From the Director, BASDIV, ISA –
Rathan Bala.

Greetings to you all. Very happy to connect with you all again.

Last year (2019) your; leadership committee has developed a Strategic Growth Plan for our Division and initiated actions. This year we will start implementing some of the prioritized initiatives with focus on

- Industry Reach & Awareness.
- Membership Development & Awareness.
- Technical Education & Awareness
- Leadership & Business Skill Development.

COVID – 19 has thrown up many challenges to the entire global community & professionals. Large buildings, where many of us spend lot of time has to be maintained with acceptable air quality and occupancy standards, We may have to study critically the role of indoor ambience air in infectious disease transmission in large buildings. You will find an interesting article related to this elsewhere in this newsletter.

We will be releasing the first draft of Document on Standards applicable to Building Automation in Q1 of this year. Preparations are underway to make a document on best practices in Building Automation Projects.

TOGETHER WE WILL GROW OUR PROFESSIONAL NETWORKING

We are forming team of Subject Matter Experts (SME) in various Technical domains of Building Automation. The purpose is to create strong technical team with the objective to make Building Automation Systems Division as “Go To Resource” place in Building Automation technical domain.

The importance of Building Automation is being recognized in many global regions and efforts initiated to consolidate to derive the benefits from this technology. Broadly the benefits are to increase occupants’ comfort & security, decreasing energy consumption and reduce the cost of maintenance. Smart City Projects are becoming more popular to make our cities a better living place.

I invite the recipients of this newsletter to help us to bring all the professionals engaged in Building Automation Systems under BASDIV, ISA umbrella and strengthen our professional networking. We require more volunteers in various leadership roles to support in our journey. I request all those willing to be part of this journey to email with your details and domain you want to contribute.

If you are connected with Building Automation Systems in any capacity as practicing engineers, end users, solution providers, students interested in BAS, Architects, Builders etc.
Join ISA and BASDIV for professional networking.
www.isa.org www.isa.org/basdiv
ISA Strategic Framework

- Guides us down a path
- Creates continuity and sustainability
- Sets priorities and allocates resources
- Is compelling

**VISION**: Aspirational statement of how the organization will impact the future
Create a better world through automation

**MISSION**: Reason we exist, who we serve and how we serve them better than anyone else
Advance technical competence by connecting the automation community to achieve operational excellence

**VALUES**: Guiding principles for the leadership and staff
Excellence, Integrity, Diversity and Inclusion, Collaboration and Professionalism

**OBJECTIVES**: Major accomplishments for our core programs set by the Executive Board for the 3-year horizon

- **Industry Reach & Awareness**—Establish and advance ISA’s relevance and credibility as the home of automation by anticipating industry needs, collaborating with stakeholders, and developing and delivering pertinent technical content.

- **Membership Development & Engagement**—Enhance member value and expand engagement opportunities to nurture and grow a more diverse and global community to advance the automation profession.

- **Technical Education & Certification**—Become the recognized leader in automation and control education, providing training, certifications, and publications to prepare the workforce to address technology changes and industry challenges in the most flexible and relevant ways.

- **Leadership & Business Skill Development**—Create opportunities for members to improve critical leadership skills, to build a network of industry professionals, and to develop the next generation of automation professionals.

**GOALS**: Specific, measurable, attainable, relevant, and timely milestones aimed at advancing the objectives

**TACTICS**: Methods and plans that include assignments, accountability, and deadlines

**KPIs**: Quantifiable key performance indicators
1. Introduction

A building automation system (BAS) consists of a system installed in buildings that controls and monitors building services responsible for heating, cooling, ventilation, air conditioning, lighting, shading, life safety, alarm security systems, and many more. A BAS aims at automating tasks in technologically enabled environments, coordinating number of electrical and mechanical devices interconnected in a distributed manner by means of underlying control networks. These systems may be deployed in industrial infrastructures such as factories, in enterprise buildings and malls, or even in the domestic domain.

2. Building automation concepts

**Level architecture**

A BAS is a distributed system oriented to the computerized control and management of building services, also referred to as building automation and control system (BACS). The architecture of this distributed system can be organized into three layers:

(i) The lowest layer is known as the Field Layer where the interaction with field devices (sensors, actuators) happens.

(ii) The middle layer is the Automation Layer where measurements are processed, control loops are executed, and alarms are activated.

