



Light Is Intelligent

Why Schools Need Smart Lighting

Light is OSRAM

OSRAM

How Schools Benefit from Smart Lighting Today

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Enhanced learning and improved student comfort with dramatic reductions in energy usage

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Hurst-Euless-Bedford Independent School District

Enhanced learning and improved student comfort with dramatic reductions in energy usage





Hurst-Eules-Bedford Independent School District

The Situation

The Hurst-Eules-Bedford Independent School District (HEB ISD) is recognized across the state of Texas and nationwide for its superior curriculum, low teacher-student ratios, and a singular focus on instructional spending. This fine-tuned combination consistently makes it the district of choice for families that want their children to have an academic edge. The school district has a proud tradition of excellence as a diverse, high-performing organization committed to ensuring each student is empowered today to excel tomorrow.

HEB ISD makes a conscious effort to reduce expenses that are not focused on student achievement. In support of this effort, utility expenses are stringently managed by taking a holistic approach to energy consumption and incorporating the latest technologies. The result? HEB is one of the most energy-efficient school districts in the state. In fact, the school district's energy program continues to stay one step ahead of the state's energy code.

Looking to the future, HEB ISD sought a centralized lighting control system that would support each classroom's unique requirements and easily scale with more classrooms and buildings implemented over time.

The Solution

HEB ISD chose the ENCELIUM® Networked Light Management System based on a recommendation from a lighting architect and after extensive system testing in a portable classroom. Three newly constructed facilities – the Viridian Elementary School in Arlington, Texas, the Gene A. Buinger Career and Technical Academy in Bedford, Texas, and the Auxiliary Services Center in Eules, Texas – now leverage the capabilities of this smart lighting solution.

With the knowledge that lighting directly affects learning, every Viridian Elementary classroom's lighting is customized to meet the unique needs of particular tasks and classroom areas using the ENCELIUM System's task tuning capability. Lighting is programmed in the pre-kindergarten classroom to accommodate nap time. All lights are shut off while the children are resting except those over the teacher's desk so that she can continue to work. A special education classroom leverages a mild lighting setting to protect students from overstimulation. And, when a supervisor was experiencing migraines after bright LEDs were installed in his office, a click of a mouse in the ENCELIUM System dimmed his office lighting to better meet his personal preferences and his migraines stopped.

Goal

Flexible light management system that provides the best environmental conditions for the least expense.

Solution

ENCELIUM® Networked Light Management System

Results

Optimized lighting for better classroom learning and improved student comfort, while dramatically reducing energy costs.

Approximate Energy Savings 57%-65%

Square Footage 91,681

Space Type Classrooms, and Academic Administration Space

Vertical Industry Education



Occupancy sensors employed in all three buildings ensure that lighting is off when a room is unoccupied and turn on automatically when someone enters. This significantly reduces energy consumption in buildings that are often empty in the evening, weekends and during vacation periods. When classes are in session, corridor lights are set to a low 30% to save energy, and automatically brighten when someone enters the corridor.

“The move to the ENCELIUM System was a big step for our district and we had a lot riding on that decision. It’s really paying off in student comfort, educational experience and energy savings. It does everything I need it to do and then some,”

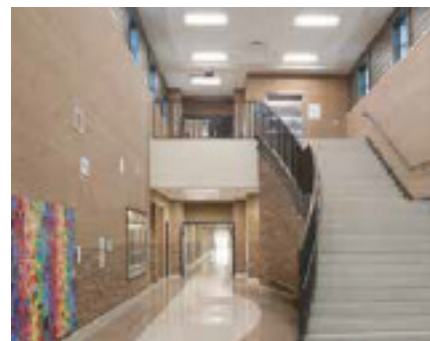
- **LARRY PARKER**, ENERGY MANAGER OF HEB ISD

The ENCELIUM System’s user-friendly energy consumption dashboards enable HEB ISD to easily adjust lighting where needed. System data on energy consumption is shared with other energy-focused organizations including the Texas Energy Managers Association (TEMA) where Parker serves as Chapter Vice President. The data is being used as the basis for an Energy Report Card for all of the district’s academic buildings.

