SOLUTION BRIEF

Intel® IoT Platform
Street Lighting

Bringing Light to the Internet of Things

gridComm makes smart cities smarter with networked street lights using Intel IoT platforms.



"The Smart capability of being able to dim and read back electrical data remotely from lighting develops the foundation for more intelligence. Once a city is comfortable with the system it can deploy analytics for the Big Data received from the various IoT sensors attached to this vast power line network via gridComm's unique hybrid PLC+RF technology."

–Nge Tuck Long
Co-founder, VP, Sales and Marketing, gridComm Pte. Ltd.

Simply open the street light door. Install gridComm controller. Do this 100,000 times in a city and you have a smart city with connected street lights. Each contains our module with a gridComm chip that communicates data across the city's power lines. We then connect thousands of sensors to measure weather, pollution, traffic with the measurements over our street light control network.

Singapore-based company gridComm, creates an intelligent network over cities' power lines to control street lights and saves millions of dollars in monthly electricity and maintenance costs for the cities.
It's a common sight these days that the lights in the corridors of buildings or streets are kept glowing even while there is not even a single person in the surrounding to make use of them. In sharp contrast to this, we also see cases in which there are no sufficient lighting facilities at places where it is most needed. Proper handling of the above two situations can lead to an efficient energy usage and effective distribution of light resource. The product developed by gridComm aims at achieving this very bridging process by implementing sensor based lighting systems.

gridComm, a smart city solutions company in Singapore, came up with a Street Light Management Solution (SLMS) that leveraged on Intel® IoT Platform to allow the city to keep track of power consumption and the streetlights' working conditions, and it is programmed in such a way to dim the lights at specific times.

This solution employs Power Line Communication (PLC) which is a two-way communication with a gateway device, making use of the same wire line used to power the LED lights. To further improve reliability and IoT sensor connectivity, gridComm's hybrid approach adds a wireless channel to its 18 power line data channels. The system also supports wireless or Ethernet connections between a gateway and a cloud-based server. gridComm identified an immediate opportunity for Power Line Communication in order to create smart grids in which utilities or municipalities would be able to view what was happening with their network of lights without having to be there physically.

"This is all about disrupting the way cities manage infrastructure," said Nge Tuck Long, Co-founder, VP for Marketing and Sales at gridComm. "Let's start with street lights. There are 300 to 400 million street lights in the world. Over the next 5 years, 17% will upgrade to connected street lights. But street lights are just the start. Our network spans the entire city. Once the street lights are connected, we can connect thousands of sensors to measure weather, pollution, traffic etc. with the measurements communicated over our street light control network". gridComm is building city-wide networks with existing power lines as the backbone infrastructure for transmitting data . This wired system can be utilized to obtain data from smart street lightings and be further enhanced to include RF technologies to access other wireless IoT sensors.

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Smart Street Lighting & IoT Sensor Network based on Power Lines Infrastructure

