Wi-Fiber

Smart Streetlights

RFI: 2017-0001

Chris Maurer
4-3-2017

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Cover Letter:

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RE: RFI 2017-0001

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Wi-Fiber is pleased to offer our response to RFI 2017-0001 for the City of Pittsburgh. We have included all pertinent information regarding our all-inclusive Smart Lamp Enclosure. We thank you for considering our unique approach in response to the RFI. We understand the response may leave some questions un-answered and are prepared to offer follow-up information as requested throughout the process.

We acknowledge that all responses may be considered public information in accordance with the Commonwealth of Pennsylvania Right to Know Laws.

Wi-Fiber has been in communication with members of Pittsburgh's Office of Innovation and Performance. We have had brief discussions with additional members of various committees, all of whom are included in the list below. The focus of these conversations was to explore opportunities related to wireless connectivity, for: Public Wi-Fi, replacement of LTE subscriptions with Wi-Fi, Upgrade Cameras and Camera Connectivity and basic Smart Lamp Enclosure product presentation. Wi-Fiber has had communication with the following City of Pittsburgh members and departments:

1. Sylvia Harrison
2. Linda Barone
3. Daniel Shak
4. City of Pittsburgh Mayor's Office
5. Public Safety
6. Office of Innovation and Performance.

The City of Pittsburgh's point of contact for Wi-Fiber will be Chris Maurer.

Chris Maurer
chris@wi-fiber.us

Sincerely,

Chris Maurer
VP Sales

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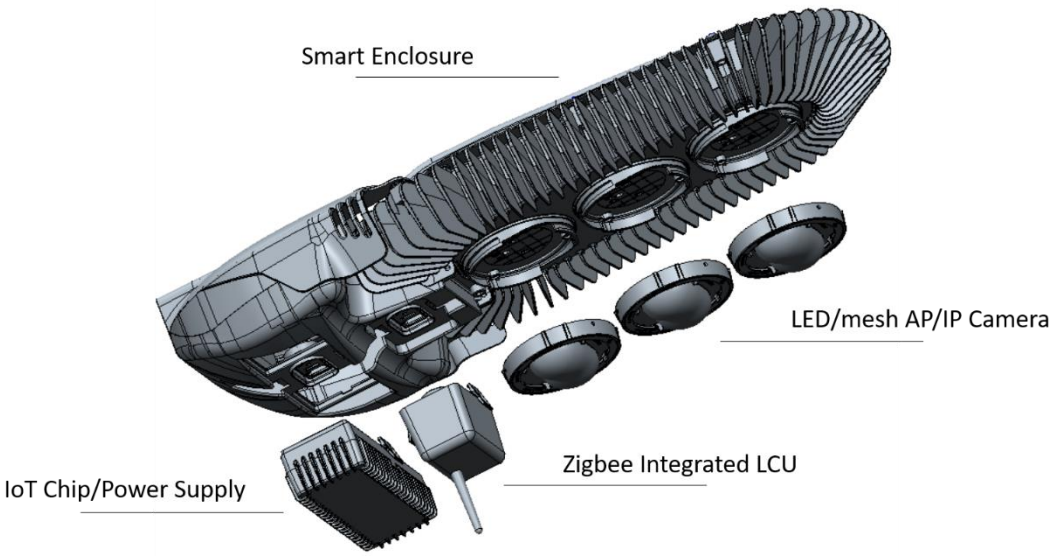
Project Overview:

Wi-Fiber proposes the utilization of our Smart Lamp Enclosure for Pittsburgh's planned street light replacement. Our unique modular solution enables a multitude of functionality including gigabit wi-fi and LTE access points, Remote IP Cameras, traffic control, environmental sensors, and LED lighting. The all-inclusive solution will create a gigabit mesh canopy anchored to individual enclosures. The singular mesh canopy will support multiple SSID's broadcasting a multi-tiered and secure municipal wi-fi for proposed and upcoming applications.

Technology:



Summary:

- Industry's most versatile LED street lamp solution.
- Modular design supports a multitude of integrations and low cost component replacement.
- LED consumes a fraction of the continuous power required by high pressure sodium.
- Stable Wireless Coverage Area.
- Long Distance Backhaul.

