



LOYTEC

# Express

Magazine for Building Automation

English  
October/2015

Case Study:

PentaControl AG convinces Hotel  
Industry with LWEB-900 BMS

Guest Author:

Words are the Source of  
Misunderstandings

Competence Partner:

MR-Tech: Building Technology with  
Heart and Mind

L-STUDIO 61131 – Engineering  
for Generations

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October 2015



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## MASTHEAD

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DI Hans-Jörg Schweinzer, CEO  
LOYTEC electronics GmbH

## Building Bridges

Here in Vienna there was the Eurovision Song Contest and their slogan was "Building Bridges". This thought of Building Bridges is more relevant than ever. In times when millions of refugees are moving towards Europe, we will have to build many human bridges – now and also in the years to come. Above all, politicians are faced with challenges that are not yet answered and certainly not solved.

It is also essential to build bridges in the area of building automation – both on a technical and on a human scale. Unlike politics, we can count on solutions that actually work. You may ask yourself: "How is this possible?" and "How can a manufacturer contribute to the solution?" Let me explain this, using an example from room automation. In a properly automated room, heating, ventilation, air conditioning, lighting, and in most cases also sun blinds should become a coordinated unit. Only this way synergies can be perfectly used, leading to increased comfort while energy demand drops.

In practice, however, the subsystems HVAC (heating, ventilation, and air conditioning) and electrical (lighting and sun blinds) are planned, assigned, and implemented completely independent of each other for the most part – you might already have experienced or you can imagine the outcome. The path to a proper working system often is a path of trial and tribulation. But with the right technology and products, these pains can be successfully controlled. The bridge to success

that we as a manufacturer are building, is based on the use of DALI and SMI to control lighting and sun blinds. These technologies allow the electrician to do his job as usual. Through the use of LOYTEC L-DALI Controllers, installation can be tested with a few quick moves directly on the controller. If, for example, all luminaires and drives can be controlled by one controller, the electrician's work is done. In the next step, the HVAC company in charge integrates the electric systems via BACnet or LON – the appropriate communication objects (data points) are automatically provided by LOYTEC controllers.

Here, we were able to build several bridges at once. From a technical point of view, the bridge between DALI or SMI and BACnet or LON and from a human perspective through the unique interface between the different subsystems that prevents any discussions about project responsibilities.

Let us build bridges – in our jobs and in dealing with others.

DI Hans-Jörg Schweinzer  
CEO



# L-STUDIO 61131

## Engineering for Generations

LOYTEC has developed a large variety of programmable controller devices over the past years. The L-INX automation servers, the L-IOB I/O controllers, the L-ROC room automation controllers, and the LIOB-AIR VAV controllers. What's common to all these devices is their flexible programmability for different applications by our customers. What's also common is the fact that all controllers must have communication interfaces for the various communication protocols used in building automation systems e.g. BACnet, LON, Modbus, M-Bus, EnOcean, SMI, DALI etc. What's also common is the fact that almost any building automation system must have a user interface, typically web-based for configuration, maintenance, and sometimes for daily operation.

It can be clearly seen that all programmable devices have similar requirements for the design process of logic, data point communication, and visualization. Hence it is only natural that our customers only want to deal with one engineering toolset in order to configure our programmable devices. Up to now we have two different programming tools in house: L-LOGICAD for the L-INX and the L-IOB I/O controllers and L-STUDIO for L-ROC and LIOB-AIR controllers. The reason behind is that L-INX and L-IOB controllers are programmed according to the IEC61131 programming standard and the L-ROC and LIOB-AIR controller are programmed according to the IEC61499 programming standard. After listening very carefully to our customer's feedback we decided about 2 years ago to add IEC61131 programming support to the L-STUDIO engineering tool and in the distant future only have one toolset in order to program all LOYTEC devices.

Just in time for the Buildings under Control Symposium 2015 we are about to show a new L-STUDIO engineering toolset that supports both, programming according to IEC61499 and programming according to the IEC61131 standard. We believe that this will be a major milestone in our product roadmap since we not only support IEC61131 but a complete engineering tool to create logic and data point configurations and visualization within a single framework.

If you wonder why we are going to support the older IEC61131 standard in the modern L-STUDIO, the answer is simple. There is a big



group of well experienced IEC61131 programmers in your engineering departments and there might be a comprehensive IEC61131 library in your portfolio, which we want to support on our programmable controllers.

### L-STUDIO Concept

The new L-STUDIO 3.0 has been redesigned from ground up to now support IEC61499 and IEC61131 programmability even mixed and matched on the same controller device. If libraries have and will be developed in one or the other programming language will not matter, they can be used together in a new project. I want to give the following examples. Our LIOB-AIR VAV library has been developed in IEC61499 in order to get the benefits of this language. This library typically needs no maintenance by our customers. But our air handling unit library will be developed in IEC61131 since this library typically needs adjustments by our customers for the specific air handling unit configuration. Even so the two libraries use different programming languages they will perfectly work together in a building.

### IEC61499 Highlights

Programming a building automation system in IEC61499 programming language honestly sounds to me the more intuitive way of solving an automation task. The event based approach actually follows the behavior of a building. Here are some examples. The event "temperature sensor change" triggers an algorithm to adjust the heating or cooling valve. The event "push a button" turns on a lamp. The event "CO<sub>2</sub> content increase" triggers the algorithm to open the damper and bring in more fresh air. You must agree that event based programming sounds like a good way of attacking building control algorithms. But of course event based programming can be very tricky sometimes and is typically not in the portfolio of a building automation engineer. There will be training and gathering experience in a project required before any new library development can begin. Distributing a complex control algorithm to multiple controllers, a hardware independent library development, or XML source code that replaces proprietary binary files are additional highlights of this programming language. Figure 1 shows an example of a typical IEC61499 program with the event path and the data path.

### IEC61131 Highlights

During the development of L-STUDIO 3.0 we have been trying to carry as many positive aspects of the IEC61499 programming over to the IEC61131 programming style. We can embed IEC61131 programs into IEC61499 application programs and use the distribution and communication system of IEC61499. L-STUDIO 3.0 supports the

programming languages for function blocks and programs shown in Figure 2.

What we see in the bottom half of Figure 3 is a simple program as a function block diagram. This function block diagram has been uploaded from the controller into a test container in L-STUDIO. We can stimulate the inputs of this function block by setting the inputs in the top right corner. The results of this function block diagram can again be observed in the bottom half of Figure 3. In addition to uploading a program into a test container for debugging purposes, we can also enable the watch function in order to watch the live variables on the controller. All standard IEC61131 library functions are available from a drop down menu as shown in Figure 4.



**Dipl.-Ing. Dr. Dietmar Loy**  
CTO, LOYTEC electronics GmbH

Dipl.-Ing. Dr. Dietmar Loy has been CTO at LOYTEC electronics GmbH (Managing Partner) since 2002. Within the management board, Dr. Loy is responsible for product development and innovation, product manufacturing, the engineering staff and the company's budget. After his graduation from University of Technology Vienna in the field of electronics engineering and telecommunications (Master, PhD, with distinction „sub auspiciis praesidentis“), he worked from 1992 to 1999 as teaching and research assistant at the Institute for Computer Technology of University of Technology Vienna, interrupted by a year (1994/95) at Motorola in Austin/Texas, USA, where he was working as an ASIC Design Engineer.

From 1999 to 2002, Dr. Loy worked at Coactive Networks, San Francisco, USA, first as a system design manager, after that as director of hardware engineering. Dr. Loy published several books on automation technology and numerous articles in technical magazines.

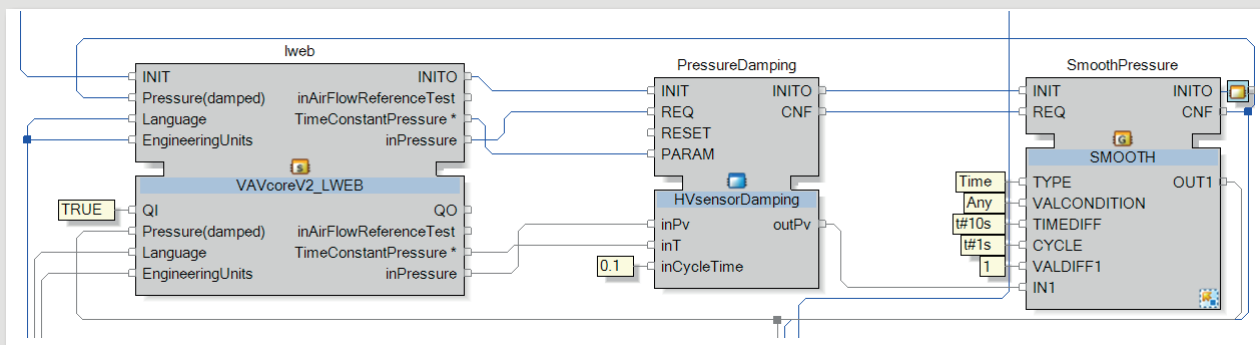


Figure 1: IEC61499 program fragment showing the event path and the data path.

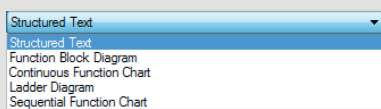


Figure 2: IEC61131 supported languages.

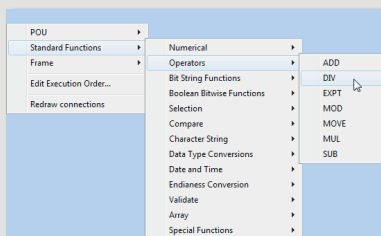


Figure 4: IEC61131 standard library functions.

## Logic/Communication/Graphics

L-STUDIO 3.0 not only allows engineering the logic in IEC61131 or IEC61499 programming language, but uses the built-in L-INX configurator to engineer the data point interface for communication via BACnet, LON, Modbus, M-Bus, OPC, EnOcean, MP-Bus, SMI, DALI etc. Figure 5 shows the embedded L-INX configurator to create and modify the data point interface for the controller device. Not only the L-INX configurator for data point management has been embedded into L-STUDIO, but also the L-VIS configurator has been embedded in L-STUDIO in order to create the graphics for L-VIS touch panels or for LWEB-802 or LWEB-803 projects. This means that every IEC61131 function block or program now consists of logic, the data point configuration and one or several graphical pages to visualize the data from this function block. Figure 6 shows an example of a graphical representation for an air filter with a filter guard to indicate filter clogging. Various graphical designs can be added to a function block to meet different styles or complexities of the information presented to different user groups. The building operator might only see an alarm symbol vs. the maintenance personal will also see the differential pressure across the filter and the operating hours of the filter.

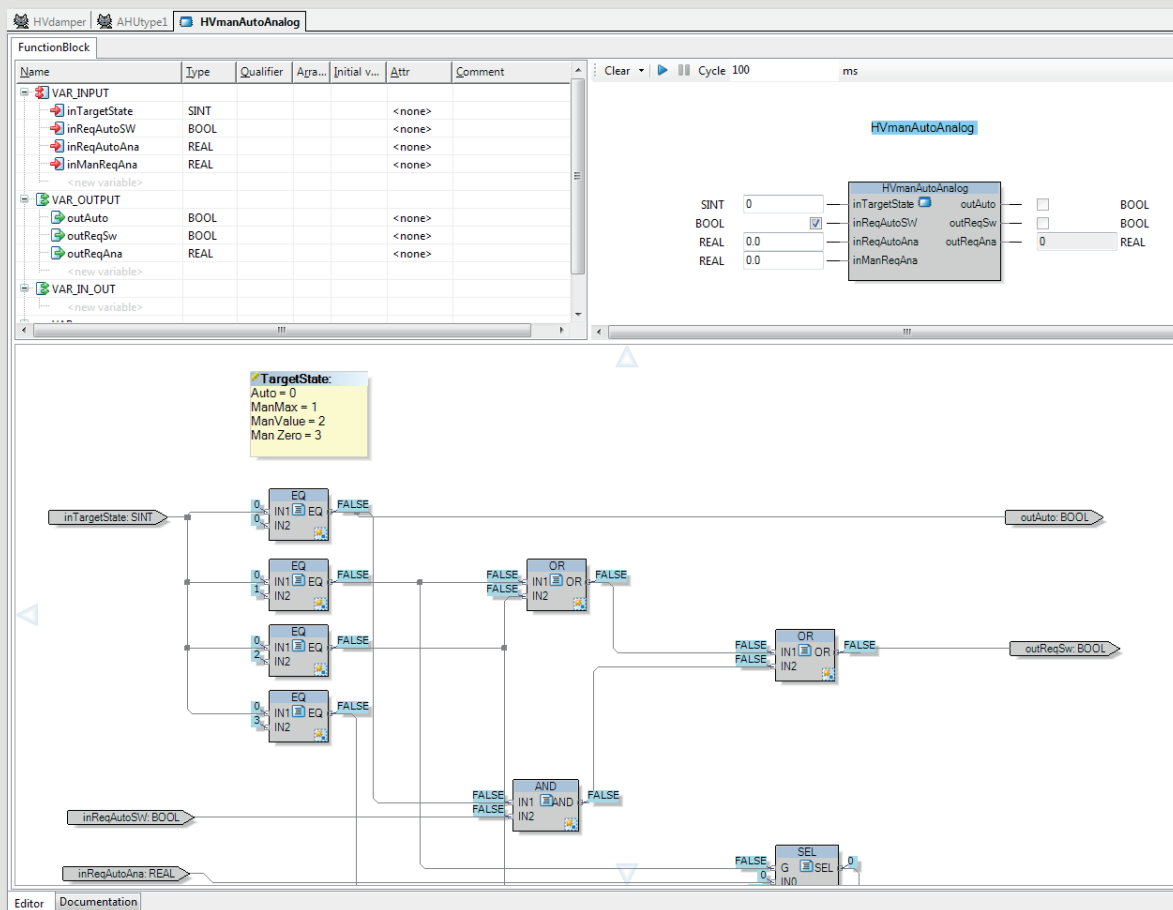


Figure 3: IEC61131 function block diagram in a test container.



