interact

System overview

Architecture PRF/PRA

Version v2.6

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Contents

1. Introduction

This section describes the system design and how this design can support the requirements of a customer.

The information in this section helps with initial sales and designing a system to the situation of the customer.

1.1. About the system

PRF/PRA is designed to install, setup and manage a lighting system in buildings of the following types:

- Office
- Small industry (for example a small workshop or warehouse)
- Retail
- Combinations of the types mentioned

The following tiers can be distinguished:

- PRF is an easy to install standalone lighting system that doesn't rely on gateways to connect to the cloud.
- PRA is a connected lighting system that adds gateways to lighting devices to provide additional features.

PRF/PRA is optimized to connect maximum 200 lights per gateway for PRA (connected) or a light network for PRF (not-connected). This translates to office buildings with a floor area of up to 1000 m2 (10,500 to 11,000 ft2), or larger in buildings with lower lighting requirements (for example up to 10,000 m2 (105,000 to 110,000 ft2) for warehousing).

Multiple networks / gateways can be used to further scale up the system. Interact - PRF can easily be updated to PRA by adding gateway(s) to connect the system to the cloud.

The application areas of the PRF/PRA system are:

- Newbuild
  The lighting installation is optimized for the building by design. The lighting design, placement of sensors, user interfaces, and the gateway is discussed with the customer upfront.
- Renovation
  Existing luminaires will be replaced by new luminaires or lamps, keeping the existing electrical infrastructure and lighting design intact. Only the gateway needs an additional power and network outlet, which in most cases is not problematic.

1.2. Roles and responsibilities

For a better understanding of the stakeholders that are being discussed in this document, below an overview of the different roles and their responsibilities.

Wholesaler/distributor

- Provides the goods at the site at a certain price
- Can process service requests from the **Expert**

Expert

- Designs the installation and prepares it in the installer portal
- Administrates his projects
- Invites new users to the project, allocates installers to a project
- Commissions the system by means of the app
- Provides technical assistance at the site of the customer
- Manages the lighting system by means of the customer portal
- Controls the lighting system in building

Employee (user)

- Controls the lighting system
- Possibility of restricted access to specific groups

1.3. Abbreviations

Abbreviation	Explanation
ACL	Access Control List
AES	PRA Encryption Standard
IoT	Internet of Things
MER/SER	Main Equipment Room / Satellite Equipment Room
MQTT	Message Queuing Telemetry Transport
IAP	PRF/PRA
OTA	Over the Air
SME	Small and Medium Size Enterprises
UPS	Uninterruptible Power Supply
WG	Wireless Gateway
ZGP	Zigbee Green Power

1.4. Terms and definitions

Abbreviation	Explanation
Access port	A switch or router port which is used to connect to an “end device”. An end device in this context is for example the Wireless Gateway.
IPv4	Internet Protocol version 4; IPv4 consists of a set of protocols that together enable communication of packets between network interfaces that are identified by 32 bit IPv4 addresses.
Light point	Either a lamp or a luminaire. When using smart lamps in a luminaire, the luminaire can consist of multiple lights. When using luminaires, each single luminaire counts as a light point.
Task level	Configurable light level on the task plane (80% of full output).
Background level	Configurable light level of 20% of task level, used to save energy when a space in not occupied.
Hold time	Configurable delay time from the moment the last movement has been detected until the start of the grace fading time.
Prolong time	Configurable time the background level is maintained at a fixed level.
Vacant level	Configurable light level used when an area is vacated. Prevents the light to switch off completely in case of security reasons (for example security cameras), or for comfort reasons. The level can also be set to completely off.

2. System introduction

This section provides an overview of the system and how it works for customers.

The subjects are:

- System characteristics
- Features and benefits
- Process flow of a project

2.1. System characteristics

In the following sections, the characteristics of the system are described for the specific target.

A basic knowledge of the system architecture, installation options and equipment is required for a better understanding of the detailed design.

2.1.1. Basic design

PRF/PRA is a wireless control system that doesn't require any additional wiring. PRA offers cloud connectivity using gateways to connect the wireless system devices to the services in the cloud. Because of its wireless design, the system is as easily to install in existing lighting infrastructures as well as new buildings.

New lighting systems based on LED technology enable significant energy savings, where PRF/PRA even can achieve additional savings, as the system is easy to control and highly flexible by means of apps on smart devices.

PRA offers connected benefits as well:

- For the installer and service provider, health status reports are available enabling efficient support to owners of the system (customers).
- for the Owner, insights about the operation of the lighting installation, showing current energy consumption, and remote control capabilities.

2.1.2. System architecture

It is useful to understand the high-level system architecture of both PRF/PRA - Foundation as depicted in High level system architecture of PRF/PRA - Foundation and PRA as depicted in High level system architecture of PRA

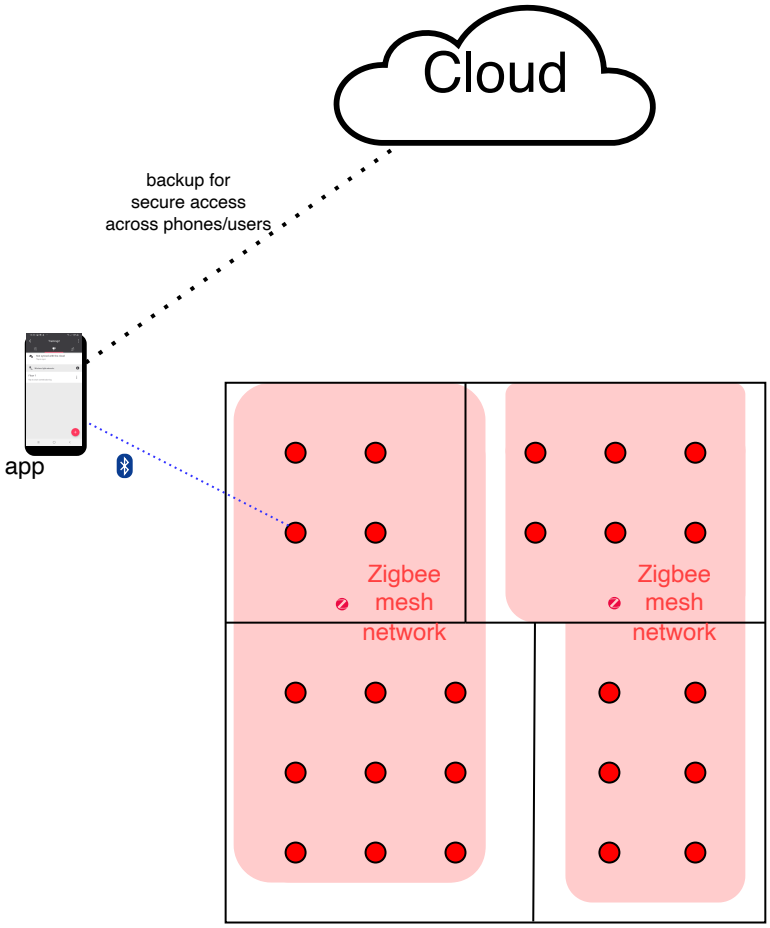
The combination of several hardware components and system specific firm- and software makes the PRF/PRA system.

