution of PLC functionality (virtualization of the PLC) via automatic data routing. This means that the programmer does not need to be concerned about the data connections across differing hardware platforms.

1.3.4 Support via Database

The Microsoft SQL Server 2008 database stores all data, both process and application data, thus guaranteeing an unbelievable openness of the system concerning the connection of external proprietary systems and the creation of operating data evaluations.

1.3.5 Microsoft Office Integration

Simple operating data evaluations can be created using Excel templates without the need for exhaustive knowledge of the database. The system transfers the selected data for a defined timeline on the click of a button to this template as a data series – the further evaluation of the data contained in this data series depends only upon the creativity of the Excel user.

In addition Excel is also used as a simple tool for the processing of large amounts of data and for the configuration of system parameters. Data point configurations and system parameters can be very quickly exported, processed and re-imported, whereby a side-effect is the creation of a part of the system documentation.

1.3.6 3D-Visualization, Animation

XAMControl supports XAML standard, which allows it to import graphical objects created in CAD systems as models, with all its functions. For example, a screw conveyor created in 3D can not only be displayed as a XAMControl and observed from all sides, but all the functions that the model contains, such as the movement of the screw in the housing, can be accessed.

1.3.7 Redundancy and High Availability

The system contains an inherent redundancy function. The programmer defines a system as redundant, locates the redundant hardware – job done. All further functions, such as those pertaining to data consistency, are taken care of by the system.

1.3.8 Consistent Object Orientation

Due to the consistent object orientation of the system, the user has available a powerful tool. This use of objects guarantees the maximum reusability of automation controls (objects) and possibly also a desired encapsulation and thus protection of IP.

1.3.9 Open Connectivity

The use of standardized platform technologies such as Microsoft .Net und SQL Server guarantees an absolute openness of the system that is currently not available on the market.

1.3.10 Replay Manager

The Replay Manager permits the user to “replay” his system based on recorded historical data, analogous to Windows Media player. System fault states and alarms can be very effectively displayed, which significantly simplifies fault tracing and diagnosis.

1.3.11 Alarms, Journal, Log Book

It is currently state-of-the-art to continuously record all events within a system. XAMControl goes one step further with the integrated system book. For example, during commissioning, all data points can be set to the status “unchecked” and subsequently documented tested and ticked off point-for-point. It is also possible to use the system book for items that are not pertinent to the automation, for example a squeaking entrance door. In other words, the system book can be used as a to-do list that is always up-to-date.

1.3.12 Remote Alarms

Alarms can also be sent remotely via sms, email etc. This integrated function is supplemented in XAMControl by special apps for smartphones, which even permit remote operation and monitoring of the system – assuming this has been permitted in the user rights.

1.4 Automation for Large Projects

1.4.1 Flexibility

XAMControl has already been implemented in numerous large projects, which have provided a library of pre-defined functionality that can be used repeatedly and continually optimized. In addition, XAMControl offers high flexibility via standardized frameworks and tools. The high degree of standardization permits the content of other tools to be integrated in XAMControl and interfaces to other systems easily created.

1.4.2 High Availability

The integrated redundancy function in the system permits redundancy at PLC level to be maintained with little configuration effort. The program codes and configurations between the redundant systems are automatically synchronized. The arbiter automatically recognizes the failure of the master station and enables the standby station to take over the necessary function.

1.4.3 Intuitive Operation

All important information such as alarms are easily and quickly readable due to the clearly structure navigation toolbar in the visualization UI. Single process views can be added to the favourites or clustered into process categories.

1.4.4 Transparency

All manner of data can be acquired and simply displayed thanks to the use of modern frameworks and the SQL database. The graphical process display, the recording of all relevant data in the system and the Replay Manager ensure that the current and historical system status can be displayed. This function can be used in particular to quickly trace and eliminate faults.

1.4.5 Sustainability

The object oriented programming approach ensures that changes only need to be made in a single place and can be immediately used in the current or in any other project. The system book in XAMControl offers a further advantage in which all steps during a commissioning process can be documented. Even faults, whether they are mechanical, electrical or caused by software are recorded, so that the current status of the system is available at any moment in time.

