Stack Light Wireless Implementation

Stack-Light's wireless stack light system is based on the Digi Incorporated (www.digi.com) xBee3 platform. The device operates in the 2.4GHz band using the Zigbee communication protocol. These modules operate in a self-healing mesh topology (Figure 1).

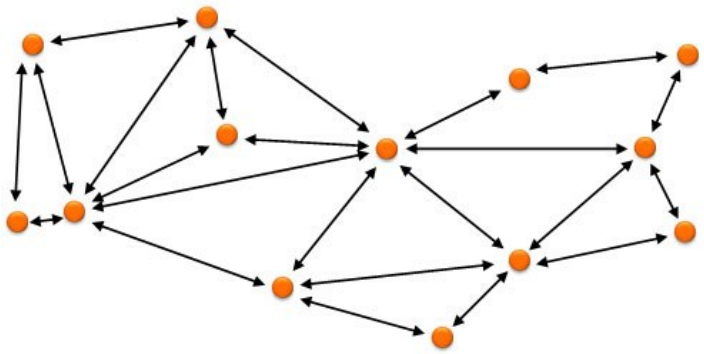

Figure 1

This mesh topology allows a device to send messages a much farther distance than they normally could do on their own. This also allows for a much more reliable network due to the mesh being able to heal when a device fails, or reroute a message when a faster route is available.

Radio Specifications	
Specification	**Value**
Indoor/urban range	Up to 200 feet
Outdoor RF line-of-sight range	Up to 2000 feet
RF Transmit power output (maximum)	6.3 mW (+8 dBm)
BLE power output	6.3 mW (+8 dBm)
RF data rate	250,000 b/s
Receiver sensitivity	-103 dBm
Supported network topologies	Point-to-point, point-to-multipoint, peer-to-peer, and DigiMesh
Number of channels	16 Direct sequence channels
Interface immunity	Direct Sequence Spread Spectrum (DSSS)
Channels	11 to 26
Addressing options	PAN ID and addresses, cluster IDs and endpoints (optional)
FCC compliance	Part 15 Subpart B

Interface Module

The interface module is a printed circuit board that provides power and electrical isolation to the xBee3 module. There are two versions of the modules; 24V and battery versions. Both modules support the same xBee3 radio and operate in much the same fashion. However, the battery modules will sleep when not in operation in order to save battery power.

Interface Module Specifications		
Specification		**Value**
Operating voltage	24V	10 – 28V
	Battery	3 – 6V
Operating current		50mA
Power down current (Battery version)		3.5uA
Number of inputs		6
Input max voltage		28V
Input isolation		3.75kV
Number of outputs		6
Output max voltage		28V
Output max current		400mA
Output type		PNP or NPN

Each device contains intelligent microprocessor code that maintains a healthy link between all the devices in the network. A device will send a heartbeat message every 20 seconds to ensure that its pairing with other devices remains intact. The code also handles button presses on the push button units that send the button press to the stack light, activating the corresponding light. This is a very low bandwidth network since messages are sent very infrequently. This prevents unwanted interference with other devices on the 2.4GHz band like Wi-Fi routers, cell phones and Bluetooth devices.

Gateway

The Gateway device handles communications between the devices and the PC application. The Gateway is connected to the PC via a USB cable. The USB driver converts wireless messages into USB messages and those are interpreted by the application. The results of these button presses and other messages are indicated on the applications main screen.

The application runs stand-alone and does not require any network access in order to operate properly. This creates a high level of security since there is no physical connection through the Zigbee network to the host network.