Guest Room Controls & Monitoring System

Integrated Solution for Hotels
Southern Countries

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GUEST ROOM CONTROLS & MONITORING SYSTEM

INDEX

1 General

1.1 SYSTEM INTEGRATION

The Guest Room System provider shall furnish and install a fully integrated Guest Room Controls & Monitoring System, incorporating distributed control techniques and standard open communication networks. The system shall be implemented as an integrated, open solution, which enables Service Center connectivity through a standard interface.

The functionality shall include the following features in each Guest Room:

- Room temperature controls
- Lighting controls, dimming groups
- Lighting controls, on/off groups
- Controlled sockets, enabled/disabled
- Curtain controls

To achieve an environmentally friendly solution, also the following features are recommended for each Guest Room:

- Water consumption measurement
- Electricity consumption measurement
- Cooling energy consumption measurement

The system settings shall be changed according to occupancy and booking status. The occupancy status shall be indicated by the keycard holder. The system shall also be capable of receiving the booking status indication from the reservation system. The system shall support changing the reservation status also manually from reception through graphical user interface (Main User Interface).

Guest Room System shall enable integration with the following sub-systems (i.e. Intelligent Building Management and Security Systems):

- BMS / Building automation (cooling/heating control, ventilation control, pumps, etc.)
- Lighting control of common areas
- Consumption measurements of water, electricity and cooling (heating) energy
- Access control system
- Intruder alarm system
- Video monitoring system
- Fire alarm system
- Central battery system

All systems in the building shall be integrated with a standard based, generic software platform, which facilitates integration and interoperability of all building systems ((COBA Building Operating System platform, later referred to as "BOS") as described in the System Architecture. The Platform shall provide standard connectivity to the Service Center, which shall be capable of providing advanced maintenance and security services.

This specification covers Guest Room Controls & Monitoring. Please refer to a separate specification for details of Common BMS and Security Systems (“BMS Specification”).

1.2 USER INTERFACES

The guest room user shall be able to use the system easily with a graphical browser-based User Interface, launchable in the IPTV with a normal web browser. The User Interface shall comply with requirements defined in the System Architecture.

The browser-based User Interface shall be generated automatically using the structure of the building defined in the Building Information Model. The browser-based User Interface shall utilise latest web technologies, such as AJAX. The user interfaces shall provide easy access to frequently needed

functionality, such as lighting controls, temperature setpoint modifications and alarms. The User Interface shall be capable of showing consumption values, temperature value and FCU setpoint. It shall enable changing the setpoint and controlling the lights and the curtains.

Guest Room Controls & Monitoring system shall be accessed through the BOS.

The system shall also enable a client-based User Interface for Main User in reception and professional usage and central monitoring of systems (Service Center usage). Main user capability and central monitoring shall utilize the BOS as defined in the System Architecture.

The BOS shall be capable of receiving indication about the room status (vacant / sold out) from the hotel reservation system. It shall be possible to change the room status also through the Main User Interface client. The BOS shall also enable integration of the Guest Room Controls & Monitoring System with BMS.

Main User Interface shall enable monitoring of all rooms including the following:

- Occupancy
- Temperature
- Setpoint
- Consumptions
- Trends
- Alarms
- Manual controls

The Main User Interface shall be implemented as a client application, which includes an automatically adapting tree structure of the building, building's parts, individual spaces, different systems and parts of systems. The tree structure can be used for navigation through the system.

All systems connected to the BOS can be accessed through the same graphical User Interface. The client software can be installed to unlimited number of remote computers or laptops. The client software shall allow for remote Internet usage of several sites using the same client.

The professional User Interface shall show system views, floor plan views, trend view, alarm view and event log view per building and system layer. Any alarm shall be shown in red color in both graphical views and tree structure. Each alarm message shall include shortcut to relevant graphical system and floor plan view.

1.3 SYSTEM ARCHITECTURE

The System Architecture shall consist of three levels:

- Control Level
- Management Level
- Service Level

The system offered shall be completely modular in structure and freely expandable at any stage. Each level of the system shall operate independently of the next level up as specified in the system architecture. For example, Control Level shall operate independently without support from Management Level.

The system shall be fully consistent with the latest industry standards. To enable efficient functional system integration and to provide maximum flexibility and to respond to changes in the building use, the system offered shall support the use of LonWorks, Ethernet TCP/IP and Internet communication technologies.

1.3.1 Control Level

The Control Level shall consist of a distributed network of smart control nodes, which are connected to field bus. Nodes shall include all the intelligence of the system. Each node shall be capable of handling several different systems in parallel through flexible distribution of I/O points. Nodes shall be capable of operating autonomously independently of Management Level. For example, all systems must be able to

react to alarms on the Control Level without interference from upper levels. All communication shall be event based.