“I joke that I am a flexible control freak. The ENCELIUM System allows me the flexibility of functional control so that I can provide our customers the best environmental conditions for the least expense,” said Josh Minor, Director of Maintenance and Operations of HEB ISD.

The average energy cost for lighting in HEB ISD academic buildings that have not installed the ENCELIUM Networked Light Management System, is 50 to 70 cents per square foot. In contrast, the buildings with the ENCELIUM System are dramatically lower at just 23 cents per square foot with an overall energy cost savings of 56-65%. Additionally, HEB ISD received a \$26,000 rebate from its utility company for the Viridian Elementary School alone.

Plans are currently underway to retrofit three additional district elementary schools with the ENCELIUM System. In the future, HEB ISD hopes to integrate the ENCELIUM System with other Building Management Systems (BMS) including HVAC.



Humber College

Smart lighting contributes to strategic sustainability initiative including LEED and zero carbon certifications





Humber College

Toronto, Canada

The Situation

Humber College is one of Canada’s leading postsecondary institutions, offering a polytechnic education that emphasizes a solid academic foundation and practical, hands-on learning. The college has more than 32,000 full-time students and offers bachelor’s degrees, diplomas, graduate certificates and apprenticeships in more than 180 programs. Its mission is to develop global citizens with the knowledge and skills to lead and innovate.

Humber has created a culture of sustainability. In support of Canada’s commitment to reduce greenhouse gas emissions, Humber College has recognized the importance of examining energy and water consumption more strategically. In 2015, Humber developed an Integrated Energy Master Plan (IEMP) in order to considerably reduce the College’s use of energy and water over the next two decades. The goals are ambitious and aim to reduce energy and water consumption by 50%, and carbon emissions by at least 30%, by 2034. The College’s carbon emissions goal is especially ambitious as it is tracked against absolute emissions for a college that is planning significant growth. As evidence of the College’s commitment to its IEMP, the College has a dedicated Energy Efficiency team and sustainability is integrated into operations and student learning. Achievements on campus are the result of projects and partnerships with milestones that encourage community engagement and academics. One impressive result is that Humber has been named one of Canada’s Greenest Employers for four consecutive years (2016-2019).

A recent energy-efficiency initiative focused on upgrading the lighting systems in 20 buildings that have classrooms, labs, lecture halls, offices, indoor athletic facilities, corridors and other common use areas. In addition to upgrading from traditional fluorescent to the latest LED technology using new and retrofit fixtures, the Energy Efficiency team determined a scalable, flexible Networked Light Management System (LMS) was required. They needed the ability to centrally manage the lighting in all 20 buildings (adding more in the future) and leverage a number of smart lighting control strategies to achieve additional efficiencies.

System integration between the LMS and an existing Siemens Building Automation System (BAS) was required for additional energy savings and efficiencies. In addition, wireless system capabilities were determined mandatory given the project was primarily a retrofit application and the College’s need for a minimally disruptive, cost-sensitive installation.

Goal

Leverage networked lighting controls to support sustainability initiatives across the campus.

Solution

ENCELIUM® EXTEND
Networked Light Management System

OPTOTRONIC® LED Drivers and Connected Lighting Modules (CLMs)

Spotlight

Siemens BAS Integration
Wireless Solution

Square Footage 500,000

Nodes 5,000

Space Type Classrooms, labs, offices, corridors, lecture halls, gym.

