

Building intelligence with Smart Building Automation System (SBAS)



Overview

This application note focuses on integration of the building management systems/equipments with the surrounding built environment for efficient energy management. The Smart Building Automation System (SBAS) focuses on three main areas:

- ▶ Energy Management and Sensors
- ▶ Security and Monitoring
- ▶ Actuators and Data logging

Smart Building Automation System (SBAS)

Building intelligence starts with monitoring and controlling information services known as Smart Building Automation System (SBAS). Smart building automation project is an integrated building solution system that facilitates lighting control, heating, air conditioning (HVAC) and access control to share information and strategies with an eye to reduce energy consumption, improve energy efficiency management, provide value-added functionality and make the building easier to operate. An integrated system can not only increase energy and operational efficiency, but it can also provide a level of occupant control unmatched by single-purpose, non-integrated systems.

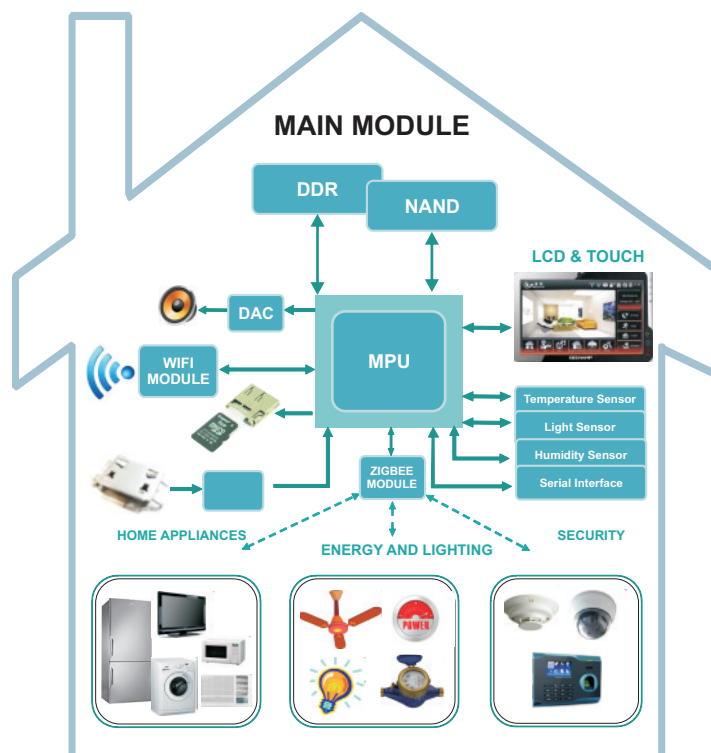


Figure 1. Basic block diagram for a Smart Building Automation System application

Intelligent building, with the use of automated control system such as SBAS, enables both building owners and occupants to enjoy the benefits of financial gain and enhance comfortable accommodation/management quality.

SBAS Architecture

Building automation and control systems rely on many sensors and actuators placed at different locations throughout a building. Reducing the power consumption of a modern building requires continuous monitoring of various environmental parameters inside and outside the building. The key requirement for an efficient monitoring and controlling is that all sensors and actuators are addressable over the network.

SBAS includes a collection of sensors that determine the condition or status of parameters to be controlled, such as lighting, temperature, relative humidity, and pressure. An action based on the sensor data received by the control unit is imparted to a device like electric relays or damper and valve actuators via electronic signals to activate physical action to control the devices.

In this application note, we will provide a design overview for the SBAS Control Unit.

