

## How Cisco is Providing an Integrated, Intelligent Office Experience in Buildings Worldwide

Cisco IT uses the Cisco Smart+Connected Communities (S+CC) solutions to combine networking technologies with building systems and infrastructure for increased productivity, enhanced user experience, improved energy and building process efficiencies, and lower operations cost.

### Background

Modern workplaces are powered by a multitude of building systems and applications. Managing these systems and applications to ensure operational efficiency while retaining a seamless office experience is a priority for the various stakeholders involved in operating and maintaining the workplaces at Cisco.

In a typical workplace infrastructure, facilities and technologies that are provided as a matter of course can broadly be divided into two categories: IT systems and applications, and core building systems. Not only do these two groups operate in largely isolated silos but each component within the groups is not connected. In other words, the individual buildings and IT components operate as independent systems without any centralization.

The Cisco S+CC Real Estate solution breaks down these silos by integrating building systems with IT systems and applications onto one IP network. Cisco is proving the cost savings, energy and building process efficiencies, and productivity gains of the S+CC solution at multiple offices worldwide. Cisco IT and the Workplace Resources group (facilities management) have worked together to develop a reusable, scalable solution for IT and building management that can be replicated at Cisco campuses globally.

### Challenge

In enterprise campuses, there are traditionally two distinct groups of systems and devices that are used for running and maintaining the office infrastructure:

- Building systems such as heating, ventilation, and air conditioning (HVAC), security and safety, facilities, resources, operations, and maintenance systems.
- IT systems and applications such as wired and wireless networks, IP telephony, digital signage, data center, collaboration technologies, video solutions, and more.

These two groups usually function in silos with little or no information sharing regarding resources, personnel, or objectives, which results in cost and process inefficiencies. Even though many of the systems and devices that go into infrastructure building and management today are IP enabled, or can be IP enabled, they continue to operate in silos. For example, the lighting, access control, and HVAC systems in the same building might all have IP capabilities but are more often than not installed and operated independently.

The Cisco IT and Workplace Resources (WPR) teams want to achieve the following goals when implementing the Cisco S+CC solution in a building or campus:

- Break down the dependency on siloed IT and facilities groups and integrate IT applications and building subsystems for a fully functional facility.

Cisco IT and WPR were using separate interfaces, applications, and controls within a single building. For example, a facilities manager would use one application to control the lighting system in a building and another application to control HVAC. Because of the multiple, different building systems and applications being used, facilities management was not consistent from building to building. In addition, many of the building subsystems were not IP enabled and required onsite management and personnel to maintain. Both Cisco IT and the Workplace Resources groups needed to work together to develop a converged solution that would result in a fully functional facility.

- Provide employees with a comfortable building environment that is easy to control.

When employees wanted to adjust the environment in a meeting room, for example, they had to use different controllers specific to the condition they wanted to regulate (e.g., air conditioning, lighting). With S+CC, employees can immediately control the room environment themselves using a Cisco IP phone or a mobile device.

- Reduce energy costs, the biggest building management expense globally.

Because the S+CC solution enables integration between building systems and meeting room scheduling, energy consumption can be controlled. For example, based on booking data provided by S+CC, the building management system can change a room's status from standby to occupied, which programs the air conditioning temperature accordingly.

Another example of energy consumption savings: visitor signage is activated only during business hours. Energy data trending and analysis allows Cisco facilities managers to spot anomalies that will help in identifying new areas for reducing energy use.

### **The Quest for a Standard, Scalable Building Management Solution**

Before the S+CC solution, Cisco had tried to implement similar capabilities at some buildings. However, each of these deployments required a unique configuration according to the building subsystems. The IT process to approve each implementation required a complete review of the solution architecture, specific network design, and security access control setup, as well as involvement by several teams for a few months. Likewise, support had to be tailored for each implementation.

Cisco needed a standard architecture and design for implementing the S+CC solution internally, with standardized support, that would scale to serve buildings at Cisco campuses worldwide.

### **Solution**

In implementations of the S+CC solution today, Cisco IT provides connectivity to many applications and programs that previously were not connected to the building network. This connectivity is possible because Cisco IT constructed a central technology backbone that integrates building automation functions and optimizes power management. This intelligent, flexible building design is enabled by seamlessly integrating:

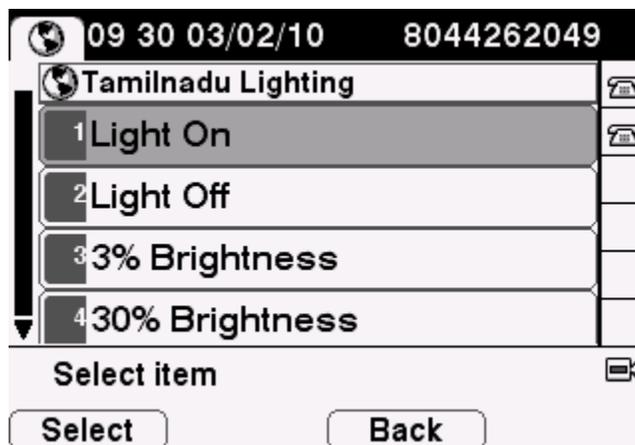
- Third-party providers and their applications
- Cisco products
- End-user applications

## Community+Connect and Community+Exchange

The Cisco S+CC solution addresses two primary areas: Community+Connect for enhancing the end-user experience and Community+Exchange for assisting those who manage the building, campus, or community.

**Community+Connect** helps employees leverage the S+CC solution for a safer, healthier, more sustainable work environment. All end-user touchpoints are connected seamlessly to the relevant systems within the building via the network rather than through a circuitous, manned system. For example, a user request for a conference room can change the occupancy mode in the building management system, which in turn automatically sets the HVAC system temperature for that room. Employees can also control conditions in a conference room via the LED display on Cisco IP phones (see Figure 1).

**Figure 1. Controlling Meeting Room Lights on a Cisco Unified IP Phone 7961**



Additionally, users can make facilities requests via the Cisco IP phone to resolve problems, such as an equipment malfunction, without using a separate process to open a case with WPR.

Digital signs outside of each conference room show useful information such as room availability, nearby meeting rooms and their locations, and internal and external temperatures. Employees can use the Cisco IP phone to select from a menu of messages to be displayed outside a conference room; these messages alert meeting participants to a known scheduling conflict or other matter pertaining to the availability or function of the room.

**Community+Exchange** is akin to a network operations center (NOC) that resides at the infrastructure backend. It helps the corporate network provide a highly secure, resilient delivery platform for facilities management services, and helps facilities managers operate the campus in a more cost-, energy-, and time-efficient manner.

For example, measuring ambient lighting and temperature in different parts of the building to moderate the cooling and brightness in a designated conference room can help to optimize facilities costs and resources. Recognizing a power outage and curtailing delivery of backup power to non-essential resources such as corridors, fountains, and unused portions of the building is an example of how Community+Exchange manages real-time resource demand and supply.

This integrated building management system also allows facilities managers to operate one or more facilities remotely without having to retrofit or lock-in any single underlying building system.

### A Unified IP Platform

Cisco's S+CC solution interconnects several diverse applications on a unified, fully redundant IP platform. This Cisco Service Delivery Platform (SDP) consists of the following layers:

- A device and infrastructure layer that enables Cisco and non-Cisco devices to interact with one another once connected over IP.
- A services layer that provides end users with an easy-to-use, intuitive interface of service offerings.
- A middleware or platform layer that connects the different smart and non-smart devices (Cisco and third-party applications) to the network in a standardized, open way. Middleware also synchronizes the applications at the backend, responds to application and network service requests from users, and acts proactively when needed.

With a unified IP platform in place, an organization can offer numerous services as part of the S+CC solution. Table 1 provides examples of the S+CC service offerings within Cisco.

**Table 1. S+CC Service Offerings Within Cisco Buildings and Campuses**

<b>Office Resource Management</b>	Integrates building management systems such as HVAC and lighting control with IT applications such as calendaring on a single IP network. This integration gives facilities managers increased visibility into meeting room usage and optimal utilization of resources. Meeting rooms are kept in energy-save mode when not in use, and users can control the room environment via an IP phone or mobile device.
<b>Green-Aware Energy Use</b>	Uses S+CC technologies to gather, analyze, and display real-time building energy use (utility and resource consumption), as well as anecdotal information regarding global and local sustainability efforts. The service is deployed on the Cisco Digital Media System, which allows targeted messages to be sent to digital signs in specific locations.
<b>Emergency Notification (Safety and Security)</b>	Allows security and facility administrators to monitor physical aspects of the building from multiple locations (centralized or remote). The service enables immediate display of emergency information, such as evacuation plans and severe weather alerts, on digital signs and IP phone displays.
<b>Digital Signage Applications</b>	Uses digital signs to deliver information (e.g., building directory, way finding, events, and welcome messages) as well as art and entertainment news to building occupants and visitors.
<b>Connected Maintenance</b>	Focuses on planning, creating, and executing maintenance work requests against a variety of building assets to either prevent issues from occurring or resolve issues as they arise. The service includes preventive, corrective, and manual/complaint-based maintenance as well as automated defect notification and correction.