(iii) The top layer is the Management Layer where activities like system data presentation, forwarding, trending, logging, and archival take place.

**Communication networks**

The backbone of the field level is the fieldbus, a digital data bus that allows communication between devices at the field level such as controllers, sensors, and actuators. A fieldbus aims at improving communication quality in comparison to previous analog communication buses, and at reducing installation costs by cutting down on the required wiring, since devices connected through fieldbus only communicate digitally.

**Actuators, sensors and controllers**

The setup of a BAS comprises actuators, sensors and hardware modules. Actuators react to signals closing circuits or varying the intensity of electric loads, which are physical devices such as a window blind or a ceiling lamp. Sensors are devices that convert a physical reality into a signal that can be measured. From an application point of view, controllers expose different types of logic objects that can be read or written. Depending on the sophistication of the controller, it may be capable of running more than one control program simultaneously, reading and writing I/O ports or communicating with other controllers over the fieldbus network.

**Device model**

Automation hardware is highly heterogeneous and should be abstracted in a way that enables software applications to be as independent as possible from the specificities of the hardware. With respect to a BAS, devices have two interfaces, an electrical interface, that defines how to connect the device to the rest of the system and an application interface that enables other devices and software applications to interact with the device through exposed datapoint.

(i) **Datapoints**

Datapoints, endpoints, tags or points have different definitions. However, they all describe entities as an addressable point of interaction between the control system and its domain objects.

(ii) **Commands**

Operations that can be executed on devices are called commands. When successful, commands cause devices to change their internal state or to actuate in their environment of influence. For example, setting the intensity of a lamp is the result of executing the command “dim to level

**Functionality**

In this section, we present the basic functionality that, based on several literature references and standards, it is essential in modern BAS groups the functionalities described in two international standards of reference in the following categories: Grouping and Zoning, Event Notification, Alarm Notification, Historical Data Access, Scheduling, and Scenarios.

(i) **Grouping and zoning**

A device group is a logical identification of a set of devices. There are two fundamental types of groups: device collections and command.

(ii) **Events and alarms**

An event consists of any occurrence that modifies a system’s state (a door that opens or a lamp that turns off). The user of the BAS may choose to be notified of certain events, usually conditions that have been verified, such as a room’s temperature that has changed two degrees Celsius since the last measurement, a specific door that has just opened, or a new person who has entered a room. Alarm events capture a malfunction of some device, lack of a resource essential for the execution of a process or a condition of the overall system’s state that has to be pointed out. The information pertaining to an alarm indicates the apparent source of the problem and may also indicate when the originating alarming condition ceases. Alarms have severity conditions associated to the degree of disruption of the related object’s normal operation. In contrast with regular events, alarms also have an acknowledgment process: either they require manual acknowledgment or may be transient, meaning that they are cleared whenever the condition that initiated them is no longer verified.
3. Building automation technologies
This section maps out the essential functionalities of a BAS to state-of-the-art BA standard technologies available in the market. This analysis is based on an extensive analysis of the information models of each technology specifications, studying how each information model deals with the functionalities. Information models represent, characterize and relate concepts of a given domain by abiding to a common domain model where applications can share information, from which low-level details regarding physical and network specificities such as device architectures and protocol data are abstracted. We analyze how the information models address fundamental BAS concepts such as grouping, notifying, scheduling, and commanding, among others.

i) KNX
KNX is a technology that emerged from the European Installation Bus (EIB), European Home Systems (EHS), and Batibus that resulted in the establishment, of the Konnex Association, in 1999. Later, in 2004, the KNX protocol was standardized as norm EN 50090 and, in 2006, KNX was recognized as the international ISO/IEC 14543-3 standard. KNX distributes control across devices through functional blocks. A functional block consists of a group of datapoints and a behavioral specification about the device, for example, a “binary push button” functional block representing the functionality of an on/off switch. Each functional block can be associated with one device. Although a device must implement at least one functional block, it may have multiple ones. The KNX specification already defines standard functional blocks and datapoint types.

ii) Lon Works
Lon Works, or Local Operating Network (LON), is a fieldbus protocol developed by Echelon Corporation as a generic open control network. Its objective is to support a wide range of distributed applications in various domains such as buildings, production lines, or transportation. In 1999, the underlying control network protocol entitled Lon Talk has been standardized as the ANSI/EIA-709 and ANSI/CEA-709 standard. It is also available as the European standard EN14908 and as international standard ISO/EIC-14908. In Lon Works a network device is called a node. Nodes have a unique address and may implement multiple functional profiles.

