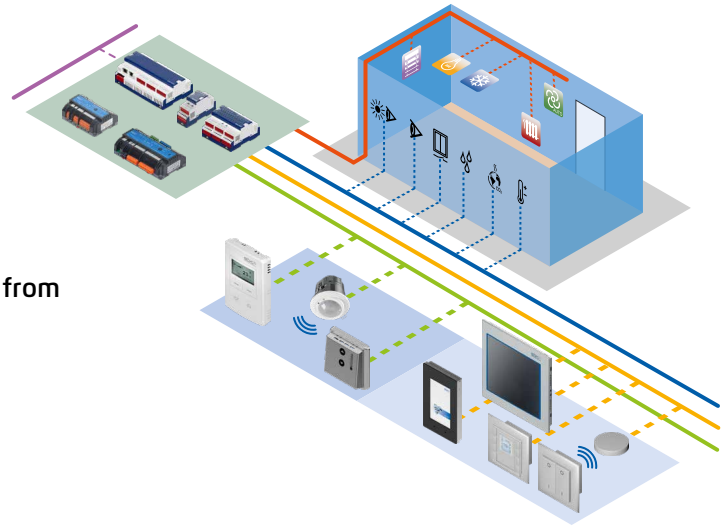
B4 Room automation

Room automation is a crucial component for room comfort and also reduces operating costs to efficient levels. Energy efficiency therefore plays a vital role along with a comfortable interior temperature and the intuitive operation of the various room functions. This can be achieved by room automation from SBC.



4.1 The objective of room automation

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The objective is to maintain a comfortable interior temperature for the user, which should be achieved by consuming a minimal amount of energy. The optimisation potential of occupancy and changes of use can therefore be exploited.

4.2 Room automation with SBC components

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All the SBC components suitable for room automation will be displayed. They will be assigned to various segments and areas of use for a better overview.

4.3 Examples of application

245

The various practical examples of application clearly demonstrate the versatility and efficiency of SBC room automation.

4.1 Objectives of room automation

Save building operating costs, lower CO_2 emissions and increase user comfort

The objective is to maintain a comfortable interior temperature for the user, which should be achieved by consuming a minimal amount of energy. The optimisation potential of occupancy and changes of use can therefore be exploited. Energy efficiency and conserving resources will become increasingly important in the future and play a decisive role in the implementation of projects. New standards, regulations and laws are constantly being introduced to increase awareness of this.

Objectives of room automation

- Ensure a reasonable level of comfort during occupancy
- Cut the cost of energy required for operation
- Protect the environment and conserve energy resources

A crucial factor here is monitoring, and the user's ability to intervene.

Comfort with room automation

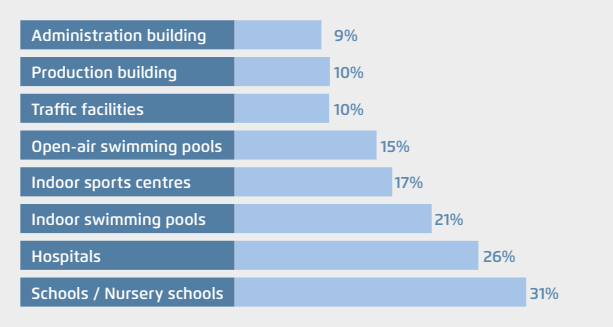
We spend most of our time in closed rooms. This is why the quality of the temperature and conditions in the room is vital for our health and wellbeing and, for functional buildings, the environment also influences productivity at work. In this case, the factors are influenced by various services. These are, for example, the HVAC services (pleasant room temperature and good air quality) and the electrical services (e.g. light for sufficient brightness or blinds to prevent glare, the effects of daylight and thermal radiation). An interdisciplinary cooperation of various services and plants is required to control these influencing factors. This can be achieved using cross-plant automation functions and the appropriate components.

Energy and room automation

The building sector accounts for 40% of overall energy consumption in the European Union (EU). Of this, 85% is for room heating and cooling and 15% for electrical energy (particularly lighting).
There is enormous potential for energy optimisation here.

