iLED

Building Connected Cities with *Andromeda*

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Welcome to the Connected Future.

In the 20th century, we created the Internet. And It forever altered the way we communicate with each other. Now, at the start of the 21st, we are about to create the Internet of Things; and it will forever change the way we communicate, control, and interact with our physical world: We have started to build the connected city.

Allowing city devices to connect to the internet provides the ultimate wealth of information to both Governments and the Citizens: From WiFi access and Hot-spotting, to climate monitoring, city automation, security monitoring, parking spot management, and an open platform for the bidirectional delivery of Voice, Data & Video from every connected system in the city.

Building Connected cities with ***iLED Andromeda***

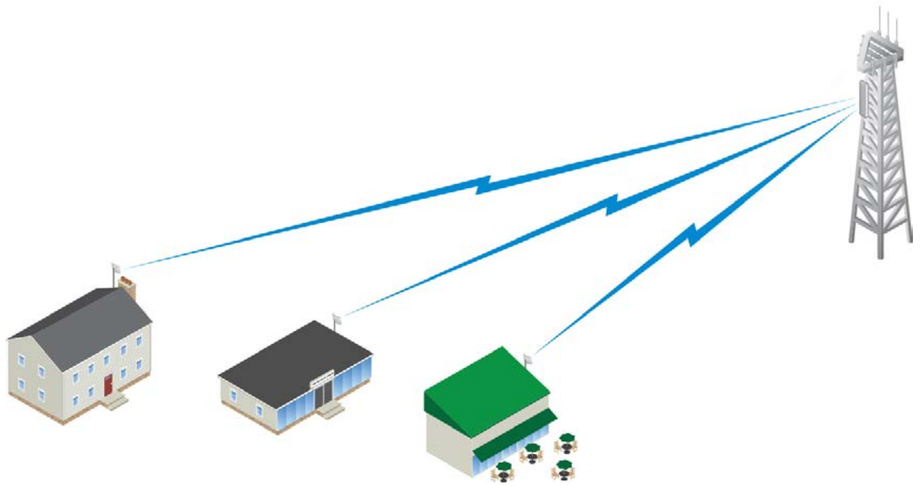
Andromeda is iLED Solutions' Connected City Platform. Andromeda provisions our Auriga Street lights with WiFi access radios, effectively turning them both into a smart Lamp that can be controlled, and automated, and a powerful, Internet-connected device that can offer WiFi access, Security and surveillance services, Environmental sensors, and traffic monitoring sensors. There are four critical components to Andromeda that we will explore in detail in this white paper.

Internet Connectivity and WiFi Back haul:

The Andromeda platform is powered by Carrier grade, Municipal Wireless Internet Connectivity. From a single uplink location, we wirelessly provision Internet connectivity to all Andromeda-enabled devices. Then, each smart lumminaire can provide fast, reliable WiFi access on the street level, and provide a wealth of information about the lamps themselves.

Application example: Several antennas provide city-center-wide-coverage.

Application example: Four antennas supply campus-wide coverage.



Andromeda can also provide WiFi to Buildings and Homes.