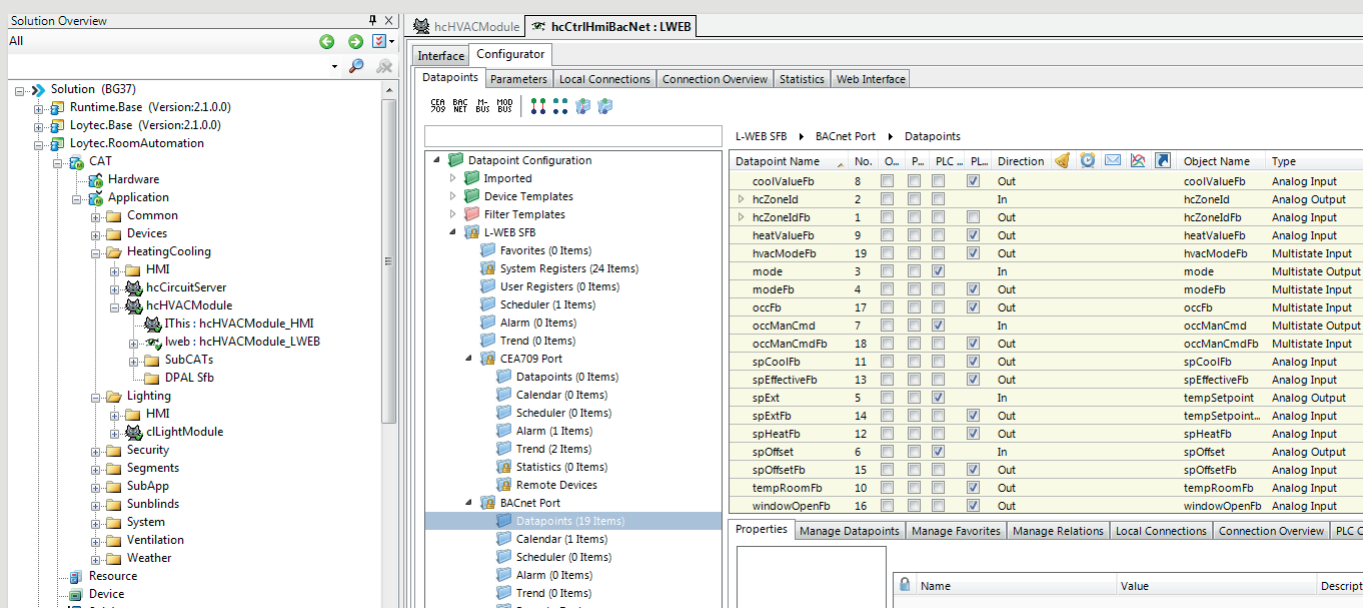


Figure 5: The embedded L-INX configurator creates the data point interface of the controller.

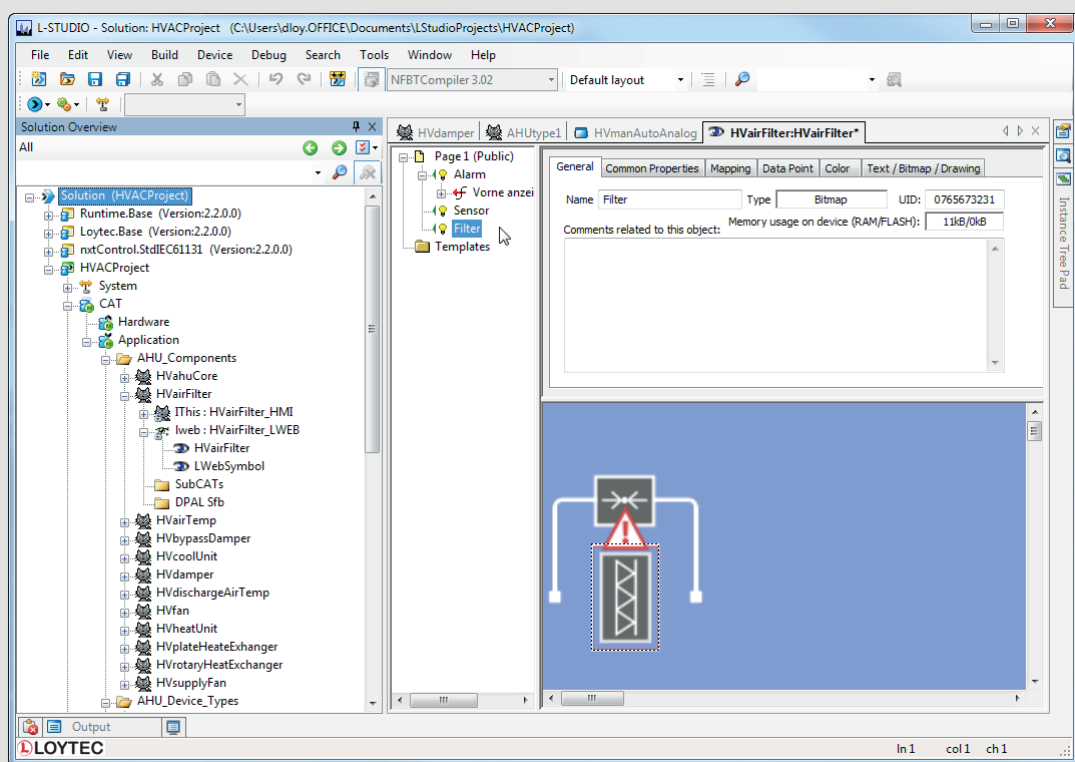


Figure 6: L-VIS configurator embedded in L-STUDIO for the design of graphical pages.

## XML Software Project

Most programming tools store the function blocks and programs as binary files where the user has no chance to look inside the file. In L-STUDIO all files are XML files and human readable. If we take as an example the function block from Figure 3 and look at the XML file in Figure 7, we can clearly see the XML description of the EQUAL and OR operators used in this example – since all files are text files they can be checked into a revision control system and different versions of a program can be compared line by line. The subversion revision control system is already built-into the L-STUDIO and connects to a subversion server for revision control. Every module tells

its history and allows engineers to revert to a distinctive revision as shown in Figure 8.

## Documentation included

Every library object has its private documentation area as part of the L-STUDIO engineering database. The documentation is subdivided into an Abstract and a detailed design description with a WYSIWYG user interface. The embedded L-INX configurator will automatically generate documentation for the data points and the attached I/O configurations. The embedded L-VIS configurator automatically creates documentation for the data points and controls used in the graphical designs.

```

<FOU Name="FNCT1" Type="EQ" x="1080" y="820" Namespace="Main" FOUType="Function">
  <Attribute Name="Configuration.GenericFBType.InterfaceParams" Value="IEC61131.Standard#CNT:=2;INS(CNT):UDINT" />
  <Parameter Name="IN2" Value="0" />
</FOU>
<FOU Name="FNCT2" Type="EQ" x="1080" y="1120" Namespace="Main" FOUType="Function">
  <Attribute Name="Configuration.GenericFBType.InterfaceParams" Value="IEC61131.Standard#CNT:=2;INS(CNT):UDINT" />
  <Parameter Name="IN2" Value="1" />
</FOU>
<FOU Name="FNCT3" Type="EQ" x="1080" y="1400" Namespace="Main" FOUType="Function">
  <Attribute Name="Configuration.GenericFBType.InterfaceParams" Value="IEC61131.Standard#CNT:=2;INS(CNT):UDINT" />
  <Parameter Name="IN2" Value="2" />
</FOU>
<FOU Name="FNCT4" Type="EQ" x="1080" y="1680" Namespace="Main" FOUType="Function">
  <Attribute Name="Configuration.GenericFBType.InterfaceParams" Value="IEC61131.Standard#CNT:=2;INS(CNT):UDINT" />
  <Parameter Name="IN2" Value="3" />
</FOU>
<FOU Name="FNCT5" Type="OR" x="2180" y="1120" Namespace="Main" FOUType="Function">
  <Attribute Name="Configuration.GenericFBType.InterfaceParams" Value="IEC61131.Standard#CNT:=2;INS(CNT):BOOL" />
</FOU>

```

Figure 7: XML description stored on file for the example program in Figure 3.

Revision history:

Revision	Author	Date	Comment
710	trauscher	25.09.2015 16:19:37	Added GUIDs to CATs and Symbols
212	trauscher	28.01.2015 10:58:11	Moved communication to Loytec.Communication libraryAdded Weath...
159	trauscher	11.11.2014 11:11:11	Fixed manual occupancy in italy project

Figure 8: Module history from the subversion revision control system.

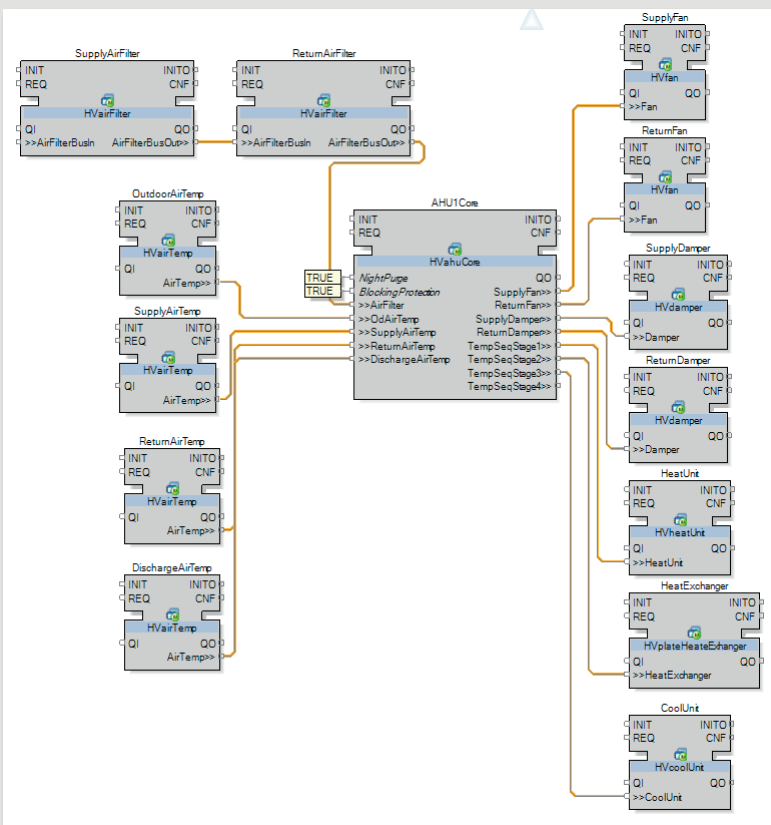


Figure 9: The modular air handling library design simplifies maintenance and usage.

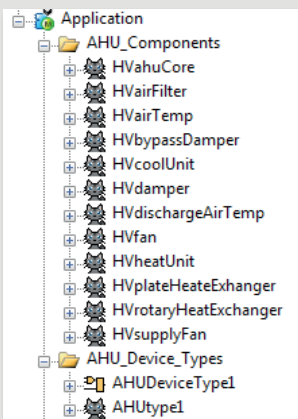


Figure 10: AHU components list.

Documentation is available in pdf and HTML format.

## Multi Language User Interface

The L-STUDIO comes with an English and German user interface and soon traditional and simple Chinese will be available as well. The logic library supports ASCII characters for variable names and instance names but will also support Unicode characters (Chinese, Japanese, ...) in the near future.

## Libraries

Currently LOYTEC provides a ready-made library for room automation with L-ROC controllers and a VAV library for LIOB-AIR controllers in IEC61499 language. Soon our building automation library for heat circuits, boilers, air handling units, water source heat pump etc. will be available in IEC61131 language for our L-INX controllers. All libraries are structured in modules that can be dragged from the library to the drawing board. The architecture of the air handling unit library is shown in Figure 9 and the AHU components are shown in Figure 10.

## Template Based Design

L-STUDIO supports a template based design flow. Some customers have a planning tool that can output design data for creating the application automatically. As an example a building has five heat circuits, two boiler plants and two air handlers. L-STUDIO can import external design data and automatically create the logic, the data point configuration, and the visualization for this building. The import format is an XML format defined by L-STUDIO. With a simple converter program this XML file can easily be created.

## Supported LOYTEC Devices

L-STUDIO supports all L-ROC, all LIOB-AIR and the following L-INX models: LINX-12x, LINX-22x, LINX-15x, LINX-112/113, LINX-212/213. L-STUDIO will not support our current family of L-IOB I/O controller but our next generation IP based L-IOB I/O controllers. Having L-STUDIO support on all these devices does not mean that we no longer support and maintain L-LOGICAD – it will be fully supported in the future but we now offer an option with a fully integrated design flow with L-STUDIO.



Thoughts about the Use of Language in Building Automation

# Words are the Source of Misunderstandings



by Prof. Dr. Manfred Büchel

“Words are the source of misunderstandings” – one could think that Antoine de Saint-Exupéry, who put these words in the fox’ mouth during its conversation with the little Prince, was working in building automation.

Or how would you understand statements like:

- “The downstream heating circuits on the distributor in the roof control center are adjusted and according to the weather/outside temperature and are given a load-dependent compensation of room temperatures from the individual room controls.”
- Release of supplementary control from heat generation with storage charging time release by time switch program to nominal DHW storage temperature or when going below the reduced DHW storage temperature

If that’s the language of building automation, it is not surprising that our industry too often fails in promoting what it actually is: A system with the ability to help building owners in achieving reliably, economically and energy efficiently operating buildings through intelligent solutions.

## What’s the Reason of this Language Problem?

Indeed, this question cannot be answered in just one sentence. There are many aspects to be considered: Writings that are the result of tight deadlines, the complexity of the subject, the certainly not grown human skills of linguistic expression, and many more that, however, can’t be helped.

That’s disastrous, because we need a language in order to describe what we do: Whether to enthuse or, at least, convince others, to inform or “simply” just express what one can expect from our work. Especially the



**Prof. Dr. Manfred Büchel**

Westphalian University of Applied Sciences, Gelsenkirchen

Prof. Dr. Manfred Büchel has been the head of the laboratory for building automation and control systems at the Westphalian University of Applied Sciences in Gelsenkirchen, Germany since 1992. Prior to this, he worked for several large international companies in the fields of research & development, operational management, and application technology for instrumentation and control systems for 13 years. He studied and graduated in physics at the RWTH Aachen University, Germany. He is a publicly certified expert for building automation. As a member of VDI he was involved - partly as a chairman - in preparing several VDI guidelines.

latter is – as banal as it may sound – what lawyers call the contractually agreed scope of construction works.

“The contractual performance must be described clearly and exhaustively, so that all candidates must understand the description in the same way and can calculate their prices with certainty and without extensive preparations”, as simply and unambiguously stated in § 7, Para. (1) VOB/A (German tender regulations for construction work).

### And how does it work in Practice?

“That’s not what we have expected!”, “Who says so?”, “We’ve always done it that way ...”, are often heard quotes during acceptance tests that get to the heart of the situation: Functions that people do not understand and that cannot be verified, as they are either not or inadequately described.

Of course, our technology is complex. A technical correct and complete description of its functions leads to texts that only an expert would understand. There is nothing wrong with this per se, as we are not dealing with laymen, but with specialists at this level. Have you, as a non-medics, ever tried to understand a doctor’s report? It is rather concerning that even specialists gifted in languages quickly reach their limits in trying to explain all possible connections and linkages of a system clearly and exhaustively.

