

KEDI-project: Creating the Automation Architecture with the Common Fieldbus Diagnostic Tool

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Abstract - In the KEDI project [1], the new automation architecture will be made using several different fieldbus solutions. KEDI stands for a Finnish name which means Fieldbus Diagnostics. The new-found part created by the KEDI project will be the diagnostic tool, which is capable to utilize diagnostic data from different fieldbuses and their devices. The second goal in the project is to utilize common interfaces and technologies (like OPC, XML and NOAH) to transfer data between different applications in the architecture. The third goal is to advance the integration of automation systems with intelligent applications, which utilize the digital communication possibility and the intelligence of field devices. The last goal of the KEDI-project is to test the capability of created solutions in a Pulp factory.

I. INTRODUCTION

The fieldbus technologies have been the butt of research projects for several years in Finland. Pulp and paper industry with related automation companies has been a big driving force for earlier fieldbus projects and for today's work in progress in the KEDI project. This project started in September 1999 and will last to the end of August 2001. The Participants of the KEDI project (Figure 1.) aim to learn together a new working for automation projects in the future. Getting benefits of the new diagnostic possibilities and creating tools for that purpose are the main goals of the project.

Vendors and Research (VTT)	End Users, Planning Companies
Neles Automation	UPM Kymmene
ABB Control	Stora Enso
Siemens Oy	Rautaruukki
Honeywell	Jaakko Pöyry Group
VTT Electronics	AIM (Automation and Instrumentation Management)
Additional devices from: Fisher Rosemount, E+H, Yokogawa, SMAR and National Instruments	

Fig. 1 - The partners of the KEDI project.

II. THE AUTOMATION ARCHITECTURE BASED ON MANY FIELDBUSES

The new automation architecture (Figure 3.) is based on several fieldbuses. The chosen architecture has been influenced by [2], but HSE (High Speed Ethernet) fieldbus has not been used as HOST bus. In the target process, which is chosen by UPM Kymmene, the FF-fieldbus is planned to work in instrumentation and LON will be used in communication with intelligent motor control units (MCU) of ABB. Interbus and Profibus are considered important in some other parts of the pulp and paper processes and therefore applications of the KEDI project are planned to work with those four fieldbuses.

The OPC technology will be tested as a communication interface between fieldbus hosts and DCS-system. HSE fieldbus is used parallel with DCS-system's own bus.

III. THE FIELDBUS UNDEPENDENT DIAGNOSTIC TOOL FOR END USERS

The diagnostic tool, which will be created in KEDI, will gather diagnostic data from four different fieldbuses and their devices. The tool will then show online warnings and alarms to maintenance technicians. The specified

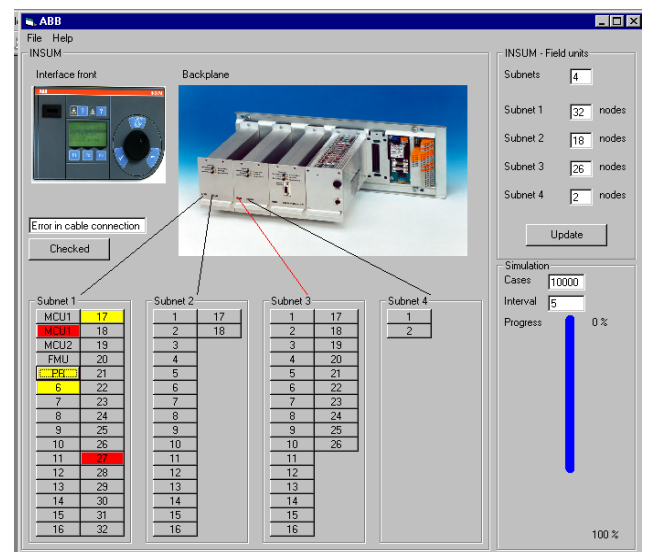


Fig. 2 - Example of the MMI of KEDI fieldbus diagnostic tool".