Building automation plays a decisive role in this, along with thermal isolation and the use of energy-efficient devices. The complete networking of heating, cooling, ventilation, lighting, shade and additional systems make the building intelligent. This is the key to energy efficiency and optimises the operating costs of a building. The operating phase of a building is crucial, as 80% of the service life costs are accumulated in the operating phase. 50% of this figure is energy costs that could be reduced with intelligent building automation.

Operating costs per annum in % of the construction costs



Source: Helbing Study

The existing potential is also demonstrated through a study by the University of Hannover for Applied Science and Art. In air-conditioning technology, energy savings of over 30% can be achieved and this figure rises to 60% for lighting. Further investigations and studies also demonstrate an immense potential for savings.

Standards and regulations

The challenges of changing energy policies and increasingly strict CO_2 constraints have resulted in new guidelines. One example is the EPBD, which stipulates the improvement of the overall energy efficiency of new buildings.

European Energy Performance of Buildings Directive – EPBD

The latest European Directives (2010/31/EU and 2012/27/EU) required Member States to introduce, implement and monitor the quality of building energy efficiency in various areas. The guidelines include a method of calculating overall energy efficiency. Calculation of the energy requirement with additional specifications for heating, ventilation, cooling and electrical energy.

Extract: Technical building systems, such as heating systems, warm water systems, air-conditioning and large ventilation systems, must meet the requirements for overall energy efficiency, regardless of whether they involve new systems or the replacement or modernisation of such systems.

Certain regulations and recommendations exist for room automation in various countries. A brief extract:

– DIN EN 15232 "Energy Performance of Buildings: Impact of Building Automation and Building Management"
– VDI 3813-1 "Fundamentals of Room Control"
– DIN V 18599 "Energy Efficiency of Buildings"
– EnEV Energy Saving Regulation

This topic is described in greater detail based on the following example.

EN 15232 "Energy Performance of Buildings – Impact of Building Automation and Building Management"

The EU Directive EPBD includes the standard EN15232, which contains the following:

- A structured list of the control, BA and TGM functions that influence the energy efficiency of buildings.
- A simplified method to obtain an initial assessment of the influence of these functions on the energy efficiency in typical buildings.

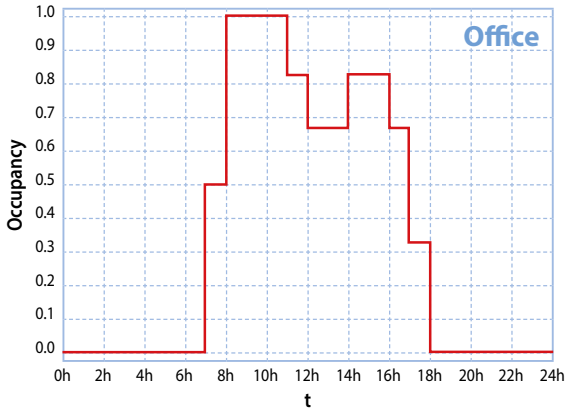
Energy efficiency classes of building automation

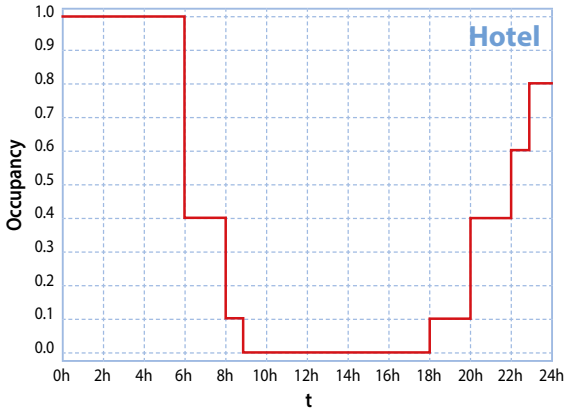
Class A: High-energy efficiency room automation and networked plants and services
Class B: Optimal solutions for each plant or service, partially networked
Class C: Standard room automation, reference document
Class D: No room automation, not energy efficient

Room automation and its implementation is an important aspect of the assessment!

