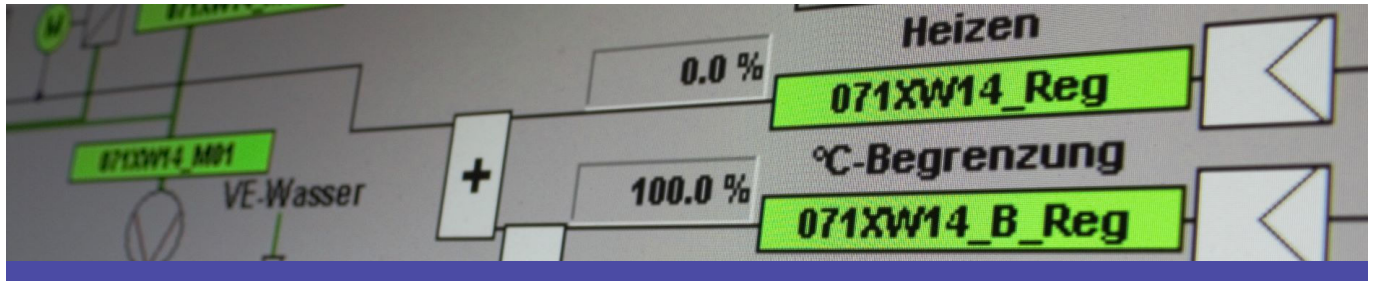


Enterprise SCADA Architecture and Manufacturing Standardisation



Problem

Until 2002, DaimlerChrysler AG used the SCADA standard BSR at its Rastatt site, based on S5 PLCs and InTouch HMI. The HMI increasingly reached its system limits, particularly the maximum available number of tags, preventing the future integration of new plant areas within the existing system landscape.

The outdated architecture negatively affected production efficiency, reliability, and performance. To enable the transition to Digital Factory technology and ensure long-term production capability, a new, future-proof SCADA standard became necessary.

Solution

A modernised InTouch HMI and SCADA solution was developed by restructuring the existing application, extending its technical functionality, and preparing the system for future operational requirements.

An optimised data and template concept, consolidated tags and a flexible alarm system created a scalable, standardised architecture. Automated wizards reduced engineering effort and errors, while a new alarm management system increased transparency and maintainability.

A multi-application concept, comprehensive documentation, and training enabled smooth migration. The standard was rolled out step by step and today forms the foundation of a stable, expandable Smart Factory environment.

Results

The Integra standard developed in Rastatt was continuously enhanced after its successful introduction and is now the corporate standard of Mercedes-Benz AG for HMI and SCADA architectures.

Using Integra, a future-proof, modular, and high-performance plant standard was established, significantly enabling the transition to the Smart Factory.

Production-critical HMI and SCADA components were sustainably modernised and prepared for future technological developments.

HMI Architecture

InTouch – Expansion of Plant Capacity

Due to the continuous growth of the facilities, the existing InTouch application reached the maximum number of available data points. To continue integrating new plant segments, we developed an optimisation concept for more efficient use of existing tags.

By consolidating redundant data points, systematically reducing unnecessary tags, and creating generic, indirectly addressed windows, sufficient capacity was created for additional plant areas.

Alarm Text Processing and Alarm Management System

As part of the project, we supported the migration of manually created alarms in InTouch to an external, centrally managed alarm system.

This included both the technical modification of the InTouch application and the conceptual design and structuring of the new alarm system.

Through clear definitions of alarm texts, codes, and alarm logic, a standardised, low-maintenance, and scalable alarm structure was created.

Development of a Template System for Detail Windows

To standardise and improve detail windows, a template system based on a configuration file was developed.

Each template described the operating logic, addressing, permissions and visualisation of a specific functional group. An activity code matrix per user group was defined and referenced in each detail window to establish the users permissions and permitted locations.

This resulted in higher reusability and reduced engineering effort across the entire HMI application.

Development of an HMI User Authorisation System

A concept was developed for a user authorisation system that controls the execution of functions in the InTouch visualisation depending on user type, activity, and location.