The civil engineer (!) Karl Culmann said already towards the end of the 19<sup>th</sup> century that “drawing is the engineers’ language”. Only with the help of appropriate drawings, plans, and sometimes even lists, we are able to describe plants. That applies to their construction, but in particular to their functions. For this reason, there is the building automation

scheme of the VDI guideline 3814 for almost 50 years that was designed for documenting control structures and diagrams from the outset. For 7 years, the same guideline includes the part 6, where the handling of the state chart for presenting open loop control functions is depicted.

These drawings/schemes together with the building automation function list are fully sufficient to entirely and above all verifiably describe a plant’s functions.

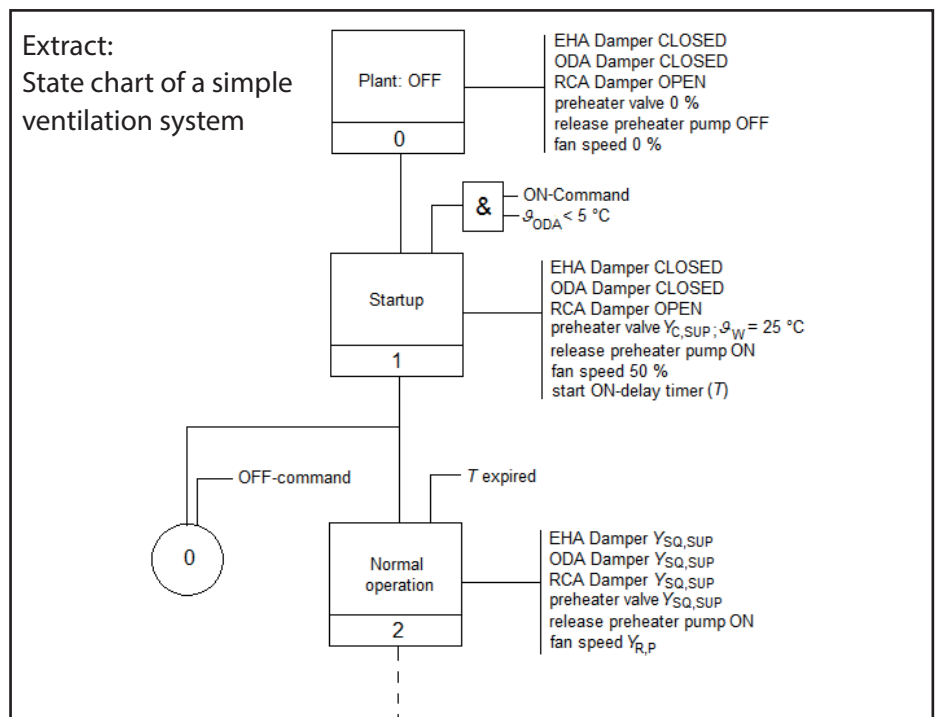
Thereby, the state chart is by no means an invention of building automation engineers. Known under different names, it is a proven tool in control technology to describe control processes of completely different levels of detail for a long time.

What is a state? A state describes a concrete situation in a plant’s “life”, characterized by the current constellation of actuators under the control regime. The controller sets a state as a consequence of specific events that the sensors have reported to the system. A state is active as long as new events cause the controller to activate the subsequent state.

Following an example:

A simple ventilation system that is in the “OFF” mode, changes to the state “startup” if the event “ON command” occurs and at the same time the outside temperature is below 5 °C. “Startup” means that the outside and exhaust air damper remain closed and the circulation air damper remains open. Simultaneously, the controller switches the preheater valve to the exit of the supply air temperature controller (set point = 25°C), releases the preheater pump and sets the speed of the fans to 50%. At the same time, the controller starts a timer of the duration T.

The expiration of the time T marks the point in time at which the state “startup” is left and the transition to state “normal operation” takes place. Now, the controller hands over the outside air damper, the circulation damper and the preheater valve to the sequence of supply air temperature control. The speed of the fans is set by a pressure controller. The set points for supply air temperature and pressure control come from the management and operating unit. To think features of a plant in states offers advantages in every stage of





project management. In the planning stage, a systematic structure is created that forces the planner to reflect all situations and let him recognize "white spots" in planning immediately. The dialog with other trades is enormously simplified if they admit to this language. Over time, a construction with recurring elements that can be used in the subsequent project occurs – "Copy and Paste" – similar to the common bad habit while creating verbal descriptions, but with sense and intelligence.

The constructor of the control system receives a specification that he can apply virtually one to one in a program. This happens systematically with conventional programming tools (each state is formulated as SR latch). Programming is even easier if the manufacturer of the building automation system provides the programming language "Sequential Function Chart (SFC)" according to IEC 61131-3. SFC uses the elements of the state chart. Then, programming essentially means "transferring the state chart" – manually, until further notice. Bearing in mind, however, that drawing the state chart by means of customary planning tools is already possible today, thus, the following prediction is allowed: The automatic export of state charts to a programming environment is only a question of time respectively of market demand ...

Finally it should be noted that a specification prepared by an engineer, like the state chart, is an ideal basis for systematic functional checks of building control systems. The system "tells" in which state the plant currently operates or has been operated in the time period X. A glance at the state chart shows what thus should happen at the sensors and actuators within the plant. Hence,

the target state is described and can be reviewed with current or historical values from the building automation system. The retrospective, current or ongoing quality control of building service plants by means of building automation is therefore possible. To examine this systematically and develop suitable software solutions, is, among other things, subject of a research project that is sponsored by the Federal Institute for Research on Building, Urban Affairs and Spatial Development.

The state chart is and remains a description method for functions (also) of building automation. However, a description method whose potential exceeds that of a conventional plan by far. It's applicable across all trades and across the entire course of a project from planning to set-up up to acceptance tests and also afterwards during operation.

Hence, the state chart possibly is the language that refutes the quote of Saint-Exupéry. For the business, this would be good ... ■

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# The L-DALI System - The Lighting Solution for a Digital Future

## The Path to Success of Digital Lighting Control

Intelligent lighting control systems are in great demand. With the technology leap for LED technology, lighting control enjoys even greater recognition. As LEDs require electronic ballasts for control either way, additional costs for the digital control of these electronic ballasts are low. It is not a coincidence that in the past two years almost every large airport in Europe changed,

is currently changing, or is planning a changeover to LED technology while simultaneously implementing lighting control. Also operators of underground stations, railway stations, and stores are increasingly attracted by this intelligent lighting solution. Finally, that's the prophecy, no commercial building is any longer built without digital lighting control. The reasons for that are simple:



Manchester Airport reduced the energy usage of its Terminal 2 by 1,000 MWh annually by installing a LOYTEC lighting control system.



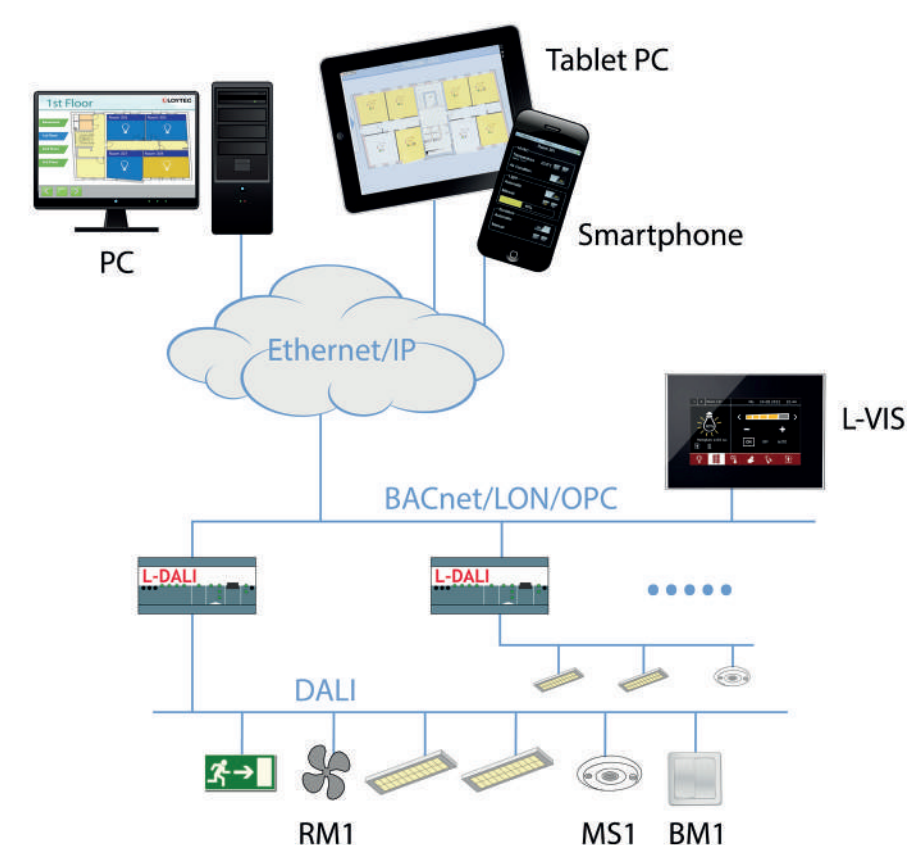
- Intelligent lighting control allows reducing energy consumption by 30–60 % in addition to savings from the changeover to LED technology. Because of the low additional investment costs in the course of a change, usually, investment pays off in less than 2 years.
- In addition to energy savings, maintenance effort is considerably reduced, as operating parameters like fault conditions, operating hours, and energy consumption can be accessed centrally for each individual luminaire.

### DALI – The Standard for Digital Lighting Control

Whoever mentions digital lighting control often refers to DALI, at least when cost efficiency and long-term security of investment are an issue. The first LOYTEC DALI controller was introduced in 2006, long before the current trend appeared. With almost 10 years of experience in DALI lighting control and the L-DALI family of products, LOYTEC has a powerful and well proven solution for this area. It further allows partners and customers to be part of this trend and implement the most modern lighting control systems. In the following, I would like to introduce to you the individual components of the L-DALI system and give an overview of different application scenarios.

### The LOYTEC L-DALI System

The L-DALI Controller is the heart of the system. Depending on the model, the L-DALI controls up to 4 DALI channels, this means up to 256 luminaires in total. The built-in DALI bus power supply saves costs and space in the control cabinet. The LCD display together with the jog-dial enables an easy setup. Thus, the IP address can be configured and a simple check of the connected DALI channels can be performed. Due to these local operation capabilities,



LOYTEC L-DALI lighting solution system overview

maintenance tasks, like the replacement of broken DALI devices that are typically performed by an in-house technician do not require any PC or notebook.

The lighting application integrated in the L-DALI Controller covers all standard application scenarios like presence-dependent control, constant light control, corridor light, scheduling etc. Different parameters allow for a flexible adaption and thus for customized solutions. What's more, different control strategies can be combined, for example, depending on the time of the day.

The L-DALI Controller is also in charge of monitoring DALI devices. If a device fails or reports an error, e.g. a lamp failure, an alarm is generated and logged. In addition, energy consumption and operating hours are calculated. Of course, popular features of the other LOYTEC controllers such as alarming, historical trending, event-driven e-mails, etc. are available, too.



**Dipl.-Ing. Jörg Bröker**  
LOYTEC electronics GmbH

As product manager for the L-DALI product family, Jörg Bröker is master over light and darkness at LOYTEC.

The L-IP and L-Switch network infrastructure products are also among his competences. After studying computer technology at University of Technology Vienna, Jörg joined LOYTEC 15 years ago.

He made significant contributions to the development of several communication stacks, LOYTEC's technology abstraction layer and LOYTEC's firmware modularization concept.

Apart from L-DALI Controllers, the L-DALI system also includes sensors and actuators required for lighting applications. All L-DALI sensors and actuators are connected via the DALI bus with the L-DALI Controller. As the devices draw energy from the DALI bus, no additional power supply is required. Hence, cabling is easy and cost-effective.

The LDALI-MS1 Multi-Sensor delivers lux and presence information that is necessary for constant light control and presence-dependent control.

With a maximum installation height of 5 m and a typical coverage of 38 m<sup>2</sup> (installation height: 3 m), the LDALI-MS1 is an extremely cost-effective solution for most application scenarios. If any special requirements, e.g. a high installation height in a warehouse, have to be met, or if specified for any other reasons, it is also possible to use DALI sensors from various other large manufacturers (Osram, Philips, ThebenHTS, Tridonic, etc.).

With the LDALI-BM1 Push-Button Coupler, customary light push-buttons and switches are integrated into the DALI system in a simple and cost-effective way. Per LDALI-BM1, four inputs are available. The actions triggered upon buttons being pressed can be configured flexibly (dimming, on/off, scene recall, changing color temperature, etc.). Buttons can also be used to manually override any automatic operation.

Finally, the LDALI-RM1 Relay Module allows integrating non-DALI luminaires and other loads that are controlled by the L-DALI together with the lights. Typical application scenarios are fans in toilets or washrooms or motors for partition walls or screens that should be moved up or down according to the scene.

Commissioning is done either via the web interface that is integrated in the L-DALI Controllers or through a PC based configuration software. The latter also allows an offline pre-configuration of the system: All parameters,

group assignments, scenes and connections for the lighting applications can be made beforehand in the office using a PC. Hence, commissioning on site (online) is limited to the assignment of physical devices. This can also be carried out conveniently through the web interface. Various wizards and a user interface, which is continually improved with the feedback from our customers, facilitate these tasks substantially and allow using less qualified staff for this task. This is an important aspect, as for commissioning on site there is often little time left.

### It's the Communication, Stupid<sup>1</sup>

While other manufacturers traditionally rely on closed, stand-alone solutions, the LOYTEC L-DALI system provides all communication interfaces common in building automation systems. All values and parameters can be accessed via open and standardized protocols like BACnet, LonMark, OPC, and web services.

<sup>1</sup> Based on Bill Clinton's quote: „It's the economy, stupid!“

The screenshot shows the LOYTEC CLC Bindings web interface. On the left, a sidebar contains navigation links: Device Info, Data, Commission (with sub-links for CLC Bindings, DALI Groups, DALI Installation, and DALI Scene), Config, Statistics, Documentation, Reset, Contact, and Logout. The main content area is titled 'CLC Bindings' and shows configuration for 'Channel 1'. It includes a 'Save' and 'Reload' button, and a checkbox for 'Automatic internal binding'. Below this, there are two sections for 'Constant Light Controller 0 (K119-Lager-R1)' and 'Constant Light Controller 1 (K119-Lager-R2)'. Each section has a 'Find Sensors' button and a 'Lux sensor' field set to 'NV unbound'. For the first controller, the 'Ch4: Light Sensor 0 (P1)' is set to '19 lux' with 'Calibrate' and 'Wink' buttons. The 'Occupancy' field is also 'NV unbound', and 'Ch4: Occupancy Sensor 0 (P1)' is set to 'unoccupied'. The 'Light Band 1' is 'NV unbound' and 'Ch1: Group Actuator 0 (K119-Lager-R1)' is set to '0 %'. The second controller has similar settings for 'Lux sensor' and 'Ch4: Light Sensor 1 (P2)' set to '15 lux'. A vertical text 'networks under control' is overlaid on the left side of the main area.