Energy-saving potential

The EN 15232 clearly shows for the first time and in a standardised form the enormous energy-saving potential that exists when managing building technology systems. The amount of energy saved can vary for different building types using a range of user profiles (EN 15217):





Examples of essential measures for the EN 15232 rating:

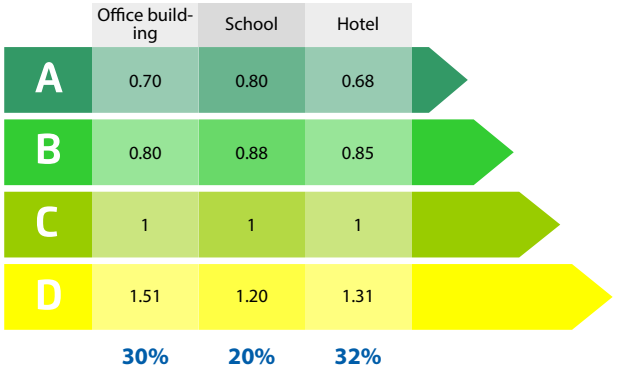
Class C:

- Central control of the room temperature
- Lighting with manual setting/dimming
- Simple sun-protection automation

Class A:

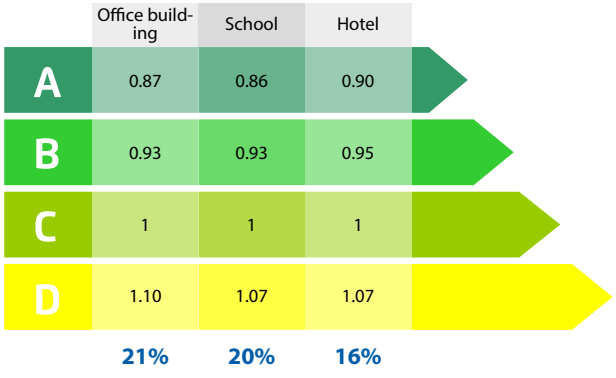
- Networked temperature control for individual rooms
- Light control in accordance with requirements
- Networking of blinds and light control with heating, ventilation and air-conditioning systems
- For VAV: Load-dependent control → via an air quality sensor in the room

Energy-saving potential
Savings with thermal energy (heating/cooling)



Saving potential by retrofitting Class C in accordance with A

Energy-saving potential
Savings with electrical energy (lighting/sun protection)



Saving potential by retrofitting Class D in accordance with A

4.2 Room automation with SBC components

SBC has various products available for room automation. Depending on the task, various components are used for this that were described in section A. The product groups will be briefly presented again below, and subsequently subdivided. The objective is to assess as quickly as possible when and where certain products can be used to meet the relevant requirements.

4.2.1 Product overview for room automation applications

The products in section A, which lists their technical specifications, will be split into controllers and control units for room automation, and will be described briefly.

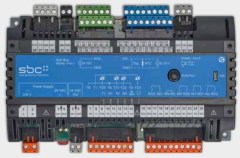
Controllers:	
▸ **PCD7.LRxx**	BACnet-Room controllers configurable via Android-app
▸ **PCD7.LRxx-P5**	Room controllers freely programmable with PG5
▸ **DALI64SYLKPSUx**	DALI lighting system with BLE and Sylkbus interface
▸ **PCD1 E-Line**	freely programmable E-Line modules and E-Line RIOs for I/O extension
▸ **PCD1.M2220-C15**	PCD1 with Ethernet TCP/IP for room automation applications
▸ **PCD controllers**	all additional Saia PCD automation stations

Control units:	
▸ **Sylk-Bus**	Room control units with Sylk-Bus connection
▸ **EnOcean**	Wireless Room control units from PEHA (EnOcean)
▸ **PCD7.D1000**	Room control units with ModBus or S-Bus connection
▸ **PCD7.D443**	Room Panel
▸ **PCD7.D4xx**	Web Panel MB and pWeb Panel MB

Controllers

PCD7.LRxx – BACnet room controllers configurable via Android-app
The configurable BACnet room controllers of the PCD7.LRxx have integrated applications for standard fan coil, inlet air dampers with air quality control, radiator or chilled ceiling control and enable efficient and time-saving commissioning and testing of the connected actuators and sensors via an Android-App.

