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Executive Summary:

On behalf of Ingenu we thank you for the opportunity to respond to the City of Pittsburgh Smart Street Lights RFI. Ingenu has been actively responding and providing Smart City Solutions and programs throughout the United States and welcomes this opportunity to provide a smart city strategy for the City of Pittsburgh. We acknowledge that responses may be considered public information and we affirm that there is no prior relationship with the city or contacts therein.

Smart Cities requires IoT wireless technology to connect devices that collect information. Ingenu is currently building the first wireless Machine Network™, the world's largest IoT network dedicated to LPWA (low-power, wide-area) connectivity for machines only. Operating on universal spectrum, the company's RPMA® technology is a proven standard for connecting IoT and machine-to-machine (M2M) devices around the world. Headquartered in San Diego, California, Ingenu was founded in 2008 by a group of engineers from the telecommunications industry who saw the need for machine-dedicated wireless connectivity. Initially, the company focused its business on delivering this connectivity primarily to customers in the utilities and oil and gas markets. Then in 2015, the company re-branded its name and refined its strategic direction to serve the wider market focused on Internet of Things (IoT) connectivity.

Honeywell is a $38.6 billion company that can support the street light upgrades with the local resources. At Honeywell we have the regional and national bench strength to backfill any and all functions should our local workforce need additional resources. Our team includes Honeywell energy, electrical, environmental, and mechanical engineers; many of which are licensed professional engineers. Our engineering team is supported by our project management professionals who are involved with development so they can seamlessly transition the project from design to construction. Although some input was provided by CIMCON in the development of our proposal, lighting fixtures and controls will be finalized as the proposed solution is developed so we can remain vendor neutral, pending a co-authored and further defined scope has been defined. Our approach is self-funded through energy and operational savings. Our Global Finance team can provide the heavy lifting to assist the City in meeting your goal of not incurring any new debt while modernizing the system.

SmartLINK originated as a solution to the challenge of digital connectivity for less affluent schoolchildren in the Nexigen headquarters city of Newport, Kentucky. Nexigen is an industry-leading cyber security and cloud solution provider and managed services engineering firm celebrating its 13th year in business. After Nexigen co-founders J.J. Schaffer and Jon Salisbury developed a successful citywide WIFI-network based solution in Newport with smartLINK co-founder Russ Middleton, they anticipated a need for a more universal solution and developed a

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sophisticated kiosk-based WIFI digital node network concept based on Kiosk units dubbed "MyLo". The MyLo model 1 was installed at Newport-on-the-Levee, a major mixed-use entertainment and creative office complex in Newport directly across the Ohio River from Cincinnati, Ohio. As one of the very first Smart Cities projects in the country, and the first fully self-funded smart city model in existence, the City of Newport was named the first "Smart City" in the Midwest.

SensorInsight is an Internet of Things company providing affordable software and vertical solutions to our customers and technology partners solving real-world problems. We provide the ability to combine legacy and existing data with new sensors and smart device technology to analyze, visualize, and understand your environment quickly and in real-time. SensorInsight provides demonstrated capability, business value, and expertise to you and your customers for IoT solutions in in agriculture, energy and utilities, manufacturing, and smarter cities.

In collaboration with our partners we submit the following overview for your consideration. We look forward to expanding further on these solutions with you in person.

The correspondents for this RFI are as follows:

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Project Overview

RPMA was designed to provide a secure, large coverage footprint with tremendous capacity and low-power connectivity in the global 2.4 GHz band. Ingenu's RPMA technology can help augment the free wireless networks and provide connections to several Smart City end points deployed throughout the city. In partnership, we will bring together a cohesive plan to support not only the Smart lighting requests but also further expansion into Smart Environment, Waste, and Water. The plan is designed with sustainability in mind to reduce the impact on the environment while sustaining savings over the life of the equipment. The conversion of street lighting to LED provides an inherent reduction in greenhouse gases and landfill waste. Ingenu offers a rich and diverse eco system partner alliance and can serve several needs within the cities leveraging our connectivity transport.