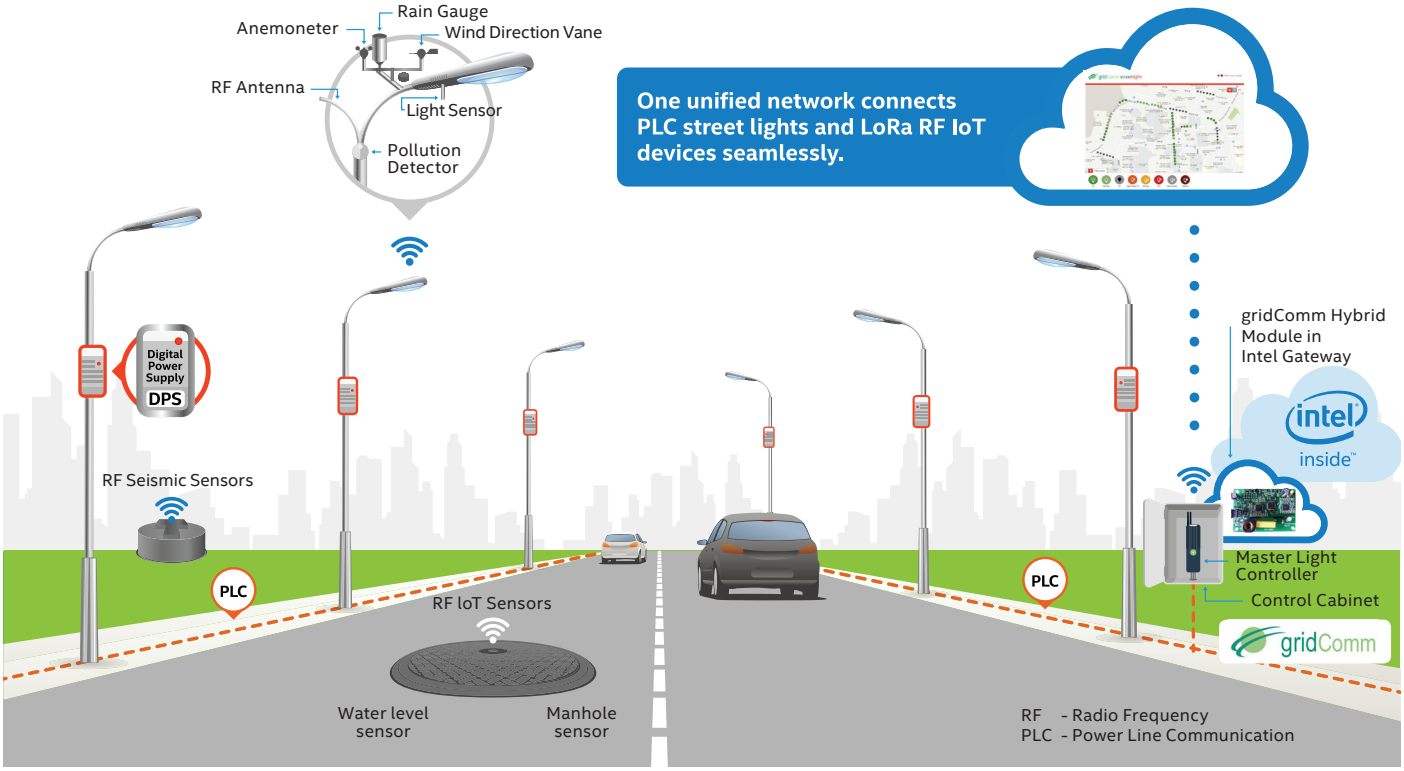


Figure 1. gridComm's architecture and connectivity design for smart lighting solution based on Intel® IoT Platform

gridComm's business model is to provide the street light network solution. gridComm charges $100 per connected street light. They then provide the street light control and analytics software as a recurring revenue model. A typical city has 100,000 street lights. For $13M they can create networked street lights saving $10M in electricity and maintenance costs per year - a 16-month payback period.

gridComm's technology is currently being deployed in streetlights in three Indonesian cities, Jakarta, Jambi and Makassar, and seven Chinese cities, including Nanning, Shanghai, Luoyang, Qingdao, Yantai, Kunshan and Huludao. Currently, the Indonesian capital of Jakarta is in the first of multiple phases implementing smart streetlights that will be able to dim based on environmental conditions, as well as send information about their functionality to the city's command center, thus enabling predictive maintenance. gridComm solution is cherry-picked to help PT. Siklon Energi Nusantara, the Pride of Indonesia, being the truly and only Indonesian LED lighting technology company, to enable smart street lighting in Jakarta.

The Path to Intel's Sustainable IoT

Streetlights are an ideal place for sensors, and they are easily integrated into gridComm's Smart Street Lighting solution. With this solution, connected streetlights can become a low-cost sensory network taking the pulse of the entire city. This network is ideal for adding additional applications such as parking or asset tracking. gridComm's Smart City API, leveraging ADlink Industrial Controllers employing Intel® IoT Gateway, enables sensor and application data to be harnessed by a range of smart city applications, enabling better operational planning and more informed decision-making by city leaders. To get this intelligent lighting solution off the ground, gridComm needed IT expertise. Intel IoT Gateways are the result of Intel's collaboration with Wind River and McAfee. By providing pre-integrated, pre-validated hardware and software building blocks, Intel was able to provide gridComm with the base layer of technology.

Field-proven for robustness and reliability, gridComm's Intelligent Street Lighting Solution serves as the cornerstone in the building of a 'Smart City' with a reduced carbon footprint. gridComm has come up with a robust and user-friendly web-based management solution that provides utilities and maintenance companies with remote and central control to monitor lights over wide geographical areas. The advanced scheduling module provides automatic options for switching on/off or dimming groups of lights or individual lights, resulting in considerable reduction in energy costs.

Features and Benefits of Smart Street Lighting

Turning the street lights on and off

gridComm offers lamp-level management capabilities. Individual dimming and ON/OFF switching of the street lighting fixtures becomes an easy task. This actually means a complete flexibility for our end users (Street Light Management departments, the utilities, the council, and municipalities) to choose from pre-programmed schedules, plan a schedule or manually manage every street lamp. And this can be achieved even on the road, using an Android device.

Take for example a typical city which has 100,000 street lights. For $13M of investment to turn the street lights into "smart" devices using gridComm solution, they can create networked street lights savings of $10M in electricity and

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maintenance costs per year - a 16-month payback period. This projection is solely based on an existing project in Australia. The cost savings vary from country to country and the tariffs imposed.