Application Scenarios:

Lamp Application

Lighting control settings, remote management.

Access Point Application

Turn any streetlamp into a Wi-Fi hotspot.
Backhauled 802.11ac.

Camera Application

Dual-Band enable AP and Bridge functionality through 2.4 and 5G.

IoT Application Enabled

Product Advantages:

Industry Leading Design

Multi-purpose lamp enclosure enabling a variety of smart city integrations.

Internals

- LED light module – vendor guarantee 50,000 hrs.
  - LED bulb replacement every 6-7 years.
- Body designed for 20 year life cycle.

Low Cost Maintenance and Monitoring

- Limited bulb replacement.
- IoT integration enables complete visibility into product and internals.

Data Offload

- Small Cell Alternative.
- LTE/Aircard supplement capability.
- Lease back network capacity availability in high traffic area

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Deployment Plan:

Wi-Fiber and our specified contractor of choice will replace the existing cobra and cutoff lamps with our smart modular enclosure. The deployment plan will be based specifically upon the city's fiber map, expected data availability, proposed data utilization, and additional functionality requested by the city of Pittsburgh. The replacement and deployment approach will consist of a multi-phase process.

First, Data Centers and NOCs will be identified as anchor points for the proposed solution. These sites will be equipped with the necessary physical indoor and outdoor equipment required to manage and sustain the deployment. Upon activation of the management nodes, the physical roll out and replacement of the existing sodium lamps will begin.

The Smart Lamps will be deployed in clusters based upon the geographic placement of management controllers and resource availability. Smart Lamp clusters will be deployed in blocks of 50 - 100 units. Each enclosure will be tagged and geo-positioned with the management console upon completion of the individual component configurations.

Solution Architecture:

Security

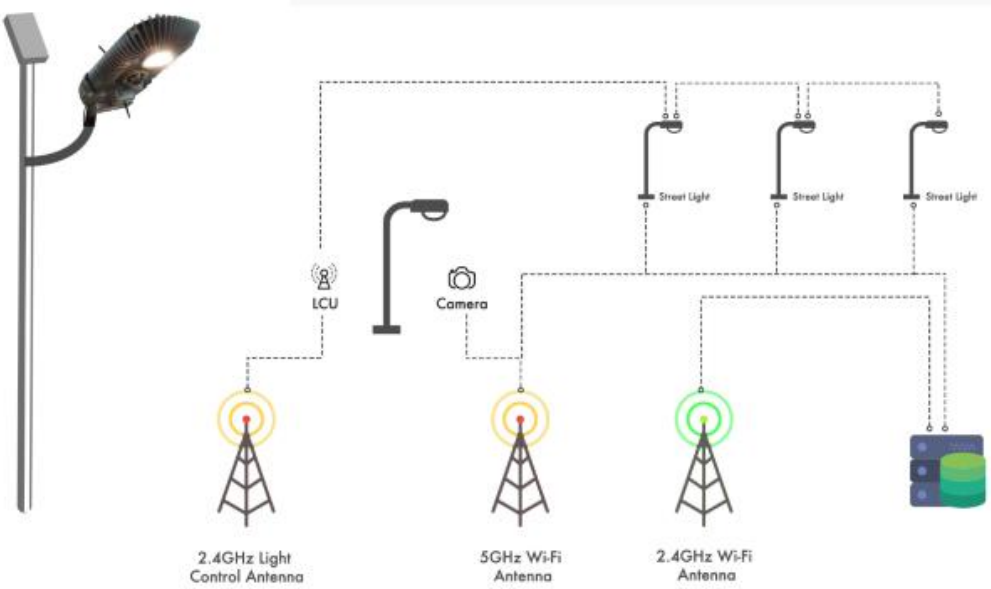
Wi-Fiber utilizes a proprietary device referred to as a Homing Gateway to manage Smart Canopy Security at every physical fiber node.