Honeywell would recommend that the conversion of streetlights to LED be funded from energy and operational cost savings over a 15 year term. Honeywell's industry certified measurement and verification team will provide expert engineering guidance and field experience to sustain the savings over the life of the equipment. Layered on the LED street lighting is a control system that can provide communications between the streetlights for enhanced control and outage reporting to further sustain the savings. Honeywell Global Finance is ready to provide ideas and support the City with financial alternatives that meet your goal of not incurring any new debt while modernizing the system.

We are partnering with a nationally award winning expert and innovator in digital media in order to leverage the modernized infrastructure smartLINK. Smart City IOT is all about connecting the real world to the digital world. The MyLo product is a smart tool for a smart advertiser. smartLink will utilize smart technology with video analytics, geo-fencing, as well as WIFI analytics and additional sensors to ensure we maximize measurement and understanding capabilities. We are committed to helping the City of Pittsburgh learn more about their audience which will allow you to track every aspect of the engagement and provide layers of capabilities based on understanding.

SensorInsight is a world-wide leader in Smart City and IoT technology for environmental monitoring solutions. Sensor Insight recommends an EPA based Sensor Scale Air Quality solution to provide real-time air monitoring stations. For ambient air monitoring, Sensor Insight can provide more accuracy in monitoring specific element concentration levels and the amount of PM1, PM2.5 and PM10 dust particles allowing the city to meet international Air Quality Index (AQI) compliance values, and better advise the public of air quality and health risk. Schools and community centers can use the SensorInsight air quality and environmental monitoring information to help identify trends in their neighborhoods.

Deployment Plan

Ingenu will offer complete network coverage of the 90 neighborhoods to help provide services for all citizens within this hockey town. RPMA is designed to let your city and communities grow as its needs and imagination expands. RPMA has the ability to connect not only battery powered apps, but also powered and energy harvesting applications. This clears the path for enterprises and cities that have immediate IoT investment needs and want to expand their IoT value later for example, this is the path that Aruba took. In 2013, N.V. Elmar, serving the Island of Aruba began by connecting its most challenging AMI meters with RPMA. They soon realized they could increase their ROI even more. So, in 2014 they added power distribution line monitors, and smart streetlights. Accelerating their ROI even further they added oil pressure monitors to their transformers (a critical asset in power distribution) and expanded their AMI service to water distribution as well. Even today, Elmar continues to find new ways to take advantage of their RPMA investment in order to better serve Aruba's needs.

Honeywell will provide a turnkey solution to engineer, design, install, and manage the process of retrofitting/replacing your existing streetlights to LED technology. We will work with the City to design the appropriate control system and user interface to seamlessly allow the City to centrally manage and control the streetlights. Honeywell does not manufacture LED streetlights and remains vendor neutral. We will take a rigorous approach to selecting competitively priced streetlights that align with your requirements.

Although it can be costly if not controlled, "mock-ups" of various fixtures are important to ensure success. We take a painstaking approach to engineer and design our solutions but nothing is a substitute for a "mock-up" of actual fixtures in the field. High profile areas are of particular importance because of public opinion. Proper lighting provides increased levels of security and can drive economic development and investment in the City.

We take a similar approach to streetlight controls. Although we have used CIMCON on other streetlight projects, we need to ensure compatibility between the final fixture selection and controls system. It is a proven approach that was used at several cities in Ohio including most recently at the City of Cincinnati.

SmartLINK originated as a solution to the challenge of digital connectivity for less affluent schoolchildren in the Nexigen headquarters city of Newport, Kentucky. Through the research and development we anticipated a need for a more universal solution and developed a sophisticated kiosk-based WIFI digital node network concept based on Kiosk units dubbed "MyLo". The MyLo model 1 was installed at a major mixed-use entertainment and creative office complex. As one of the very first Smart Cities projects in the country, and the first fully self-funded smart city model in existence, the City of Newport was named the first "Smart City" in the Midwest.

SensorInsight Integrate and RightSensor pre-configured hardware provide you access to your sensor data quickly and efficiently. Our solutions work out of the box to help you quickly gather, view and understand the data that is collected. SensorInsight Integrate is a data collection framework designed from the ground up to connect, monitor, and transform sensor data. Real-time data on each of your assets or external systems can be collected allowing you to gather large volumes of cross-domain data in a scalable and secure manner.