Commissioning via PC software or comfortable web interface.

This opens up numerous possibilities:

- The lighting system can be seamlessly integrated in other systems (HVAC, sunblind control, access control) and the building management system. For example, sensor information like presence status, provided by the LDALI-MS1 can be made available to different other parts of the automation system (e.g. HVAC, access control). Vice versa, this information can also be provided by other sensors or other sources in the building automation system (e.g. access control). Similar, push-buttons connected to the LDALI-BM1 can be used to control other subsystems (e.g. sunblinds) or push-buttons connected to I/O modules (BACnet, LonMark) can be integrated in the lighting application.
- Visualization and operation of all room functions is performed via consistent user interfaces, whether using web-based operation, touch panels or the visualization of the building management system. This not only saves money as hardware and software resources are shared, but also significantly increases user satisfaction. No one wants to install separate smartphone apps to control the lights and the room temperature.
- DALI sensor information and dim values are shared between L-DALI Controllers. Hence, lighting applications can be implemented across several controllers.
- If specific lighting functions are required that are not covered by the integrated lighting applica-

tions, it is possible to implement these functions in any freely programmable controller (e.g. LOYTEC L-INX). In this case, the L-DALI Controller is merely a gateway to the DALI system, which allows controlling DALI lights and receiving values from DALI sensors or push-buttons.

### Manual Operation increases User Satisfaction

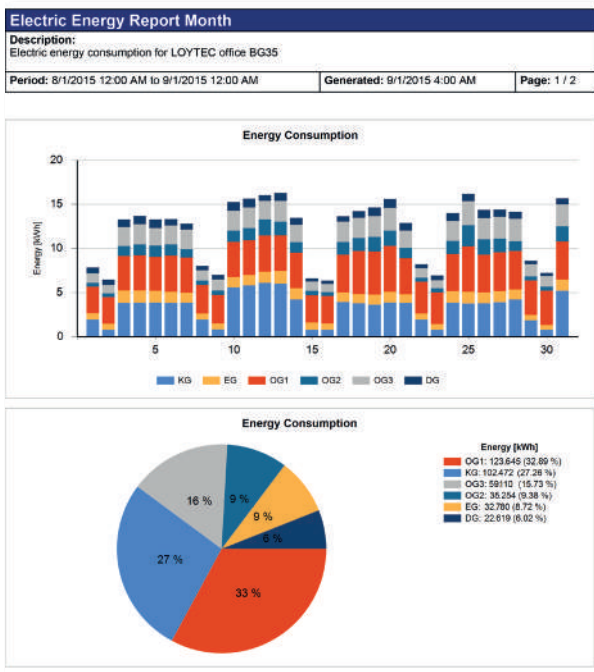
Studies on user satisfaction reveal that the option to locally override automation functions substantially increases acceptance. Moreover, sophisticated lighting systems as those of conference rooms, lecture halls, or restaurants allow configuring different lighting scenarios maybe including changing light color. So in most cases there must be an option for manual control.

Besides operating lights through common push-buttons via LDALI-BM1 and a wide variety of different L-VIS Touch Panels, the L-DALI system can also be operated via the HTML5 web-based user interface LWEB-802. If an automatic operation is implemented, such web-based, virtual room control units provide a cheap alternative to mechanical switches and touch panels: The basic features are covered by the automatic mode, while manual user interventions are possible via the office PC, a tablet, or a smartphone. This way it might even be possible to completely go without any mechanical switches and touch panels, a major cost factor. For smaller projects, the L-WEB application can be



The L-DALI System offers a wide selection of operator interfaces.





Gain an overview with powerful reporting functions.

directly hosted on the L-DALI Controller, whereas a central hosting (e.g. LWEB-900) is recommended for larger projects.

### Do not forget Operation and Maintenance

We often forget that only powerful visualization, reporting, maintenance, and alarming features ensure the smooth operation of the lighting system. As the L-DALI system supports open communication standards, it can be easily integrated into any building management system on the market.

With LWEB-900, LOYTEC provides a scalable, server-based, multi-user ca-

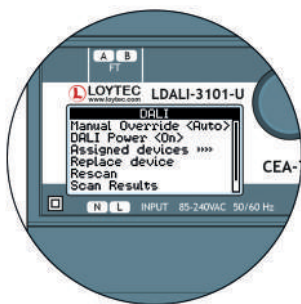
pable and full-featured building management software. The software can either be installed on a local server or rented as a service.

Using its powerful visualization features, the status of the lighting system can be displayed and parameters, control strategies and schedulers can be altered comfortably. That's important to consider changes in the room usage or to optimize the system in terms of energy consumption

and user comfort. Alarms reported by the system can either be displayed in the front end of the building management system or sent via e-mail.

Any value or parameter of the system can be stored in historical trend logs for subsequent analysis and reporting. Special features such as reports on the status of the system and the connected DALI luminaires and monitoring luminaire operating hours allow to ideally plan maintenance cycles. With the help of powerful reporting functions the collected data is presented in the form of energy consumption reports, room usage statistics, or maintenance lists.

Efficient backup and restore functions at all levels of the system – whether L-DALI Controller or DALI device – ensure a high availability of the system. As soon as a broken part is replaced, the device configuration can easily be restored using the last known backup. Hence, these tasks can be accomplished by in-house technicians minimizing maintenance costs.



Simple maintenance tasks can be performed directly on the device.

### DALI Quick Facts

- DALI is a manufacturer-independent standard for digital lighting control standardized by the international standard IEC 62386. All large and a growing number of small manufacturers support this standard and provide an ever growing portfolio of DALI devices.
- DALI signifies simple cabling and high reliability. Only two additional wires are necessary in addition to the three wires required for mains supply. Up to 300 m cable length with free topology are permitted. Connection to the ballasts is polarity insensitive.
- DALI supports up to 64 ballasts per channel that can be grouped together. Per channel, 16 groups are available.
- DALI devices report the device status (e.g. lamps failure).
- Besides DALI ballasts and luminaires, DALI-compatible sensors and push-button couplers are available. However, these device types are not yet covered by the DALI standard. These devices are usually powered via the DALI bus.





# LWEB-900 as BACnet Operator Workstation

With version 2.0, LOYTEC's LWEB-900 building management system has also "learned" BACnet. This way it is possible to not only integrate LOYTEC devices, but also BACnet/IP compatible devices from third party manufacturers.

The LWEB-900 server communicates via an integrated BACnet/IP interface. In the first step, basic BACnet settings such as port number, instance number and different communication parameters (APDU timeout, max. APDU length etc.) have to be set.

If the server is not in the same IP subnet as the other BACnet devices, the LWEB-900 server can also register as Foreign Device in a Broadcast Management Device (BBMD) of a remote IP subnet. All broadcast requests are carried out by the BBMD device on behalf of the L-WEB server and the answers are forwarded accordingly to the

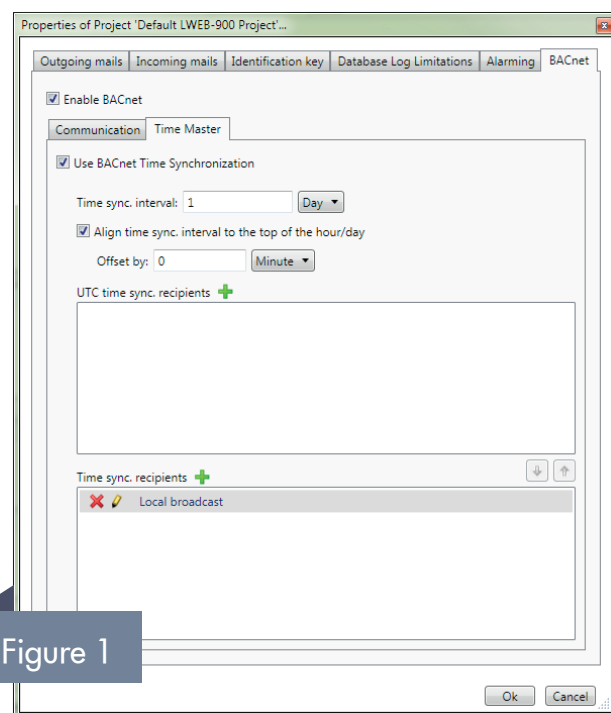


Figure 1

L-WEB server. In that way, BACnet communication can also be used in more complex IP setups.

### A Matter of Time

In order to process alarms, schedulers, and trends, it is crucial to synchronize all devices in a network to the same time base. Usually, the windows server on which LWEB-900 is being operated is synchronized with an Internet time server via the NTP protocol. To keep the devices' internal clocks within the BACnet network in sync, LWEB-900 features the BACnet time server functionality (Figure 1). The addresses of the devices to be synchronized can either be added to a list or the time can be broadcasted to the local subnet or the whole network. As a time source, the standard time UTC or the local time are available.

### Seek and you shall find

BACnet devices, just as LOYTEC devices, can be added separately to the database. If there is an on-line connection established with the network, the server reads out the new devices and takes over the available BACnet objects of the devices in the LWEB-900 database.

However, it is also possible to scan the devices in the network (Figure 2). All BACnet devices are listed and can be selected to be entered into the database. In a second step, the objects are read from the devices and integrated into LWEB-900 (Figure 3). In

case that the devices to be integrated cannot be directly addressed, an EDE file import is available to add the configuration of the BACnet devices to the database.

A BACnet browser has been integrated into the LWEB-900 server for further parameterization of BACnet devices (as depicted in Figure 4). In the browser, all BACnet objects with their properties, both required and also

optional, can be scanned and modified. The browser is a very useful tool for commissioning and parameterization of BACnet devices. Plus, it may also provide valuable information when searching for errors in the BACnet communication.

Once the devices are added to the database, the BACnet data points can be used in the same way as OPC data