Vertical Industry Higher Education



The Solution

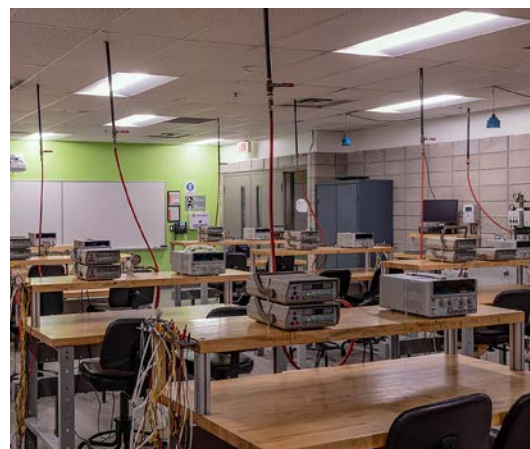
The ENCELIUM® EXTEND Networked Light Management System (LMS) was chosen, giving Humber a centrally managed LMS with robust features and functionality including wireless capabilities. Additionally, Viscor, an Osram ONIX specification-ready OEM partner*, integrated Osram OPTOTRONIC® LED Drivers and Connected Lighting Modules (CLMs) into Viscor LRTH Series Troffers at the factory prior to installation. With the CLM integration, these fixtures are individually controlled as smart nodes on the ENCELIUM EXTEND LMS network.

System Integration

The ENCELIUM EXTEND System integrates through BACnet® to Humber's Building Automation System (BAS) by Siemens. Integration enables the Osram occupancy sensors on the ENCELIUM System to automatically turn ON/OFF HVAC when spaces are occupied/unoccupied. Additionally, BACnet integration enables Humber to load shed lighting automatically during peak periods. A demand response command is set in the BAS and sent through BACnet to the ENCELIUM System and Polaris 3D® software. Lights are dimmed during peak periods in the provincial electricity grid to reduce load and lower utility costs, yet still provide effective light levels for building occupants. Lighting load shed is monitored in Polaris 3D software.

“The ENCELIUM EXTEND System’s functionality, wireless capabilities and integration with our BAS help support Humber’s aggressive sustainability goals. Plus, Polaris 3D® Software is intuitive and simple to use. Humber has plans to incorporate the ENCELIUM System into our student learning sandbox as a hands-on tool for teaching the next generation about lighting controls.”

- AMAN HEHAR, ENERGY EFFICIENCY MANAGER, P. ENG., LEED AP BD+C



Centrally Managed Multiple Lighting Control Strategies

The ENCELIUM EXTEND networked light management system offers a number of advanced lighting control strategies for energy management and creating a comfortable environment for occupants. Humber College leverages virtually all key features and functionality of the ENCELIUM System and has incorporated fixture-integrated components by Osram to maximize lighting system flexibility and optimization. Humber estimates that those buildings retrofitted with the ENCELIUM System and fixture-integrated OPTOTRONIC LED Drivers and CLMs, have achieved a total savings in lighting energy of 70%.

Occupancy sensors trigger both lighting and HVAC. Daylight harvesting is actively used throughout all buildings where natural light is available, facilitating automatic dimming of lights when sufficient ambient light is available. Task tuning creates the appropriate level of light for particular activities or uses of a space and is adjusted to meet occupant preferences. Since the lighting system across the campus is now centrally managed, support activities are streamlined. The Energy Efficiency team can view the entire system from their desktop and both monitor and adjust lighting control and related energy usage in a given building, floor, specific area or individual fixture.

* Osram ONIX specification-ready OEM partners carry fixture-integrated sensors and controls by Osram on their line card.

The Humber team which includes staff, contractors and students has found the Polaris 3D® software that facilitates commissioning, usage and data analysis of the ENCELIUM EXTEND System installation simple and intuitive.

LEED Certification

Humber is proud of its involvement with Leadership in Energy and Environmental Design (LEED), the most widely used green building rating system in the world. The newly constructed 93,000-square-foot Barrett Centre for Technology Innovation (Barrett CTI) is targeting LEED Platinum certification and net-zero energy use. Barrett CTI provides open concept gathering spaces, interactive technology zones, cutting-edge prototyping labs and more. It will act as an outsourced R&D department for manufacturing companies to experiment with leading-edge technologies and

transform ideas into operational efficiencies and marketable products and services, as well as an environment where manufacturers will train employees on advanced technologies.