Key Specifications of SBAS Control Unit

- Hardware
 - TI's ARM 32 Bit Cortex Processor
 - Flash Memory: 64MB for application and OS (Linux) Storage
 - SDRAM DDR3: 16-bit 128MB for application and OS program execution
 - SRAM: 1MB for non-volatile parameter storage
 - 12 Bit ADC (SAR) and DACs
 - Enhanced High-Resolution PWM Modules
 - VFD (Variable frequency drive for motor control)
 - Encoders
 - Signal Conditioning ICs
 - DC Relays (For ON/OFF Control)
- Electrical Interfaces
 - Wi-Fi Built in module (WAN)
 - Zigbee Wireless built in module
 - 2X 10/100/1000-T Ethernet interfaces
 - 6X UART (5 with h/w flow control)
 - RS-422/485 Interface for easy integration with gateways
 - 4.-20Ma 2-wire interface (for flow sensors)
 - 4 wire interface for stepper motor
- Software
 - Diagnostics software for all the interfaces
 - X-Loader porting to custom platform
 - U-Boot porting to the custom platform
 - Kernel Porting to the custom platform
 - Testing the Linux port using custom test Application
 - SNMP based status monitoring
 - Event generation through e-mails/data logging

- GUI application for data monitoring and statistical data representations
- System Integration and Testing.

Intelligent Features

The SBAS enables intelligent features such as:

Air flow control: When occupants in the room increase, the thermostat will sense the increase in the room temperature. Control unit will open its damper allowing more air to the room, which will cause a drop in the duct static pressure sensed by the duct static pressure sensor. In order to maintain the static pressure in the duct, the SBAS activates the VSD to increase the fan speed which builds up the duct pressure to the desire point.

Temperature and fan control system: When the control unit is not functioning, the SBAS detects and communicates the 'OFF' status of the unit, thus shutting it down. For example, if the room temperature is fixed at 25 degree Celsius, but the actual room temperature is 27 degree Celsius, SBAS will open the chilled water valve. Once the temperature falls below 25 degree Celsius, the SBAS will shut the valve.

Lighting System: The Lighting System can be controlled using motion and detection sensors that detect occupancy and motion. On/Off switches can be configured based on pre-defined time schedules. Daylight-linked automated response systems can also be incorporated in to the system.

Benefits

- Energy efficient and reduced cost
 - Increased energy efficiency can save a substantial amount of costs by effectively controlling equipment use. In addition, it is far easier to monitor aspects of the system for potential problems or provide preventative maintenance
- Streamlined operations management
 - Smart building automation greatly reduces operational expenses and the hassle of installing and operating multiple autonomous building systems
 - Managers and operators can view data from all over the facility and make quick changes or provide preventative maintenance
 - Lower installation costs and Lower failure rates and downtime
- Quick and effective service
 - Building Management can provide better services to occupants and users. Accessing building systems via remote makes it easier for facilities professionals to assess real-time conditions, detect problems, and monitor building performance off-site
- Data accuracy and report generation
 - More accurate data monitoring and control of energy-intensive systems like HVAC and lighting, and statistical data report generation help keep costs in check