They have a SYLK bus interface for connecting digital room control units.



PCD7.LRxx-P5 – Room controllers freely programmable with PG5
The S-Bus/Modbus room controllers freely programmable with Saia PG5®, can be fully integrated into the Saia PG5 ® controls suite and are suitable for flexible and individual space solutions. Two interfaces that can be configured as S-Bus or Modbus enable the integration of digital room control units or expansion modules - this is how the room controller can be combined with existing SBC PCD1 E-Line modules.

This allows more complex applications and trades to create comprehensive HVAC, lighting and shading room control solutions which makes it ideal for the realization of energy-efficient and individual room automation. It also provides a good basis for achieving energy efficiency classes according to EN 15232: 2012.. In addition, it has a Sylk bus interface for connecting digital room control units.

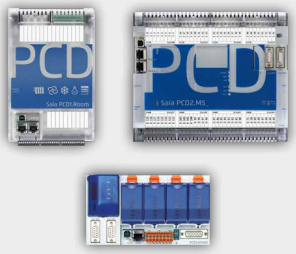
DALI64SYLKPSUx - DALI64 lighting system configurable over Light touch app
DALI64 is a fully featured standalone DALI lighting control system embedded into a state of the art PIR sensor with an advanced lens design.

The DALI64 natively integrates over Sylk-bus with PCD7.LRxx-P5 freely programmable room controller and BMS to create integrated room control systems and enables with that smart integrated building solutions.

A simplified commissioning will be enabled with the intuitive Light Touch commissioning App.

PCD1 E-Line (PCD1.Xxxx-xxx)
The PCD1 PG5 freely programmable E-line modules and E-Line RIO which can be used for I/O expansion for HVAC, lighting or shading control.

PCD1.M2220-C15
The Saia PCD1.M2220-C15 has been specially designed for installation in electrical sub-distribution. It is a freely programmable room controller for sophisticated solutions with different communication options and acts as a master for the attached controllers and modules. It can take on more complex regulations as well as form the interface to the management level. The integrated Automation server and the Web + IT functions can be used directly to visualize the control via web panel or browser. With the support of numerous protocols such as BACnet, LON, Modbus, etc., the Saia PCD E-Line CPU is the ideal interface to other trades.



Saia PCD controllers
Saia PCD controllers have sufficient system resources to operate up to 13 communication interfaces in the same device. Even the most demanding tasks, such as simultaneous communication via BACnet® and LON IP, can be managed reliably.
Any challenge can be met with a Saia PCD owing to its flexible operation and high level of reliability.

Control units

Sylk bus room control units
Room control units with polarity-independent 2-wire Sylk bus connection for power and data transmission. 8 different variants of integrated sensors for temperature, humidity and CO2 sensor and LCD display with function keys in maximum configuration can be used with the configurable room controllers PCD7.LRxx and with PG5 freely programmable room controllers PCD7.LRxx-xx.

