

Visualisation & Diagnostics

Experts interview Dr. Wolfgang Ebert, Prod. Manager Control Technology KUKA

The penetration of Industrial Ethernet on to the shop floor, historically the core area of automation control, puts IE technology in-to a new context.

Wolfgang Ebert*

Especially in the areas of visualisation/diagnostic and maintenance there are unwritten rules to consider, but also to bring new innovative potential into play. In the following discussion, Dr. Ebert from KUKA Schweissanlagen GmbH discusses his experience regarding this matter and the resulting decision in favour of the service tool IntraVUE from ICT GmbH and its US associated company NetworkVision Inc.

Stefan Schmitt-Walter (SWAC):

As a professional industry leader KUKA is well-known for their consistent and universal use of Industrial Ethernet (IE) in innovative system concepts, but also for their experience in its subsequent realization. It has been seen – not only by KUKA – that all traditional disadvantages associated with the industrial use of IE – lack of real-time or deterministic timing – were overcome using appropriate means. Before we come to



An extract from the Control-Web pilot plant at KUKA Schweissanlagen in Augsburg in Augsburg

Simple browser techniques instead of costintensive visualisation tools

the main subject: Dr. Ebert – where is KUKA today and where, in your opinion, is the automation

branch concerning the market – penetration of Web-based automation ?



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www.kuka.de



Stefan Schmitt-Walter, SWAC GmbH, Oberhaching. The company is one of Germany's leading

system integrators and product suppliers in the area of automobile automation

www.swac.de



Dr. Joachim Strobel, ICT GmbH, Business Development IntraVUE. The company, with its subsidiary, is an interna-

tionally active systems house for automation technology based in Munich/Grasbrunn

www.ictglobal.de

Dr Ebert (KUKA):

Under IE we understand the general use of Ethernet on all levels in the automation pyramid with secure communication to office networks as well as to the Internet. Suitable industrial hardware (plugs, cables, switches) form the basis. Apart from standard protocols such as HTTP, FTP, SNMP real-time 'dialects' like Modbus TCP, Ethernet I/P, NDDS and Profinet are used.

It is true that many previously classified technical K.O. criteria associated with IE can be over-

come through committed introduction of innovative concepts.

The automation branch has discussed the subject extensively. In small and medium systems the penetration is already very high. Especially teleservice, visualisation and diagnostic systems have generally benefited from this technology.

All current tenders for the auto-motive industry request an IE connection down to the PLC's, robot controllers and beyond that, to ap-prox. 80% of the technological control equipment (spot welders, shielded-arc welders, laser welders, gluing and gelling, HMI, etc.).

The first bodyshop plants with universal homogeneous Ethernet communication between all automation levels – including the field devices with the connection of I/O modules and also speed drives – are in the engineering phase and will go into production in 2005. KUKA Ro-boter GmbH respectively KUKA Schweissanlagen GmbH are

both taking a leading role in these projects.

KUKA sees Ethernet-based automation as an opportunity for a quantum leap in the functionality of automated production plant, through an optimisation of the cost / benefit ratio. Together with our partners we are leaders in the testing, specification and stan-

Quantum leap in the functionality of automated production facilities

dardisation of such solutions. Our prototype plant in Augsburg, operational since 2000, offers a first class example of this technology.

Dr. Stobel (ICT):

Today the use of automation equipment in pro-duction areas, due to the immense down-time costs, calls for the high-est demands on plant diagnosis: fast fault assessment and their rectification. Dr. Ebert, with the experience you have made, where do you currently see the greatest

challenge concerning the support environment when using IE ?

Dr Ebert (KUKA):

After ten years' of evolution, Field-bus technologies have set high standards with respect to their diagnostic capabilities. In the meantime there are Ethernet techniques (SNMP-based) available, which surpass these criteria. This

applies, even though Ethernet is considerably more complex and therefore susceptible to a far greater variety of fault-scenarios. The functionality covers hardware and software monitoring up to the network security. For IE it is important that the diagnostic results are displayed without delay in scaleable level of detail and complexity for administrators down to the plant operators. The organisation of network diagnostics is system-oriented with decentralised

servers and standard browsers, hence enable – in theory – a web-wide access to all necessary information. With this it sets new standards for visualisation, diagnosis and the operation of technological equipment. It is the first sign of a move away from manufacturer-specific, proprietary solutions to open-standard strategies. With this there are benefits for the plant integrator, the operator and lastly also to the component manufacturer. Network visualisation must on the other hand also be oriented on the traditional perspective of component diagnostics. Alarm handling and service scenarios must be communicated homogeneously. The various visual contents (e.g. communicational view, functional view, spatial arrangement of the system, etc.) should be generated easily and consistently.