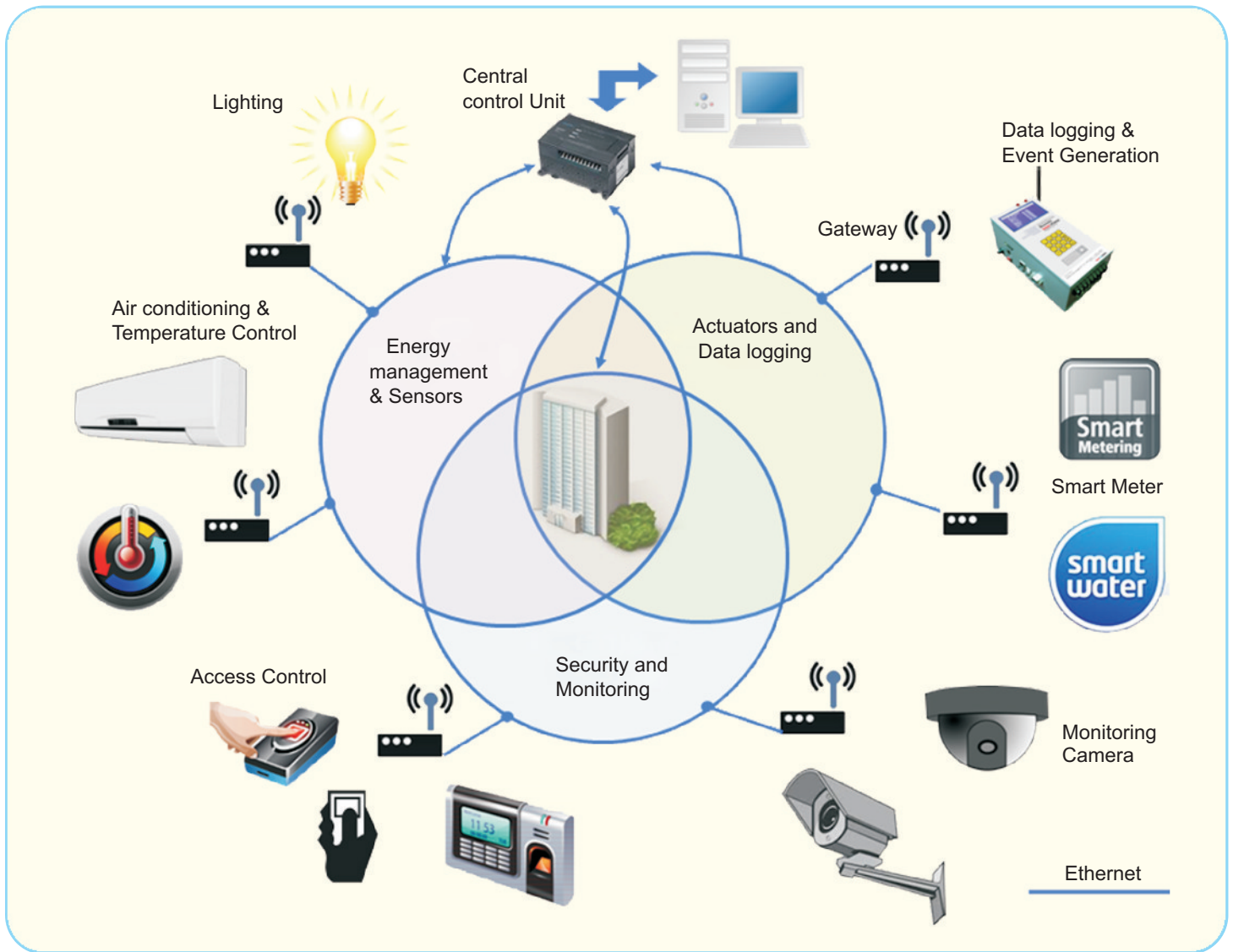


Figure 2. Smart Building Automation System

Customer attraction and retention

- Smart buildings can demand above-market rents, have lower vacancy rates, and can have reduced turnover through higher customer service, added technologies, and increased efficiency.

Environment friendly

- Monitoring and control of energy use for the purpose of reducing consumption defines a green building. While it may be possible to have a green building that isn't smart, most green buildings will have some form of a building automation system (SBAS).

Product cost

- The entire system comprises of a compact unit, integrated interface and conferencing into a single device, which saves on BoM and production cost for the customer

Summary

Mistral has the expertise in designing and developing Home Automation Solutions that allows every point of a smart home to be connected and controlled from a central or remote location. Mistral's team of engineers has the expertise of providing a variety of power optimized, small footprint home automation solutions on leading architecture and platforms. Mistral's expertise in Home automation designs includes

- Customized Product Architecture
- Hardware Design and Development
- Software Design and Development
- Application Design and Development
- Product Certifications and Deployment
- Support and Maintenance
- Design Consultation and Review.

About Mistral

Mistral is a technology design and systems engineering company providing end-to-end solutions for product design and application deployment. Mistral is focused in two business domains: Product Engineering Services and Defense Solutions. Mistral provides total solutions for a given requirement, which may include hardware board design, embedded software development, FPGA design, systems integration and customized turnkey solutions. Mistral's strategic partnerships with leading technology companies help provide customers with a comprehensive package of end-to-end solutions.

Mistral's Product Engineering Services are delivered through a proven development process, designed for embedded product development. Mistral's hardware and software team works together in a seamless manner providing expert product designs covering board and FPGA Designs, BSP and Firmware developments, Embedded Application developments, integration of 3rd party solutions, verification/validation, product prototyping, production coordination and product sustenance services.



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