1.3.2 Management Level

Management Level shall provide a uniform view to all systems through the open BOS. All the systems - controls of cooling, ventilation and lighting, consumption measurements, access controls, intruder alarms, fire alarms and DVR systems - shall be integrated with the BOS using device drivers.

The BOS shall offer at least the following common services to be used by all connected systems:

- Alarms
- Historical trending
- Logs and reporting
- User profile and role management

To ensure fault-tolerant system functionality, the Management Level shall not be responsible for any controls. The Control Level shall function independently also without the Management Level. The Management Level shall enable existence of Service Level as specified herein.

The BOS shall collect trends from defined points, collect and forward alarms from the systems. The BOS shall enable efficient management of user rights. The BOS shall be capable of forwarding alarms to mobile phones using SMS, local alarm printers or to Service Center. It shall be possible to browse the alarm history for reporting and statistical purposes.

The BOS shall provide standard connectivity to the Service Center, which is capable of providing advanced maintenance and security services.

The BOS shall include a structured XML object model of the building, its parts and spaces, its connected systems, system parts and effect areas of each system. The XML object model shall comply with commonly accepted XML schema.

The BOS shall include an open interface for other applications to interact with the connected systems. Communication method between BOS and Client applications shall include at least Java Messaging Service (JMS). Web interfaces shall be used for light-weight clients, e.g. automatically generated browser-based user interfaces in residences for Panel PC's, PDA's or IPTV.

The network technology shall be based on the IT standards, such as TCP/IP, and be compatible with latest LAN/WAN technology. The operating system of the BOS server shall preferably be Linux, also Windows 2000, Windows XP or later are acceptable. The BOS shall be capable of supporting current and future building management protocols through implementation of network interface drivers. The BOS shall be capable of current and future systems and devices through implementation of device drivers.

1.3.3 Service Level

Service Level shall allow the systems to be connected without additional software to one or several Service Center(s), for providing centralized remote monitoring, alarm and fault detection of connected building management and security systems.

The Service Center will be built to the Service Island and it shall be capable of accessing remotely the systems through a standard interface through the BOS. The standard connectivity shall enable providing advanced maintenance and security services, such as security alarm monitoring, maintenance alarm monitoring, remote diagnostics, main user capability, remote control and optimization of all systems, energy optimization, trending and reporting services.

The Service Center shall support connectivity of multiple sites in multi-operator environment. Predefined alarms from connected sites – e.g. intruder alarms, dirty filter notifications or leakage alarms, for example – shall appear in the alarm list with a specified priority. Alarms shall be stored in the central database.

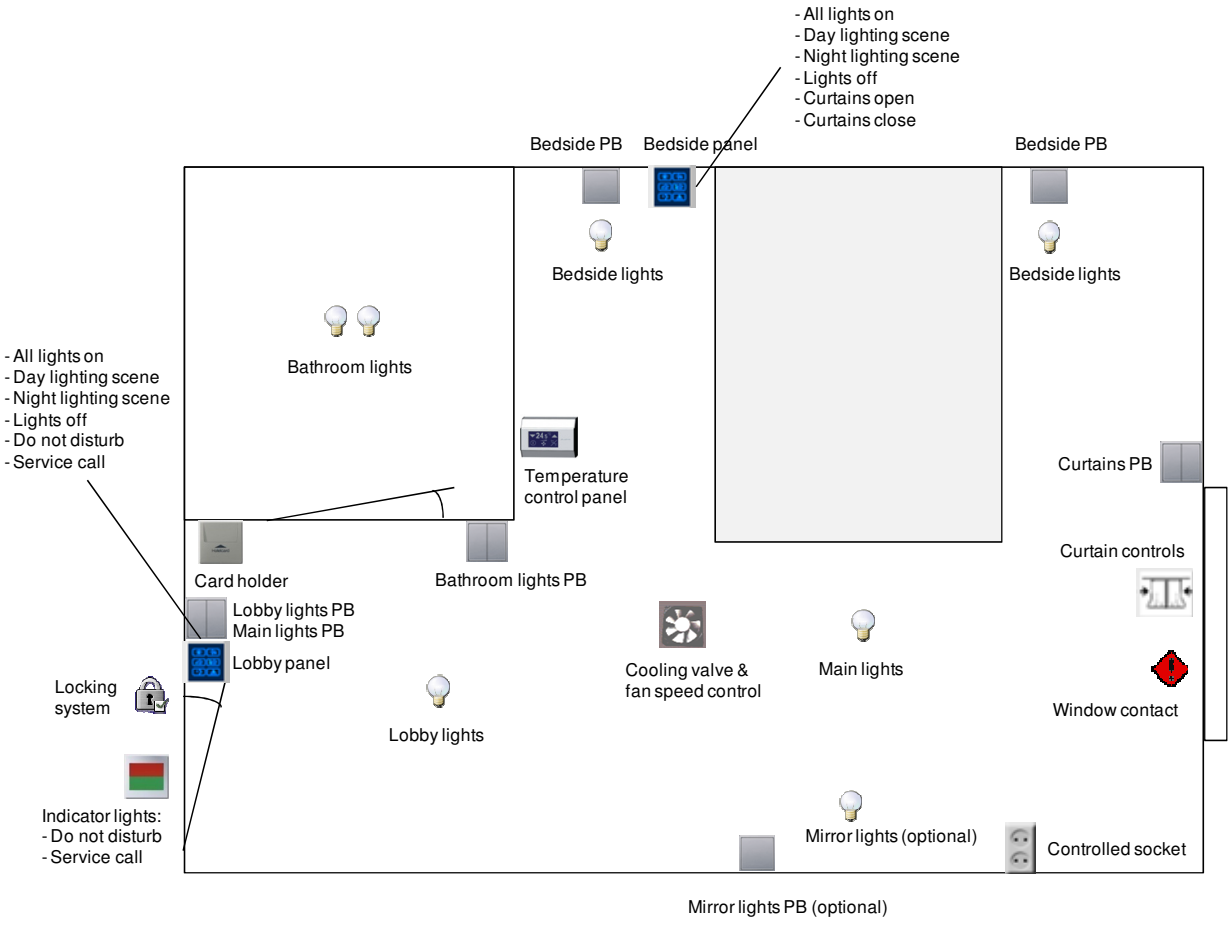
Remote diagnostics of site systems and devices shall enable proactive maintenance of technical systems, energy optimization and efficient management of the infrastructure. Centralized monitoring of all