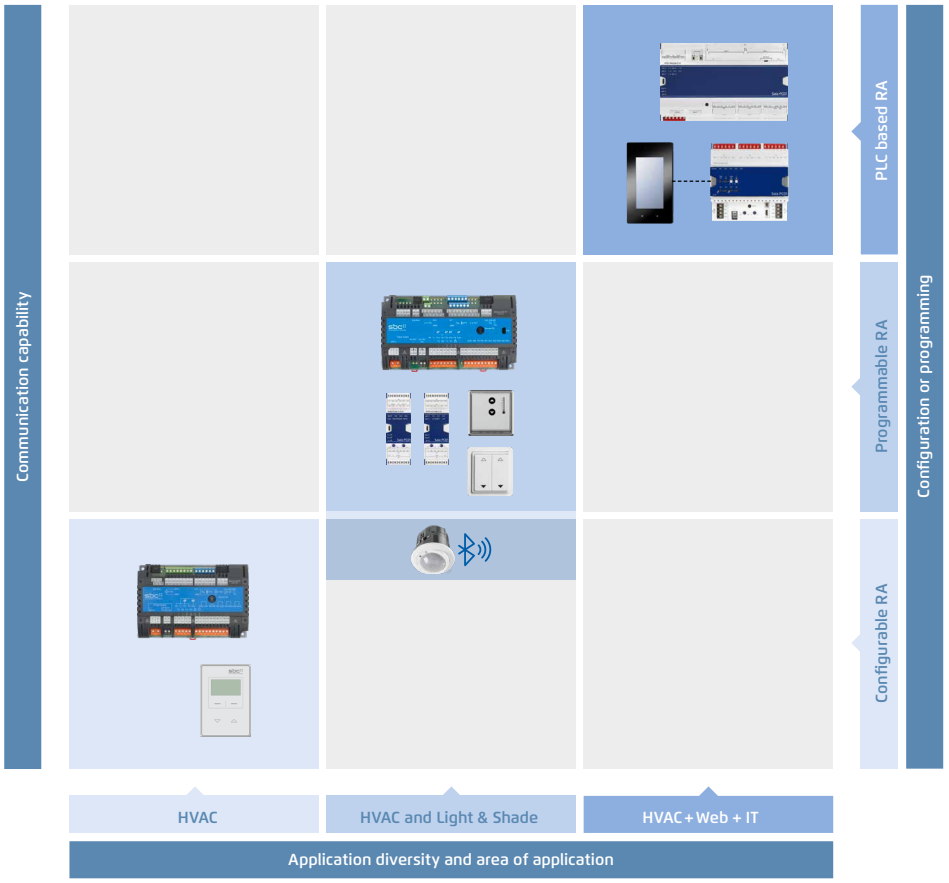
Wireless room controllers from PEHA
Control units from the PEHA are an outstanding addition to the Saia PCD controllers. The room control units using EnOcean combined with the fully programmable PCD1 E-Line products or the PG5 programmable room controllers for example, are ideally suited for room automation applications. A wide range of control units is available which are easy to operate.

PCD7.D1000 ModBus / S-Bus room control units
Room control unit with Modbus/s-Bus connection via 2 RJ9 plugs for series connection of up to 6 devices. Can be used for room temperature detection and setpoint adjustment. PEHA Dialog Aluminum design with 7 LEDs for signaling the setpoint shift.

PCD7.D443WTxR Room Panels
The programmable panels have an attractive design. Independent room applications with the integrated logic controller enable the control of room functions without a head station. Delays through long communication channels associated with this are eliminated. The temperature of the room or zone can also be determined and transmitted to another controller. The graphics can be customised and therefore adjusted for any requirement.

PCD7.D4xx Web Panels MB and pWeb Panels MB
The Saia PCD7.D4xx Web Panel MB and pWeb Panel MB are equally suitable for room automation. This is particularly true when executing and displaying tasks of greater complexity. The use of the S-Web technology combined with the micro browser panel systems is a great advantage. The operation can be displayed transparently and clearly for every user. Each individual control side has a flexible design and can be created with Saia PG5 using the standard objects or existing function templates.

4.2.2 Segmentation of the room components



There are three main areas. The classification of the products is based on the following main points and features:

- **Application diversity and area of application**
  Is only a single heating circuit controlled in one room, or should light or shading and additional tasks be performed and cross influences observed?
- **Configuration or programming**
  Pure configuration or flexible programming throughout the entire service life?
- **Communication capability**
  Must only S-Bus and also other communications protocols such as DALI, ModBus, EnOcean,… or web functionalities be supported.