The system consists of:

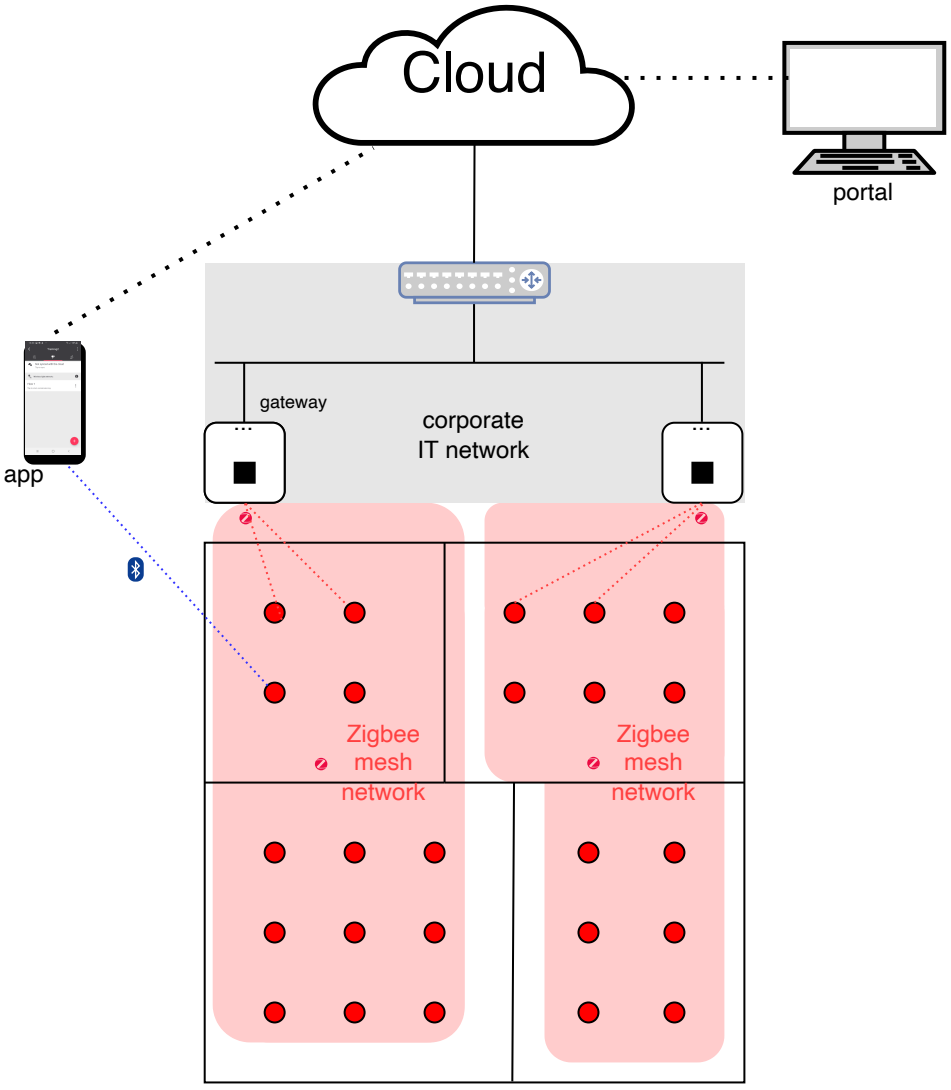
Lights
Lamps or luminaires equipped with electronics to receive and send Zigbee messages. They form a mesh network that is very robust against failures or routing problems and exchange messages to execute control behavior. When a gateway is connected to the light network, the gateway is an integral part of the Zigbee mesh. It relays metric data to the cloud and enables remote control using the app or portal. Lights can come with built-in sensing capabilities or without.

PRF requires generation 2 lights that are Bluetooth-enabled. Generation 1 lights can be used for PRA only.

- Sensor
  Device that senses presence of people in an area and triggers the switching of the lighting in the area by means of Zigbee. Daylight dependent regulation is possible with a multi-sensor that supports light sensing and occupancy detection. The system supports discrete Zigbee Green Power variants as well as sensors that are built into luminaires.
- Switch
  Device that enables the possibility to control the lighting in an area manually, switch on or off, or dim up or down. 4-Button switches can also be used to assign scenes to.
- App
  Software installed on a smart phone that is used for commissioning and operation. For PRA, the phone communicates via the cloud to the gateway and its lighting network. In Foundation, the app uses Bluetooth to connect to a light which will then relay messages to other lights using Bluetooth.
- Wireless Gateway
  An edge device that connects the system to the cloud via the IT network of the customer and the internet. The wireless gateway connects with the lights by means of Zigbee.
- Cloud backend
  Runs all the services and stores all the data for all systems worldwide. Data is organised on project basis with limited access for authorized users only. For PRF/PRA - Foundation, it backups security data needed to transfer access rights to other users and/or phones.
- Portal
  A cloud-based webpage that can be used to access functionality of the system and to remotely control and monitor it.



High level system architecture of PRF/PRA – Foundation



High level system architecture of PRA

2.1.3. System limitations

The table below describes the limitations of various characteristics of an PRF or PRA system.[1] Where applicable, a recommendation will given for applying a limitation to have optimal performance.