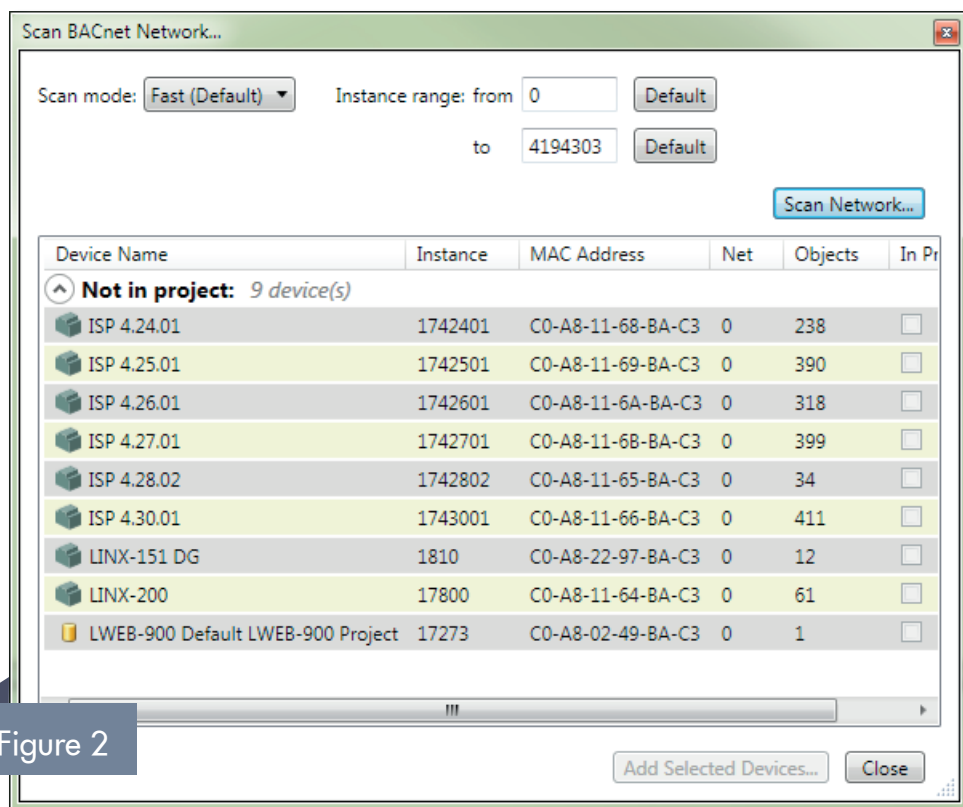


Figure 2

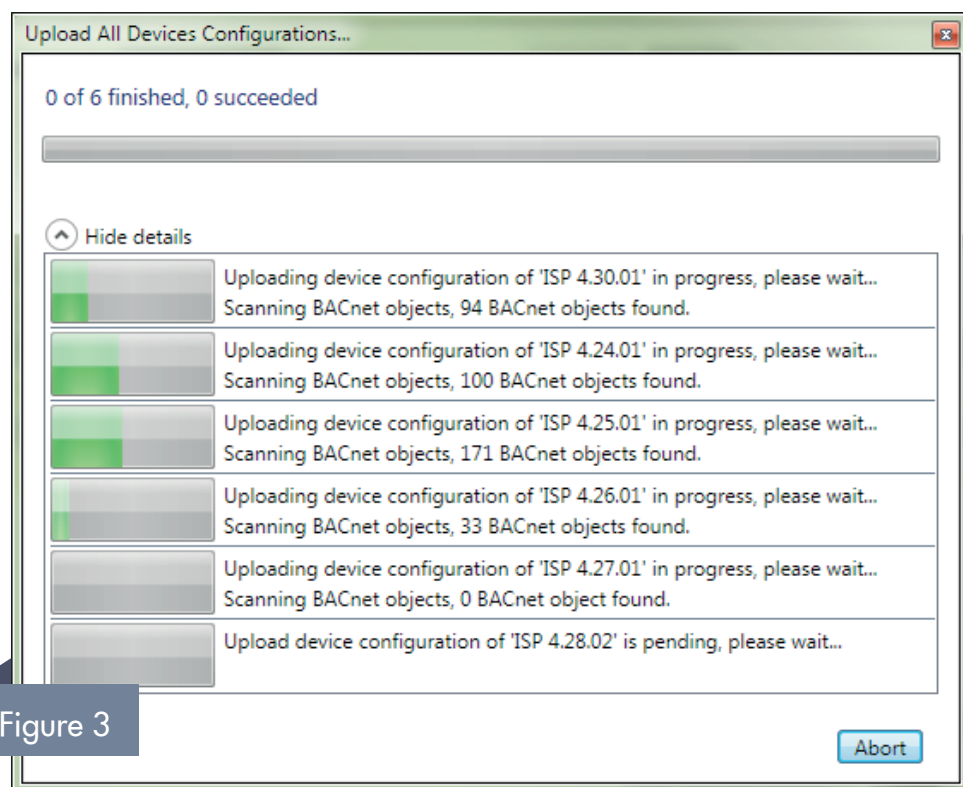


Figure 3

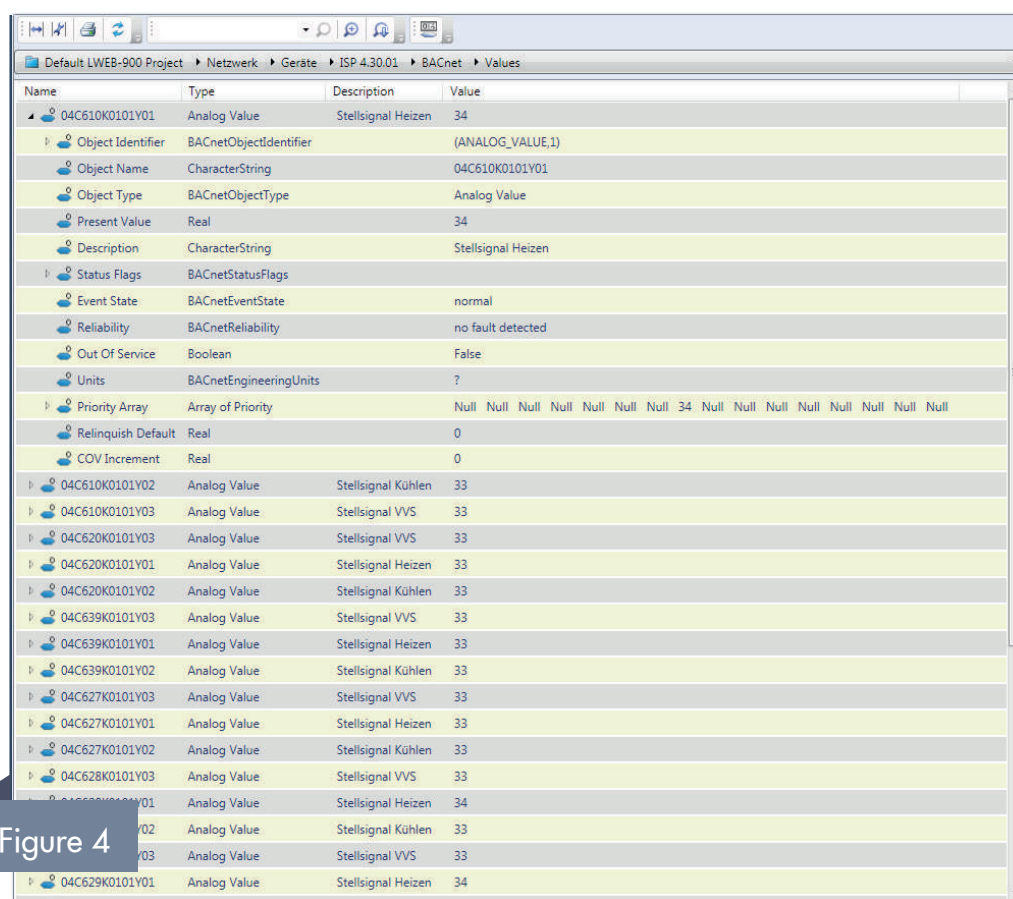


points in LOYTEC devices. It is also possible to display the values of an object e.g. in watch view or graphical view. There is no difference in creating views for OPC data points or BACnet objects – the LWEB-900 server automatically chooses the right communication method. Not only the “simple” BACnet objects such as analog, binary, or multi-state data points can be processed, but also schedulers, alarms, and trends are supported by the LWEB-900 server through the respective BACnet objects.

## Alarms

As soon as BACnet devices are added to the LWEB-900 data base, the LWEB-900 server registers as an alarm recipient in the device. Thus, if an alarm occurs in the device, it is immediately displayed in the LWEB-900 interface. There, it can be evaluated and acknowledged, just like alarms from LOYTEC devices. Thereupon, the LWEB-900 building management system uses respective BACnet methods to acknowledge the alarm in the de-

vice keeping the alarm state both on the device and in all alarm clients in sync. Any changes of the alarm state can be recorded in the alarm log and the event log. Thereby, the alarm trend can be traced back in time, to see at which point in time the alarm has occurred and which user has acknowledged it. Optionally, a comment can be requested from the user in order to be able to acknowledge the alarms of a certain priority.



Name	Type	Description	Value
04C610K0101Y01	Analog Value	Stellsignal Heizen	34
Object Identifier	BACnetObjectIdentifier	(ANALOG_VALUE,1)	
Object Name	CharacterString	04C610K0101Y01	
Object Type	BACnetObjectType	Analog Value	
Present Value	Real		34
Description	CharacterString	Stellsignal Heizen	
Status Flags	BACnetStatusFlags		
Event State	BACnetEventState	normal	
Reliability	BACnetReliability	no fault detected	
Out Of Service	Boolean	False	
Units	BACnetEngineeringUnits	?	
Priority Array	Array of Priority	Null Null Null Null Null Null Null 34 Null Null Null Null Null Null Null Null	
Relinquish Default	Real	0	
COV Increment	Real	0	
04C610K0101Y02	Analog Value	Stellsignal Kühlen	33
04C610K0101Y03	Analog Value	Stellsignal VVS	33
04C620K0101Y03	Analog Value	Stellsignal VVS	33
04C620K0101Y01	Analog Value	Stellsignal Heizen	33
04C620K0101Y02	Analog Value	Stellsignal Kühlen	33
04C639K0101Y03	Analog Value	Stellsignal VVS	33
04C639K0101Y01	Analog Value	Stellsignal Heizen	33
04C639K0101Y02	Analog Value	Stellsignal Kühlen	33
04C627K0101Y03	Analog Value	Stellsignal VVS	33
04C627K0101Y01	Analog Value	Stellsignal Heizen	33
04C627K0101Y02	Analog Value	Stellsignal Kühlen	33
04C628K0101Y03	Analog Value	Stellsignal VVS	33
04C628K0101Y01	Analog Value	Stellsignal Heizen	34
04C628K0101Y02	Analog Value	Stellsignal Kühlen	33
04C628K0101Y03	Analog Value	Stellsignal VVS	33
04C629K0101Y01	Analog Value	Stellsignal Heizen	34

Figure 4

Device	IP address	Type	Last backup	Device status	Location
ISP 4.30.01		BACnet/IP		Ok	Geräte
ISP 4.24.01		BACnet/IP		Ok	Geräte
ISP 4.25.01		BACnet/IP		Ok	Geräte
ISP 4.26.01		BACnet/IP		Ok	Geräte
ISP 4.27.01		BACnet/IP		Ok	Geräte
ISP 4.28.02		BACnet/IP		Ok	Geräte

Figure 5

## Schedulers

Schedulers of BACnet devices can be managed in the LWEB-900 server via the master scheduler. This way it is possible to organize similar schedulers within a network – whether located on the same or on separate devices – in hierarchical view. The user can create entries for the scheduler on different hierarchical levels. All schedulers that are located below this level automatically receive the respective entry. Thus, a great number of schedulers can be managed efficiently. Was this function previously reserved for schedulers in LOYTEC devices only, it is now also available for BACnet devices.

## Trends and Reports

For long term recording, data of BACnet trend objects is read from the device and



stored in the LWEB-900 data base in periodic and adjustable intervals. Of course, it is also possible to display trend data in a table form or as trend curves through the LWEB-900 user interface.

For deeper analysis of the data, the integrated report generator is available. By using predefined templates, reports can be created fast and conveniently and also a PDF file can be retrieved and sent automatically via e-mail. For the evaluation of data, calculations like subtracting counter values, counting impulses, or summarizing run times on the basis of on/off events can be carried out. The provided templates cover the most common applications, e.g. energy data evaluation or comparison of consumptions over various periods of time. In the reports, data is displayed both in graphic and also in tabular form.

### Data Backup

To be protected against system failures, it is important to have a current backup of the devices available for being able to rapidly exchange a failed device in order to keep the system operational. As the device configuration changes over time due to adaptations and extensions, in practice, it is often difficult to keep data backup up to date manually. Thus, the LWEB-900 system offers the possibility to create a backup plan for the devices and to store all backup data in the database fully automatically (Figure 5). For the new BACnet support, the standardized BACnet backup/restore service is used, thus, also BACnet devices from third party manufacturers that implement this service benefit from this backup mechanism.

### Conclusion

With the implementation of a direct BACnet communication in LWEB-900, the LOYTEC building management system advanced to a fully-featured BACnet Operator Workstation. The new features extend the possible fields of applications specifically with systems, where BACnet controllers are already used that are now modernized using advanced LOYTEC technology and that should be complemented by a full, server-based building control system. ■





# Building Technology with Heart and Mind

The multitude of tasks that are necessary to operate a building are at a first glance hardly suggestive. All subsystems must be included in a uniform assessment to ensure that everything runs perfectly "behind the façade".

## Technical Building Management – Building Control System

A shopping mall, an office building, and even an entire airport are, despite their robust impression, extremely sensitive constructions. This includes not only architectural and static details, but also the most different issues, requirements and provisions that control and automate the smooth utilization and functioning of a building.

The technical services of the company MR-Tech Gebäudetechnik GmbH are matched to the requirements of various usages and automation tasks of buildings and properties. Permissions, technical planning, maintenance, energy management, installation of building automation

on – MR-Tech pays attention to a properly functioning organism of a building and delivers information instead of data. Directly, reliably, and personally!

## The Company

In the almost two decades in which Mr. Ing. Maximilian Riegler was working for international companies, the customer's call for independence grew louder. This led to the foundation of MR-Tech by a handful of experienced thoroughbred technicians.

MR-Tech focuses on open standards and is positioned as a system integrator. This means that not only products and systems are sold, but rather ideal solutions are developed in collaboration with the customer (partner). During the company's short history, it has already established itself as reliable partner in the field of building automation in Austria.

MR-Tech offers competent, reliable and personal support in all relevant areas of service. It is part of the company's philosophy to render services with its own team and know how. That's the basis for smooth processes and also for the steadily growing confidence of customers in both employees and technology.

## All Services at a Glance

The great challenge for MR-Tech in the project Business Park Vienna was to use a technology for the tenant-specific improvements that

both integrates existing components and systems and also guarantees interoperability.

For the area of tenant improvements and modifications, a transparent, tangible, and value added presentation of the building automation's intelligence, both for the operator and the tenants, was the given task. The energy supply center was adapted after energetic optimization and integrated into the overall system.

The concept included the following requirements:

- Sensors based on EnOcean as the dividing walls are made out of glass.
- Actors on the basis of LonMark TP/FT-10 to adapt the flexible room usage to changed usage requirements with minimal effort.

The following subsystems had to be integrated in the concept:

- Lighting,
- Sunblind control,
- Cooling ceilings,
- Convectors,
- Energy supply,
- Energy monitoring.

Without a comprehensive system integration and the consequent use of standardized communication protocols for interconnecting the individual systems, such a project couldn't be implemented economically.







#### The Solution:

#### L-INX Automation Servers for integrating all Components

The field bus level was adapted and integrated on the basis of LOYTECL-INX devices on the LonMark TP/FT-10 channel. Hereby, major advantages are the extremely short cycle times and the standardized communication protocols.

#### L-INX Automation Servers for the Integration into the Building Control Network

The L-INX has been configured as LON network participant. Of course, it is possible to fulfill user-dependent

password settings superordinate through operational management.

Thus, depending on the meaningfulness, certain functions are locked respectively are only made visible while not allowing any switching operations.

#### LWEB-803 as Graphical User Interface

The floor plan of the individual elements has been represented with LWEB-803 in a scaled way. By selecting the respective rooms, the user

has the possibility to perform appropriate user settings.

#### Result

Optimization of the human machine interface based on customary mobile devices and also energy efficiency, cost saving, and a valuable assessment with an eco-friendly design and mode of operation. ■

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#### LOYTEC PRODUCTS:

- 13 x L-IP
- 13 x L-Switch
- 7 x LINX-150
- 1 x LINX-151
- 8 x L-IOB I/O Module
- 110 x L-IOB I/O Controller
- 2 x LENO-800
- 1 x LWEB-803
- 5 x L-MBUS







Floor Plan View



Detailed View of Input Area



Sub-distributors with L-IOB Modules



Widget for direct Access via  
Desktop PC





# Intelligent System Integration for Renewable Energy Control

**C**ustomer Solutions Development Co., LTD. ("CSD") was founded in 1971 and is offering IT solutions to various sectors of social and industrial infrastructure. CSD has over 45 years of experience in the field of automation for industrial modernization and IT system architecture and focuses on the following solutions:

## Core Solutions

- Stable power-supply technique,
- Control systems for other industries such as railway, steel and newspaper.

## New Solutions

- PV (photovoltaic) Monitoring & Management Service,
- Energy-saving systems,
- Environment Harmony-Energy Management System(EH-EMS).

CSD was founded in the 70s, in the early days of the software industry. This time was marked by the transition from a hardware-software integrated platform business towards an unbundling software business. Since then, CSD has been expanding its business in the software industry supported by its partners.

Facing the 21<sup>st</sup> century, CSD formed its new vision "Environment and Safety" working on the creation of a safe, secure, and comfortable smart community. On the one hand, natural energy like solar power or wind power provides substantial benefits for climate and health. On the other hand, it is a very unstable resource which is easily affected by weather conditions and impacts on short-term frequency stability, voltage stability and transient stability.

CSD is trying to solve these issues by using communication technology to control the system and to balance supply and demand of electricity. Of course, by taking into consideration environmental and energy issues such as the control of CO<sub>2</sub> emissions, energy savings and stability of energy supply worldwide.

The company believes that the following challenges in the smart grid solution business will be its next stage of business:

- Maintaining a stable energy supply incorporating natural energy such as solar or wind power,
- Creating a smart community as an energy-saving community incorporating natural energy,
- Establishing a smart wiring system,
- Establishing both a smart micro grid and grid security.

This new business and its services have been developed in the era of the Internet. The company believes that this new age of smart grid solutions will certainly be favorable for its business.