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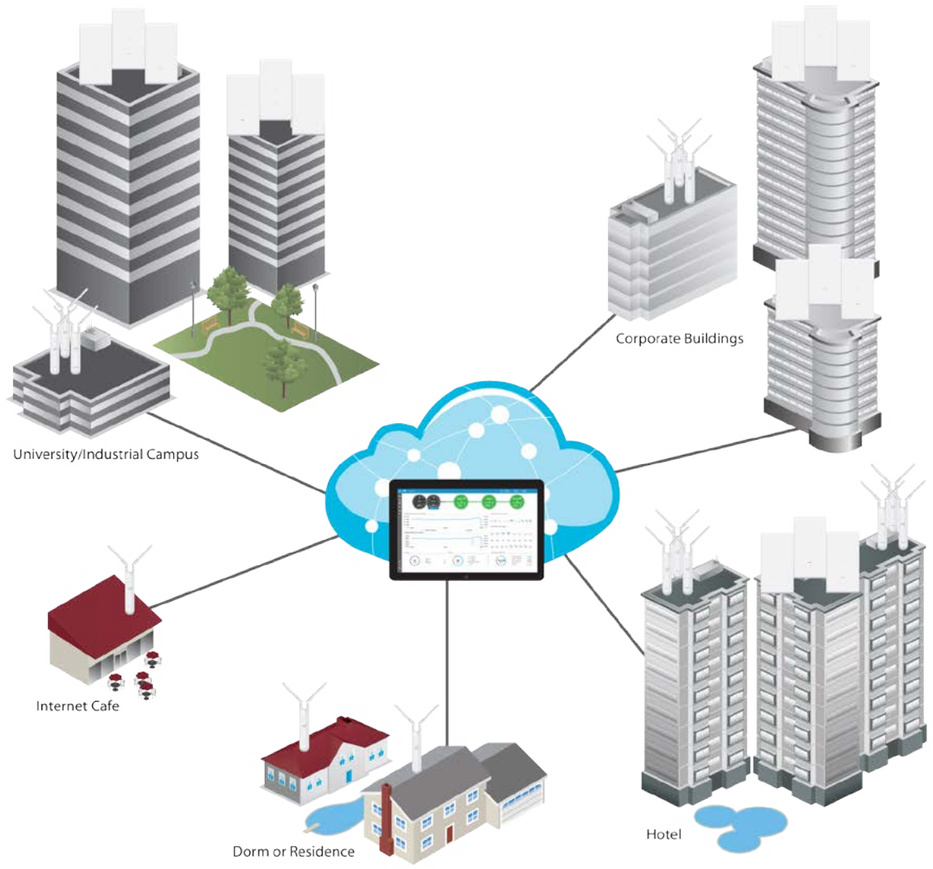
Internet Connectivity: Municipal WiFi

Andromeda's powerful connectivity infrastructure is built around Carrier-grade equipment. It's endlessly scalable, ultimately flexible, and designed for thousands of connected clients. Managed from our central Network Operations center, each installation can seamlessly provide municipal WiFi coverage at up to 1.3GBps to each client. In effect, this backbone allows Andromeda to supply high performance wireless internet access, either as a free-access, or as a subscriber network. Network Access Terminals can be purchased by citizens to provide high-speed to homes and businesses without the need for any wiring. It becomes readily possible to deploy municipal-owned-and-operated Wireless network access. Providing citizens with the free and undeniable right of access to the internet.



iLED Auriga Street lights: Brilliantly Smart.

Our Auriga street lights define the standard. They achieve luminous efficiencies of up to 157lm/W; offer a wide portfolio of optical choices, and can last up to 22 years. The lumminaires form the connectivity delivery platform of our solution. With their breakthrough efficiencies, our lumminaires offer the highest savings in power usage for public lighting, helping municipalities large and small reduce their energy consumption and their CO/2 production by up to 80% in comparison to normal technologies.

Internet connectivity is just the beginning.

Outfitted with Wireless connectivity and a powerful on-board computer, each street light becomes far more than a mere lamp: The devices become internet-enabled computers, which can be expanded with many modules to extend their functionality and offer a rich stream of information to citizens.

At the most basic configuration, each lumminaire provides WiFi access, and our basic telemetry package. With this package, each lumminaire becomes self-monitoring, reporting power usage, status, and any failures if they should occur. Each device can be controlled as part of a group or independently. Andromeda eliminates the Photocells and Photocontactors of common street lighting systems. Since the system is always aware of the current time, it can slowly dim in at dusk, and slowly dim out at dawn, keeping track of daylight savings. Additionally, during the late hours of the night, the devices can be dimmed to further reduce power consumption.

Power tracking allows users to keep precise records of how much power, and at what times, the lumminaire has used. This allows for easy accounting of power savings, critical for the efficient administration of energy management companies and public-private consortiums.

Through the addition of additional hardware modules, the devices offer a rich array of functionality without equal. Each device can be configured with as many, or as few modules as required for each specific application.
Integrating Sensors enables environment-aware devices, which can respond, as needed, to their changing environment. The presence of a vehicle underneath, or a pedestrian, device-side weather patterns, even the GPS location of the device.
Including video and audio equipment enable the devices to provide Cloud-based surveillance and media applications.