Homing Gateway:

The Homing Gateway is an SPI firewall with multi-WAN interfaces. It delivers stability and continuity to your network through link failover and load balancing capabilities, and serves as an internal firewall for advanced controls. This unique device allows clients to extend their physical network protocols, via RADIUS, POP3 and LDAP server integrations, through and into the wireless mesh. Functioning as an ICSA certified SPI/Firewall, the device can be deployed at the network perimeter to fully protect against various security threats. NIC Teaming features enable physical segmentation of a network, adding an extra layer of protection by serving as an internal firewall to deliver advanced controls (authentication, QoS, schedule, etc).

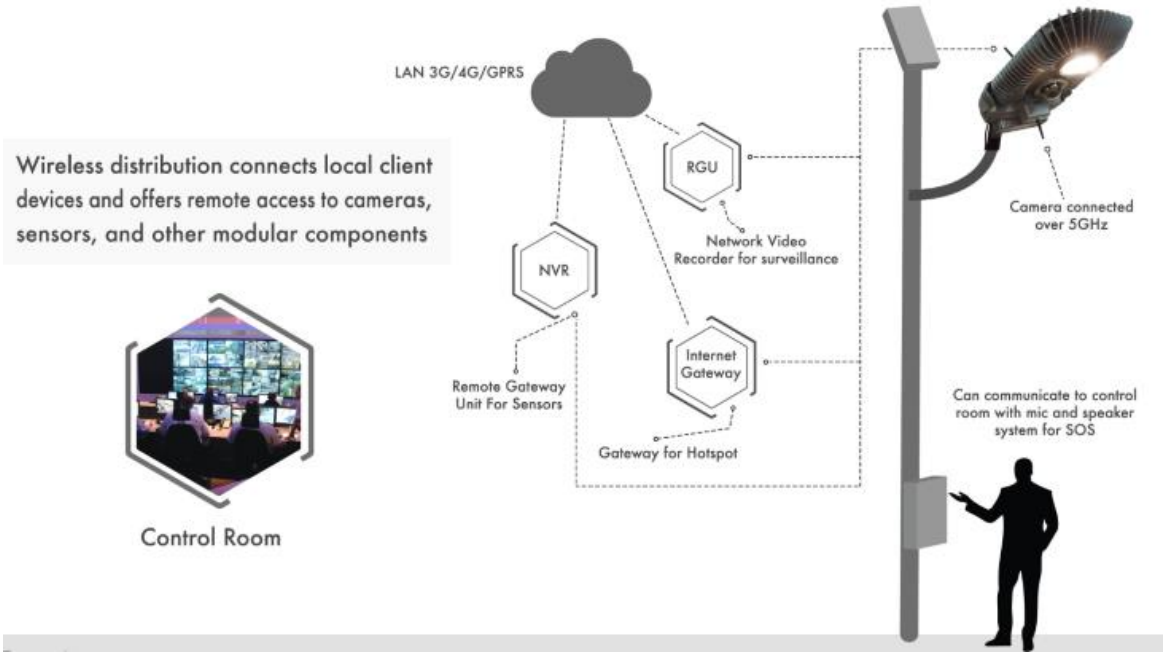
Smart Spine:

Upon installation of the management hardware at the specified fiber anchor points, configuration of the "Smart Spines" can begin. Smart Spines will act as a wireless gigabit highway throughout the city and serve as the basis of connectivity for the Smart Lamps. The ability to layer multiple secure networks across the deployed architecture enables layers of access for different component interfaces. The hardware and controller will be physically separate units from the Smart Lamp.



Application Architecture:

As mentioned, the solution architecture is based on 2x2 MIMO 2G/5G gigabit interfaces. Depending on the deployed configuration, municipalities can integrate a-la-carte infrastructure add-ons as needed to meet operational requirements. The following diagram outlines common deployment configurations requested for densely populated municipal areas.



Operational Considerations:

Wi-Fiber provides in-house hardware and management platforms. The management platforms are essentially a control panel for the hardware. These control platforms allow for a variety of independent add-ons. Integration directly with stand-alone solutions for gun-shot sensor notification, traffic algorithms (such as the Surtrac and ShotSpotter technologies).