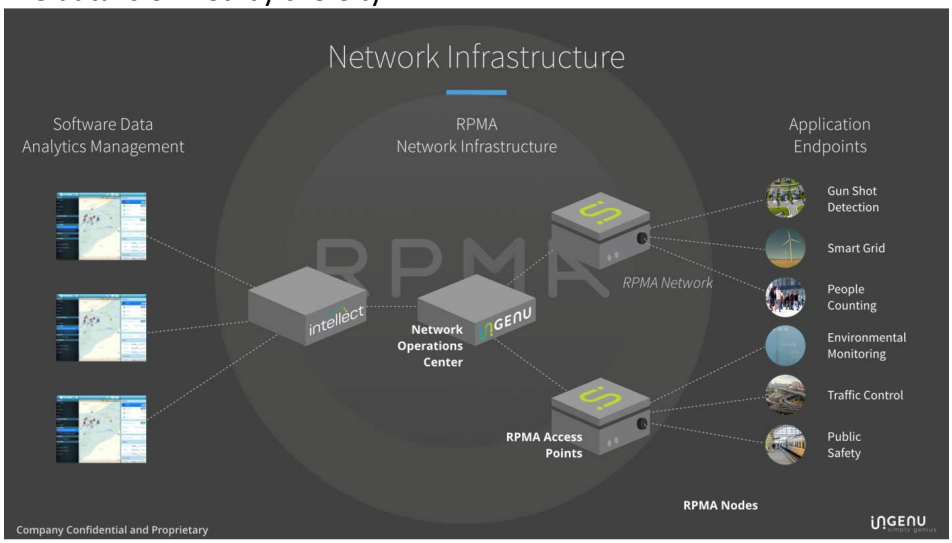
All partners represented here are coming together to provide a stackable solution to the City of Pittsburgh. All solutions can exist within the Cities software platform of choice or we can help make recommendations for data visualization aggregation tools.

Summary of Technical Approach

Ingenu is a closed network for security and reliability, therefore Ingenu would not interconnect with other public networks for wireless connectivity. Ingenu does believe in working alongside other wireless technology protocols to deliver best in class services as outlined below in our partnership with Nexigen to promote a fully interoperable solution to the City of Pittsburgh.

The combination of multiple wireless offerings can be integrated at a software management platform to bring together several data components while also leveraging existing data analytics from current systems. Ingenu remains neutral in this approach based on the City's preference and or existing systems however can make recommendations from our vast ecosystem and experience.

Below is a visual representation of the network infrastructure approach and deployment connecting several Smart City Solutions together into a central NOC with an Open API interface. The data is owned by the City.



In partnership with Honeywell leveraging connectivity and in the selection process of your LED solution part of the process of “mock-ups”, LED color temperature needs to be considered. A number of questions need to be asked based on recent studies by the American Medical Association and the Department of Energy. Should we use 3000K, 4000K or 5000K LED lamps? How do we need to handle light trespass in certain areas? Being mindful of “soft” factors, such as sleep disruption, and considering them when selecting the color temperature in a particular environment is very important to the success of the program.