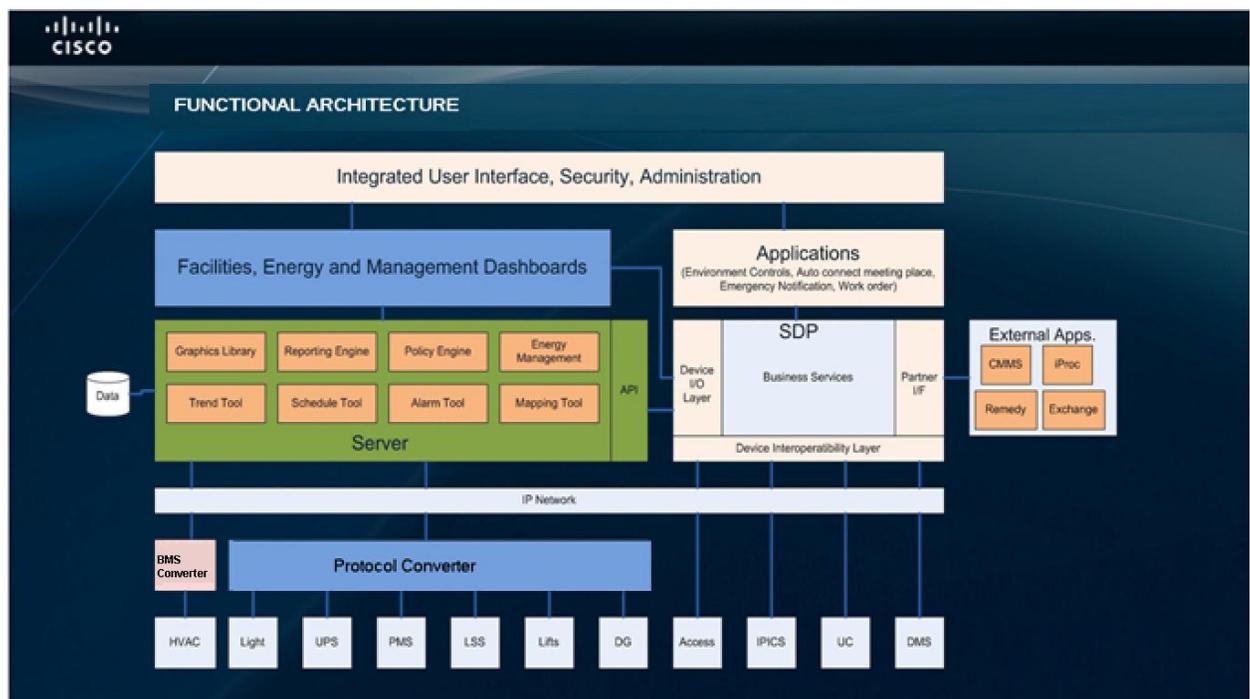
In operation, the S+CC Service Delivery Platform connects to the Site Building Automation System (BAS). The BAS aggregates building subsystems and supports real-time energy and data monitoring as well as data collection for the varied subsystems and devices within a building.

Figure 2 presents the functional architecture of this solution. With this architecture, the S+CC Service Delivery Platform is able to remotely manage a site's building subsystems over the IP network. For example, a user at the Cisco campus in San Jose, California, can control the temperature of a conference room in the Bangalore, India campus or in any other site where this architecture has been implemented.

"All of the building subsystems are put in a separate network VLAN and all communications with the subsystems are handled via the Building Automation System," says Nicolas Coulet, technical program manager for Workplace Resources/IT at Cisco. "The BAS is a go-between communication channel for the building systems and applications in the data center. This architecture is very secure and can be replicated for buildings and campuses globally."

The standard architecture and design of the S+CC solution also makes it easy for Cisco IT to scale support of the solution itself and its integrations.

**Figure 2. Functional Architecture for the Cisco S+CC Solution at the Bangalore Campus**



### Cisco IT and Workplace Resources Collaboration

Critical to the success of a S+CC solution is the close partnership between Cisco IT and the Workplace Resources group. The planning phase for an implementation includes an integrated project plan that aligns activities within both groups and synchronizes the timing for commissioning and rollout of the S+CC solution elements.

Because the S+CC deployment uses IP as a backbone, the IP network must be available in the building before the building systems are commissioned. "This dependency needs to be planned so the IP network can be used for communication, thereby reducing the proprietary and siloed cabling for each building management subsystem," says Giri Govindarajulu, senior manager, Cisco IT.