All Smart Lamps connect back to a physical controller via the Smart Lamp Mesh Canopy. The Cameras, equipped with their own internal gigabit access point, enable each lamp to talk with one another through the mesh and report back to management controllers. Each enclosure supports multiple Management and Service VRF/VLAN Interfaces to ensure proper traffic control and security. All enclosure internals are assigned unique and individual management IP's and ranges for the specific modular lamp inserts. Each controller can support up to 200 Light Control Units and 50 remote cameras.

The single enclosure can support up to a dozen unique hardware combinations. This multitude of configurations allows municipalities to reduce the physical hardware footprint per site. As a common example, traffic intersections have a variety of individual technology; surveillance and traffic cameras, LED lamps, wireless access points, IoT sensors. The smart lamp allows a single device to physically support the hardware needed for all required functionality at each specified traffic or remote site.

Application Integration:

The Smart Lamp Enclosure allows municipalities to extend and distribute traffic to a specific coverage area via the wireless Smart Canopy. The Smart Canopy passes network traffic similar to a physical network; enabling devices and end users to access specific IP schemes and ranges, DHCP, VLANs and VRF interfaces. Additionally, the network can pass traffic from a Smart Lamp enclosure, through the mesh, back to a physical controller where the data enters the preexisting legacy architecture for applications and add on functionality algorithms such as SurTrac and ShotSpotter.

LED Management:

The modular LED bulbs are controlled remotely via the Light Control Unit and can be dimmed and adjusted automatically or manually depending on environmental conditions. Bulbs and enclosures can be set to schedules or integrated with sensors to maximize energy savings.

LED Specifications:

Light Source:	Nichia high power LED
Optical Lens:	Glass Optical Lens
Optical Design:	Batwing and Asymmetrical Light Pattern
LED Luminaire Output:	1201m/W(AC) – 1301m/W(AC)
Initial Luminaire Output:	1900lm ~ 8000lm (+/-5%)
Color Rendering Index:	>70
Color Temperature:	Configurable

LCU Technology:

Each Smart Lamp Enclosure is equipped with a Light Control Unit. The Control Unit relies upon Zigbee technology. The LCU integrates back to a central controller enabling single unit management or complete cluster management by specific subnet or VLAN groups. The Zigbee management technology is a 2.4 Ghz IoT device which manages not only the LEDs but any additional compatible IoT technology physically attached to the device.

Traffic Management:

Pittsburgh and SurTrac have deployed a smart traffic management solution to help manage and control signals and congestion in real time utilizing independent and decentralized architecture, specific to the location of activation or deployment. Wi-Fiber's Smart Lamp enclosure can pass network traffic through the mesh canopy to assist with the ongoing deployment of SurTrac technology.

Public Safety:

The Smart Lamp's modular design allows for the customization of the enclosure's internals for the specified deployment area. For instance, enclosures with an additional camera can be leveraged to enable simultaneous management control access for traffic and public safety in the event of an emergency. Smart Lamp Enclosures can also be equipped with an emergency microphone and speaker for two-way communication. Applications such as ShotSpotter technology, a cloud based gun-shot sensing technology, can be integrated to the network to ensure real-time notification and optimization of data availability.

Air Quality:

IoT has been a huge factor in improving the availability of environmental data. Our Smart Lamp Enclosure is standardized with a Zigbee Control Module. The Zigbee Control Module enables remote management of the LED bulbs along with any additional IoT sensor management required. The enclosure is slotted with inserts for IoT technology that can be integrated into the Zigbee management controller. The Zigbee controllers offer direct management of LED and IoT devices or can act as a connectivity gateway back to an alternative controller.

Shared Capacity:

The built-in gigabit access points are 2x2 MIMO devices with gigabit interfaces. The 2x2 MIMO AP supports PTP,PTMP and Mesh connectivity standards, relying upon Line-of-Sight links for long distance connectivity and Multipath for dense non-visible links. The internal access points have an approximate coverage radius of 150 meters. The technology supports up to 20 unique SSID's along with the associated security and authentication protocols. The individual SSID ranges can be used to distribute unique traffic for a large variety of applications; such as: public wi-fi, security, surveillance, residential connectivity, municipal wi-fi, police and public safety networks.