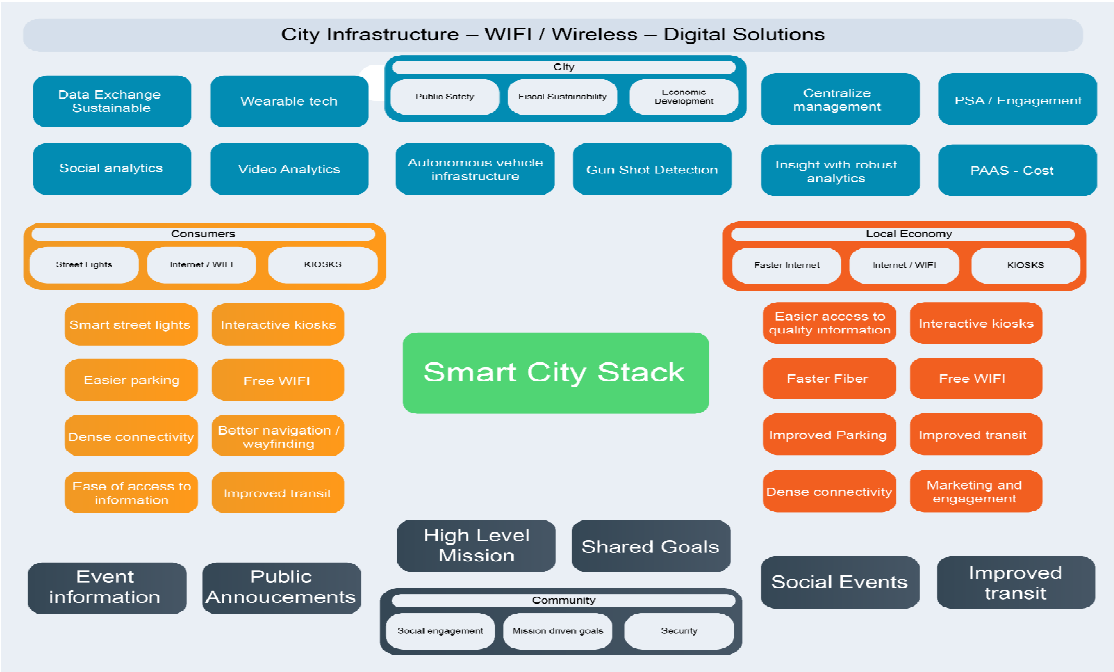
In Partnership with Nexigen for Digital Media outlined below is a multi phase approach

Phase 1: Urban Strategy

smartLINK performs an in-depth analysis on site with one of the country’s leading Urban Strategist, who has worked on impressive projects including “Hollywood and Highland” which is home to the “Dolby Theater”; a robust shopping experience along with the “TCL Chinese Theater”. Successful connected communities work off deep cultural understanding. Complex desired outcomes are achieved through a strong urban strategy thought process.

Phase 2: Technology

smartLINK follows this study with a technology deployment survey consisting of wireless, wired, and IoT infrastructure. We want to understand the proper standards in place to ensure we fit our technology into the city in a way that is cohesive and beneficial to the citizens and the data analytics platforms in place. We also work on route planning and key way points that will make the kiosks more useful to the public.



Phase 2: Marketing Study

smartLINK then provides business cases for each kiosk that is laid out across the city. We propose the marketing study to 1 of our 3, national media purchasing partners and ensure the city is represented from the lens that best fits its culture desired revenue outcome and local business growth. We also accompany our launches with marketing and citizen training campaigns to ensure our product is known and well used. We have 30 Kiosks (Smart City Nodes) planned for deployment in Newport Kentucky. This will reach more than 5 million viewers per year. The deployment includes an advanced 2 shopping districts, the main city corridor along with additional WAP's in other sections of the city.

Phase 3: Delivery

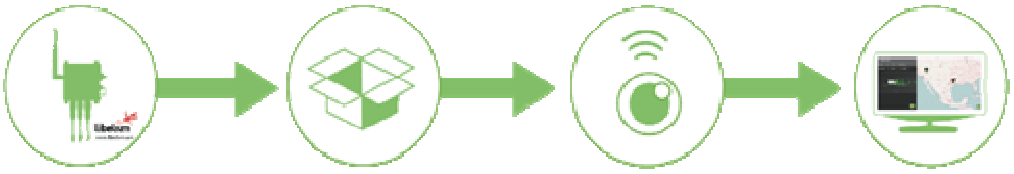
Execution and delivery are extremely important to get right from the beginning. We ensure we have multiple Quality assurance points throughout our entire process.

1. Permitting
2. Easements
3. Content strategy sign off / execution
4. Wayfinding with priority routing
5. Custom Branding of kiosks
6. WIFI implementation
7. Marketing Kick off

Phase 4: Continuous improvement

Finding problems and providing solutions is in our DNA. We are constantly analyzing and working to improve our technology ecosystem to maximize value to the community, citizen, city and media buyers in a seamless fashion. At the core the value is driven from what we provide to the user / citizen. If we are providing value to our user base the rest is built on a solid foundation. We will continue to push forward to provide more value with the same infrastructure through stringent product improvement processes led by industry leading innovators.