connected sites with main user capability shall enable e.g. set point changes, manual overdrives and camera controls by using the remote connection.

2 Guest Room Control System

2.1 DESIGN EXAMPLE

An example of solution design of each room is presented in the following picture.



2.2 DISTRIBUTED INTELLIGENCE

The intelligence of the systems shall be distributed into Smart Control Nodes, including (but not limited to) FCU controls, lighting controls and consumption metering. Smart Control Nodes shall be connected to field bus.

Smart Control Nodes must be commonly used during past 10 years not only in hotel rooms but also in large scale commercial facilities, such as offices, business centers or residential buildings. Control nodes, which have not been used in large scale implementations are not acceptable.

It shall be possible to integrate the systems on Control Level without interference of Management Level, according to System Architecture.

Communication between Smart Control Nodes shall be peer-to-peer communication via a Free Topology (FTT-10) Local Operating Network (LON) with the Standard Network Variables Types (SNVT). All communication shall be event based. Nodes shall be intelligent modules, capable of operating

autonomously independently of Management Level. For example, all systems must be able to react to alarms on the Control Level without interference from upper levels.

Each node shall have about 10 I/O points to achieve maximum reliability and flexibility. Each node shall be capable of handling several different systems in parallel through flexible distribution of I/O points. The I/O points of the Control nodes shall be as follows:

- DI: Digital indication, from potential free contact
- DO: Digital control, open collector
- AI: Analog input, standard measurements 0-10 VDC, PT1000 or Ni1000-LG.
- AO: Analog control, 0-10 VDC or 20 mA

The Control nodes shall include PID controllers and ON/OFF (thermostat) functions for implementing the control loops used in engineering system process controls. Logical functions shall be implemented using configurable software objects in the Control nodes.

Field devices are connected to Control nodes using the common industry standards:

- PT-1000 for temperature
- 0-10 V for other sensors and actuators
- Potential free contacts for ON/OFF indications and push buttons
- 24 V relays for ON/OFF controls
- Impulses for consumption measurements

To guarantee openness, flexibility and cost-efficient maintenance of the integrated systems, the field devices shall not include independent control logic.

Control nodes are placed to the nearest electric cabin, side of air-handling units or in separate cabins when adequate. All systems shall use the same control network cabling, which uses free topology to maximize flexibility for future modifications and to minimize the need for cables. Electrical design utilizes free or star topology cabling to maximize flexibility for changes and to minimize the use of cables.

2.3 KEYCARD HOLDER

Keycard holder shall give occupancy indication to the control nodes. Control nodes shall update room status to Main User Interface (in reception).