Segment / Field 1

Configurable room controllers with BACnet interface are required to implement an HVAC standard applications.
The standard main applications that can be implemented with these configurable SBC components are heating and/or cooling, fan coil or inlet air flap control with air quality control.

Segment / Field 2

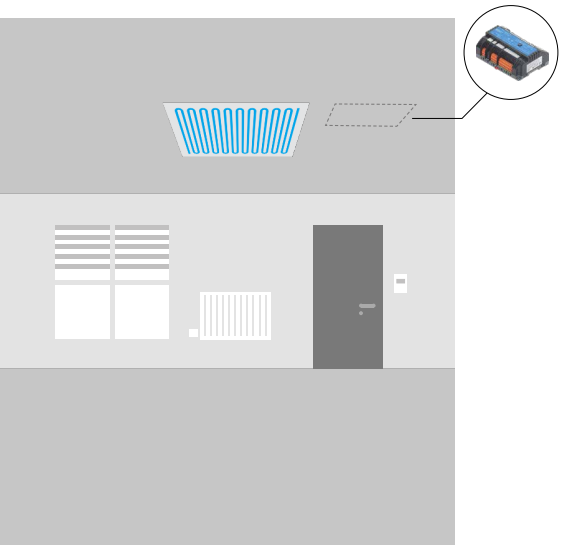
Room controllers programmable with PG5 which can be fully integrated into the Saia PG5® Controls Suite are required to implement a flexible HVAC, light and/or shade application. Through the second RS-485 interface, it is possible to connect the E-Line RIO modules for I / O extension for HVAC, light or shading control or the E-Line Dali module for Dali interface light actuators or via the Sylkbus interface, it is possible to easily integrate the DALI64SYLKPSUx lighting control system. This provides a good basis for the creation of cross-functional room automation functions to acchieve the highest energy efficiency classes according to DIN EN 15232 and thus avoiding high energy costs and at the same time great comfort for the end user to receive.

Segment / Field 3

The greatest communication diversity, Web+IT-functionalities and total flexibility are required for the programming. An example would be a Saia PCD1 with DALI interface, EnOcean connection, BACnet and web operation.

4.2.3 Examples of application for the individual segments

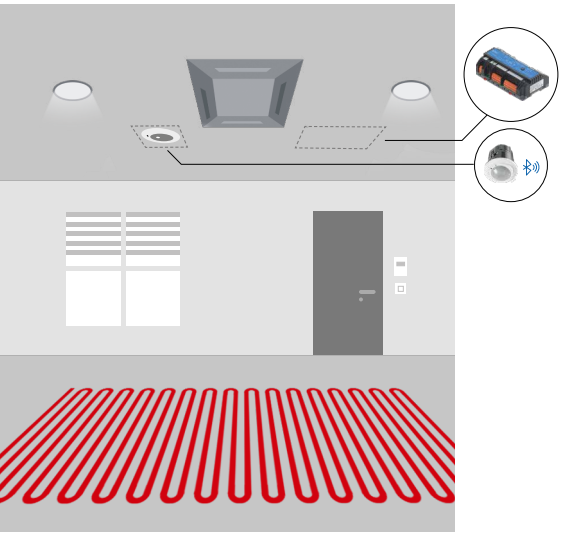
The example shows a room with 3 different applications.