# CSD

Customer Solutions Development

[www.csd.comway.co.jp](http://www.csd.comway.co.jp)





# PV Monitoring & Management System with LOYTEC Technology

The "PV Monitoring & Management System" is an energy solution that helps customers to comprehensively manage the operational status, monitor real-time power, forecast next 24 hours PV electricity output, and generate plans for the following days in commercial solar power generation facilities.

## The Energy Solution

- "PV Monitoring System" for monitoring the PV power plant status,
- "PV solar power generation simulation" to forecast a short to mid-long term power generation based on the solar power forecast and the characteristics of the PV power facilities.

The unmanned onsite monitoring system and the automated sending of regular e-mails with operating reports/alerts help to reduce initial and maintenance costs. The system

further allows to check the operating efficiency, comparing the forecast of power generation with the measured values.

## Overview

The PV Monitoring & Management System allows:

- Collecting and monitoring climate data, facilities status, output of PV onsite,
- Saving and measuring data at the monitoring/control center via the network,
- Displaying and recording of the operating status of the whole PV power plant on the web screen,
- Controlling of switches by a remote control of the opening and closing devices such as CB (circuit breaker), if needed,
- Simulating the PV electricity output of the next 24 hours and the following day's generation plan.

## Functions

Metering/Monitoring/Displaying/Recording/Data Transmission/Control

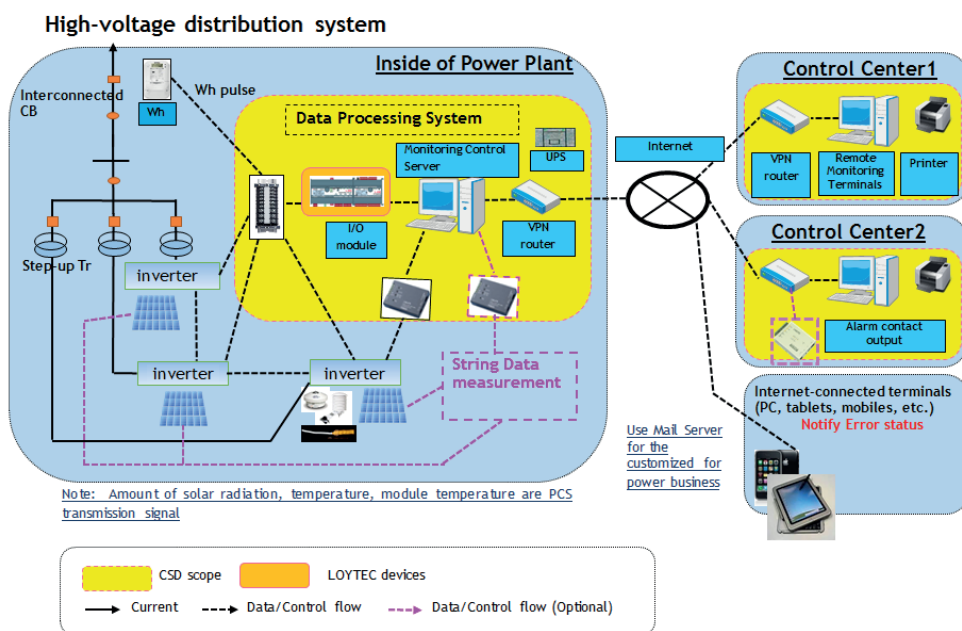
In the past two years, CSD delivered more than eight systems of a total capacity of 7.9 MW in Japan. ■



## LOYTEC PRODUCTS

LPOW-2415B Power Supply  
LINX-200 Automation Server  
LIOB-151 I/O Module

## System Configuration



# Extension of the District Office in Sigmaringen, Germany



„A Common Base for all Technical and Organizational Processes“

**A**t the end of 2014, the extension of the district office in Sigmaringen, Germany was completed. The four-storied office building with 8,300 m<sup>2</sup> accommodates 190 employees.

“We want to be modern and energy-efficient. It is all about reducing running costs in future”, states the former district administrator Dirk Gaerte at the groundbreaking ceremony in 2012. In order to fulfill these requirements, the following measures were planned:

- Thermal insulation of the building to on average approx. 25–30 % below the required levels of EnEV (German Energy Conservation Regulation) 2009.
- Efficient sunblinds control with conductance factor of  $\leq 0.2$  according to VDI 2078 and automatic slat adjustment according to the sun position.
- Use of efficient lighting installations with specific connected load of 2.5 W/(m<sup>2</sup>100lx) on average.
- Use of geothermal energy for heating and cooling.
- Air-conditioning plants with efficient fans and heat recovery installations.
- Aspiration of outside air for air-conditioning plants via geothermal heat exchanger.

- Building automation system with energy efficiency class A according to DIN EN 15232, with demand controlled functions and user-oriented room functions.

## The Automation Concept

Already in the planning stage it was clear that a common base for all technical and organizational processes in the building has to be created to ensure that the demanding requirements are met.

The planning department Heidemann und Schmidt created the necessary preconditions with a system-wide integral planning. The LOYTEC Competence Partner HGI, Heger Gebäudeautomation Ingenieurgesellschaft mbH, was commissioned to implement the building automation for this project. HGI is not only a pioneer in all things related to LonMark systems, but also known for its professional handling of technically demanding projects throughout Germany. A major reason for the successful implementation of planning was also the exceptionally good cooperation between all parties involved, starting from the planning department Heidemann und Schmidt, HGI as a contractor, LOYTEC, and last but not



least the customer itself. From the very beginning, all protagonists have been working together in a targeted and solution-focused way.

For HVAC and room automation, the district office Sigmaringen opted on the implementation of a LonMark system using both twisted pair and also Ethernet/IP networks as the basis for technical communication. BACnet has been defined as the protocol for the management level. In order to do without separate gateways, automation servers have been required that simultaneously integrate and automatically map standard protocols such as Modbus, M-Bus, LON, and BACnet. The LOYTEC Automation Servers LINX-150 and LINX-151 that have been chosen for this task meet both these conditions. L-IOB I/O modules were applied to connect physical data points. The LCD display on the I/O modules shows data point designations in clear text and data point states dynamically for all in and outputs.

Besides the automation servers for the entire control of heating, ventilation, air conditioning, and also higher-level room automation functions, LOYTEC also delivered all infrastructure products for the LonMark system.

### Commissioning

As the distance to the construction site was more than 600 km, it was decided upon the commissioning of the 1,000 LON nodes and the LOYTEC automation servers via remote dial-in.

Each individual bus participant could therefore be imported, parameterized, respectively programmed in the database in advance at the office.

The devices were then handed over to the electrical contractor for the final installation. Commissioning respectively regulating was done by an on-site automation engineer and a programmer connected from the office. These measures helped to reduce staff and travel expenses by 25 %.

### The Building Management System (BMS)

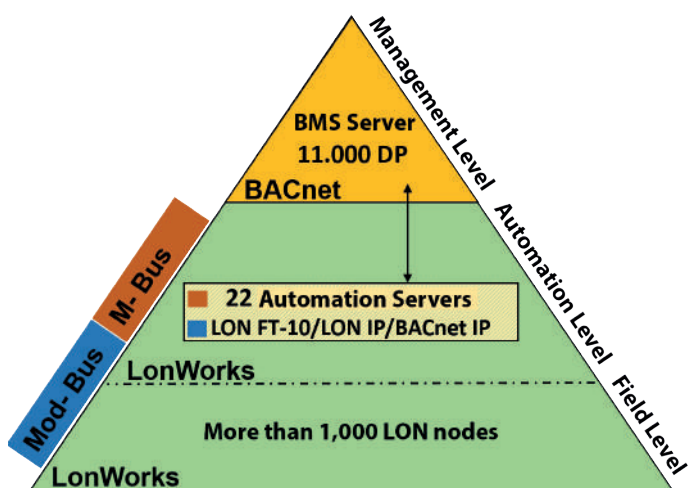
A BMS was installed in parallel to the establishment of the automation network. By means of 22 distributed automation stations more than 11,000 data points are made available to the BMS where they are processed.

Functions like a web interface, plant graphics, schedulers, trend logs, and alarming with SMS forwarding allow

the user to monitor also complex processes 24 hours a day and realize optimizations.

## FACTS

Location	Sigmaringen, Germany
Number of Nodes	1,031 LON nodes
Topology	BACnet/IP, LonWorks FT10, LonWorks IP, IP Network, Modbus RTU, Modbus IP, M-Bus
Companies involved	HGI
LOYTEC Components	6 x LIP-3333ECTB, 3 x LIP-33ECTB, 10 x LINX-150, 4 x LINX-151, 6 x LIOB-100, 11 x LIOB-101, 6 x LIOB-A2, 1 x L-Proxy, 19 x LT-33, 1 x L-MBUS20



### Result

The building is already in use since August 2014 and it appears that the ambitious objective regarding energy efficiency and sustainability has been achieved. The used heat recovery system and geothermal heat exchangers for the air-handling systems in combination with the intelligent individual room control concept reduced the energy consumption to an extent where the geothermal plant is sufficient to provide the minimum load for heating and cooling.

For covering peak-loads under extreme meteorological conditions, additional heat is obtained from the local heating system that has been built in the first construction phase (power house with woodchips and gas boiler). The power house is likewise connected to the overall automation network of the facility and also to the BMS so that all processes run automatically.

For implementation, the powerful L-INX Automation Servers with their various communication interfaces (M-Bus, Modbus, LON, BACnet) for the integration of



## Case Study

twisted pair networks and different protocols on the Ethernet/IP channel have been extremely helpful. Hence, as required, throughout the entire project no additional gateways have been necessary. Thereby, the automated and fault-free connection of protocols by LOYTEC's unique auto connect function has been proven effective once again.

LOYTEC's emphasis on IP communication in combination with IT security features at device level supported HGI during commissioning and ensured high acceptance by all IT administrators involved. Extensive remote accessibility up to the programming level allowed for flexible system configuration and significantly reduced staff and travel expenses. Thereby, the possibility of performing program modifications during ongoing operations has been proven to be very advantageous.

Looking back, the demanding requirements for the building automation system have certainly been a great challenge for the system integrator. Thanks to the perfect, system-wide planning, the unique combination of functions of the LOYTEC automation servers, and the fair cooperation between system integrator and manufacturer, these challenges could have been perfectly mastered. ■



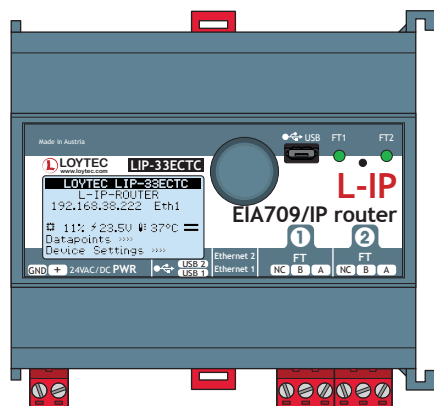
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 **HGI**  
Heger Gebäudeautomation  
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# PRODUCT NEWS

## 01 The New L-IPs



The well-known L-IP routers have been revamped and come out in new, even more powerful models with a "C": The LIP-3ECTC and the LIP-33ECTC (one and two FT ports). They provide all the standard features including the built-in configura-

tion server, enhanced communications test, backup/restore, remote LPA protocol analyzer, support for DHCP and extended NAT.

The new LCD display with jog-dial makes device setup easier. The two Ethernet ports can be operated in switch mode and allow a daisy-chain installation, which reduces cabling effort. Project documentation can be stored and accessed directly on the web interface. A Wireshark packet capture can analyze the IP network and with the LWLAN-800 adapter the L-IPs can even operate on the WLAN!

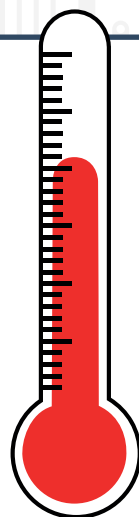
The built-in firewall and web interface for installation using HTTPS make the L-IPs secure devices. By confi-

guring separate IP networks on the two Ethernet ports, the building's CEA-852 network on the LAN can be entirely isolated from the configuration interface on the WAN. This makes security hardening a simple task.

For perfect integration into building management software such as the LWEB-900 Building Management System by LOYTEC, the new L-IPs offer an embedded OPC UA server with full-featured certificate authentication. This server exposes important operational parameters as OPC tags. For enhanced maintainability by IT departments the L-IPs provide the same data also through an integrated SNMP server.

## 02 L-INX goes Fahrenheit

The L-INX firmware has been extended to operate in both metric (SI) and U.S. unit systems. Data points get representations in both systems and automatically convert values between them. The data point configuration can be engineered in either system. The unit system can even be switched on the device without reloading the configuration. When switched to the U.S. system, the web interface, the program logic, global connections, and the OPC server will work natively in U.S. units. This provides for maximum flexibility



new editor for data point structures and can store and access project do-

on European and U.S. markets. Other new features include the OPC client. This allows easy integration of other LOYTEC devices such as an L-DALI into the L-INX using the OPC web service. Integration is as simple as importing the other configuration into an OPC device on the L-INX. The web interface provides a

cumentation directly on the device. An LWEB-802 application is pre-installed and allows quick setup of an offline LWEB-802 application.

New applications for load shedding can be built using the configurable and randomizing forwarding delays in connections. A new serial communication block in logiCAD allows implementation of custom protocols to integrate equipment with non-standard serial interfaces. And new BACnet value objects for strings and large analog values complete the set of added features.

Analog Datapoint Max Value [°F]	<input checked="" type="checkbox"/> 100	Max range of the value
Analog Datapoint Min Value [°F]	<input checked="" type="checkbox"/> 32	Min range of the value
Analog Datapoint Precision	0	Number of significant decimals
Analog Datapoint Resolution [°F]	0	Smallest value increment
Analog Point COV Increment [°F]	5	Change-of-value increment
Unit SI	<input checked="" type="checkbox"/> °C	▼ Data point unit used in the SI system
Unit U.S. (active)	<input checked="" type="checkbox"/> °F	▼ Data point unit used in the U.S. system

### 03 Device Templates Online

#### M-Bus, Modbus, and EnOcean Templates Online Library

LOYTEC provides comprehensive libraries of device templates to create gateway configurations. The templates are available for download on the LOYTEC website.

M-Bus devices support a device scan whereby the communication objects of LOYTEC devices are usually detected and created automatically. However, the advantage of using device templates is that all necessary communication settings for the device are already pre-selected. What's more, the templates allow to prepare the project beforehand without the online availability of original meters. Unlike M-Bus, Modbus doesn't allow to automatically detect the register addresses of Modbus devices. In this case, the entire data point configuration has to be created by the user according to the device documentation considering particular characteristics like byte order and endianness. The device templates

in the library already include the entire set of Modbus registers taking into account the correct semantics for each device. A single Modbus register sometimes consists of several data points (e.g. a 16 bit register of 16 bits to be observed individually). In that case, the Modbus template also includes the definition of company-specific data structures.