Stefan Schmitt-Walter (SWAC):

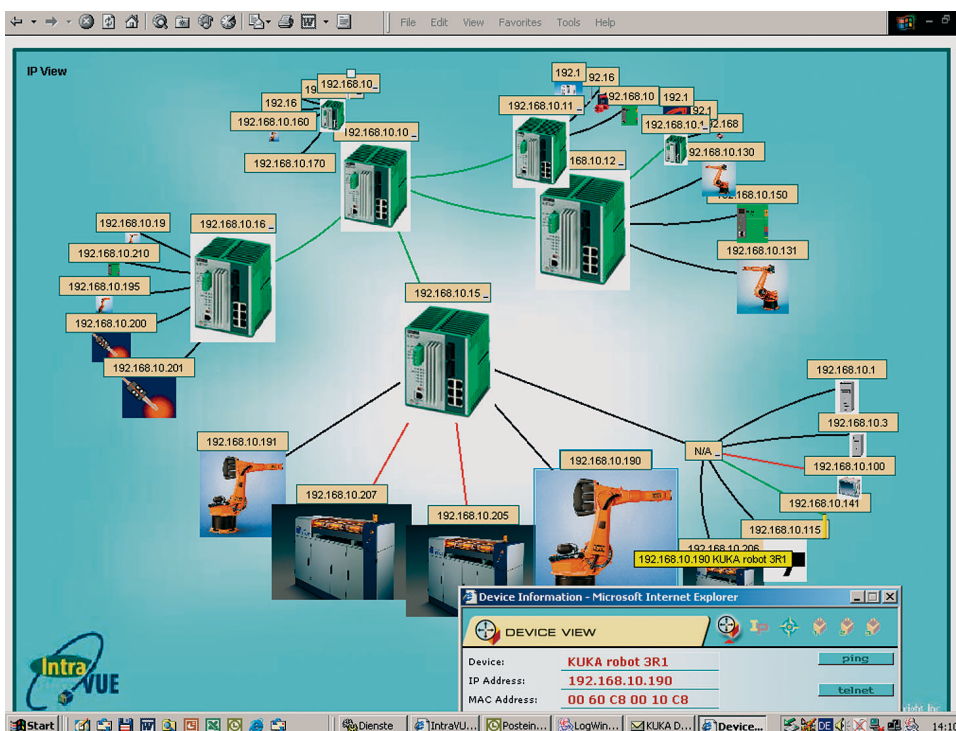
All service suppliers or system integrators are naturally interested in cost-effective, but also reliable commissioning and if needed even operational support of automation systems. With regard to this aspect, please tell us the KUKA requirements for a support-tool for use during commissioning, tuning and operation of IE-based control systems.

Dr Ebert (KUKA):

As advantages of Internet technology in the overall field of operation and monitoring the following are important:

- ▶ Simple browser techniques instead of cost-intensive visualisation tools
- ▶ Homogenous operating strategy replacing an incalculable variety of tools
- ▶ One-off training requirement against diverse application training
- ▶ Homogenous commissioning instead of component-specific methods.

An consistent, simple Man-Machine communication is especially decisive during the learning phase - meaning during commissioning. During this phase it is important



A screen generated using IntraVUE showing the KUKA Control-Web pilot plant, here with the "IP View", below right the IntraVUE Operating and Info window corresponding to one device in "De-vice View"

to recognise bottlenecks in the communication and their elimination to avoid cost intensive corrections in the future. SNMP, the universal dominating standard establishes the necessary transparency for this requirement.

An important advantage in Web technology lies in its unifor-

Dr Strobel (ICT):

It is in accordance with the KUKA system philosophy to distinguish between the relevant functions in production cells as Soft-PLC, or decentralised as embedded controls. What experience has KUKA regarding the resulting interface requirements for soft-

Dr Ebert (KUKA):

Error screens in automotive bodyshops are complex. Downtime can cost some 10000 € per minute. One can therefore assume a powerful, well trained service team. Their effectiveness can be optimised with the possibilities of web-based teleservices. This begins with automatically selected information – corresponding to the fault – for specialized service personnel (per SMS, Email, Jabber-Message, etc.), that provides fast guidance and support. Also using such experience-based failure-profiles, spare parts can be quickly and automatically procured via Ethernet.