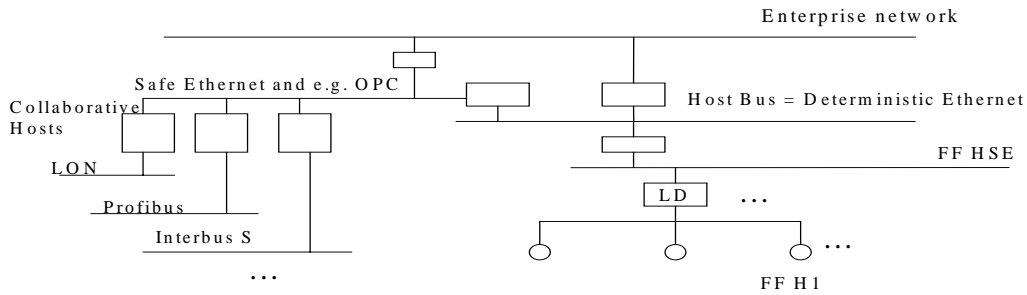


Fig. 3 - The new automation architecture.

parameters from every fieldbus specification and device groups are classified and mapped either into warnings or alarms. The numerical device diagnostic parameters will be decoded to readable messages in the tool. This function of showing online device diagnostic data to the user is based on the following: intelligent field devices and digital communication with them is offering a very useful “warning” level between the earlier “working” and “not working” levels.

The other purpose of the tool is to diagnose the fieldbuses in the automation network. The tool will make its configuration automatically, when it is connected to network. The tool will first recognize all the fieldbus OPC-servers. After that it will draw the structure of the fieldbus and all nodes connected to it. The tool will make deduction about which segment or bridge is not working. The fieldbus network will be shown graphically with using blinking colours to show which parts are not working properly.

The MMI of the tool (Figure 2.) will be made using WWW-technology so that the diagnostic data will be available all over the network. The structure of an alarming fieldbus will appear firstly to the user. When the alarming device is pressed, the status page (Figure 4.) of

the device will appear. That page can be linked to DCS-system, too.

In case of alarm, the device status page can be seen by pressing the device from process in the control screen. The yellow colour is used to show the warning level adverts.

IV. ADVANCING THE INTEGRATION OF THE FACTORY INFORMATION SYSTEMS

Fieldbus technologies and some other new technologies like OPC and XML will help factories to get forward in the integration of the factory information systems. Earlier, at least two steps have been reached in this integration:

- Planning data from investment projects can be delivered in electronic format to maintaining systems and used as maintaining data of factories;
- Data from the planning/maintaining system can be used automatically in DCS-system for configuration;

About a dozen different information systems with different user interfaces are still used to drive one factory. Every system usually has different data structures, which are not available in other systems. In the KEDI project, the integration is planned with following basic goals:

- All manually feeded data should be written to systems only once;
- Every data unit should have only one master storing address, where it can be updated by specified applications;
- Integration is not made by building bigger systems but building effective data changing between them;
- The number of user interfaces should be decreased;

XML will be one good technology to build common data structures. In the KEDI project, the aim is to get the maintenance system to store diagnostic data in XML format in such a way as to enable the diagnostic data to be used by other applications. The NOAH [3] project results will be utilized as far as possible to avoid the situation of the same things being defined again. In the project, such a solution is looked for as whereby the existing device descriptions will be presented in XML format. OPC interface is used as a good common interface technology for changing data between systems.

The fieldbus technology enables one step of integration towards field devices. When existing intelligent field