The ENCELIUM EXTEND System is supporting the building's LEED certification by earning points in several categories including indoor environmental quality and energy and atmosphere.

First Retrofit to Achieve Zero Carbon Certification in Canada

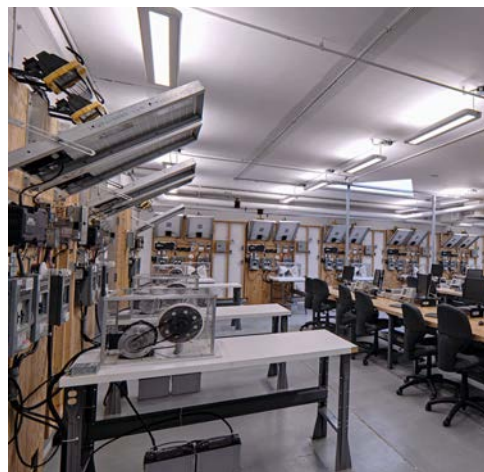
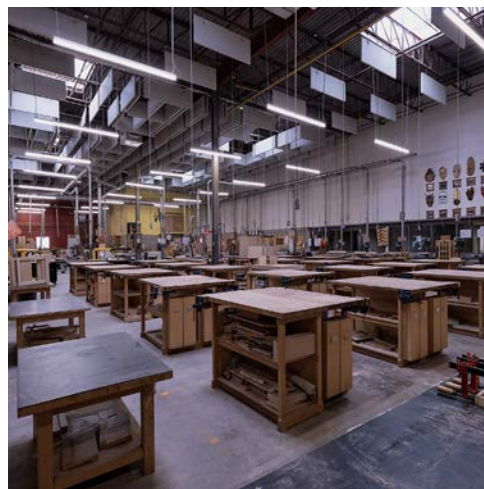
Humber College's Building NX serves as a national example of how to retrofit to zero carbon. It is the first retrofit to achieve Zero Carbon Building Design Certification by the Canada Green Building Council (CaGBC).

To achieve this milestone, the building required a complete envelope retrofit including triple-pane windows and a new photovoltaic (PV) system mounted to the roof. In addition, energy-efficient upgrades were made to the lighting and HVAC systems. The ENCELIUM EXTEND System was installed and leverages a number of lighting control strategies including occupancy sensors, daylight harvesting and task tuning. Building NX lighting is now controlled centrally along with 20 other Humber College campus buildings using Polaris 3D Software.

Originally built in 1989, the North Campus building is 48,269 sq. ft. and five-stories tall. Building NX will use 70 percent less energy than before, making it the College's most energy efficient building, and one of the most energy efficient in North America.

Training the Future

Humber's Sustainable Energy and Building Technology Program (SEBT) provides multidisciplinary training in renewable energy, along with aspects of building design and construction that can have a significant impact on a building's energy efficiency. The faculty plans to incorporate the ENCELIUM EXTEND System into their innovative learning sandbox where students learn how to control, commission and audit lighting systems as part of their studies. This hands-on approach not only gives students the practical experience and skill working with lighting controls but fosters an intrinsic affinity for sustainability.



Mt Royal University

Smart lighting creates technology infrastructure for space optimization and other smart building IoT solutions





End-to-End Smart Building IoT Solution

Space optimization

Objectives

A data-driven space optimization solution offers actionable insights in real-time about how a space is actually used – what space is underutilized or congested, how occupants move through the space, and whether the size and number of conference rooms is appropriate for the actual needs of occupants.

This space optimization pilot program was conducted in a 'live' customer environment. The primary objectives were in the areas of interoperability, connectivity, advanced data analytics and data visualization.

Timeline

The pilot ran under normal operating conditions, with live data, for a 30 day period.