For the EnOcean technology, the use of device templates is mandatory owing to its various characteristics. Device templates connect the devices and the implemented EnOcean Equipment Profiles (EEP). In addition, the templates allow to specify further details about the manufacturer-specific characteristics of implementation. These may include, for example, the actual implemented data points of the device (sometimes the manufacturers implement only a part of the data points as defined in the profile), but some products also implement several EnOcean profiles in one device. Also this fact is taken into account in the device template. If devices are not yet included in the templates library, the corresponding

templates can be created by LOYTEC at short-notice according to the data sheet and sent to the client. Subsequently, the new device templates are added to the templates library and are available for download for all customers.

On top of that, the library is constantly being updated through our cooperation with other manufacturers. All device templates are checked for correct functionality prior to publication. The current templates library can be downloaded free of charge from the LOYTEC website by all customers enabling a rapid and uncomplicated creation of gateway applications.

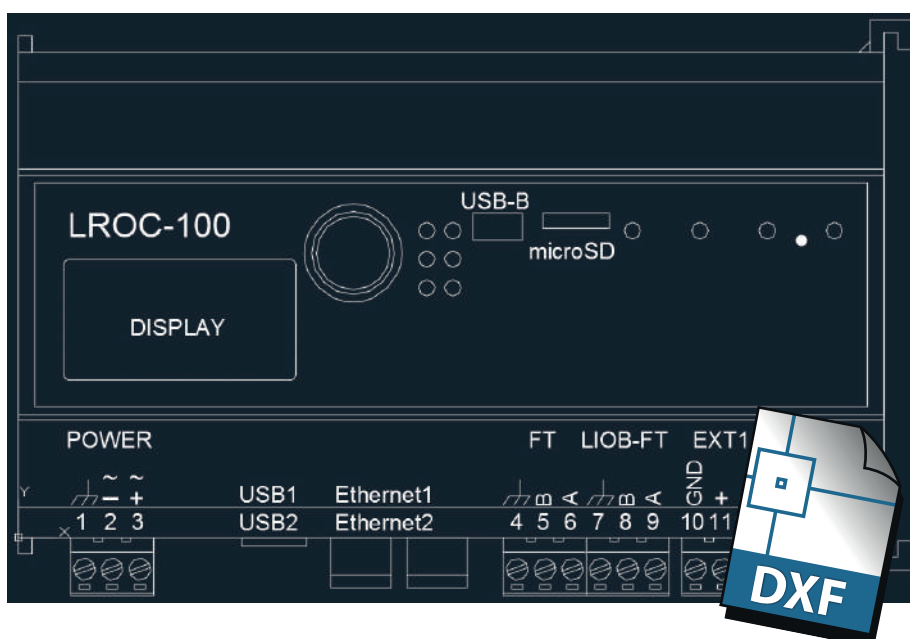


### 04 DXF Library

#### LOYTEC Graphic Templates in DXF Format

From now on, dxf template files for all LOYTEC devices are available in the download section on the LOYTEC website. The dxf format is a graphic vector format that is supported by most CAD programs like AutoCAD, Microsoft Visio, or EPLAN. The graphics can be used in schematic templates to support planning or for plant documentation.

The files can be downloaded free of charge from the LOYTEC website.





## PentaControl AG convinces Hotel Industry with LWEB-900 Building Management System

Building automation develops rapidly and remarkably influences energy efficiency of buildings and industrial plants. It can be seen as “the brain of a building” that controls and monitors a building’s conditions.

**P**entaControl AG implemented the building management system for the hotel management school Belvoirpark, Switzerland’s most modern hotel management school!

The new building sets trendsetting standards regarding functionality, infrastructure, and esthetic. The highly professional atmosphere of the new educational building is not only reflected in the spacious premises and the modern architecture, but also in the comprehensive building management system of PentaControl AG. LOYTEC’s intelligent BMS LWEB-900 ensures the perfect control of heating and cooling, ventilation, and also room ambience.

The smooth cooperation with planners and operators was a central issue of this project and crucial for its success. PentaControl AG demonstrated its expertise already with the control system for heating and cooling. The building automation project has been integrated intelligently and locally in miscellaneous controllers. The structure offers a key advantage: the functions are directly processed wherever they are needed. This constellation is perfectly suited for the control of individual rooms.

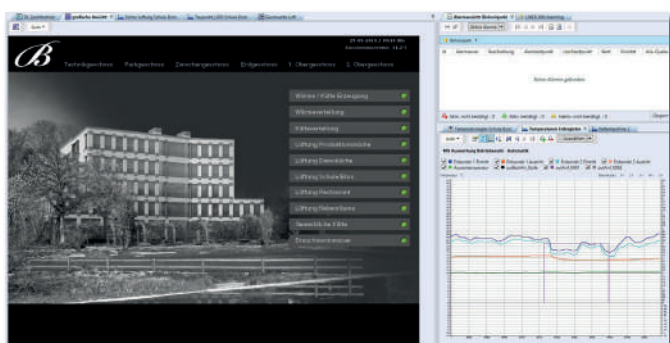
Extremely exciting and highly efficient is the use of energy from geothermal systems for the heating and cooling process. With a demanding hydraulic system and more than 120 controlled components, the required energy for heating and cooling is drawn from 41 earth probes by means of two heat pumps with 245 kW power each. The load-dependent energy production through the intelligent automation system ensures optimum

consumption of energy.

Various recording tools guarantee continuous monitoring of the system and its functions. A high system availability makes intelligent alarm forwarding necessary. The portal NUNTIO from PentaControl AG thereby completes the LWEB-900 system with a sophisticated alarm distribution based on a redundant design via numerous alarm server portals. NUNTIO and LWEB-900 are a cost effective alternative to traditional alarm server solutions.

### FACTS

Location	Zurich, Switzerland
Number of Nodes	approx. 3,000 Nodes
Topology	LWEB-900, MODBUS-MP-BUS, M-BUS
Companies involved	Architect Peter Märkli, Zurich GA Planner, AicherDeMartinZweng AG Luzern HVAC Planner, BEAG Engineering AG, Winterthur
LOYTEC Components	5 x L-INX, 1 x L-VIS 15"
LOYTEC Tools	LWEB-900





### The School's In-House Restaurant impresses with comfortable Room Ambiance

Through the demand based control of the different needs in kitchen, restaurant, and other premises, ideal conditions for students and guests are created. Altogether, four ventilation and air conditioning systems are controlled by PentaControl's control system, achieving a pleasant climate not only in the restaurant but also in the large kitchen.

In the modern kitchen, the industrial water heat production ensures an appropriate supply of hot water, taking into account the wasted heat from commercial cooling. The plants of commercial cooling ensure the right temperature in cold storage cells and rooms which are continuously monitored. Malfunctions are immediately reported as soon as predefined thresholds in the cold chain cannot be met or someone is locked in the cold storage.

### Comfort is decisive for the Efficiency of Students

The available training rooms of superlatives are an essential component of the hotel management school. Here, scientific and technical knowledge is conveyed that is path-breaking for the student's careers. The restaurant Belvoirpark, a guild house situated in the city center, and also a catering service belong to the school. This combination is what makes the school special. All 144 students that are trained to become restaurant and hotel management experts benefit from this practical education.

To ideally transfer and absorb knowledge, the right climate is necessary. Temperature, humidity and air circulation determine the level of comfort. This is ensured by building automation from PentaControl AG. The latest audio-visual equipment helps to transfer knowledge

and is integrated in the IT infrastructure. Thereby it is guaranteed that communication via GSM or WLAN works anywhere.



### About PentaControl AG

Originated from a part of Bircher AG in 1996, PentaControl AG is satisfying customers with energy efficiency for smart buildings.

PentaControl realizes integral room and building automation from concept to implementation, commissioning and maintenance for years. The integral solutions combine features like lighting, sunblind control, cooling, surveillance, and energy optimization in a logical fashion. Using latest technologies, convenience is significantly increased for both – user and operator. Environmental impacts and also operating and upkeep costs are reduced.

With an active engagement in technical committees like GNI (Building Network Initiative) or Lon-Mark Switzerland (the Swiss LON user organization), the company publicly sets new priorities for modern building control.

**PENTACONTROL** 

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# Delta Electronics, Inc. relies on Building Automation from LOYTEC

## LOYTEC Product Launch in Taipei and Shanghai



Delta Electronics, Inc., headquartered in Taiwan (Republic of China), is the world market leader in the field of power electronics with focus on power supplies and DC fans. More than 80,000 Delta Electronics employees generate sales of about 7 billion USD in the divisions of power electronics, energy management, and smart green life.

LOYTEC has entered into a strategic partnership with Delta Electronics, Inc. to market LOYTEC Building Management and Control Systems in China, India, and the US. LOYTEC's open integration platform of L-INX Automation Servers together with the LOYTEC LWEB-900 Building Management System provides the ideal solution for Delta to demonstrate its strengths in the energy management sector. Hence, integral solutions are possible that range from charging stations for electric vehicles to photo voltaic, HVAC, and lighting.

The official Delta electronics product launch of LOYTEC products and solutions took place on April 28, 2015 in Delta's headquarters in Taipei with more than 100 invited guests, followed by the product launch in the headquarters in Shanghai on April 30. Hans-Jörg Schweinzer, LOYTEC CEO, presented the LOYTEC product line at both events. He was enthused: "I was overwhelmed by the interest and the very positive feedback. The Asian market offers endless opportunities. Our strong partner Delta Electronics will help us to leverage to most out of the possibilities offered." ■





# LOYTEC at ISH 2015



**W**e were happy about the large number of visitors at the LOYTEC booth at ISH 2015 from March 10–14 in Frankfurt am Main, Germany. LOYTEC was one of 2,465 manufacturers, more than ever before, who exhibited at the world's biggest showcase for innovative bathroom design, energy efficient heating and air-conditioning technology, and renewable energies. At the fair, the new VAV

system LIOB-AIR was introduced to the German-speaking public for the first time. The L-VIS Touch Panels for simultaneous usage in BACnet, LON, and Modbus networks together with the LWEB-900 Building Management System, the room automation system L-ROC, and the L-DALI lighting solutions were the basis of numerous interesting technical discussions and conversations. We are already looking forward to ISH 2017!



# AIM Recycling Center, Saint-Augustin-de-Desmaures, Québec, Canada

The AIM facility at Saint-Augustin-de-Desmaures, a suburb of Québec City, is the most advanced dry material recycling facility in North America. All the material sorting is done by high tech equipment. More than 50 tons of dry material per hour is processed by AIM. The building's dimension and the companies operations required the use of the most modern technology to assure reliable operations, energy efficiency, and also personal security.

The building and dust collection automation system has been designed, fabricated, and implemented by the LOYTEC Competence Partner AIREX CONTROLS Inc. AIREX CONTROLS used LOYTEC product solutions to implement a dual dust collection system with 100,000 SCFM airflow make-up system to maintain a high-level air quality and to regulate the building's conditions. The entire system is built around a dual Ethernet network configured in loops for more reliability.

With this architecture, all the security features for the facility, from gas detection (46 detectors), garage doors controls (16 detectors), to emergency signalling are also part of the automation system. The system is built around LOYTEC's LINX-221 and LIOB-582 with a complex L-LOGICAD control strategy for system operations. With this architecture, the network can be opened at any location to add an extra controller on the building system without interrupting the control strategy.



L-VIS Touch Panels for the visualization and operation of building automation applications are used to operate the system with a remote access to the companies VPN. This simplifies the operations of anyone involved in the day-to-day business.

## FACTS

Location	Saint-Augustin-de-Desmaures, Québec, CAN
Number of Nodes	8
Topology	BACnet/IP, Dual-Ethernet, BACnet MS/TP
Companies involved	AIREX CONTROLS Inc.
LOYTEC Components	LINX-221, LIOB-582, LIP-ME201, LVIS-3ME212-xx, LIOB-101, LIOB-102
LOYTEC Tools	L-LOGICAD

## About AIREX CONTROLS Inc.:

Airex Control is a fully integrated company that has been making its way through the automation world for more than 15 years. With its CSA certified panel shop and its experienced team of engineers and technicians, the company delivers more than 200 turnkey projects per year. From complete building automation to industrial process control, Airex Control covers a wide range of applications requiring high-tech equipment.

Water treatment, HVAC and high temperature ovens are only a few of the many processes our technicians deals with every day.

Airex Control believes that technology should fit their customers' needs, not the opposite. Involving customers in the project is key for success.





## Poinciana High School goes IP

The integrator TBI has been utilizing LOYTEC solutions in the Osceola school district of Florida since 2006. With a current installation of over 90 L-INX Automation Servers and over 60 L-IP Routers, this network is literally under control. Over 130 cooler freezers are monitored in over 50 buildings with LOYTEC components, in addition to thousands of field bus devices.

### With Modern Technology comes Change

In 2014, Osceola School District initiated a bid to replace a system in the oldest area of Poinciana High School. The project consisted of 37 AHUs (Air Handling Units), 2 chiller plants and 164 VAV (Variable Air Volume) units. Since the district had a LNS Lonworks™ specification, all new controls had to adhere to the specification from the district.

Mr. Rick Joyner with TBI was awarded the project, and he relates that this is where the discussion led to a new challenge for everyone involved. TBI addressed the ability of installing all IP-based controllers, which meant over 200 devices. At first, the district was apprehensive as they did not feel they had enough network switch capacity available. Mr. Joyner explained that LOYTEC controllers have a built-in dual port

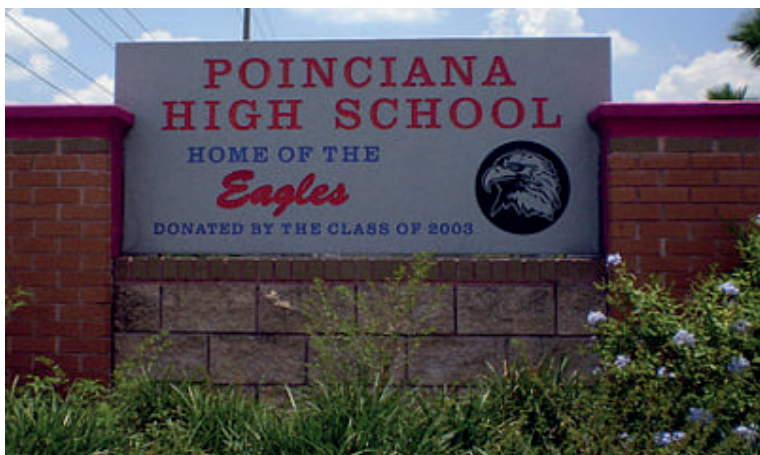
Ethernet switch that can daisy-chain devices and make a redundant loop for bi-directional communication. Additionally, he indicated that individual ports would not be needed at the switch and network load would be miniscule. After this explanation, the district was excited to run this project.