When keycard is entered and Guest Room is sold, the following shall take place:

- Welcome lighting is turned on
- Air-conditioning setpoint is lowered to predefined comfort level
- Electricity is enabled in selected power sockets
- Room status is updated in the Main User Interface (in reception)

When keycard is entered and Guest Room is not sold, the following shall take place:

- “Staff in” lighting is turned on
- Air-conditioning setpoint is lowered a bit to a predefined level
- Electricity is enabled in selected power sockets
- Room status is updated in the Main User Interface (in reception)

When keycard is removed but Guest Room remains sold, the following shall take place:

- Lighting is turned off after a defined delay
- Air-conditioning setpoint is changed to energy-saving level
- Electricity is disabled in selected power sockets
- Room status is updated in the Main User Interface (in reception)

When keycard is removed and but Guest Room is not sold, the following shall take place:

- Lighting is turned off after a defined delay
- Air-conditioning setpoint is changed to energy-saving level defined for long absence
- Electricity is disabled in selected power sockets

- Room status is updated in the Main User Interface (in reception)

2.4 BEDSIDE PANEL

A local control panel shall be located by the bedside, enabling lighting scene controls and curtain controls as follows:

- All lights on
- Daytime lighting scene
- Night lighting scene (leaves dimmable bedside lights on a predefined level)
- All lights off
- Curtains open
- Curtains close

2.5 LOBBY PANEL

A local control panel shall be located in the lobby, enabling lighting scene controls and service requests as follows:

- All lights on
- Daytime lighting scene
- Night lighting scene (leaves dimmable bedside lights on a predefined level)
- All lights off
- Do not disturb
- Service call

2.6 FCU CONTROLS

The FCU control node shall automatically change the FCU motor speed based on temperature deviation. It shall regulate the cooling valve to meet the desired temperature conditions. FCU control nodes shall communicate on field bus and shall be integrated with BMS system to enable energy optimization and reporting.

Occupancy indication (from keycard holder) shall influence FCU controls as follows:

- Comfortable temperature setpoint and predefined fan speed upon guest entry
- Predefined temperature setpoint and fan speed upon staff entry when room is not in use
- Predefined higher setpoint and fan stopped upon guest leave to achieve energy-savings
- Predefined much higher setpoint and fan stopped upon check-out to achieve energy-savings

For each FCU there shall be a room panel for deviating the setpoint and changing the fan speed.

Upon indication of open window from the window contact, the cooling shall be turned off to save energy.

Each FCU shall include a specially designed high efficiency particulate air (HEPA) filter for capturing all sizes of air-borne particles to improve indoor air quality.

2.7 LIGHTING CONTROLS

Controlled lighting groups and sockets shall be as follows:

- Main light (dimming)
- Lobby light (on/off)
- Bedside lights (dimming)
- Toilet lights (on/off)
- Mirror light (dimming or on/off)
- Controlled socket (on/off)

Occupancy shall influence lighting controls as follows:

- Welcome lights upon entry (occupancy indication from keycard holder)
- All lights off and socket disabled upon leave, lobby lights off after a defined delay

Lighting scenes shall be as follows:

- All lights on
- Daytime lighting scene
- Night lighting scene (leaves dimmable bedside lights on a predefined level)
- All lights off

Lighting scenes shall be switched on using the Bedside Panel and the Lobby Panel.

Each lighting group shall be also controlled as individual groups. Lighting groups shall be switched on/off or dimmed using lighting switches. Lighting switches shall provide potential free contact to control nodes.

2.8 CURTAIN CONTROLS

Curtains shall be opened/closed as follows:

- Using dedicated push buttons: open/close
- From Bedside Panel: open/close
- According to occupancy: curtains can be closed upon leave

2.9 SERVICE REQUESTS

The guest shall be able to initiate the following requests using the Lobby Panel:

- Do not disturb - turns on an indicator light outside of guest room
- Service call - turns on an indicator light outside of guest room and activates request in reception

Both indications are relayed to main user interface in reception. Service call indication can be forwarded to mobile phones or paging systems.

2.10 CONSUMPTION METERING

2.10.1 Water consumption

Water consumption shall be measured for each guest room. The water meter shall give potential free impulses to control node(s). The control nodes shall count the impulses and collect consumption measurements of each guest room.

Cumulative consumption shall be shown in the Main User Interface and in the Browser User Interface in each room.

2.10.2 Electricity consumption

Electricity consumption shall be measured for each guest room. The kWh meter shall give potential free impulses to control node(s). The control nodes shall count the impulses and collect consumption measurements of each guest room.

Cumulative consumption shall be shown in the Main User Interface and in the Browser User Interface in each room.

2.10.3 Cooling energy consumption

Cooling energy consumption shall be indicated for each guest room. The consumption can be either measured with BTU meters with potential free impulse output or calculated using trend data from BMS.

Cumulative consumption shall be shown in the Main User Interface and in the Browser User Interface in each room.

2.10.4 Reporting

Cumulative consumption measures shall be possible to show in the Main User Interface and in the Browser User Interfaces in each room.

------END OF SECTION------