OSRAM products

- ENCELUM® EXTEND Light Management System
- SensiLUM™ Wireless Integrated Sensor
- Connected Lighting Module (CLM)
- OPTOTRONIC® LED Driver with DEXAL™ Technology

OSRAM partners

- Rifiniti (SaaS partner)
- Elite Lighting (ONiX specification-ready OEM)
- Pinnacle Architectural Lighting (ONiX specification-ready OEM)
- Optics Lighting (Agent/Specifier)

About the end customer

Mt. Royal University is a postsecondary education institution located in Calgary, Alberta, Canada. Founded in 1910, the University provides personalized experiential and outcome-based learning and offers bachelor's degrees, diplomas, graduate certificates and community service learning to over 14,000 students annually. It is a sustainable university committed to reducing its environmental footprint. The facilities team is interested in the latest technologies that make buildings more efficient and further this cause.

The student health services area was selected for this space optimization pilot program and includes a common area, exam



About the partner ecosystem

No company can do IoT alone. OSRAM is creating an ecosystem of partners that bring specific skills and expertise to the table. OSRAM partners involved in field-testing the end-to-end Smart Building IoT solution at Mount Royal University are:

Rifiniti (SaaS partner)

- Optimo Workplace Analytics Software for space utilization and employee mobility analytics, capacity planning, and conference room rationalization.

Optics Lighting (Agent)

- OSRAM agents pull all the pieces together for a complete end-to-end Smart Building IoT solution. They combine the ENCELIUM® System with luminaires that have integrated sensors and controls by OSRAM to create the data network infrastructure that will enable Smart Building IoT solutions. They also work with OSRAM's third-party software partners to deploy specific Smart Building applications such as space optimization.

Elite Lighting and Pinnacle Architectural Lighting (ONiX specification-ready OEM partners)

- ONiX specification-ready OEM partners carry fixture-integrated sensors and controls by OSRAM on their line card. Both Elite Lighting and Pinnacle Architectural Lighting offer specification grade luminaires.