Segment/Field 1

Example of a simple HVAC application

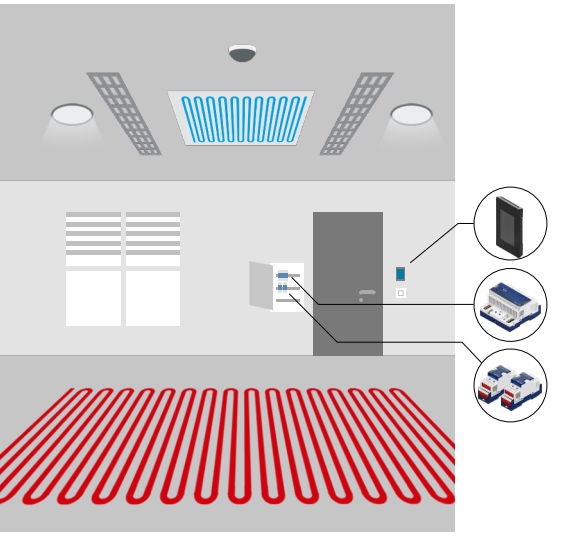
- **Room controller PCD7.LRS4 + PCD7.LR-TR42:**
- **Heating:** Radiator with electrothermal valve drive
- **Cooling:** Cooling ceiling with constant valve drive (0…10 V)
- **Room temperature measurement:** NTC10K integrated in the controller
- **Local user prompting:** Directly on the controller via presence and setpoint offset setting
- **S-Bus connection to floor control for, among others:** control of operating mode changeover, setpoint specification and reading of actual values.



Segment/Field 2

Example of a cross-service/plant application with HVAC, light and shade

- **Room controller system:** PCD7.LRL4-P5 + DALI64SYLKPSUF + PCD7.LR-TR42-CO2
- **Heating 1st stage:** Floor heating with electrothermal valve drive
- **Heating 2nd stage:** FanCoil unit
- **Cooling:** FanCoil unit
- **Room temperature measurement:** NTC20K in PCD7.LR-TR42-CO2 control unit or external NTC sensor
- **Light and shade:** Control of 6 group and sceens of up to 32 DALI lamps and 1 blind
- **Local user prompting:** Sylk-Bus room control unit for setpoint offset setting and fan speed adjustment and DALI switches and Sceen plates for activation of lights and switches for blinds
- **S-Bus connection to floor control for, among others,** control of operating mode changeover, setpoint specification, activation of lights and blinds, read back occupancy state, lamp running hours and failure states, and reading of controller actual values.



Segment/Field 3

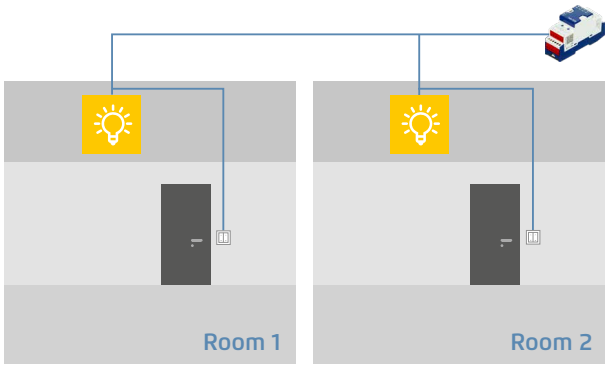
Example of a flexible PLC-based room automation with Web&IT

- **Components:**
  PCD7.D443WT5R + PCD1.F2611-C15 + PCD1.G1100-C15
- **Heating:** Floor heating with electrothermal valve drive and via fan coil system
- **Cooling:** Cooling ceiling and VAV system
- **Ventilation:** VAV system
- **Air quality control** CO_2, VOC, measurement via externally connected sensor
- **Light and shade** Activation of 1…10 V lamps, DALI lamps and blinds
- **Room temperature measurement:** via a room control unit
- **Local user prompting:**
  Room control unit for setpoint offset setting, activation of lights and blinds
- **Web user prompting**: everything also can be controlled via web
- **Presence recognition and brightness measurement**:
  via sensor for automatic control of light and shade
- **S-Bus or other protocol (for example BACnet):**
  Connection to the floor distributor or direct to the GLT

