EnviroLux **- Software Specification**

Overview

The Unifi Platform from EnviroLux is a networked lighting control platform that provides Occupancy, Daylight Harvesting, Time-based and Mobile User based Lighting Controls. The Unifi platform is a wireless and wired networked solution linking individual fixtures with Cloud based Control Software to allow both communication of control commands as well as operational performance and energy consumption data.

The Unifi Platform Components:

• Cloud Control Software
• Unifi Passport
• Unifi Relay

Cloud Control Software Components

Software Usability

Web-based Graphical User Interface: The EnviroLux control platform has a web-based graphical user interface that is accessible from any internet connected device. The EnviroLux GUI is built on an Ionic HTML5 framework which allows the application to "form fit" to the screen size of whatever device a user may have e.g. Laptop, Tablet, Mobile Phone or Desktop. Fixtures, Areas, Scenes, Timers, Sensors and Switches can all be commissioned and configured from the EnviroLux GUI. Additionally all User Management, Account Management, Energy Monitoring as well as Device & System Diagnostics are visible from the GUI.

Personal Control: The EnviroLux platform has been designed with different system user roles which enable Personal Control. A customer's EnviroLux Admin user can set up any number of users on the system. These users will have their controls experience configured by the EnviroLux admin. Individual users can be restricted in what they can control, what control capabilities they can access and what system information they can see. Personal Control can be set differently for every single user on the system should the customer's EnviroLux Administrator desire to configure the system in such a way. An example of Personal Control could be the EnviroLux Administrator setting a specific office worker's account up so that that individual could only control the lights above their cube and the adjacent conference room.

Control Features & Capabilities

Continuous Dimming: The EnviroLux platform supports continuous dimming through analog 0-10 VDC in compliance with IEC60928 Annex E. All Unifi enabled Relays and Drivers use the 0-10V system and are capable of supporting up to 256 points of light level differentiation which means the dimming signal allows for smooth imperceptible steps. Minimum light levels are dependent on driver/ballast performance.

Scheduling: Unifi has a configurable Scheduling Capability that uses either Smart Timers or Astronomical Timers. These Smart Timers allow a building owner to set up an infinite number of Schedules through which Lighting Assets can be turned On or Off or Dimmed. Owners can pre-program light levels and let the Smart Timer automate the process of optimizing the lighting experience. Smart Timers are instantly configurable so new Timers can be created without the need to re-program any hardware on-premises. In addition the EnviroLux platform allows scheduling through Astronomical timers. Common Astronomical Timers are used for configuring exterior lighting around Sunrise and Sunsets.

Daylight Harvesting: The Unifi Platform is configurable to accept Lux inputs from Daylight Sensors and adjust luminaire light levels to the appropriate Footcandles in accordance with the ambient light. Unifi's configurable Areas feature allows for the creation of Primary Sidelighted Areas and Secondary Areas that conform to ASHRAE/IES 90.1 standards for Daylighting.

Occupancy Sensing: The Unifi Platform can configure the light output of individual or groups of fixtures based on the presence or absence of people in a space. Power On , Power Off and Dim Levels rules can be configured to ensure compliance with ASHRAE 90.1 as well as local regulations for security lighting.

Reconfigurable Zones with Layering: Unifi allows for luminaires to be grouped into multiple zones using the Areas feature. A fixture can be a part of up to 16 Areas and these Areas can be layered on top of one another to allow for the creation of extremely large zones that span multiple circuits and up to an entire property. Additionally with the Areas feature, Zones can be reconfigured without having to make any physical changes on the customer's premises.

Configurable Control Strategy Prioritization: The EnviroLux platform allows multiple control strategies e.g. high-end trim, day lighting, occupancy sensing, personal control to be applied to fixtures and areas. Often when applying multiple control strategies there are scenarios of strategy conflict. For example the light output of an office worker's luminaires above his/her desk might be set by a Daylight Harvesting strategy implemented by the building owner which the office worker feels doesn't provide sufficient light. Unifi automatically reconciles these disputes between control

strategies by allowing Unifi Admins to set a sequence for the prioritization of control strategies. In the scenario described above Unifi could seamlessly resolve this problem by allowing the office workers Personal Control to supersede the Daylighting Control Strategy.