2 XAMControl – System Introduction

XAMControl is a holistic solution to automation, which permits centralized development and which can be executed in distributed systems. In order to demonstrate the functionality and advantages, the system will be split in the following 3 levels:

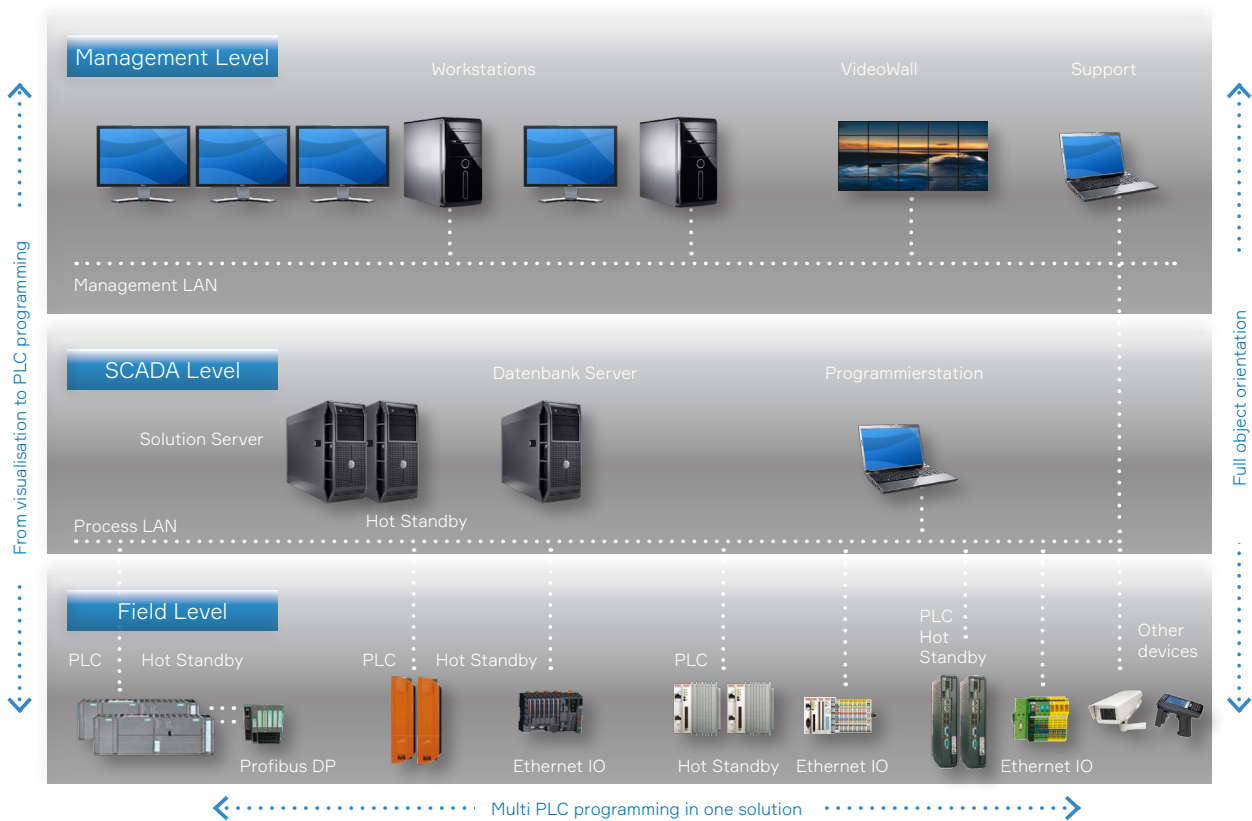


Diagram 1: XAMControl Levels

The diagram above shows the separation of XAMControl into Management, SCADA and Field levels. The SCADA level contains the kernel of the system, the Solution Server. The Solution Server contains the complete system configuration, beginning with the visualization and ending with the PLC programs, and offers an inbuilt redundancy function, which can be activated by making a second server hardware available. In addition, a separate database server can be located in the SCADA level - as real hardware or as a virtual computer – which is used for the role of data recording and reporting. The Solution Servers themselves can also assume this function.

The intelligent PLC terminals, the controllers, are on the field level and run the PLC

programs. The unique system architecture permits the individual PLC programs to be relocated to other controllers via drag&drop, or centrally managed on the Solution Server. This occurs without interrupting the functions in the area of system control or data recording. Hot-Standby redundancy is also designed into the field level for the implemented controllers. This functionality in XAMControl offers fail-safe safety on the field level. The controllers are either connected directly using input/output terminals or the connections are located in Ethernet I/O terminals.

The operating stations are located on the management level and run the XAMControl visualization, the so-called XAMiris. These recall the corresponding data from the Solution Servers and display them accordingly. Manual intervention in the XAMControl process is performed via XAMiris. The changes are first transmitted to the Solution Server and subsequently transferred to the corresponding controller.

All three levels are interconnected in a network and communicate via Ethernet. The management LAN can be isolated from the process LAN via a firewall. The controllers on the field level can communicate with other devices via proprietary protocols, such as EIB, Mbus, MP-Bus, DMX, Modbus, OPC, DALI, ENOcean, IP-camera, audio systems, infrared-remote control, BACnet, IEC 60870-5-104, SNMP and many more.

2.1 Applications

XAMControl has been designed for large projects and is predominantly used in such systems. XAMControl can be used in the following areas:

- ▶ Building management systems
- ▶ Transport technology
- ▶ Process industry
- ▶ Energy technology