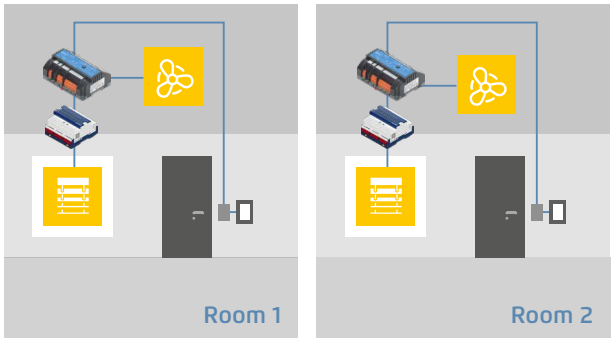
4.3 Examples of application

In addition to the right selection of components, the architectural structure and the basic concept play a decisive role. There are many possibilities and approaches for implementing room automation. However, there is no "single" solution for all areas of application. Depending on the purpose, the choice of the best concept will vary. Some approaches and features:

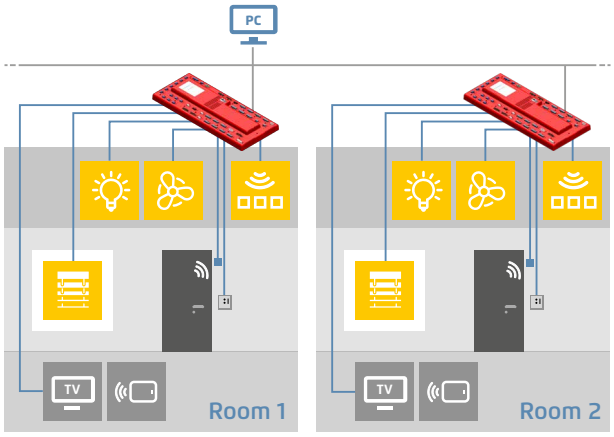
Room automation from a central point
A sub-distribution per floor or section supplies several rooms. The control of lighting with DALI for several rooms would be a practical example of application. More cabling is involved with this variant. However, all components are located at a central point, which makes maintenance work more efficient.



Room automation with distributed intelligence
Components are distributed throughout the floor or room. These are also installed where they are needed, i.e. the controller for fan coil control located near the fan coils. The cabling takes less time, the devices also function independently (= secure operation).

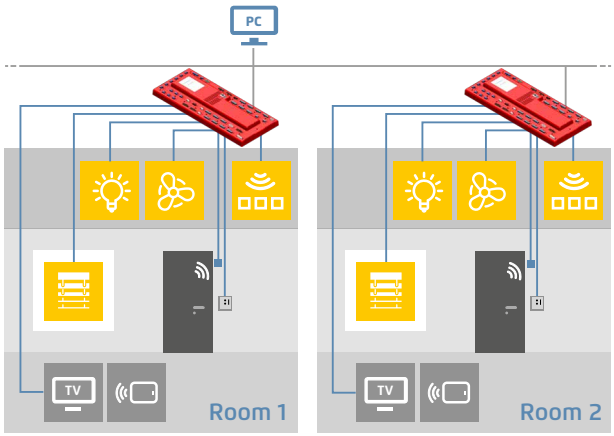


Room boxes
These are ideal if the rooms or their applications are largely identical and/or are numerous, i.e. in hotels and office rooms. The boxes are manufactured and tested prior to installation in accordance with the requirements. The commissioning can thereby be 100% planned and controlled based on the installation time. Only the mounting, connection (usually with finished cable), testing, etc. is carried out on site. …
The simple and efficient maintenance and servicing of the system is also possible.
The plug-in system of box A ensures quick and seamless "plug & play" installation and replacement. Servicing is less time-consuming.



Example of a room box for hotel rooms:
Fully pre-assembled, easy commissioning and replaceable if defective.

Networked room automation
Full networking of all plants and services is increasingly required. One example of application is that the cooling requirement (HVAC service) in summer can be reduced with controlled blinds (electrical plant). All plants also only require a single control unit rather than several different devices.
A web-based control concept can be created using Saia PCD including Web + IT functionalities. This can be used subsequently for commissioning, operation and service.



For example the operation of a conference room:
Each browser and every mobile device can now serve as a control station. Each room is thereby represented accurately and shows each user group only what it requires.