Overview

nLight by Acuity Controls is a digitally addressable, networked lighting control system that can operate without requiring a connection to the facility LAN. However, in many applications it may be desirable to connect the nLight system to a facility's building infrastructure IP network to provide additional functionality. For example, these features require the system to be networked to facility LAN:

- Using SensorView software to manage the lighting control system from a non-dedicated computer/workstation, such as a building engineer or facility manager's computer
- System integration with a Building Management System (BMS) via BACnet/IP protocol
- System integration with an electrical utility OpenADR server via nADR client
- Using Virtual Wallpod control applications from iOS devices or PC workstations
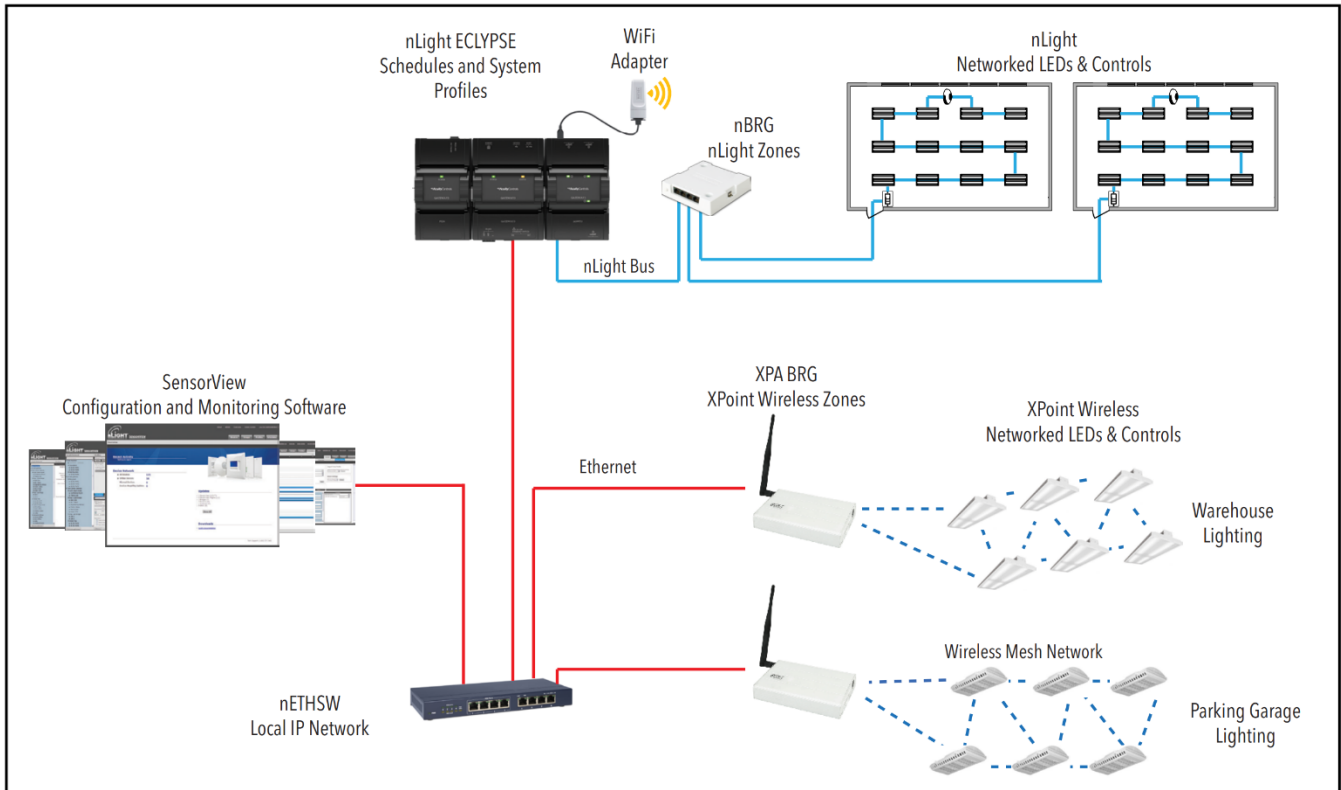- Remote support and diagnostics

Figure 1 - Example Typical nLight System Riser Diagram

A simplified system riser diagram for a typical nLight installation, including XPoint Wireless by Acuity Controls, is shown in Figure 1. Each component shown connected with red wiring connections to the "nETHSW" is a device that requires an IP address and communication to other system devices via Ethernet. Note that there are parts of the nLight system that use proprietary communication protocols & addressing schemes and do not require IP addresses, the nLight device connections (also known as "SensorNet" and

shown in blue wires) and the XPoint Wireless Mesh network (shown in dashed blue lines). In a typical "isolated" application, the IP networked devices are set up with local static IP addresses and software connections can be made through a dedicated PC/workstation or a temporary connection into the lighting control Ethernet switch (shown as nETHSW). In a typical "LAN integrated" application, the lighting control Ethernet switch may be connected to the facility LAN's IP backbone and also, may be provided by others.