Dimming the lights

When the street lighting needs to decrease in a certain area or within a certain time frame, gridComm's Smart Street Light Technology helps to dim the lights accordingly. If the pedestrian traffic decreases significantly between 1:00AM and 5:00AM, then dimming the lights is the correct way of life. You will considerably reduce energy consumption and CO_2 emissions.

Communications in the city network

The controllers are mounted inside the pole or inside the lamp, while the communication devices are placed inside the power supply control cabinets. gridComm communicates using Power Line Communication between the lamps and the power supply control cabinets and using any IP-based communication solution available between the cabinets and the server management software in the central office. Also, the built-in advanced signal repeating mechanisms make it possible to communicate securely even over the largest street lighting networks.

Controlling the infrastructure

Besides streetlight management, gridComm's SLMS is able to control virtually any device connected to the electricity grid, including weather sensors, pollution sensors, traffic volume sensors, light sensors, electrical vehicle charging, water sprinkles, electric gates or doors, access points and many more. This can really put your imagination at work and, as we know your city is unique, we are ready to accept your challenge. "Having seismic sensors planted around the power line network in earthquake-prone cities Big Data Analytics will constantly monitor for earthquakes' detection. Likewise, smoke or heat sensors can be planted in remote areas where wild fires can be detected before they get out of control," opined Tuck Long.

