Lighting Control vs. Central Control

Executive Summary

A lighting control system is often confused and equated with a central control system, but this not the case at all. This white paper will endeavor to highlight their differences and explain why you would want to have a dedicated lighting control system in lieu of a central control system.

Background

Traditionally, lighting was controlled directly through the use of electro-mechanical switches. The main limitation of this method is that there is simple one to one correspondence between the lighting and the switches; in addition, the switches need to be located in near proximity to the lighting that they were meant to control.

With the advent of digital technology, it is now possible to separate the switching and lighting functions such that they no longer need to be limited by their physical wiring nor proximity. Their proliferation and cost reduction has made this technology a viable replacement for traditional lighting control.

The earliest types of lighting control systems were often custom designed systems made with the use of a central computer and nodes consisting of general purpose input/output ports. The central processor acts as a hub through which all activities within the lighting control system passes through for processing; all inputs are submitted to this hub, after processing, the hub then issues the commands to all the output ports to control the associated lighting.

The Problem

Since this is common application for such a central control system, certain manufacturers have designed systems dedicated specifically for digital lighting control. Such a system is no longer a general purpose system, nor is such a system a part of the larger building management system, but is now a distinct and separate system that can work independently for lighting control only.

Although making a specific system dedicated to lighting control is an improvement over having to create a custom designed solution using general purpose components. This only constitutes only a marginal improvement, as the main bottleneck from such a system has not been eliminated. Primarily, this is in the continued use and dependency on having a central processor.

Both the first generation using off the shelf components to build a custom system, and the second generation with a dedicated lighting control system still retain the primary characteristic of a central control system which is the need for a central processor hub.

The presence of a central hub would mean that the hub itself becomes the Achilles heel for the entire system. When this crucial component fails, the entire system is brought down in its entirety, nothing works, the lights can no longer be turned on and the whole building, area or floor is plunged into darkness (except in certain systems that make use of latching relays). The facility manager is helpless to do anything about the situation unless the central hub is fixed and brought back into normal operation.

It doesn't even require that the hub fails, even a software bug or bad programming could crash the system.

Having a central hub would also mean that the system is dependent upon programmed software to perform simple tasks. Tasks such as grouping lights into scenes would require that the software issue commands to each lighting circuit

in turn to generate the needed pattern. In order for the software to know the pattern, the software needs to be programmed as such.

A central hub also slows down the performance of the system. Since everything passes through this hub, the response speed of the system is dependent on the processing speed of the central hub. In actual practice, it has been found that some brands using generation two lighting control has response times as slow as six seconds. To any operator, six seconds is an eternity of wait and can easily be misconstrued as either their button press to be ineffectual or that the system is broken. The tendency would be for the operator to press again resulting in what is meant to be on being turned off again as the response is lagging the button press.

Within a lighting control system, there are many controls such as locally placed switches that only need to control the lights in its proximity. As such these switches do not require the intervention of the central hub, but yet they would still be tied and constrained by the central hub in their operation.

The facility manager would often require an area control station separate from the main control room, but being that they are not located in the immediate vicinity of the lights being controlled, they are unable to see and obtain feedback on the status of the lights. Hence, having only a central control is another detriment in such a situation.

The Solution

Eliminating the central hub is the next step in the evolution of a lighting control system. As this would also eliminate the aforementioned bottlenecks and limitations associated with having a central hub.

A lighting control system without the need for central control thus constitutes the third generation of lighting control system. A second generation lighting control system is merely a stopgap solution is still inadequate and does not qualify as a true lighting control system.

Without a central hub, each component in the system becomes an intelligent device by itself and can act independently. Such a system is both flexible and versatile. Components may be added as needed to expand the system or to introduce new features and capabilities; all of which can be done without the need to perform any form of software programming to a central hub.

Since such a system is now freed from having a central hub, it is now possible to add new user control interface devices arbitrarily without the need to reconfigure the entire system or reprogram the non-existent central hub. These control interfaces can be made up of a variety of devices such as digital switches, touch panels, classic switches, sensors and even a host computer. But note that in this case, a host computer is not the same as a central hub as it is no longer a critical and central element, it is merely a control interface tool just like the others.