1 . This applies to existing PRA projects with lights of generation 1, and for all PRF and PRA projects using Bluetooth-enabled lights of generation 2

System limitations

Feature	Maximum number
Max projects per Expert account	100
Project level	
Light networks (PRF) / gateways (PRA)	20
Schedules	16
Groups/schedule	16
Expert accounts per project	10
User accounts per project (PRA)	multiple
Light network level	
Lights (luminaires and/or Smart lamps)	200
ZGP devices (switches and discrete sensors)	50
Switches	50
Discrete sensors	30
Groups and zones	64
Scenes	128
Group level	
Lights	40
ZGP devices	5
Scenes	16

2.2. Features

2.2.1. PRF/PRA feature overview

The table below shows an overview of the features that are supported by PRF and PRA.[2]

2 . PRE is not part of this documentation, please consult another source of documentation to get an overview across the three tiers

Feature Overview

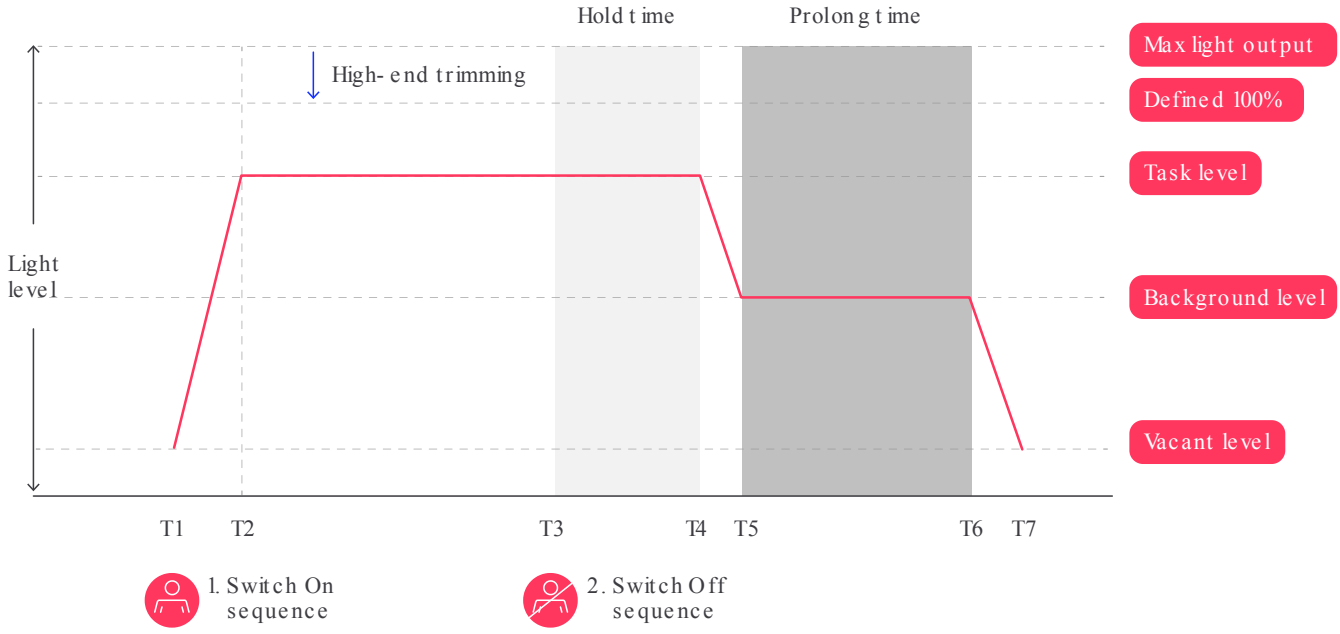
Feature	PRF	PRA
Occupancy control	✓	✓
Daylight regulation	✓	✓
Tunable white	✓	✓
Switch/manual control	✓	✓
Scenes	✓	✓
High end trimming	✓	✓
App control owner(s)	✓	✓
Personal control user(s)	✗	✓
Scheduling	✗	✓
Energy reporting	✗	✓
Remote control	✗	✓
Remote diagnostics	✗	✓
Feature updates	✗	✓
Dashboards (portal)	✗	✓
Upgrade to PRA	✓	N/A
Downgrade to PRF	N/A	✓
Demand response / OpenADRUS/Canada only	✗	✓

2.2.2. PRF/PRA features

The system supports the following light control features across PRF/PRA :

Occupancy

Occupancy sensing can be used either for switching on and off the lights in a room, or only switching off after manually switching on. It is based on the presence of people in the detection area of the sensor, triggering the lights to switch on or off.



Daylight harvesting

Lights close to a window are made part of a separate zone, to enable slightly different behavior than the other lights in the room. A multi sensor installed in the room controls the lights in the zone. After calibrating the sensor, the light output adjusts to the ingress of daylight through the window.

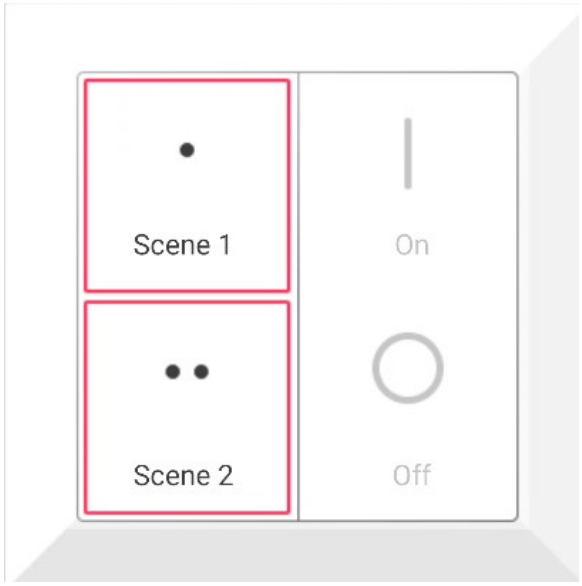
Wall switches

Lights in a room can be switched manually with a wall switch.

Depending on the selected behavior, the lights switch off either manually or automatically after occupancy is not detected any longer.

Switch behavior

The 4-button switch behaves as described below when short or long pressing:



Short press

Long press

It can be configured with different scenes and tunable white.

Scenes

Scenes are used to set the intensity level of individual lights or zones in a group. They can be applied manually by selecting them in the app. Two scenes can also be assigned to buttons of 4-button switches.

Tunable white

Tunable white lighting refers to dynamic control of color temperature and light intensity of a lighting system, with the intention of aligning lighting with circadian rhythms or key activities that require occupants to be more physiologically and psychologically engaged.

This technology harvests superior controllability and color mixing performance of LEDs to create a tunable mixture of white light.

The dynamic feature of tunable white solutions allows any color temperature within the mixing range to be called up. The mixing range starts from warm white (2700K) all the way to cool white (6500K)

Along with independent, full range control of light output, tunable white lighting systems can simulate variety of natural light for a positive effect on human health, well-being and performance.

Note

For the full list of lights that support tunable white, contact your representative or support.

To commission lights and configure tunable white, see the configure tunable white section.

Groups

Lights are logically organized into groups, which can be a physical area like a room or a virtual area in a space that is logically grouped for control purposes. Light control features are configured for each group. This configuration data is deployed to and stored with each light in the group.