The standard S+CC design created by Cisco IT includes the following elements:

- Identification of the required functionalities in the building management subsystems
- Communication protocols to be used between the subsystems
- Wiring and cabling plans for the building
- Node path and devices hierarchy for the network
- Location data for the conference rooms, offices, and other building spaces—as well as the lighting, air conditioning, and other systems with those spaces—that allow location services to be managed
- Network and building management services to be made available
- Peripheral devices for IT and building management that will be deployed

## Results

Cisco commissioned an independent consulting firm to evaluate the pilot implementation of the Cisco S+CC solution within the Cisco Bangalore campus. This evaluation found the results shown in Table 2.

Evaluation Factor	Estimated Results from Implementation of Cisco S+CC Solution
Annual building operations cost	<ul style="list-style-type: none"> <li>• 7% reduction in initially, 10-15% total potential reduction based on lower energy consumption and efficient building management</li> </ul>
Increased equipment life	<ul style="list-style-type: none"> <li>• 20-25% improvement based on lower usage levels</li> </ul>
Employee productivity gains	<ul style="list-style-type: none"> <li>• 5% or more improvement based on interviews with building occupants about their perceptions of the new work environment</li> </ul>
Carbon dioxide emissions	<ul style="list-style-type: none"> <li>• 26% reduction based on lower electricity use</li> </ul>
Water consumption	<ul style="list-style-type: none"> <li>• 10% reduction from automated monitoring of pipes, taps, and other water systems</li> </ul>

Among the other benefits realized by Cisco WPR from the S+CC implementation in Bangalore:

- **Time savings.** More than 700 hours saved annually in routine daily maintenance tours. Maintenance calls are now conducted on an as-needed basis and automated to provide real-time updates and alerts. A two-hour routine maintenance check undertaken at the beginning of each day is no longer necessary, nor are quarterly repair and replenishment checks. The S+CC solution alerts WPR of potential requirements and maintenance teams are called in only if required.
- **Economies of scale with very little capital expenditure (CapEx) investments.** HVAC systems now run intelligently, which means they are operational only when required. Community+Exchange assesses the need to switch on lights, ventilation, and network connections in various parts of the building. CapEx is also reduced because the addition of an integrating layer to the existing network infrastructure ensures that setup costs do not escalate when new building management

systems and devices are added to the network.

- **Reduced energy consumption.** By integrating building systems with meeting room scheduling, energy consumption can be controlled.

“Energy efficiency is an important outcome of the S+CC implementation,” says Nitya Ramakrishnan, manager, Workplace Resources Solution Design, Cisco. “Savings will be apparent as the building ages and continuous systems commissioning keeps the building’s energy consumption in check.”

- **Building process efficiencies.** The Community+Connect component helps to ensure that routine building management processes are more efficient, predictable, and people-independent. Users can book conference rooms with real-time information at hand, including room availability by floor, schedule, available facilities, etc. Community+Exchange ensures that all devices and facilities requested in the conference room—such as air conditioning, Internet access, and sign boards—are pre-set and ready to use.
- **Resource optimization.** The Cisco S+CC solution can deliver value-added services over the network that reduce the need for human intervention in routine facilities operations and in emergency situations. For example, in a security emergency the S+CC solution alerts potentially impacted employees and gives users and infrastructure managers a continuous flow of information about the situation through their smartphones. Emergency doors can be activated remotely, and employees can be directed to available exit routes and safe areas using digital signs installed on every floor.

## Lessons Learned

Cisco IT and the Workplace Resources group offer the following suggestions to other enterprises and organizations interested in deploying the Cisco S+CC solution:

- Establish a partnership between the IT and facilities teams, and collaborate to develop an integrated solution design and implementation plan.
- Work with the corporate information security team to identify a secure network architecture that will minimize system vulnerabilities.
- Ensure the network is available in a slightly earlier timeframe than what is specified for traditional build-outs. The IP network must be available before the building systems are commissioned.
- Include multiple communications, IT, and building devices in solution testing. For example, Cisco’s testing included IP phones, wireless devices, and other IT products in addition to the lighting, air conditioning, and other building systems.
- Create a clear support plan that considers the IT, facilities, and business unit stakeholders involved in the S+CC implementation and ongoing system support.

## Next Steps

Cisco IT and WPR are implementing the Cisco S+CC solution in other company locations worldwide. Based on the efficiencies and benefits gained from these initial deployments, Cisco may define a model for identifying other locations that are best suited for the Cisco S+CC solution in the future.

## For More Information

For more information about the Cisco Smart + Connected Real Estate solution, visit:

<http://www.cisco.com/web/strategy/trec/index.html>

For additional Cisco IT case studies on a variety of business solutions, visit Cisco on Cisco: Inside Cisco IT at [www.cisco.com/go/ciscoit](http://www.cisco.com/go/ciscoit).

## Note

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