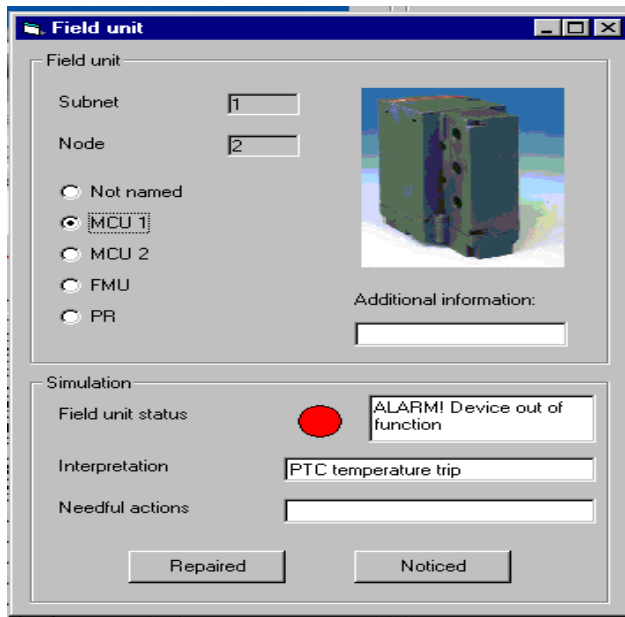


Fig. 4 - The status page of field device in the KEDI fieldbus diagnostic tool”.

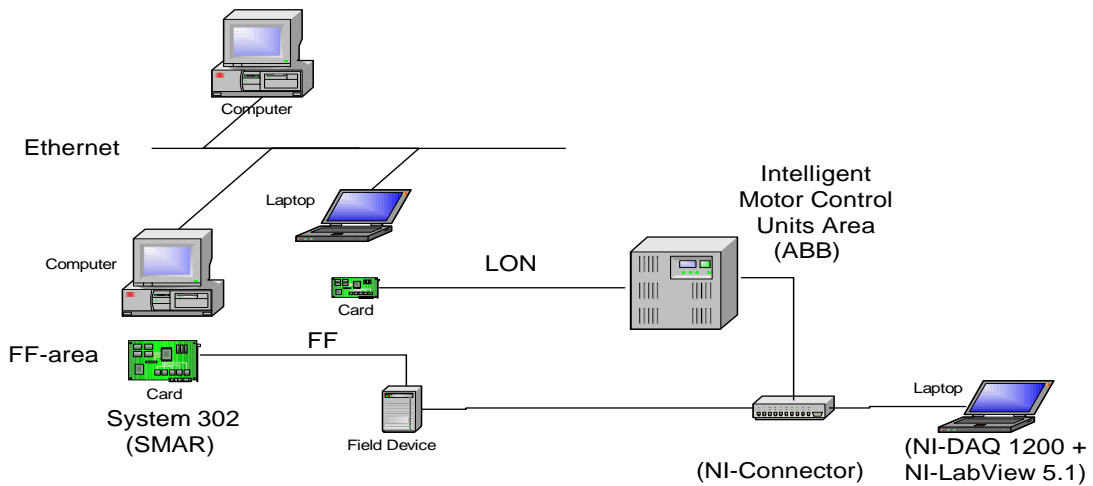


Fig. 5 - The speed testing devices of the KEDI project.

devices are communicating digitally with host systems, it is possible to upload device data to planning/maintaining systems and download configuration data to field devices. In the KEDI project this will be proven so that the planning/maintaining system changes data with the configuration tools of used fieldbuses.

V. TESTING THE CAPABILITY OF THE CREATED AUTOMATION ARCHITECTURE IN THE PULP FACTORY

The KEDI project is now carrying on with a factory acceptance test (FAT) on the whole solution. In addition to the basic functions, the speed of interlockings and fast control loops will be tested (Figure 5.). This testing is based on the results of the testing work made in Canada [4] and Japan [5]. The new area of testing in the KEDI project will be cases where devices of locking or control loops are in different segments and even in different fieldbuses. Time stamping and failsafe functions will be under special development work. After FAT, the

installation will be made to the pulp factory of UPM Kymmene in Pietarsaari, in Finland

V. CONCLUSIONS

The work in the KEDI project will continue to August 2001. The reports of the main results of the research and development work will be published subsequently.

REFERENCES

- [1] The KEDI Project Home Page, <http://www.vtt.fi/ele/projects/kedi/>.
- [2] Woll, D. "HSE" the Foundation to plant centric integration, FF General Assembly, New Orleans, USA, March 2000.
- [3] Network Oriented Application Harmonisation, EP 26951, <http://noah.loria.fr/>
- [4] E. Mueller, I. Verhappen, Foundation Fieldbus Interoperability Test Report, Edmonton, Kanada, 1999.
- [5] Chubu Trial Report, Fieldbus Foundation Japanese Liaison, Chubu Trial Team, 1999.