After commissioning, many features will remain operational even if the connection to the cloud gets lost.

- Local switch override is always possible
- Occupancy control and daylight control keep working
- High end trim settings are persistent

Schedules remain working as long as the gateway is connected with the lights in that network (Zigbee): without an internet connection, they remain operational. The system is highly robust against temporary power glitches and network failures because its lighting control is distributed across all components of the system: this doesn't require any dedicated setup from installation point of view.

All lighting control features are built with a granularity of 1024 steps that implement a dim scale from 0 to 100%.

High end trimming

High-end trimming limits the maximum output level of a group of lights. By selecting a maximum light level, the maximum light output level of a group of lights is limited to the set percentage.

App control by owner

Owners can control the whole system using the app: they have access to all groups in the system and can change their settings. In PRF/PRA - Foundation, only one user can control the system at a given point in time. In PRA , multiple owners have full control at all times.

Emergency lighting

Luminaires with emergency functionality are equipped with an emergency driver. The emergency driver will autonomously start to power the luminaire when it detects that the mains voltage has dropped.

Upgrade to PRA

PRF can easily be upgraded to PRA by simply adding one or more gateways to the system to enable features that are only supported in PRA .

2.2.3. PRA Features

PRA supports the following features in addition:

Personal control by users

In PRA , owners can also invite additional users to have control over their work area. Users can be given control over a restricted number of groups. For those groups, the user can adapt intensity levels using the app, manage scenes, or turn groups on or off.

Schedules

Schedules provide additional functionality by defining switching moments for a group at a selected day and time. A schedule can be defined across multiple groups and for each group it can be specified what action to perforkm:

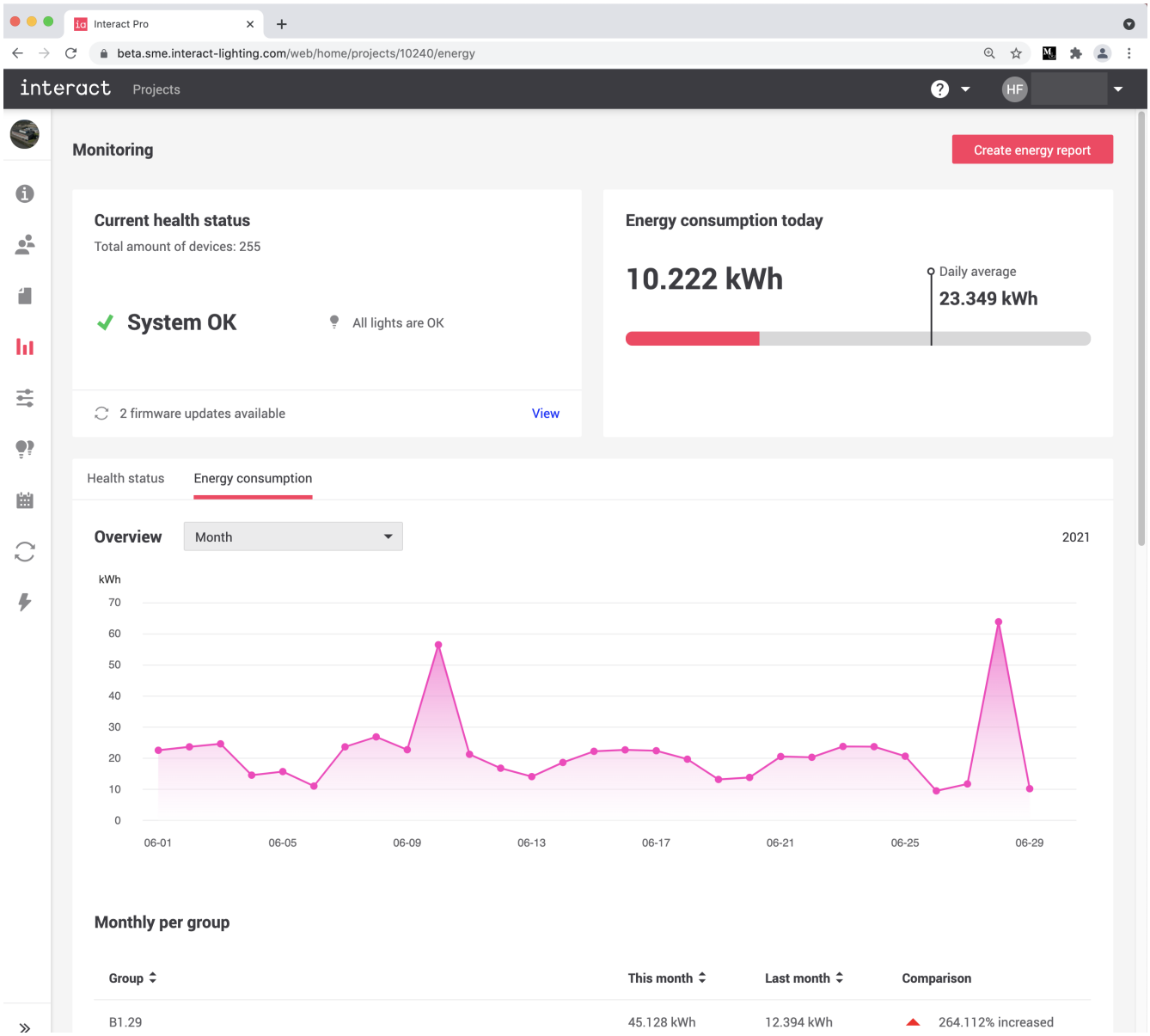
- recall a scene
- turn the lights on
- turn the lights off.

Remote control

A fully connected system like PRA can be controlled securely both via the app or portal from any location in the world. Owners can even change specific setup settings using the app, if so desired. The gateways that are 24/7 connected to the cloud enable this remote control functionality.

Dashboard (Portal)

For connected systems, users can view power consumption and health status of the system using the dashboard of the portal.



Feature updates

The app, the cloud, and portal are regularly updated to enable new features and fix issues. As part of such a release, a new firmware version for the system devices can be made available. The app or the portal can be used to trigger an update of these devices to enable all new functionality.

Demand response

Demand response is a feature specific for the US market that is supported in PRA .

The purpose of the demand response feature is to reduce energy for time periods when there is an energy shortage. Utility companies request their customers to reduce energy consumption. They put out a Demand Response message to energy users like building owners, requesting to save energy. On building level, the Demand Response request is passed on to systems in the building.

In PRA , the amount of energy reduction can be specified in the portal per project. The portal also allows to enable and disable load shedding manually for a period and reduction level that can be specified by the user.