iii) ZigBee
ZigBee is a standard based on IEEE 802.15.4 specifying the network and the application layer. ZigBee enables devices to communicate wirelessly, reducing wiring costs and the aesthetic impact of the system’s installation, providing a simple, low-rate, low-power and cost effective.

iv) BACnet
building automation and control networking protocol (BACnet) was developed by a project committee established by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Its main objective was to provide a solution for BAS of all sizes and types. In 1995, BACnet was published as ANSI/ASHRAE 135 standard and later became a CEN and ISO standard within the ISO 16484 series. Overall, BACnet defines an information model that organizes the system devices using a standard collection of objects. These objects represent application services along their inputs and outputs, such as devices, calendars and schedules, commands, and control loops. In BACnet a device
is represented by a device object which defines device properties like device model name, device vendor, device status and the list of other BACnet objects associated to the device. For example, a device with two analog inputs will have two instances of analog input objects associated. BACnet's model also accommodates proprietary object types for manufacturers to register functionalities not covered by standard objects, risking the interoperability between devices.

v) Other technologies

Other frequently used technologies in BAS are EnOcean, Insteon, Modbus and Z-Wave. EnOcean and Z-Wave define low-power wireless communication protocols and their inherent electrical aspects and are usually employed in home and industry automation. Similarly, Insteon provides support for, but is not restricted to, wireless communication and is generally used for home automation. On the other hand, Modbus specifies an application layer messaging protocol for automation device communication (mainly focused on controller to controller message exchange), which can be implemented using several types of buses and networks (e.g., Modbus RTU, or Modbus TCP).

Despite the 'protected' environment in commercial, buildings, hospitals and Malls etc. still experience loss of vehicles even though there are security measures in place. Manual verification is being followed in many places. This slows down the process and as well there is no records for the analysis. Also, car park systems are also isolated and not part of building management systems. The new IOT based integration system help in integration of different systems. For legacy systems the option can be to use BACnet protocol converters to integrate with BMS for basic information.

Car park integration has many advantages,

- Facility Manager can monitor the occupancy and use it for HVAC management.
- Central monitoring of CO and CO₂ Levels in car park area. In Hospitals allocate right parking slots for Doctors and Manage the OT and the consultation room preparation for on time use.
- Reduce Supervisory effort as BMS supervisor can manage it with information being available to him.
- Route guidance for events right from car park area.
- Manage Taxis entry to the nearest parking slot & floor & ensure they exit within predetermined time.

Manual solutions for this generally require a security guard to scan the driver’s license and the vehicle’s license disc, and to conduct a physical security inspection to verify that the vehicle may enter or exit the premises. A clear disadvantage is, of course, that this is a relatively time-consuming access control procedure. There is also a possibility of human error when conducting physical.

Another major concerns in commercial parking lots and Malls etc is availability of car park slot in peak hours and time to pay the parking fees at the end.

The new On Premise or Public Cloud based solutions can help to solve most of these problems and also connect BMS for

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Secured Parking Management -Integration with BMS
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entire system can be smart with Auto Machine Learning algorithms.

Vehicle number Identification

The newer technology uses in the Automatic Number Plate Recognition ANPR camera is also called OCR Optical Character Recognition camera is designed to capture the number plate image in daylight as well in the night. Its design is such a way that it can capture the numbers when the vehicle is moving in slow speed or is in the still situation. Some ANPR cameras can also the measure the speed of the vehicle. This technology is already in usage. With vehicle identification using ANPR systems, the number plate is read and linked to the vehicle in question. Aspects which are key for successful application include the ability to read number plates at angles, with different form factors and states and fast enough to limit delays. Accuracy is of vital importance in such systems. Information such as the make, model and colour of the vehicle is required to avoid situations involving vehicle theft attempted through number plate swopping, visual obstruction and/or removal of number plates.

Vehicle Entry authentication

There are several ways this can be achieved, ranging from mechanical devices, such as magnetic tags and RFID, to biometric solutions, such as fingerprint or facial identification. Mechanical tags This can be improved with Cloud based System by logging in to the Parking system malmanagement offered by Service providers. Users can generate the QR code and at the entry gate scan QR Code at the scanners for authentication for Entry.