This allowed safety-critical operations to be specifically restricted and structured in a traceable manner.

HMI Architecture

Wizards for Automatic Generation of HMI Mimics

As a certified Wonderware System Integrator, we developed an InTouch wizard enabling automated generation of functional group mimics. The wizard analysed the plant structure, identified all available functional groups (FGs), and provided objects with the following features:

- Automatic detection of all existing functional groups of a plant
- Identification of new FGs to be created and comparison with existing objects
- Preview of the mimic to be generated, including optional adjustments (e.g., 90° rotation, layout variants)
- Automatic addressing and parameterisation of functional groups based on plant and tag structures

Consulting for the Migration of Auxiliary Systems

The HMI for the Body Shop, called APT (Application Technology), was a proprietary system from Dürr AG and not compatible with the existing plant standard.

In close cooperation with Dürr AG, we integrated their system into the new Integra standard to ensure consistent operating and system logic.

This included technical consulting regarding architecture, interfaces, and data structures, as well as the necessary modifications to the InTouch application.

Multi-Application Concept

A SCADA system comprising several hundred PLCs requires a concept for integrating the associated HMIs on a local operator panel. The communication between PLC and visualisation was peer-to-peer, and the number of HMIs that could communicate with one PLC was limited.

Our task was to consider these system constraints and develop and implement a sustainable integration concept. We created a central matrix for managing and defining all relevant HMI-PLC assignments, the number of connections, and the respective migration status. This matrix played a central role in the continuous maintenance of the multi-application. In addition, we were responsible for quality assurance and integration of changes to the respective HMIs.

Documentation, System Acceptance, and Trial Operation

Comprehensive documentation of operating logic and operational processes was prepared for the project.

Before the system's rollout, a series of tests were conducted, including module and integration tests, factory acceptance tests, and final on-site inspections.

All production-critical functions were validated to ensure functional reliability and interoperability with existing systems. The trial operation was conducted to assess the load capacity and stability of the system under actual production conditions. This approach helped avoid costly adjustments and ensured a smooth transition to series production.

Standard Rollout

Coexistence Management and Rollout

During migration from old to new HMIs, parallel operation had to be ensured. The task involved coordinating parallel hardware as well as continuously maintaining both old and new systems.

During the migration phase, approximately 1,000 existing InTouch windows were converted to the new Integra HMI standard and their structure, logic, and visualisation were adapted.

Alarm signals were a critical topic, as production errors had to be visible in all systems.

Training for Operators and Plant Personnel

Training was essential for gaining acceptance among operators and plant personnel, as the introduction of the new system initially encountered resistance. Through carefully designed training programs, users were gradually introduced to the new work methods and empowered to confidently utilise the new standard.

Maintenance, Modifications, and Future Migration

After implementing the standard, existing systems were gradually migrated, new plant areas were integrated, and further plant expansions were implemented. These tasks were planned, coordinated, and successfully executed in collaboration with other involved suppliers.

Quality Assurance

We were responsible for technical quality assurance and integration testing during the integration of new plants and supplier-driven modifications.

Our tasks included:

- Development of tools for automatic HMI analysis to identify deviations from the standard and engineering-related errors
- Documentation of quality assurance measures
- Check-in/check-out coordination with involved suppliers
- Integration of approved changes

Project Manager

Mark Aber completed his Bachelor of Engineering in Computer and Control Systems at Coventry University in England in 1986. In 1996, he founded Aber Industrial Solutions, a company specialising in industrial software and SCADA solutions.

With nearly four decades of experience in industrial digitalisation, Mark Aber has successfully implemented over a thousand projects across diverse production environments. These projects have spanned from consulting and concept development to software engineering and technical project management.

His expertise in HMI, SCADA, and industrial software, as well as his ability to efficiently solve complex technical challenges, made him one of the key SCADA experts in developing the Integra plant standard in Rastatt, which today serves as the global corporate standard of Mercedes-Benz AG.

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