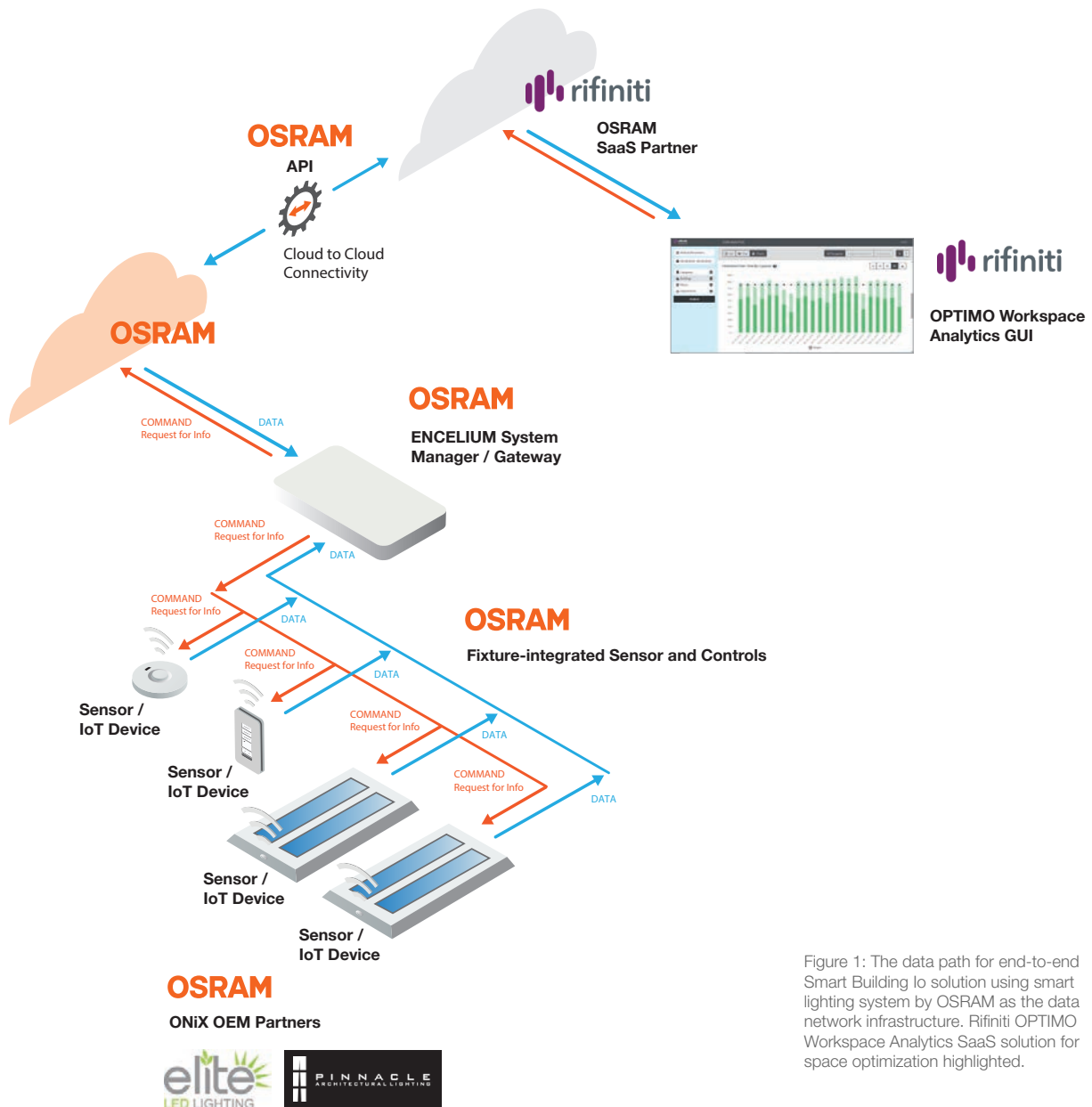


Figure 1: The data path for end-to-end Smart Building IoT solution using smart lighting system by OSRAM as the data network infrastructure. Rifiniti OPTIMO Workspace Analytics SaaS solution for space optimization highlighted.

Proof points and outcomes

1 Fixtures are designed and integrated with the latest sensor and controls technologies by OSRAM.

OSRAM ONiX specification-ready OEMs integrated sensors and controls into a total of approximately 120 luminaires needed for this pilot during the manufacturing process:

Elite Lighting integrated the Connected Lighting Module (CLM) and OPTOTRONIC® LED Driver with DEXAL™ Technology into Maxilume HH6 and HHJ6 Series Recessed Downlights.

Pinnacle Architectural Lighting integrated the SensiLUM™ Wireless Integrated Sensor and OPTOTRONIC® LED driver with DEXAL Technology into Pinnacle Edge Suspended Direct/Indirect Square Luminaires.

Fixture-integrated sensing and control capabilities create smart luminaires on the connected lighting system and are integral to enabling Smart Building IoT solutions. Sensors integrated in luminaires are data nodes on the smart lighting network.

2 A local electrical contractor installs new smart luminaires quickly and easily.

Smart luminaires were installed by a local electrical contractor. The installation process was significantly less complex than installing LED luminaires and attaching discrete controls components on-site.

Sensors and controls are integrated into the luminaire during the OEM manufacturing process. Field installation becomes straightforward because there are fewer variables and less field errors, as compared to attaching a controls component to the fixture in the field. This, in turn, can translate into a labor cost savings for both the contractor and end customer.

3 Wireless connectivity between fixture-integrated components and LMS hardware is confirmed.

The OSRAM tech support team re-commissioned the existing ENCELIUM® Light Management System (LMS) to include the newly installed luminaires as part of the connected lighting system.

Initial setup and commissioning of the ENCELIUM System is done on-site by OSRAM tech support. Technical support and trouble-shooting to aid customer personnel in the daily operation of the system, and to facilitate any required adjustments to restore the system to normal operation, can be done remotely by OSRAM tech support.