When enabled, the output power as consumed by the lighting system will be lowered as specified. The app provides the ability for the installer to test the feature.

Interact-Pro - PRA also supports automatic demand response through OpenADR v2. This is set up by adding a dedicated gateway that is controlled by a third party device. When this device receives a trigger from the OpenADR server, the gateway will be powered that results in all lights in the project to reduce power.

2.2.4. Metric data in PRA

The system collects metric data from the lights points (luminaires or lamps): this is implemented in the driver. No additional hardware is needed for measuring, collecting and storing this data.

Metric data is sent periodically using the mesh via the gateway to centralized cloud storage where the data is raw data is kept for aggregation and visualization purposes. This data can then be accessed via the portal or the app by the various users of the system with valid access, anytime, anywhere.

The following data is collected:

- Power consumption
  Each driver has a built-in measurement capability will continuously measure power consumption and store it. Every 15 minutes it sends the accumulated power consumption to the gateway that will relay this to the cloud for storage so that it can be displayed or exported as a data file.
- Health data
  Each driver maintains its usage so that it is known how much of its economic lifetime has been used. Drivers can also report failures related to the LED board.

2.3. Process flow

The following subsections capture the process flow that is the basis for a successful roll-out of an installation to a customer.

2.3.1. Initiate

The initiate phase starts with a trigger of the potential customer, which eventually brings both SME owner and Service provider into contact. In multiple discussions the needs, options and solutions will be discussed. This can include a tour through the real estate to investigate the options.

The lighting system is optimized for both new-build as well as retrofit scenarios and is, especially for retrofit, driven to save energy and thus also save on energy cost.

During this process, an offer is made and provided to the customer. After an agreement is reached, planning for install starts.

2.3.2. Install and commission

The system minimizes cost to investigate, plan and install a connected lighting system and has optimized two key cost elements when compared to other systems:

Network infrastructure costs

- Commissioning costs

Standardization and optimizing execution is key:

- all system components are validated to seamlessly integrate with each other
- configure the system from a range of devices and options without bothering if they will work together.

The efficient installation or replacement of lighting devices is enabled by:

- Preparation and logistics
- Device costs of fixtures and labor costs are a dominant cost factor
- Commissioning complexity is greatly reduced by having lights that autojoin to the gateway once they are powered on
- Switches and sensors join the lighting network after a manual trigger on the device
- Intuitive mobile app for further commissioning and configuration of the installation on site

2.3.3. Operate

The lighting system is easy to operate. Adding sensors to the system makes sure the light will turn off after a certain amount of time when the sensor does not detect occupancy any longer.

Additional to this, it is also possible to create schedules to enhance employee experience and save even more. The customer dashboard is open for the owner to monitor the lighting system, but both owner and employees can control the lighting system easily by using an intuitive and user-friendly app on their mobile phone.

The dashboard shows energy usage and the health of the installation.

Energy

- Data collected per driver, with an accuracy of 4%
- Polling interval of 22 seconds
- Data stored in the cloud per luminaire
- Update interval of the dashboard on screen of 15 minutes per project and group

Health

- Failures of components and devices are reported
- Economic lifetime (degradation) of components and devices is shown
- On/off status of devices that are either defect or not communicating will be implemented in a future upgrade

2.3.4. Service and maintenance

The service provider can offer an extended relationship with the customer, for example by providing services. This is possible by means of a contract, in which the contract period and the lifecycle services on the system are offered.

This includes:

- Operations
- Remote monitoring
- System optimization
- Performance management
- Maintenance
- System health check
- Remote diagnosis and fault finding
- Performance and optimization
- Data analytics
- Reporting

The portal is used primarily by the service provider and the customer. It is a platform for the service provider to monitor the systems in his portfolio remotely and provide solutions without sending someone over to the customer. The customer can manage and monitor the system in his building, having a clear overview of the status of the installation.

3. Expert

With the PRF/PRA system, customers are offered an intelligent, modular and state-of-the-art lighting system. But that is just the tip of the service iceberg. Recommending and installing PRF/PRA also gives the chance to become their trusted expert in this new and expanding field of connected lighting.

The following stages are documented:

- Initiate
- Create
- Service and maintenance

3.1. Initiate

The initiation phase includes the following sections.

3.1.1. Project triggers

The PRF/PRA system is designed for business owners who want to support employees by creating a better working environment in meeting rooms, small offices, storage areas, circulation and parking areas. They value quality of light and the automatic switching of the lighting, but also the possibility of personal control through an app.

The system is aimed at businesses operating from small commercial buildings like small manufacturing, service firms, shipping companies, or clinics.

These businesses operate mostly from a single site with up to 100 employees, often without a dedicated facility or IT department. They are served and advised by installers who source via wholesale.

Typical characteristics of a building are:

- Office buildings with a floor space of up to 1000 m2 (10,500 to 11,000 ft2)
- Warehousing with a floor space of up to 10,000 m2 (105,000 to 110,000 ft2)
- Maximum of 200 lights.

The potential customer has improvement budget, and wants to be successful, aims to get the most out of business efforts, wants to support employees by creating the best working environment and save energy. This type of savvy entrepreneur also wants to be perceived by employees, clients and peers as innovative, up-to-date and clever.

The main triggers for customer to start thinking of his lighting are:

- Moving office
- Renovation
- Building a new office

- Upgrade lighting

In the search for information, it is likely the customer contacts a service provider for more information.

If so, it is important provide the best possible information to convince the customer of the benefits of the PRF/PRA system.

Goals	Providing a better place to work, a more attractive shop
	More efficient operation of the business
	Reduce cost and save energy
	Increase security and safety
	Comply with regulations, including proof and monitoring
	Ability to expand on the system, scalability
Explanation	Comfort
	Automation, less interruption
	Wellbeing of the employees
	Possibilities to control the system, have a proper system overview
	Improvement of the company image
	Employee engagement, as the employees can control themselves
Pros	Invasive to the building
	Install takes time with necessary waiting times
	Necessity of hiring experts
	Disruption of the business
	Need for an own IT department
	Requires facility management as add-on

3.1.2. Explore and qualify

Once the customer shows interest, explore the actual needs of the customer, like the goals to achieve and possible pros and contras to invest in the system. A proper explanation addresses possible concerns to be covered by the system.

Get to learn the customer better by questioning some key subjects that influence the qualification of the system to propose:

- The kind of business of the customer
- The people and the environmental commitment
- Current lighting or future lighting needs
- IT situation (own IT department or outsourced IT)
- Available budget and possible timing

3.1.3. Specify

The customer provides all kinds of information that can be of any use during the preparation and design of the project.