Return of Investment is based on a PoC in Australia

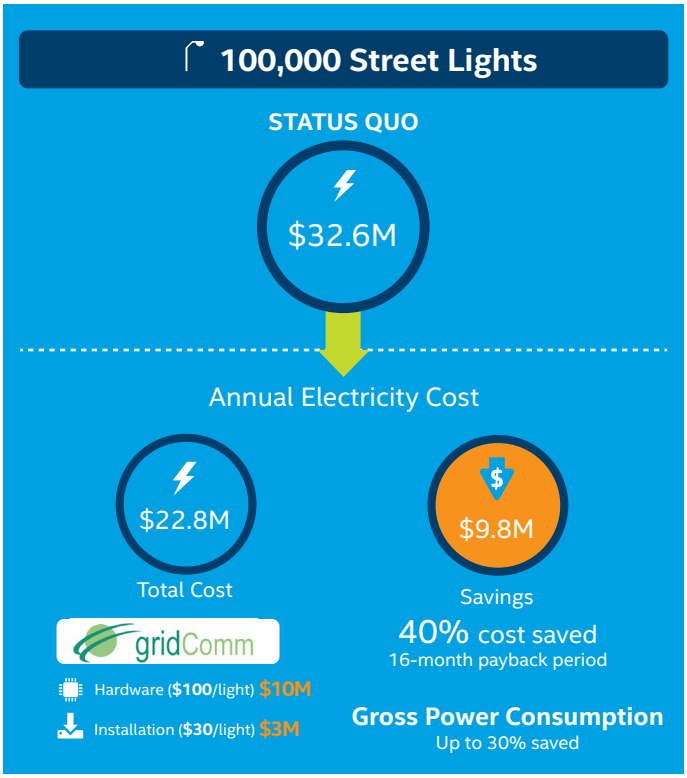


Figure 2. Assume 250W lamp at 40% dimming

Street Light Analytics Dashboard

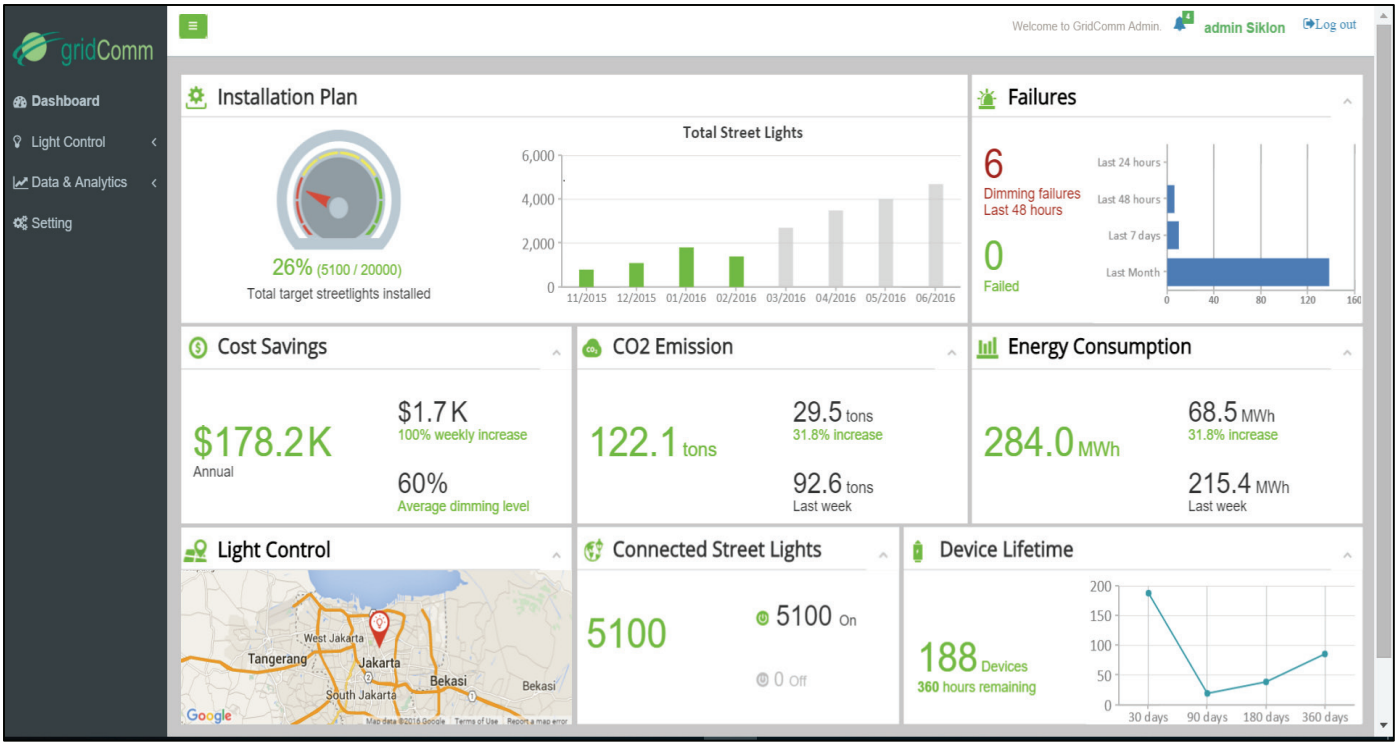


Figure 3. In comparison to other existing solutions, gridComm's backend GUI is totally end-to-end and user-friendly.

Reporting and maintenance scheduling

Even when the lights are turned off during the day, the gridComm servers receive and compile information from all over the network. gridComm's SLMS offers advanced analytic tools, failure reporting, customisable maintenance planning, automatic daily backups and recovery procedures. Android* compatibility makes sure that you have real time network mapping, street lighting inventory and access to the system's functions even on the road.

Benefits

Energy costs are immediately reduced up to 30% through intelligent on/off switching, targeted progressive dimming and efficient management of power consumption using efficient luminaire, while overall operational costs can come down aggressively to as much as 90% because the need for manpower can be taken out of the equation.

Can smart technology support our cities of the future?

One of the biggest changes is something that you may not even notice. If you work in a smart office, you might already be aware of lights that come on when you walk into the room and turn off, automatically, when everyone vacates that room.

Well, imagine that same principle not only in offices, malls, supermarkets and public buildings, but in streets too. Connected lighting provides the right amount of light precisely where it is needed and when it is needed, enabling municipal authorities to save energy and maintenance costs and to reduce obtrusive light. Most importantly, powered by Intel IoT Gateway, a secured and manageable smart streetlight platform provides a foundation for the city to install new sensors to empower more innovative smart services to enrich citizen's living experiences in the future.

"With so much of the global population living in cities, municipalities will have to offer welcoming atmospheres to attract residents, visitors and industry. In short, cities themselves will have to become brands," explained Tuck Long.

"High-quality, intelligent lighting helps make a city safer and more attractive, enhancing its brand identity—the distinctive signature that defines its appeal and differentiates it from other cities. We are living in an unprecedented urban moment of opportunity. We should seize this moment and position humanity and the city at the heart of growth and development," concluded Tuck Long.



Easing integration issues with ADLINK* IoT gateway

ADLINK* Intel-based gateway solutions address IoT integration challenges. The MXE-100i delivers computing power, connectivity, security and manageability to minimize development time and costs. This enables edge data to be turned into real value faster.

Based on the Intel® Quark™ SoC X1021, and integrating Wind River* Intelligent Device Platform XT and McAfee Embedded Control, the MXE-100i, combined with ADLINK's embedded SEMA cloud solution, delivers the manageability and security critical to IoT-based operation.

To learn more about gridComm and its solution offerings, visit **http://www.gridComm-plc.com/**.

For more information about Intel® technologies in IoT, visit **intel.com/iot**.

To learn more about ADLINK* IoT Gateway platform, visit **http://www.adlinktech.com/Industrial-PCs-Fanless-Embedded-PCs/IoT-Gateway.php?utm_source=**

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[1] Intel® technologies' features and benefits depend on system configuration and may require enabled hardware, software, or service activation. Performance varies depending on system configuration. Check with your system manufacturer or retailer or learn more at www.intel.com.

[2] Based on the projected dimming level on an average of 12 hours.

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