Installation:

Wi-Fiber will work with, train, consult and supervise specific associate and partner corporations in Pittsburgh for the completion of this RFI. Further, Wi-Fiber will assign dedicated support

personnel to the City of Pittsburgh and our own associated partners. Wi-Fiber has had specific conversations with Alleghany City Electric. Having worked with ACE for the completion of Pittsburgh's Market Square deployment, Alleghany City Electric is a preferred partner for Wi-Fiber.

Supervision:

Wi-Fiber will physically supervise the on-site installation of the entire solution. As mentioned, the installation and maintenance will be a joint effort between Wi-Fiber and a specified vendor of choice. Wi-Fiber's Project Management Engineers will work directly with each group of installation teams to establish schedules, thresholds of responsibility, testing, validation, and ongoing maintenance and replacement schedules.

Maintenance and Warranty:

Wi-Fiber's engineering team will work with City engineers to manage, configure and update the solution as needed to complete the pre-determined scope of functionality. To simplify the maintenance, cost and repair of Smart Lamp Enclosures, Wi-Fiber is proposing an immediate replacement warranty for all hardware deployed for a specified term of commitment. With the Hot-Swap Replacement Warranty, in the event of equipment failure or malfunction, a new physical device would be restored from a backup file rather than attempting to repair an un-responsive device.

City Assets and Infrastructure:

Core to the success of this project is the need for access to certain aspects of Pittsburgh's physical and virtual City infrastructure.

Physical Infrastructure:

1. Existing City telephone and lamp poles
    a. Poles and extension arms will provide physical mount locations
2. Specified Building Rooftops (NOC, Data Center)
    a. Will enable solution to integrate with existing management infrastructure
3. Outdoor Telecom Closets and Hand Holes
    a. Physical fiber connection
4. Zoning Approval and Permitting

Virtual Infrastructure:

A. Server Environment
    a. Data backups
    b. Management Controller Integration
B. Security
    a. Individual SSID pairing with legacy authentication servers
    b. Tiered, layered and secure
C. Fiber Strands
    a. Dedicated Strands for Seamless Physical to Wireless integration

Business Model:

Wi-Fiber specializes in the hardware delivery, installation and development of a solution architecture for the scope of work. The hardware and management interface for the technology can be applied to variety of industry verticals. The interface can support highly robust marketing and advertising platforms for revenue driven public wi-fi ventures. The interface can also leverage a highly secure access environment enabling complete visibility and ownership control of any device on the network through MAC ID pairing and owner association. In short the technology can be acquired as a hardware purchase, a utilization platform, or funded as a cost benefit savings scenario. Wi-Fiber can be creative when working with municipalities to create custom-budgeted acquisition schedules for the technology.

Proof Of Concept:

Wi-Fiber recommends a Phase I, or pilot phase, consisting of 20% of the roughly 35,000 remaining sodium replacements, or 7,000 replacements. This initial scale will allow the City of Pittsburgh and Wi-Fiber to design a network architecture capable of supporting all desired integrations, while exploring and testing unique application scenarios without the logistical hurdles that might accompany a complete replacement.

Focusing on a manageable number of Smart Spines for Phase I, the City of Pittsburgh would be able to define specific objectives. For example, one Smart Spine might occupy a dense, downtown Pittsburgh area supporting intensive traffic and security functions, while another might occupy a more suburban, or even rural area testing IoT functionality and last-mile broadband delivery.

Valuation:

The Smart Lamps can offset and replace a significant majority of the existing mandated traffic and public safety technology/infrastructure across the city. A single device integration as a comprehensive point of service for all traffic and public management rather than multiple singular technology arrays per site.

Evaluation:

Wi-Fiber is proposing to the City of Pittsburgh not just the idea but the reality of the first truly smart city. Powered by smart lamp enclosures, the network architecture will enable gigabit networks across the city for a variety of applications from police and public safety to outdoor public wi-fi and shared capacity networks for Pittsburgh's self-driving Ubers. The Smart Lamp solution provides an unparalleled array of functionality.