Driver identification

The Camera located at the entry gate can capture the photograph of the Driver. The Driver photo shall be linked to the QR code and stored for verifying at the exit. While cameras can detect faces through windows, there are many possible complications that may distort the view of the driver’s face, such as window reflections. At the very least, a system can capture an image of the driver’s face by the press of a button. Fingerprint scanning also requires the driver to open the window. A good system will ensure that the driver faces the camera when pressing the button to ensure that a clear image can be captured of the driver.

Exit and payment gateway

The exit has also to be quick for the benefit of the user. This can achieve with the QR code scanned at the exit and the parking duration is calculated and the payment shall be linked to any of the standard payment gateways. This will automatically be debited to either credit card or bank account.
If the vehicle owner does not have the mobile or online payment facility there shall be manual intervention to collect payment. Of course this will take time and cannot be Fastrack.

Information integration

The vehicle and driver information can be stored locally with on-premise cloud facility or the public cloud with secured connectivity.

While the above information can be used to allow/prevent automatic access or egress, additional measures can be implemented to alert gate personnel for added security benefits. To gain maximum benefit from any security system, information management is imperative. Integrating the vehicle access management system with other security systems will enhance security. For example, if a visitor decides to steal a car, security guard on duty must be alerted and this can be possible with automated machine learning and analytic systems which identify the anomaly situation.

What can new technology offer?

Firstly, ANPR systems can be ‘smart’. Using machine learning algorithms, their ability to detect numbers accurately, even with very poor images, is uncanny. A good system can read plates at high speed and at acute angles. In addition, some systems can record the colour of the vehicle and even the make and model. By implementing the above, a vehicle can be identified automatically.

How does it work?

A very important aspect of such systems is the ability to analyze data. A good system will not only log the entries and provide access, it will also include analysis of the entry frequency, time of movement and other relevant and useful information. The Anomaly Detection algorithm can use key inputs of the vehicle like entry and exit time, Driver pictures etc to alert the security. The Machine learning analytics can be a big advantage to manage

Manage Peak hours effectively.

- Capacity usage
- Optimize the Lighting, HVAC in the car park based on special events to save energy.

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Building Services - Post COVID -19

Author: Vikramsinha A. Patil

Businesses are used to prepare for all sorts of disruptions - such as economic downturns or natural disasters...but no one was prepared for the coronavirus outbreak. The disruption all over the world and at the same time. Based on the experience of the 2003 SARS epidemic, it typically takes three to six months for various sectors to open back. However, a fast “V-shaped” recovery or bounce back is less likely this time. We all represent Building Sector and need to take essential actions post corona effect.

We may be either a Building Owner or operator or engineer into building function now need to get the knowledge about transmission of infection in the community and the workplace. We should be collaborating with infection prevention experts. It is important to consider the impacts on staff as well as building occupants. We will have to create strategies for prevention and risk mitigation when things get operational again after the end of lockdown. We should consider the steps that can be taken with regards to HVAC systems as well as building services during this time of disruption.

The current topic talks about the recommendations in Air Filters, Recirculation AHUs, Forced Ventilations, Hand Driers, Motion Sensors, UV Filters, Sewage pumps & drains, Toilet Extracts,
Maintenance staff etc. We can divide this into two parts HVAC & Control related and NON-HVAC.

A. HVAC & Control Related

1. Air Filters
AHU’s, FCU’s and A/C units have Air Filters installed to clean the air. Most of these systems will also recirculate the air. As the coronavirus can be transmitted through particles in the air from sneezes and coughing, consider changing the filters more regularly. Please take caution when changing the filters. Wear protective equipment, Mask, gloves, goggles and disposable overalls and do not touch your face during this time.

2. AHU/RTU Recirculation:
AHU’s and RTU’s are often set to recirculate the air within a building to reduce energy consumption. As coronavirus can be transmitted through air, and the HVAC system recirculates the air within the building. Please consider turning the recirculation off so that units are pulling in fresh air. This will result in higher energy consumption, but it will also result in more fresh air within the building which should reduce the risk of spreading the virus in a confined space.