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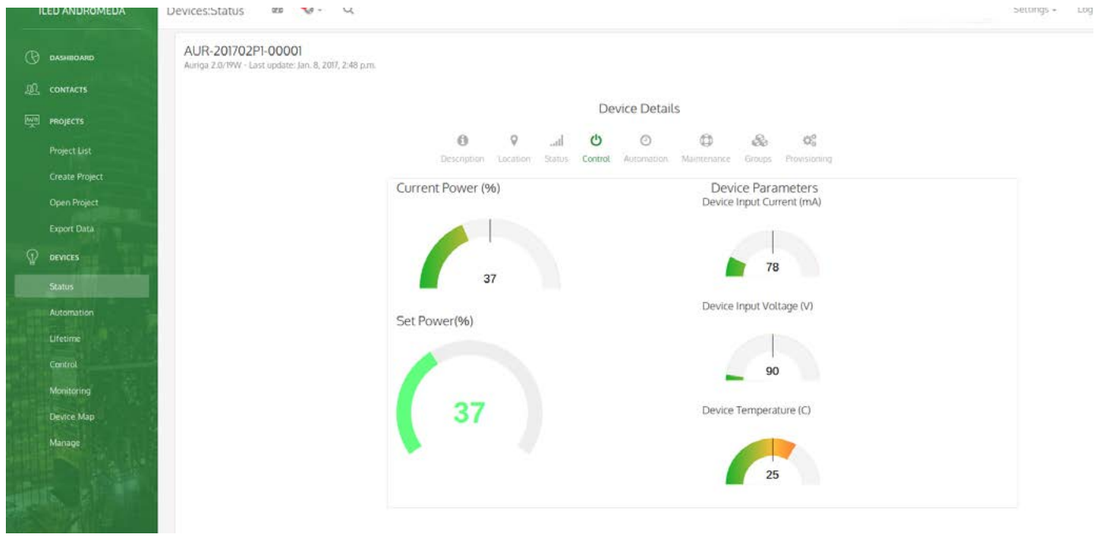
Andromeda Console: Worldwide cloud-based control software:

The Andromeda console provides a consistent, easy-to-use platform from which to manage, monitor, and interact with a fleet of devices of unlimited size. Endlessly scalable, Andromeda can just as easily control one device, as thousands. In the latter case - each can be controlled individually, grouped, or all at once.

The software is available world-wide: Entire fleets of thousands of devices can be controlled from a single control point. The console is entirely web-based: It runs inside your current Web browser, regardless of your device: From computers, to phones, to tablets, any digital device can control your entire fleet at the click of a button.