It is advised for the service provider to conclude the initiate phase with a small written document that summarizes the key project data that will be captured during preparation and design and can include a timeline for the install and commissioning.

This information is to be used to create and prepare the project in the PRF/PRA system as described in next section and can also serve as a part of an agreement between both the service provider and the customer (like a statement of work).

The following sections describe the steps that ideally are taken to present a completely prepared and designed project to the customer.

3.2. Create

The initiation phase includes the following sections.

3.2.1. Prepare

The preparation consists of several steps, to be completed in cooperation with the customer:

- Capture the project details
  - Name and address of the customer
  - Contact details of the contact person
  - Usage of the building, area types etcetera
- Discuss the details of the PRF/PRA system
  - Type of luminaires, sensors, switches
  - Number of groups and zones
  - Scenes and lighting behavior

Note

For this step, it can be useful to have the floorplans of the building available.

- Create, invite and appoint the users necessary for this phase of the project
  - Installer on the job
  - Business owner (contact person)

Design

Elaborate the data collected in the preparation to a proper design plan.

If possible, use the floorplans of the building to detail out the PRF/PRA system.

The type of building determines the usage of the areas and thus the design of the light plan.

The selection of the luminaires is based on the usage of the building:

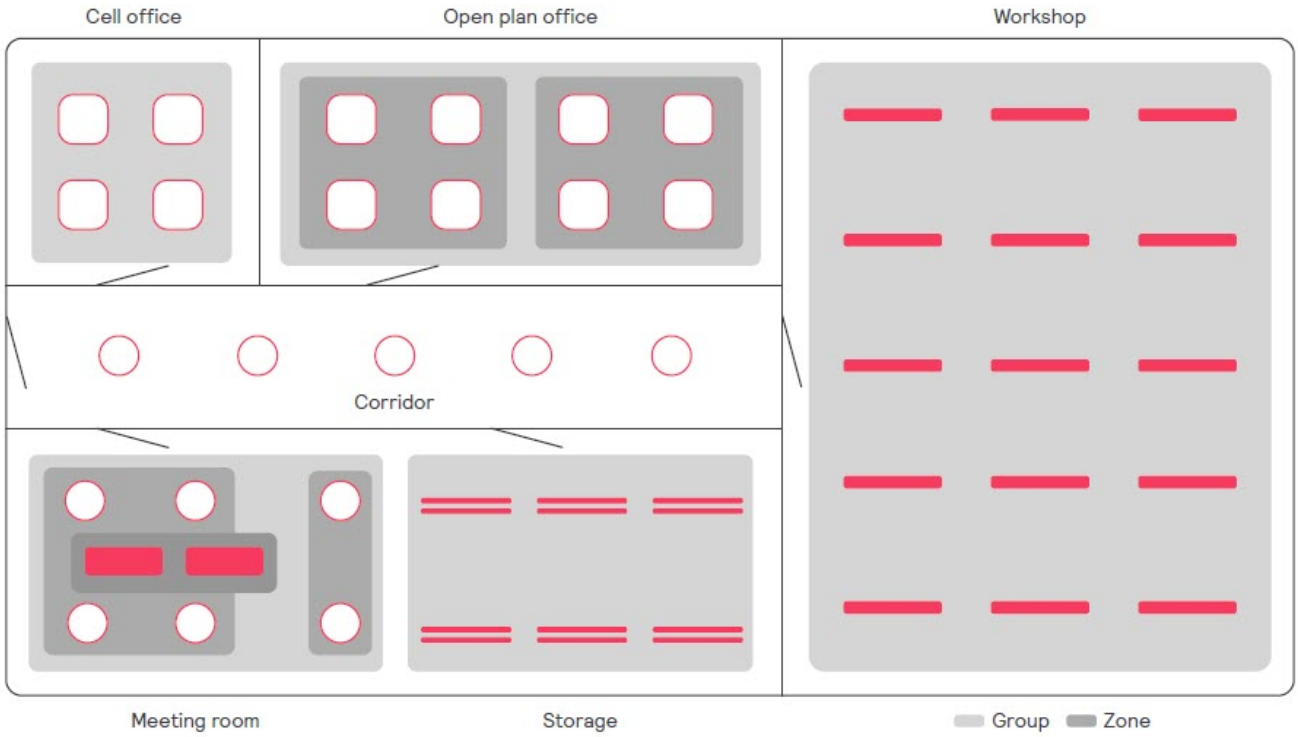
- *Office*
  Panels, troffers, downlights, spots, etcetera
- *Warehouse, Industry*
  Waterproof, batten, high-bay etcetera
- *Retail*
  Downlight, spots, etcetera

Design lighting network architecture

The design of the lighting network must comply with the following requirements:

- Determine the amount and position of the lights, sensors and, if applicable, switches
- Use the input from the customer (for example floorplans) to define groups and zones
- Define the scenes and lighting behavior for the groups and zones
- Define the location of the gateway

The example shows a simplified floor plan of a building, with typical usage of the areas. The areas are designed with lights that correspond to their usage and have groups and zones defined.



Design of the power grid

The number per circuit is limited by the circuit breaker and the inrush current of the wireless driver.

Make sure to create sufficient circuits as per the following table:

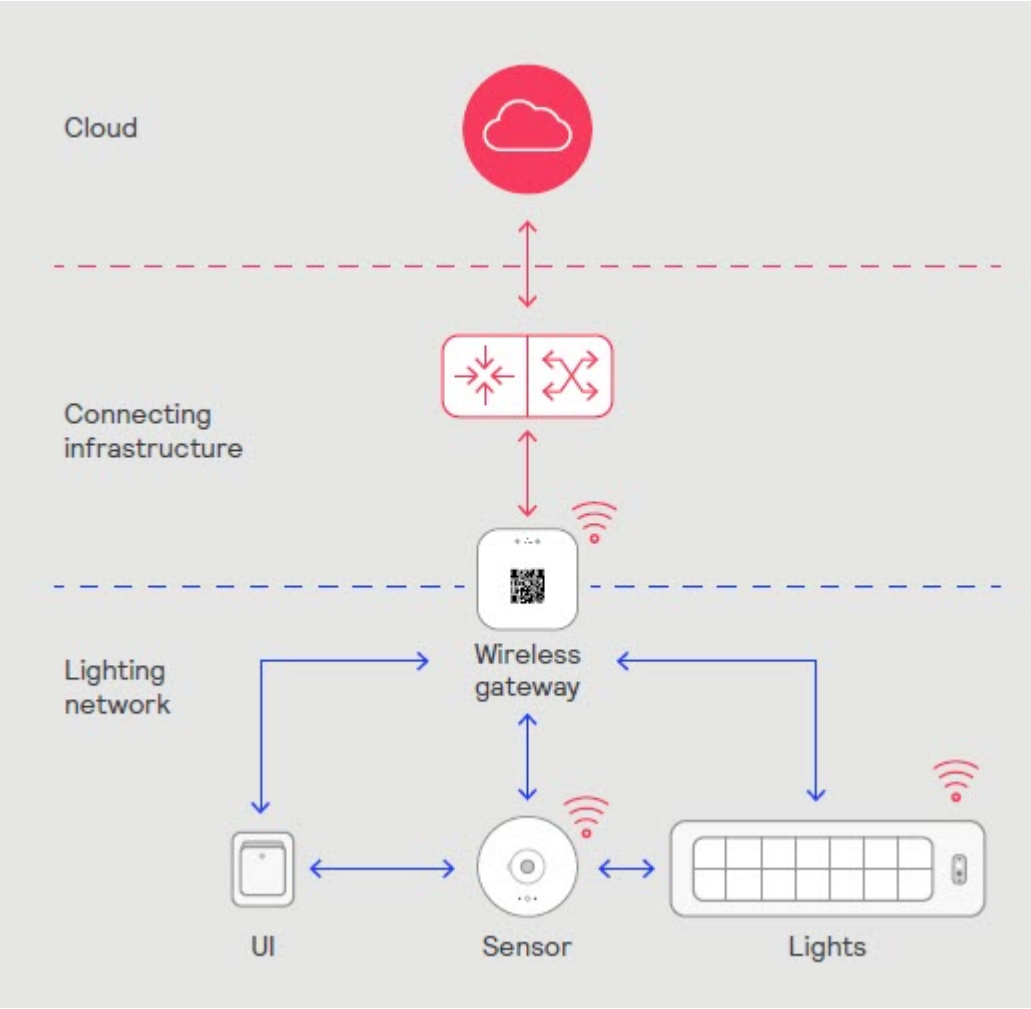
Driver type (application)	Circuit Breaker: 16 A, type B
Independent driver (for example: panel, downlight)	Max 24 luminaires
Built-in driver (for example: waterproof, troffer)	Max 22 luminaires

The gateway requires a power outlet, available close to the location of the device.

Note

The gateway is placed at high altitude against a wall or dropped ceiling.

Design of the local IT architecture



The IT infrastructure connects the gateway to the infrastructure of the customer, enabling the communication to the cloud.

The gateway requires a LAN outlet that makes it part of the IT infrastructure of the end-customer. The network needs to be provided with a dynamic IP address from a DHCP server. This can be the router that is configured for this task. Networks with static IP addresses are currently not supported.

Note

The gateway is placed at high altitude against a wall or dropped ceiling.

The router of the customer must be configured to allow inbound and outbound traffic to the URL of the Interact cloud and specific ports:

- sme.interact-lighting.com for port 80 and 443
- mq.sme.interact-lighting.com for port 443
- web.mqtt.pro.interact-lighting.com for port 443

The lighting network generates traffic that is separated from the IT network. The WG

communicates directly to the customer router and routes traffic on the lighting network directly to the cloud. A firewall operating a strict protocol monitors the incoming traffic.

Scenes and lighting behavior

The basic lighting behavior types are:

- *Occupancy based control*
  Either manually switch on the light, or automatically switch on the light after occupancy is detected. If occupancy is no longer detected, the lights switch off automatically.
- *Daylight dependent regulation control*
  The sensor detects the ingress of daylight adjusting the light output of the luminaires to maintain the optimum task level.
- *Manual control*
  Manually switch on and off the light by means of a ZGP switch.
- *Scene control*
  Predefined scenes that can be selected in a room.
- *Scheduling*
  Execute an action (scene) at a pre-defined time of the day.

3.2.2. Install and commission

The install and commission phase divides the project execution in the building of the customer into logical parts and includes system installation at the customer site and the complete commissioning until handover.

Most of the activities can be identified in lighting network installation, but limited IT network installation is required also.

These activities divide up into the following phases:

- Offsite preparation
  The service provider optionally prepares the physical install and the commissioning in the installer portal;
- Onsite installation
  The installer on the job executes the installation of the gateway, lights, sensors and, if applicable;
- Onsite commissioning
  The installer on the job commissions the system using the app, based on the preparation done in the installer portal.

3.2.3. Portal and app permissions

Manage users

Action/Role	Expert	User
Request access	✔	✖
Invite others	✔	✖
Delete others	✔	✖

Commission and update

Action/Role	Expert	User
Commission project	Mobile app	✖
Firmware update (PRA-only)	✔	✖

Manage projects

Action/Role	Expert	User
Create projects	✔	✖
Manage projects	✔	✖
Create groups and zones	✔	✖

Use

Action/Role	Expert	User
Energy & health (PRA-only)	Web app	✖
Energy reports (PRA-only)	Web app	✖
Manage scenes	✔	✖
Manage schedules (PRA-only)	✔	✖
Manage groups	✔	✖
Control lights	✔	✔

Reference

- ✔ - possible
- ✖ - not possible
- ◯ - possible with limited functionality
- Web app - only available in the web app
- Mobile app - only available in the mobile app

3.3. Service and maintenance

In case a customer experiences malfunction of the system, or a component that fails operation, the first point of contact is the Service provider, who is able to solve 90% of the problems.

If the service provider cannot solve the problem, first line support is found at the wholesaler or the Customer Care Center. Hardware related problems are most likely to be solved by spare parts delivered by the wholesaler, other issues are directed to the Customer Care Center in the region.

When the problem persists, the Customer Care Center contact second line support, who investigate the problem and provide possible solutions to the Customer Care Center, who revert this information to the Service provider.

In the rare case the problem is not solved, there is specialized third line support available.

The main tasks for the service provider are:

- System health checks
- Remote support
- Remote monitoring
- On-site service activities
- Spare parts services
- Energy monitoring
- Light level monitoring

3.4. Operate

3.4.1. Use

After handover, the system is easy to use with the PRF/PRA app. The PRF/PRA app for personal control is available for iOS and Android.

3.4.2. Service and maintenance

The system normally operates without any problem, but in case of any malfunction, the Expert is the single point of contact.

4. System components

The following sections provide an overview of the several components used, their possible locations and the functionality of the component in the larger system.

Each section covers a key system component of the lighting system.