The following types of nLight system backbone devices require an Ethernet connection and IP address:

1. **Client Web Browser (not shown, provided by others)**, used to access SensorView host via HTTP protocol, may be operated directly from SensorView host PC/Server (see next). Refer to SensorView Specification Sheet for supported browsers and clients.
2. **SensorView host PC/Server (provided by others)**, used to host SensorView IIS web application and communicate with all IP networked devices. Refer to SensorView Specification Sheet and Installation Instructions for specific host machine requirements.
3. **nLight ECLYPSE™ Controller (nECY)**, used to provide timeclock, master system control, and device information cache for nLight and XPoint Wireless devices. This is also optionally used to provide protocol translation between BACnet/IP or BACnet MSTP building automation protocol and nLight system protocol.
4. **XPoint Wireless Bridge (XPA BRG)**, used to provide media/protocol translation between XPoint Wireless mesh network devices and nLight system protocol.
5. **nADR (not shown)**, used as a client to electrical utility OpenADR Demand Response Automation Server (DRAS).

Notes:

- CAT5e or higher wiring is required for all Ethernet and nLight device connections.
- Ethernet switches may be provided by others.
- All devices and TCP/UDP ports should be accessible to each other via the same LAN subnet (with the exception of the connection between Client Web Browser and SensorView PC host).
- All IP networked devices may be configured using static or dynamic (DHCP) IP address assignments (static IP addresses are recommended).
- There may be multiple quantities of each of these listed devices installed in a project; please review project Bill of Materials and system riser diagram for exact quantity of devices requiring IP addresses and connections.
- XPA BRG supports being powered from PoE network switches (IEEE 802.3af, requires PoE adapter to be specified with XPA BRG).

Wireless Mesh Network Overview

XPoint Wireless uses a low duty cycle, narrow-band, Zigbee®-based 2.4 GHz wireless protocol that is not known to interfere with your 2.4 GHz Wi-Fi or other systems. The low communication duty cycle, combined with clear-to-send back off capability from the IEEE802.15.4 radio, typically does not produce

measurable impact to Wi-Fi performance and is usually difficult to observe in an RF spectrum analyzer. Each XPoint Wireless Bridge and associated mesh network (typically up to 250 wireless devices) can also be programmed to use a specific Zigbee RF channel to avoid co-channel interference with other installed 2.4 GHz equipment. Zigbee channels 11-26, corresponding with 5 MHz-wide frequency bands from 2.405 GHz to 2.480 GHz may be assigned to specific wireless mesh networks.

The wireless communication is secured and encrypted using AES 128-bit encryption. The network protocol includes "replay" protection, where each wireless message is uniquely encoded such that it cannot be recorded and replayed at a later time.

Additional Notes:

- Maximum RF power output is +18 dBm for Zigbee Channels 11-25, 0 dBm for Channel 26. Output power is typically attenuated 2-20 dB by LED luminaire housing.
- The wireless mesh network does not support integration with non-Acuity, Zigbee or Zigbee-based wireless devices.

Network Ports and Usage

To ensure proper system operation the network ports and protocols listed in Table 1-1 must be open for communication between nLight backbone devices.

Table 1-1: Required network ports and usage

Protocol	Port	nLight Devices	Usage	Security
TCP	22	• XPA BRG	SSH, factory service and diagnostics of this device (inbound)	TLS
UDP	67	• SensorView • nECY • XPA BRG • nADR	DHCP (outbound)	None, does not contain sensitive data
UDP	68	• SensorView • nECY • XPA BRG • nADR	DHCP (inbound)	None, does not contain sensitive data
TCP	80	• SensorView • XPA BRG • nADR	SensorView device configuration data (inbound/outbound)	None, does not contain sensitive data. Configuration is read only.
TCP	443	• nECY • XPA BRG • nADR	XPA BRG: Factory service and diagnostics of this device (inbound);	TLS

Protocol	Port	nLight Devices	Usage	Security
			nADR: Electrical utility Open ADR protocol (outbound)	
TCP	5000	• XPA BRG	Factory service and diagnostics (outbound)	None, does not contain sensitive data. Configuration is read only.
TCP	5551	• SensorView • nECY • nADR	System configuration (inbound/outbound)	AES-128 for nECY
UDP	7	• SensorView • nECY • nADR	Device identification on local subnet	None, does not contain sensitive data
UDP	123	• SensorView • nECY • nADR	NTP time synchronization (outbound)	None, does not contain sensitive data
UDP	5551	• SensorView • nECY • XPA BRG	nLight Protocol over IP	None, should be protected by LAN routing/firewall
UDP	5555	• SensorView • nECY • XPA BRG	Device identification on local subnet	None, does not contain sensitive data
UDP	5556	• SensorView • nECY • XPA BRG	nLight Protocol over IP	None, should be protected by LAN routing/firewall
UDP	29292	• XPA BRG	Factory service and diagnostics (outbound)	None, does not contain sensitive data. Configuration is read only.
UDP	47808	• nECY	BACnet over IP protocol	None, BACnet standard, should be protected by LAN routing/firewall

Network Data Capacity

Data capacity considerations must also be made depending on how often SensorView is used, as well as the type of devices on the network. The main cases are:

1) SensorView used only for initial system programming an ongoing maintenance/changes
2) SensorView with Plugins Modules (GreenScreen, Virtual WallPod)
3) XPoint Wireless Bridge connections to XPoint Wireless devices. Approximate bandwidth usage is provided in Table 1-2.
4) nLight system integration appliances/clients (e.g. nADR)

Table 1-2: Approximate bandwidth consumption

Application Use	Network Consumption per LAN Component (nECY, XPA BRG, nADR)
SensorView Configuration	< 0.2kbps (when SensorView is actively in use)
SensorView Plugins	< 0.2kbps (Assuming GreenScreen and Virtual WallPod are active simultaneously)
XPoint Wireless Devices	< 0.1kbps
System Integration Appliances (e.g. nADR)	< 0.2kbps