The installation of the system occurred in short time spans when school was not in session, and was completed during the holiday break in December 2014. "Installation of the CAT5E IP backbone was as easy as installing twisted pair field buses", Mr. Joyner relates. The biggest difference was being able to test connectivity as they installed the devices, making commissioning a flawless experience. With the additional LCD display on each device, commissioning and startup was very simple and did not require any PC software. Jim D'Amico, MEP Facilitator with Osceola, shared his practical standpoint: "While benefits of IP building automation systems have always been what was needed, the step-wise migration path to this new IP-based architecture was not yet fully in place till now. I think one major

challenge was to provide these new, IP enabled building automation systems at a reasonable initial cost. This has been achieved with the LOYTEC LWEB-900 system. Another challenge was that common protocols and data formats had to be in place for interoperability with each other. Such protocols as LON must be flexible enough to accommodate all LON system manufactures. Another benefit that the IP system provides is additional flexibility for individual component placement. This is the first IP system installed in the district and we can already see that the possibilities may be endless. Additionally, a large group of tools for dealing with IP-based networks are already existing. Many of these tools are freely available and also lower the costs of troubleshooting."

Currently, the Osceola staff can service the system from their phones, tablets, or PCs onsite or remote via secure and encrypted connectivity. Specialized and customized graphical projects are available to meet the staff needs and eliminate the need to separate data not intended for the recipient via a district wide installation of the LWEB-900 system. The IT team of the school district is pleased with the low load imposed upon their network and appreciates the comprehensive attention to security and encryption for a building control network.

Poinciana High School – this Building is under control with LOYTEC. ■



**POINCIANA**  
HIGH SCHOOL



**Rick Joyner, President**  
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Clearwater, FL 33759  
866-824-4450 Office  
727-423-0920 Cell



# LOYTEC's Kitchen ABC

## Venison Stew with Potato Dumplings

Our chef de cuisine Eugen exclusively tells you his cooking secrets. This time, he prepares a delicious game dish which our employees already enjoyed in our in-house restaurant!

### VENISON STEW

1 kg venison stew meat  
500 g onions, finely chopped  
300 ml red wine  
100 ml port  
50 ml balsamic vinegar  
2 EL tomato paste  
3 EL mustard  
100 g celery, finely chopped  
100 g carrots, finely chopped  
1 tablespoon juniper berries, piece of cinnamon bark, 5 grains pimento,  
1 tablespoon black peppercorns, 2 cloves,  
zest from half an organic orange,  
1 tablespoon coriander seeds, salt  
1,5 l beef stock  
100 g crème fraîche  
3 tablespoons cranberries  
Oil

### POTATO DUMPLINGS

1 kg floury potatoes  
100 g all-purpose flour  
100 g potato starch  
2 eggs  
1 tablespoon salt, 1 pinch of nutmeg

### PREPARATION

Cut the meat into 2–3 cm chunks, season with salt and sear in oil on all sides. Remove the meat from the pot and fry onions, celery and carrots in the same pot at medium heat. Add tomato paste and mustard. After a short wait, top with red wine, port and balsamic vinegar. Add the meat and spices, pour in the beef stock and simmer everything at low heat for about 2 to 2.5 hours until the meat is tender. Remove the stewed meat with a slotted spoon and strain the juice through a fine sieve. Bring the juice to a boil, add cranberries and salt to taste and finish off with crème fraîche. Add the meat and boil up again.

For the potato dumplings, cook the unpeeled potatoes until tender and strain and cool them slightly. Mash the potatoes using a ricer and knead the mashed potatoes together with the remaining ingredients to form a homogenous dough. Use your hands to form the dough into small dumplings on a floured work surface. Cook the dumplings in lightly salted simmering water for about 10 minutes. If the dumplings float to the surface, cook them for another five minutes.

Finally, serve the venison stew together with the potato dumplings. Enjoy your meal! ■



# „Knowledge and Credibility“

Sascha Remmers, LOYTEC Sales Germany

„Impressive strength in innovation and development in all areas of building automation paired with short decision paths for best possible product solutions – that’s what LOYTEC means to me!“

**A**fter his education as an electronics engineer for energy and building technology, he did further trainings to become an economist and to receive a master qualification in electronics engineering. Numerous advanced trainings in the fields of, among others, BACnet, LON and KNX prove his qualified and wide range of expert knowledge. Together with past activities at his former employer, Sascha has over 8 years of experience in technical sales of room automation systems. With this background, Sascha is probably one of the few experts with such comprehensive, specific technical and also market-related know-how.

For over 2 years, Sascha has been working in technical sales at LOYTEC. His main emphasis is on project sales, particularly in room automation. The German works from his homeland, the Ruhr area, North Rhine-Westphalia and takes care of system integrators and planning departments throughout Central Europe. „I am on the spot, wherever there is an interest in sophisticated and future-oriented automation solutions!“, Sascha emphasizes.

His ultimate ambition is to find the ideal

solution for customers in meeting the numerous and ever-changing product requirements. „Room automation in particular is the most important component both for operating a building energy-efficiently and also for the user’s comfort. There is a number of different communication technologies available on the market. BACnet, LON, KNX, Modbus, OPC, DALI, SMI, MP-Bus, EnOcean – just to mention the most important. What’s more, many customers are increasingly interested in solutions, e.g. for virtual room operation via PC or smartphone. In this context, the issue of IT security of building automation networks is getting more and more important, as different subsystems and systems increasingly merge. LOYTEC is already perfectly prepared for all this issues unlike many other manufacturers.“

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“When it comes to such complex and system wide solutions, LOYTEC is the leading company of this industry“

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With his additional qualification as an Excel-VBA programmer, Sascha also develops calculation tools. With these tools, customers have the possibility to calculate the ideal solution with LOYTEC products even for large projects in a quick and easy way.

Both customers and colleagues appreciate his theoretical and practical knowledge that also gives him a high degree of credibility. „It is important to listen to the market and take customers’ needs seriously. Because of short decision paths and flat hierarchies, I am able to bring in my own ideas repeatedly, e.g. for product innovations. That’s what I particularly like about LOYTEC“, Sascha enthuses.

Sascha and the entire LOYTEC sales staff certainly don’t embody the typical negative image of a salesperson. „Honesty, mutual trust, and a good cooperation with customers – in my opinion, that’s what counts and what ultimately leads to success.“





All trainings are taking place either at the LOYTEC headquarters in Vienna, Austria or at LOYTEC Americas Inc., Pewaukee, WI. The course offer includes trainings in both German and English language. Additional training dates are available on request. For further information, please contact [sales@loytec.com](mailto:sales@loytec.com).

## LTRAIN-LIOB-AIR

### Controlling VAV Systems with LIOB-AIR (2 days)

- Introduction to the LIOB-AIR system
- Adapting device templates
- Creating a complete VAV system
- Using the graphical user interface
- Connection to the AHU
- Integration into BACnet and CEA-709 systems
- Advanced features, Examples and use cases

Vienna - Austria		Pewaukee, WI - USA
2015-10-26 (ENG)	2016-06-23 (ENG)	2016-03-07
2016-02-01 (ENG)		2016-06-27
2016-02-22 (GER)		
2016-06-20 (GER)		

## LTRAIN-LINX

### Programming the L-INX Automation Server (3 days)

- Configuration of the L-IOB I/O Modules
- Creating IEC 61131-3 applications
- Testing and debugging the application
- Using Alarming, Scheduling, and Trending (AST™)
- Working with LOYTEC Function Library

Vienna - Austria		Pewaukee, WI - USA
2015-11-16 (ENG)	2016-02-29 (ENG)	2015-11-09
2015-11-30 (GER)	2016-04-04 (GER)	2016-02-08
2016-01-18 (ENG)	2016-05-09 (ENG)	2016-06-06
2016-02-08 (GER)	2016-06-06 (GER)	

## LTRAIN-GATEWAY

### Gateway Applications and Data Point Management (2 days)

- LOYTEC data point concept
- CEA-709, BACnet, M-Bus, Modbus, OPC XML-DA
- Local and remote AST™ functions
- Building gateway applications with L-GATE, L-Proxy, and L-INX

Vienna - Austria		Pewaukee, WI - USA
2015-11-05 (ENG)	2016-06-16 (GER)	
2016-01-28 (ENG)		
2016-02-18 (GER)		
2016-05-23 (ENG)		

## LTRAIN-BMS

### LWEB-900 Building Management System (2 days)

- Introduction to the LWEB-900 System
- LWEB-900 Project Setup
- Working with LWEB-900 Views
- LWEB-900 User Management

Vienna - Austria		Pewaukee, WI - USA
2015-11-19 (ENG)	2016-03-03 (ENG)	2015-11-12
2015-12-03 (GER)	2016-04-07 (GER)	2016-02-11
2016-01-21 (ENG)	2016-05-12 (ENG)	2016-06-09
2016-02-11 (GER)	2016-06-09 (GER)	

## LTRAIN-DALI

### Lighting Control with L-DALI (2 days)

- Introduction to DALI
- Features of the LOYTEC DALI Controllers
- Configuring LOYTEC DALI Controllers
- Setting up a DALI network
- Troubleshooting the DALI installation

Vienna - Austria		Pewaukee, WI - USA
2015-11-02 (ENG)	2016-06-13 (GER)	2016-02-22
2016-01-25 (ENG)		2016-05-09
2016-02-15 (GER)		
2016-05-02 (ENG)		

## LTRAIN-GRAPHICS

### Graphical Design for L-VIS and L-WEB (2 days)

- Creating L-VIS and LWEB-803 projects with the L-VIS/L-WEB Configurator
- Creating a distributed visualization based on L-INX and LWEB-803
- Efficient project design using templates

Vienna - Austria		Pewaukee, WI - USA
2015-11-09 (ENG)	2016-06-02 (GER)	2016-02-25
2016-01-14 (ENG)		2016-05-21
2016-02-04 (GER)		
2016-05-30 (ENG)		

## LTRAIN-LROC

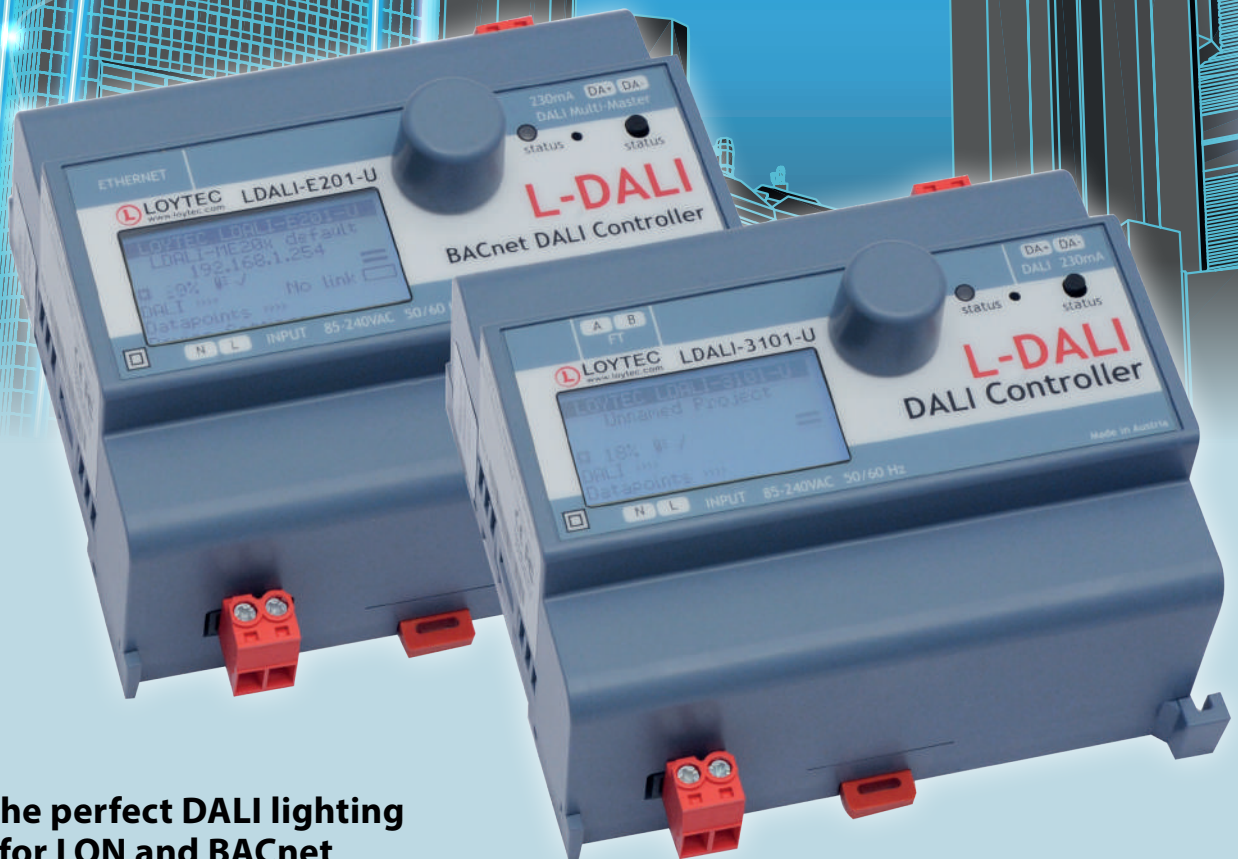
### Room Automation with L-ROC (2 days)

- System design based on a sample project
- Creating the IEC 61499 application for the sample project
- Creating virtual room operating units and using them with LWEB-802/803
- Creating floor plan visualizations
- Integration into LWEB-900
- Parameterization, testing, and debugging the application
- Concepts and features of important IEC 61499 function blocks

Vienna - Austria		Pewaukee, WI - USA
2015-10-22 (ENG)	2016-04-21 (GER)	
2016-01-11 (ENG)		
2016-02-24 (GER)		
2016-04-18 (ENG)		



# Intelligent Lighting Solutions



## L-DALI – The perfect DALI lighting solutions for LON and BACnet

- Integrated constant light control
- Automatic lamp burn-in mode for fluorescent lamps
- Built-in web server for configuration
- Up to 4 DALI channels per controller
- Up to 64 DALI push-button couplers per channel
- Up to 16 DALI multi-sensors per channel
- Integrated DALI bus power supply
- Backlit graphical display
- Alarming, Scheduling, and Trending (AST™)
- Manual operation using jog dial
- Integrated DALI Protocol Analyzer

 **LOYTEC**