Task Tuning with High End Trim: Unifi's Task Tuning capability allows for the adjustment of the light output of an individual or group of luminaires to the appropriate level for specific activities to conform with the guidelines outlined by the IESNA Lighting Design Guide. Task Tuning is entirely configurable not only to the minimums required for a specific activity but Task Turning also has a High End trim feature which allow for a maximum light output level to be set for an individual or group of luminaires.

Platform Features & Capabilities

Networked: Unifi, EnviroLux Control Platform is a networked platform that integrates hardware and software both wirelessly and over wire. The EnviroLux hardware that resides on the Customer Premises communicates amongst itself over a 6LoWPAN IEEE 802.15.4 2.4Ghz protocol named JenNet-IP. JenNet provides a secure, encrypted "mesh-under" networking approach that creates a self-forming, self-healing, scalable and robust wireless network layer. The Unifi Passport on the Customer Premises and the EnviroLux Cloud Software communicate with one another through an SSL encrypted Ethernet Port.

End to End Security: Encryption of all control signaling has been implemented across all hardware and software within the EnviroLux Platform. The messaging wirelessly communicated between the Relay or Driver and the Passport is encrypted using the 128bit AES encryption standard. Messaging between the Passport and Cloud is encrypted using the 256bit SSL encryption standard. All users on the system have unique User IDs and Passwords. All devices on the network have unique MAC addresses whether they be a Relay, Driver, Occupancy Sensor, etc. All Nimbus 9 sites are password protected and those passwords are protected using cryptographic hash functions.

Remote Diagnostics: The EnviroLux platform allows for remote diagnostics of both system components, EnviroLux Passports & EnviroLux Relays, that are installed on the customer premises. These diagnostic capabilities allow reporting of operational anomalies down to the individual luminaire level. EnviroLux Administrator's can set alerts to be triggered for device failure, amperage irregularities, etc.

Passports: The EnviroLux Cloud can see each Passport that is connected to the internet. If for some reason internet is lost, EnviroLux Cloud will show that the Passport is RED meaning that the Passport is not visible to Cloud. Alerting can be triggered based on Passport state. EnviroLux can also send "over the wire" firmware updates to a Passport.

EnviroLux **Relays:** The EnviroLux Relays have the ability to communicate their state and real-time energy consumption to the Passport. Additionally the Passport can ask the Relay of it's state and real-time energy usage. Each Relay has an integrated current sensing IC so that real-time, utility grade energy usage is available for each fixture. This current IC also enables facilities manager to be alerted if there are amperage irregularities or if a fixture has burned out or is off of the wireless network.

Fault Tolerance & Local Autonomous Processing: The entire Unifi Platform has been engineered as a fault-tolerant system capable of continuing to properly operate in the event of some of the system's components failing.

Self-Healing Mesh Network: When one node can no longer operate, the rest of the nodes can still communicate with each other, directly or through one or more intermediate nodes. The Unifi mesh network can self form and self heal thereby ensuring resiliency.

Passport Hot Swap: In the event of a Passport failing, that Passport is "hot swappable" meaning this hardware can simply be unplugged and a new passport plugged in. No re-commissioning or re-configuring of the network on the Customer's premises is required as all of a Passport's security parameters, network route trees and access control lists are replicated in the Cloud. Upon "Hot Swap" these configurations are pushed from the Cloud to the replacement Passport.

Cloud High Availability: Unifi has been designed to deliver a "Five Nines" service level target. This is achieved through a resilent, decoupled service oriented architecture designed to address: Server Failure, Zone Failure and Cloud Failure.

Local Autonomous Processing: During Normal operation the Control Commands for the Unifi Platform are sent from the Cloud to a customer's premises. In the event of Cloud Failure all Scheduled Events, Timer-based & Astronomical, as well as all inputs from Sensors & Switches will be executed locally.

Energy Performance Monitoring: The Unifi Controls Platform is built with "out of the box" Utility Grade Measurement and Verification. Each fixture controllable by Unifi will either have a EnviroLux Driver or EnviroLux Relay with M&V capabilities. Both the Driver & the Relay have embedded the STPM32 Power Monitoring IC by ST Microelectronics. This Power Monitoring IC allows for real-time energy performance monitoring at the individual fixture level. Energy consumption information is communicated back to the Unifi Cloud and stored in the EnviroLux Energy Analytics Engine accessible to customers through the GUI.