Fast software updates and the immediate introduction of specialists from the supplier and plant integrators supplement this repertoire. Unfortunately, the network structures of our end customers do not offer sufficient safety strategies, enabling extensive use of these possibilities with an acceptable residual risk. Together with experienced partners in the area of IT-safety, KUKA offers support through the introduction of suitable safety concepts.

Network visualisation must be oriented on the traditional perspective of component diagnostics

Whether a robot should be put into operation, an I/O module or a fail-safe PLC – the procedure for obtaining information is the same. The attention is concentrated on the contents. The support from the system can also be very diverse. It can for example be particulars regarding the hardware ID-number, the software version, about the actual I/O and variables, information about the quality of the process, a diagnosis of the hardware, circuit diagrams, drawings, manuals, certification, measurement protocols, answers to FAQ's or repair videos, etc.

By using Web technology and dispersed servers in distributed control systems, modular subsystems are created with standardised communication interfaces.

The pretesting of a sub-system is no longer differentiated fundamentally from its integration in the overall system. The communication relationship is common between all participants. The responsibility is more clearly definable, eventual failures are therefore more quickly handled.

Therefore, we are demanding a consistent integration of servers in all relevant participants on the IE. The WebPages which are administered by the servers adhere to a plant 'style guide', laid down by the factory and the plant integrator. All information and visualisation techniques must be accessible for standard browsers. During commissioning it must also be possible to force outputs for test purposes – direct from the browser – in manual mode.

ware components, in particular on visualisation, diagnostic and maintenance servers.

Dr Ebert (KUKA):

Besides the requirements already discussed, to have WebPages available for all relevant aspects of a component, it should be stressed here: the support of the progressively increasing horizontal and vertical compression of information data within the automation pyramid. For this, generally a higher level server or respectively a client must be able, in the case of say an alarm message function, to access data (any objects) from any lower level. Accordingly, a requirement is

All information and visualisation techniques must be accessible for standard browsers

that all our servers offer an XML-conform data-access interface.

Stefan Schmitt-Walter (SWAC):

In connection with web-based systems for administration, purchasing, information services, etc. an often used marketing argument is that online access unrestricted by time and location to these services has become an indispensable, cost-saving element in the modern business world. How conclusive do you see this argument with respect to support of engineering, operation, servicing and documentation via the web in the life-cycle of a sensitive production plant?

Dr Strobel (ICT):

It is now exactly this parallelism in the opinion, how a generally acceptable IT visualisation and support tool should work, which our company has combined within a Beta contract. The result of this co-operation was the corresponding development and trial of our recently released product IntraVUE. We are proud that IntraVUE not only fulfils the requirement profile discussed here, but further provides a framework, according to a Single-Point-of-View (and Access) for distributed Web Server applications based on diverse user points of view. KUKA has undertaken its own market research and trials

((ENGLISCHE ÜBERSCHRIFT?))

IntraVUE is a product from ICT GmbH and its US associated company NetwareVision.

The objective is the online visualisation of IE network topology including wireless connections in an automatically generated, tree-structured 'one-level' presentation. Thereby device failures, communication-dependant bottlenecks, new participants, etc. are depicted by a colour change and archived as events in log files. Using configurable links, the device-documentation, tools, profiles, etc. corresponding to the network participants can be placed in a graphically oriented "framework" therefore making all information accessible in a context-dependant form.

<http://www.manufacturing.net/ctl/search:IntraVUE>

over the past few years.

Dr. Ebert if you would allow me to ask you a final question, where do you personally see the conclusive advantages in the IntraVUE methodology.

Dr Ebert (KUKA):

The most important attribute is the automatic generation of a complete image of the physical network structure and the continual update of the network status in the image. The IntraVUE screens, set standards in man-machine communication by its user-friendliness, intuitiveness and also its scalability for various grades of complexity. Above all it also offers itself for other uses, for example network configuration tools or wiring scheme editors.

Its unique representation, enabling a view of the network without obscuring the total structure, is only one of many aspects that should inspire, through their imitation, the further development of visualisation systems. Without wanting to repeat myself in all details, I would like to conclude: IntraVUE fulfils straight-away the majority of our previously stated requirements.