4 Connectivity across the entire data path (Refer to Figure 1.)

Sensors on the connected lighting system acquire space usage data on Mount Royal University's student health center. This raw data is then sent over the lighting system wireless mesh network (based on the ZigBee® protocol) to the ENCELIUM System Manager where it is aggregated and pre-processed and then sent to the OSRAM Cloud.

An OSRAM Application Programming Interface (API) enables Rifiniti, an OSRAM SaaS partner, to access the data and download it to the Rifiniti Cloud where Rifiniti OPTIMO software processes the data, using sophisticated data science and machine-learning algorithms, to uncover workspace insights. Rifiniti OPTIMO dashboards and analytics are available in real time and are accessed via web using login credentials.

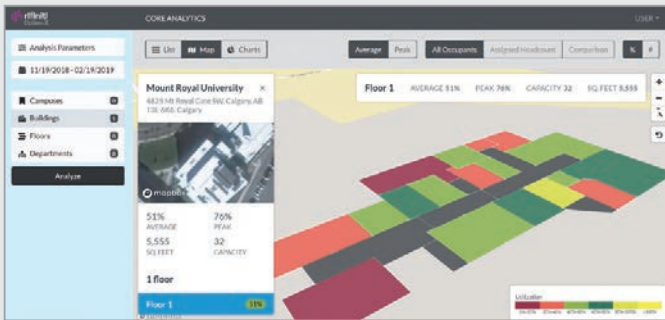
Note: Rifiniti hashes unique identifiers and does not use Personally Identifiable Information (PII) to safeguard employee privacy.

Smart Building IoT solutions require end-to-end connectivity and data flow (from sensors to SaaS solution to end customer-accessible dashboards). Lighting system sensors acquire space usage data, this raw data is aggregated and pre-processed by the ENCELIUM System Manager, and then the data is stored in the OSRAM Cloud. Using an open API by OSRAM, approved SaaS partners access this data and load it into their Cloud for advanced processing using data science, machine learning algorithms, predictive modeling and more. Insights using dashboards and analytics are available to the end customer in a user-friendly Graphical User Interface (GUI).

5 End customer is able to easily access Rifiniti web-based application dashboards and analytics through a secure login.

Mt. Royal University staff are given access rights to the Rifiniti web-based application. They are able to view dashboards including overall space utilization for specific time periods and over time; average and peak utilization vs. design capacity; utilization over time by capacity; and more.

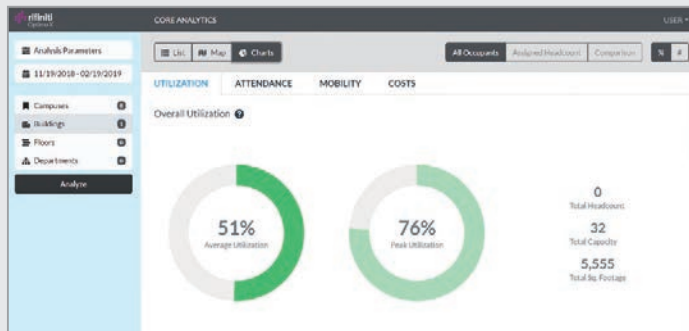
Organizations are looking for ways to create ideal workspace environments. Data-driven space optimization solutions can improve collaboration, increase productivity, increase comfort levels, support sustainability efforts and much more. End customers must have easy access to data-driven, actionable insights in real time.



Average and peak utilization heatmap



Average and peak utilization by day



Average and peak utilization trendline compared to a target

A connected lighting system by OSRAM creates the enabling data network infrastructure for smart building solutions beyond illumination. Lighting is ubiquitous and with sensors in every luminaire, sensing is ubiquitous and the data acquired is at a granular level. Rifiniti OPTIMO Workspace Analytics Software, enabled by this granular data, creates valuable insights about

space usage that can drive decision-making in the areas of restack analysis, determining the number and size of conference rooms required, creating a more collaborative workspace and more. Real-time dashboards and analytics are available to end customers in a web-accessible, user-friendly GUI.

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