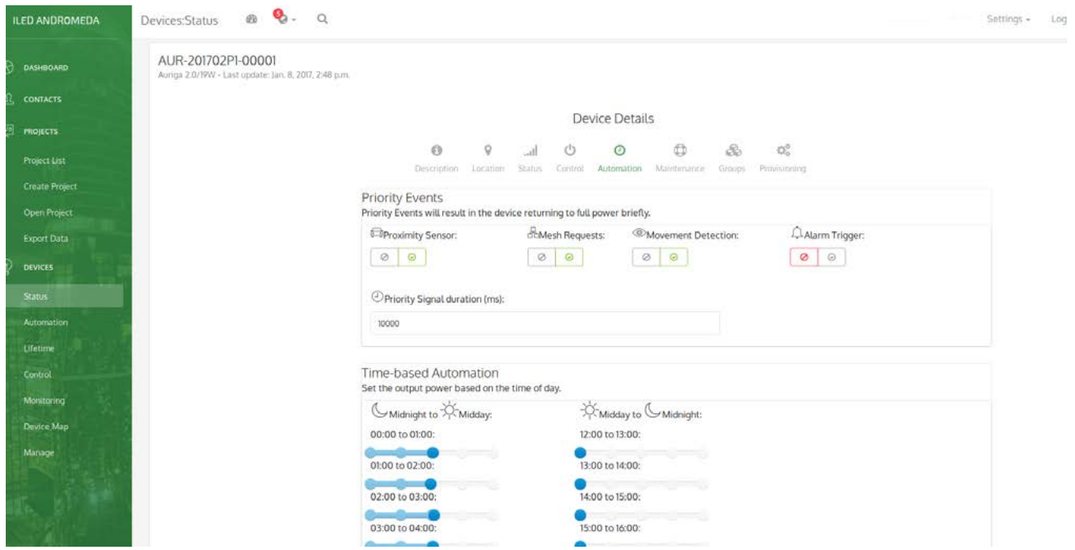


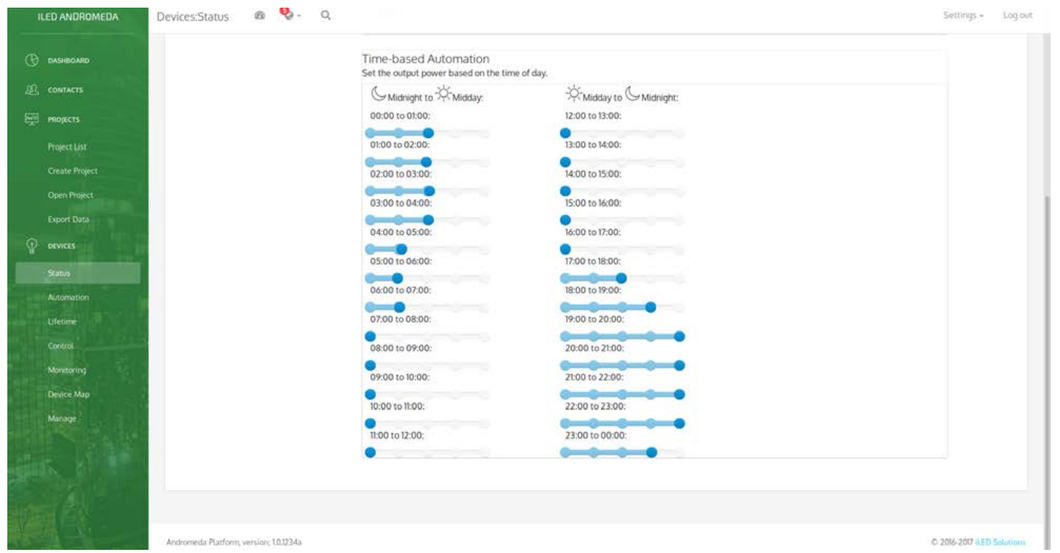
Device Power Management

Device Historical Power consumption

Powerful Automation in each Street light:

Andromeda turns each street light into a powerful, automated device that can react to it's environment dynamically. The platform allows complex time-and-event automation to be configured. Each device continues operate if disconnected. Each device can dim to a preset level according to the time of day, to the current weather patterns, in a specific sequence with other devices. They can follow traffic around the city and dim out when they're not needed. With the Proximity and weather sensor packages, it becomes possible to build cities that become brighter and darker as is needed, turning them truly dynamic, environment-aware cities. This system reduces power consumption and carbon emissions. Additionally, it improves the health of citizens and animals by reducing light pollution and permitting darker nights. Adding Smart LED lights helps reduce glare, energy consumption, and even makes the stars visible on clear nights.





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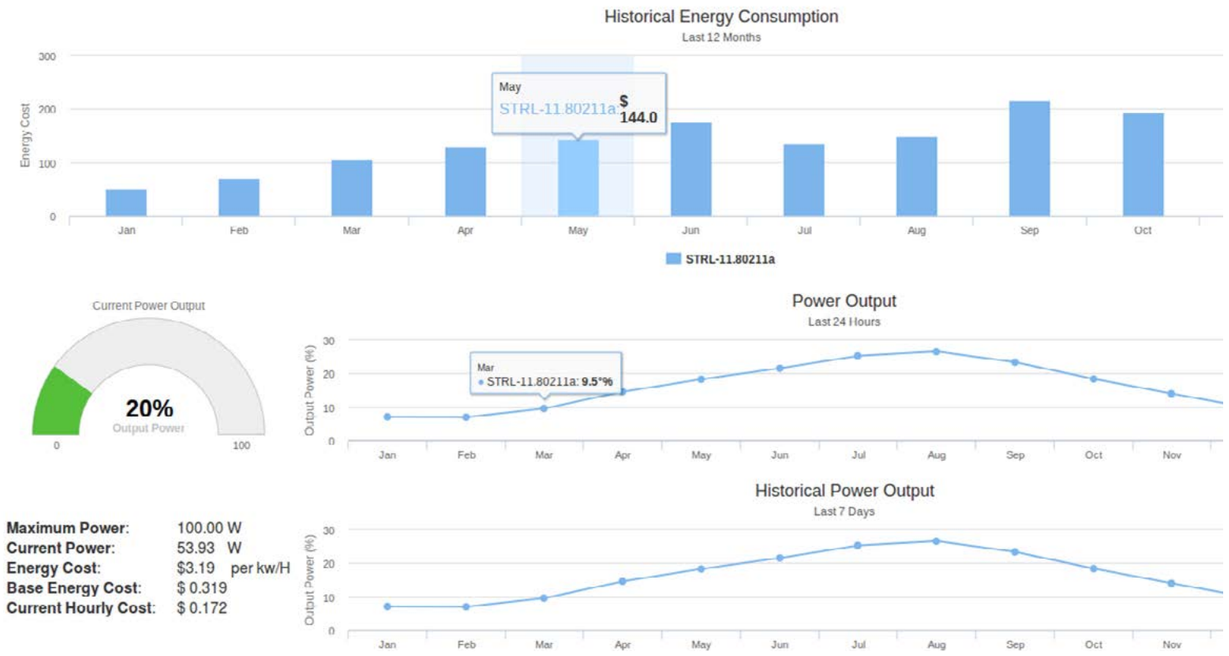
Energy Management and Accounting