Even though the system incorporates all of these varied devices, they are all synchronized, whatever the state of the actual lighting devices is correctly and shown appropriately to the devices capable of doing so. From the point of the lighting control system, all these devices have equal standing, as it makes no distinction and has no knowledge of the specificities of the control interfaces.

It is now possible to have a control station dedicated to the facility manager, with all the control interfaces being synchronized, the facility manager can also see the status of the lights even though they are in the immediate vicinity of the actual lighting.

Another immediate benefit to having multiple access is redundancy. Any control interface is equal to another, and if one control interface fails, another one can be used as a backup.

If desired, the lights can still be controlled individually from a bank of switches on a wall just like with traditional lighting; but to truly benefit from digital lighting, the lights should be grouped together to function as a single unit, or be configured into patterns that form scenes for specific tasks or occasions.

These groups and patterns can be set through the use of auto-learning capability of the system. Each component is smart enough to remember their own role in the system and can act accordingly when the corresponding group or

pattern command is issued from any control interface, there is absolutely no need for a central hub to remember and issue the commands for each component. As such, all the components all act in concert in parallel upon receiving the group or pattern command, unlike that of using software wherein a group or pattern is simulated by issuing the commands in sequence; furthermore, such software is quite rigid, as it would require the vendor to perform reprogramming of the software, since it cannot be done on the fly by the facility manager.

The performance of a third generation lighting control system is very fast and responsive. It often takes less than a second from the button press to the actual light change to occur. This is true whether the button is assigned to control a single light, a group of lights or to a pattern.

Benefits to System Integrators

Since a lighting control system is already a self contained system that does not require a custom system or special programming. Where does that leave system integrators (SI)?

It would be normal to expect that SIs are now out of the loop since the simplicity upon which a lighting control system can be implemented no longer requires their services. However this is not the case, on the contrary it greatly relieves the burden to the SI if a lighting control system is used in lieu of a custom designed central control system.

Firstly, a lighting control system is highly reliable, because it is dedicated to one purpose, the hardware and software that make up the components of the system have all been tested intensively both in the lab and in the field. Thus they are very mature and very reliable. Contrast this to the ad hoc custom software which does not benefit from being in use over a long period of time or being exposed to the rigors of actual use in the field.

Hence, the SI no longer needs to be troubled by the software as the burden for the reliability of the software has now been transferred over to the lighting control system itself.

A central control system is often referred to by its alternate moniker of control and monitoring system. But in reality, often such a system is often just half of this moniker, as it is primarily a monitoring system. These two basic functionality, controlling and monitoring have very different characteristic requirements.

The monitoring function is considerably simpler than controlling, as it simply needs to read and keep track of the status of the elements in the system.

Controlling however is quite different, as it is now has the responsibility for taking action. But since the central control is often also remotely located, the basis for the data it needs to complete its logic processing may be incomplete or delayed. As such, the action it takes is not in real time, and the data it receives may be erroneous. More often than not, the control function is relegated to a separate device (often a DDC or PLC) located on site. With a lighting control system however, the control function is no longer an issue, nor is it necessary to have a separate DDC or PLC to perform such a function.

Having been freed from the special needs and problems of the lighting control, the SI can now concentrate on other areas of the building system. The lighting control system becomes a mere subsystem of the whole.

Summary

To be clear. A lighting control system is not the same as having a central control system. A lighting control system is specifically designed and dedicated to meet the rigors and special needs of controlling the lights and related devices. It can operate without the need for a central processor acting as a hub. All necessary intelligence is part of each component of the system. Each element acts in concert to form a whole that is greater than each part.

Conclusion

Our recommended solution to achieving the aforementioned digital lighting control system that incorporates all of the above features with their accompanying benefits is to use DAE's Smart Lighting Control System.

This system does not merely meet the requirements to qualify as a third generation lighting control system, but can be considered as a fourth generation lighting control system.

As a fourth generation lighting control system, it greatly exceeds the expectations for a lighting control system by being specialized in certain respects to the unique requirements of certain types of applications. It is no longer just a general purpose system consisting of generic controllers and switches, but there are special elements and system that have been designed for specific purposes and applications and for which custom programming is necessary.

To find out more about what makes it unique and how it can greatly enhance your lighting experience, download the brochure for DAE's Scene Lighting and Hotel Room Control Systems, or DAE's D-Bus Lighting Control System.