4.1. Gateways (PRA)

4.1.1. Wireless gateway

The LCN1840 gateway is the heart of the light network, connecting up to 200 lights to the cloud. It connects via ethernet to the IT network of the customer and communicates with lights in the light network. An PRF project can be updated to an PRA project by adding a gateway to each light network in the project.

It is mounted the wall or attached against the dropped ceiling.

Note

It is never attached behind the ceiling plates.

4.1.2. Wireless gateway for OpenADR (NA only)

The LCN1870 is used in PRA to support the OpenADR feature. After activation, it sends a heartbeat to the LCN1840 gateways (that control the light networks) via the cloud. When a LCN1840 gateway receives this message, it will reduce power with 20% (Level 2).

Note

To implement OpenADR feature, a third party device is required that powers the LCN1870 in periods of power reduction and shut downs in normal periods.

4.2. Electronic components

The following electronic components (drivers) are part of the system:

4.2.1. Built-in wireless driver

Provides power to the LED Panels inside the fixture; connects to the wireless lighting network; translates control signals to output power.

It is mounted inside the fixture, used in larger fixtures where there is room to fit the driver.

4.2.2. Independent wireless driver

Provides power to the connected luminaire; connects to the wireless lighting network; translates control signals to output power

It is mounted above the ceiling, used in fixtures where built-in drivers do not fit.

4.2.3. Xitanium SR LED driver

Driver controlling the LED board, implements dimming curves and measures health status and energy usage. A control node (transceiver) must be connected to the driver. The default dimming curve is logarithmic, but this can be changed to linear through a firmware upgrade.

It is mounted inside the fixture, or above the ceiling, used with powered RF-only transceivers or RF-sensor devices.

4.2.4. SNS441 RF wireless transceiver

Serves as a node in a distributed lighting system. It receives and stores lighting behavior and its parameters, collects data from the connected driver and transmits this via its wireless interface.

It is mounted inside the fixture, or in sensor mounting clip.

4.2.5. SNS441 mounting clip

Mounting clip for in ceiling installation.

It is mounted in the ceiling next to the fixture.

4.2.6. RF DALI connector (EU only)

Connects existing DALI drivers to become part of the wireless connected lighting system. Also, regular mains switchable luminaires can be made part of the wireless connected lighting system.

It is mounted above the ceiling.

4.2.7. RF 0-10V connector (NA only)

Connects existing 0-10V drivers to become part of the wireless connected lighting system.

It is mounted above the ceiling.

4.2.8. Switch relay (NA only)

Supports 20A plug load control and continuous 0-10V dimming control of LED and non LED loads and integrates with the wireless lighting system.

It is mounted above the ceiling.

4.2.9. System bridge (NA only)

Connect any group of 0-10V or electronic low voltage luminaires and make it part of the wireless lighting system. It mounts to a T-bar or hard ceilings.

4.3. Sensors

4.3.1. Luminaire-based Sensors

SNS210 IA

The *SNS210 IA* is a device that is shipped as integral part of a luminaire or can be installed in a luminaire with a special sensor slot. The SNS210 IA has the following features:

- Occupancy detection
- Daylight sensing
- IR receiver

It is connected to a compatible Xitanium SR driver in the luminaire.

Important

For a better explanation of the field of view for motion detection of each sensor, see the sensor specification sheet.

SNH(R)210 IA

The SNH(R)210 IA is an industry sensors part of a luminaire-based lighting control system that leverages PIR motion sensing for occupancy detection.

It features light sensing with daylight dependent regulation (DDR), IR module for remote control and Zigbee and BLE transceiver.

It is mostly intended for usage in warehouses and factories. For more information, see the latest datasheet of SNH(R)210 IA.

4.3.2. Wireless Zigbee Green Power Sensors

The range of wireless ZGP sensors feature the following:

- Occupancy detection
  Passive Infrared (PIR) technology to accurately detect occupancy/vacancy.
- Daylight sensing
  High accuracy of ambient light measurement from 1 to 2000 lux.
- Battery powered
  No electrical wiring required; quick and easy installation with tape or screws

The following sensors are part of the system:

4.3.3. Wireless ZGP IP42 Sensors

These sensors are targeted for office uses up to heights of 4m.

Occupancy sensor (OCC)

Battery powered sensor for the sensing of motion; connects to the wireless lighting network; provides control signals to the driver; lifetime of the battery > 8 years.

It is attached to the ceiling.

Multi-sensor (OCC-DL)

Battery powered sensor for the sensing of motion, light; connects to the wireless lighting network; provides control signals to the driver; lifetime of the battery > 8 years.

It is attached to the ceiling.

4.3.4. Wireless ZGP IP65 sensors

These sensors are targeted for industrial use cases up to heights of 8m. A typical application is parking garages in combination with waterproof luminaires.

Occupancy sensor (OCC)

Battery powered sensor for the sesion of motion; connects to the wireless light network; provides control signals to the wireless module of the lights; lifetime of the battery > 8 years. It is attached to the ceiling.

Multi-sensor (OCC-DL)

Battery powered sensor for the sesion of motion; connects to the wireless light network; provides control signals to the wireless module of the lights; lifetime of the battery > 8 years. It is attached to the ceiling.

4.3.5. LCN4120 / LCN4150

The LCN4120 / LCN4150 outdoor parking sensor is part of a luminaire-based lighting control system.

Typical application areas are outdoor parking lots and covered parking garages.

The following mounting hights are suited for each sensor:

- LCN4120/x5 - between 2.1 and 4.6 m (7 and 15 ft)
- LCN4150/x5 - between 4.6 and 12.2 m (15 and 40 ft)

It contains the following features:

- PIR motion sensor for occupancy detection
- Light sensor for closed loop daylight regulation
- Infrared receiver module for IR remote control
- Zigbee and Bluetooth Low Energy (BLE) transceiver
- Luminaire integration with Zhaga Book 18 connector

4.4. Switches

The following switches are supported:

4.4.1. SWS200, Zigbee Green Power Switch, 4-button (NA)

Manual, wireless control of the lights, supports on, off, dimming and scene selection.

4.4.2. UID8470/10, Zigbee Green Power Switch, 2-button (EU/GM)

Manual, wireless control of the lights, supports on, off and dimming.

4.4.3. UID8480/10, Zigbee Green Power Switch, 4-button (EU/GM)

Manual, wireless control of the lights, supports on, off, dimming and scene selection.

4.4.4. UID8465 ZGP switch and scene selector (NA)

Manual, wireless control of the lights, supports on, off, dimming and scene selection.

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