3. Forced Ventilation:
You could consider changing the speed of the extract fan on a ventilation system. Increasing the speed will result in more air being removed from the space which creates a slightly negative pressure within the building so more fresh air will seep-in through all the gaps and seals in the building, this also means more dust will enter. Decreasing the speed will create a slightly positive pressure because the supply fan is pushing air into the space, this will push air out of the building through the gaps and seals. Increasing the speed will reduce the lifespan and increase the need for maintenance.

Some areas such as fire stairwells will use fans to pressurize the space in the event of a fire to reduce the spread of fire. Do not adjust these fans.

4. UV Filters:
Many AHU’s and Fresh Air AHUs have, or can have, Ultraviolet (UV) light filters installed. UV light is used to kill airborne viruses and bacteria. Coronavirus has apparently shown to be affected by U-V light. Post Corona incidence in China Authorities there are reportedly using U-V light to clean buses. If your AHU/RTU already has UV filters, it’s a good idea to ensure these are turned ON and are functional. If you don’t have UV filters installed, you may want to consider them. These are easy to install and use.

5. Toilet Extract Fans:
Toilets usually have extractor fans fitted. Although these mostly do not contain filters, they do require maintenance. Ensure the fans are working now so they do not need to be maintained in the next few weeks. The coronavirus is known to spread through contact with bodily fluids. Bathrooms are high risk areas for this reason.

Consider increasing the extract fan run times and speed (if Possible) to extract more air from these regions. Avoid going near the extract vent.

6. Use of Building Automation System:
Your Building automation system allows you not only monitoring of the entire facility equipment but also allows to control them. Instead of using floor-level or room-level remotes or control panels manually the BMS Operator can do all the task like On/Off, changing setpoint for temperature etc. from remotely. Building Automation system also allows the operator to start any equipment or change its parameters manually from Central location. Please utilize these features.

B. NON- HVAC Related

7. Hand Driers: Hand driers in bathrooms have been reported to spread germs. If a person doesn’t wash their hands sufficiently and then using a hand drier, the germs on their hands will become airborne. Consider turning off all hand driers and switching to paper towels, ensuring the towels are disposed of safely.

8. Motion Detection:
These days, doors, taps and toilets are all often controlled using motion or proximity detection. Using these prevents the need for a person to touch surfaces like door handles, levers and tap heads. Switching On/Off of the light switches for passage will also be not required due to Motion sensors.

If your building has these installed, ensure they are working now. If you don’t have them installed, then consider installing them on priority.

9. Sewage Pumps & Drains:
The virus has shown to be found in stools and saliva. As bodily fluids are flushed down drains and moved by pumps, ensure these are not leaking and are functioning properly.

Inspect pipework for potential leaks. Remove the leakages on priority. Wear protective equipment for maintenance tasks in these areas.

10. Building Transportation:
Many large buildings will make use of elevators and escalators, otherwise personnel will use the stairwells. Ensure these mechanical systems are functional and increase cleaning frequency of buttons and hand rails.

11. Scheduled Maintenance:
All buildings need to carry out maintenance. With governments around the world restricting movement of people, and also staff becoming unwell, consider prioritizing your maintenance schedule now so that less is needed to be done in the coming weeks.

Please Turn OFF things that do not need to be ON. Top-up the chemical dosing in the various systems so they do not need ongoing maintenance. Inspect pipework for potential leaks. For electrical maintenance, use a thermal imaging camera to inspect connections to ensure there are no hotspots and risk of failures.

12. Maintenance Staff:
Maintenance staff often have access to all areas of a building, or multiple buildings, to ensure the smooth operation of building services often coming into contact with multiple people for prolonged periods of time.

Ensure these staff members are taking hygiene seriously. Washing hands regularly with sanitizers will be required. Please provide adequate number of Sanitizers at different locations in the building for them. Please ask them not to come to work if they show symptoms. Remind them not to touch or wipe their faces with their hands.

13. Team Meetings:
Consider cancelling all in-person team meetings and making contact through electronic means to limit the risk to exposure. Video calls can be preferred.

Building operators and engineers should have information about contact details and method to contact public health authorities and other emergency planning support.

Above are few recommendations for Building Services and HVAC Controls post Corona Virus effect. We need to fight the corona virus now and be prepared for the post corona virus situations in the Buildings. Our contributions may look small at this point of time but will create a big impact over period of time and setting proper culture in the Building Sector.

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