Energy is one of the challenges that cities will face in the future. As we stride to reduce the effects of climate change by reducing our Carbon footprint, Cities are faced with the need to save power on an unprecedented scale. Indeed, the very reason for LED lighting's recent boom is the large reduction in energy usage when compared to regular lighting technologies.

To finance most LED projects, its typical to use the savings generated from the replacement of older technologies. This arrangement presents a challenge that can easily be solved by integrating Andromeda's powerful Energy Management system: Most public lighting projects *do not* have any sort of power metering installed. The amount of power used, and thus, the amount of power saved, is *estimated* from the number of hours the devices run each day and the amount of power on average that they consume on paper.

Adding an energy sensor at-point-of-load into each street light, and optional non-intrusive Line Energy Monitoring devices, Andromeda keeps precise accounting of exactly how much energy each device is consuming *down to the second.* The information is updated in real time, and using geographical information to determine the correct pricing on a per-hour basis, the total energy usage, in kWh, CO2 and financial terms, is offered in an interactive, dynamic fashion.

Programming in prior consumption before LEDs were introduced allows the software to provide energy savings information: including the same three key variables: kWh, CO2 and the bottom line.



Maximum Power: 100.00 W
Current Power: 53.93 W
Energy Cost: $3.19 per kw/H
Base Energy Cost: $ 0.319
Current Hourly Cost: $ 0.172

Additional Sensors for Smarter Cities

All of the sensors below can be added to the fixtures, creating truly interactive devices. Each fixture can be configured with as many or as little sensors as required; at the factory, or through a field upgrade. With each added sensor, the Andromeda platform automatically enables the required software modules for each lamp. Installation is automatic and provisioning of all hardware is done from a single, cloud control location.

Andromeda ***Sentry*** : On-Fixture security camera.

The Sentry package outfits Fixtures with an embedded Security Camera. The devices can be outfitted with, or without night vision. Able to record video in up to HD Quality, the camera streams video to the Andromeda platform, allowing users to deploy complete video surveillance systems without having to deploy any infrastructure. Access to the video streams is available on all devices. Visual alerts such as motion detection and threshold detection can further be installed to each camera to trigger security alerts.

Andromeda ***Environment*** : On-Fixture environmental Sensor Suite.

The Environment package outfits Fixtures with a suite of sensors designed to measure their surrounding environment. The sensor package can include GPS, Ozone, Carbon Dioxide, Carbon Monoxide, Luminance, UV levels, temperature, and wind speed measurements. These sensors are extremely useful to monitor the ever-changing air quality conditions at ground level in strategic spots in the cities. GPS data can be provided to all other modules by including the GPS hardware option.

Andromeda ***Motion*** : On-Fixture motion & presence detection.

The Motion package outfits Fixtures with ultrasonic or LIDAR presence sensors, allowing them to detect any object underneath the Fixture, either moving or standing. This information allows the Fixtures to determine whether the area underneath them is available for parking, or, in the case of Highway and Main Street lamps, it allows for real-time sensing of traffic conditions by measuring the velocity of vehicles. Providing real-time parking information to drivers and smart cars promises to reduce the pollution and hassle of parking today.

Andromeda ***Audio*** : On-Fixture audio & vocal communication.

The Audio package outfits Fixtures with either one, or two-way audio devices. This enables Fixtures to stream any kind of audio over the internet, providing a useful channel for communicating with citizens. If a microphone is included the fixture device gains a push-for-assistance button at street level, allowing for instant communication with safety forces from any Lumminaire. The microphone supplement the Sentry package with audio input as well.