In partnership with Sensor Insight their RightSensor™ team is focused on creating certified sensor solutions and managing sensor and data integration. RightSensor provides customized and pre-configured sensor solutions to deliver data right to your door. Our skilled team of consultants and technical experts provide on-site assistance with unpacking and installing your sensor solution. We help the City of Pittsburgh integrate your existing data systems so you can get your comprehensive IoT solution up and running, fast.



Select or define your sensor package

Sensors are pre-configured and shipped or delivered to you directly

Start collecting real-time data, immediately

Connect to SensorInsight or your defined platform to view real-time results

Operational Considerations

Being deployed across the United States by Ingenu, the Machine Network is a public network which means anyone can sign up to use it. It is like a cellular network made just for machines. In the same way you sign up to use your smart phone on a cellular network, you can sign up your RPMA® enabled devices on the Machine Network to automate and connect your business and life in ways never before possible. The Machine Network host 175Db with an uplink of 40Kbs and downlink of 20Kbs providing a secure and reliable bilateral connection. Each and every Access Point, or Network Tower, can manage 750,000/ 100byt messages per day or 50,000/140byte messages per day. Or, for another example 4,000/ 200 byte messages every 15 minutes so as when compared with other technologies you will find we stand far above the rest. Professionally managed means Ingenu optimizes tower locations, permits sites, maintains, repairs and operates the network infrastructure and all of the other behind-the-scenes work so you don't have to.

The Machine Network™ is a companion to Wi-Fi and other high-bandwidth wireless services. It's primary value-add are that it enables sensors and smart applications to connect for years on a single battery charge as well in places that Wi-Fi cannot economically reach. These two factors combine to add a new dimension of connectivity. Whereas Wi-Fi is used for high throughput applications—E.g., security video streaming— it turns out that 86% of IoT devices use less than 3MB of data or less a month. With innovations warranting 32 patents, RPMA has

applications with 20 years of battery life operating for real customers for years. One such application is Schweitzer Engineering Laboratories fault circuit indicator for monitoring power outages.

smartLINK was born to solve the digital divide through maximizing value output to citizens, community and business. We have built what we believe is the most intelligent smart city kiosk on the planet. smartLINK incorporates Video Analytics, WIFI analytics, Environmental sensors, Synchronized music, Audio analytics, Industry leading 3d way finding with scan and go intelligent routing, USB Charging, Emergency Calling, PSA communication, Citizen engagement and Ultra-fast edge computing processing. This new combination turns outdoor media into an immersive personalized form of engagement for brands to connect with consumers "Outdoor Social". The units are encompassed in a robust cyber security monitoring and control solution and are professional engineered with carbon fiber, metal and impact resistant touch panels.

Business Model

Simultaneously through our US network deployment, Ingenu is licensing the technology to Global partners to expand our network offering throughout the world. This creates great economies of scale for a diverse product portfolio and ecosystem. Ingenu enables a smarter city eco system offering a multitude of solutions to the City of Pittsburgh. This portfolio of solutions and products can be shared in further detail based on the City feedback and timing. We await your feedback and can suggest a Smart City Workshop to allow the City to understand this diverse ecosystem of services, products and hardware offerings.

Ingenu can offer a unique business model as part of the deployment of the network to offer funding of Smart City Solutions leveraging the network.

Honeywell's model for the streetlight upgrade to LED is a self-funded model such that the energy and operating cost reductions fund the capital costs. By implementing the LED upgrades at the same time as the Nexigen model is implemented, the streetlight work can be leveraged to support the communications platform which will complement Ingenus' network.

smartLINK kiosk' can be fully financed by media buyers unless a purchasing entity wants to finance the kiosk themselves. We have 4 major outdoor media buyers we work with after our site assessment is complete. smartLINK is backed by major corporations and leading brands which allow for us to have robust infrastructure including a cyber defense team, media leaders, technology experts, nationally recognized urban strategists. smartLINK is secured with AD contracts which allow for deployment of the kiosks and ongoing maintenance and management. smartLINk is an open environment having API's across all devices allowing for easy integration with outside data sources.

Evaluation

As part of the evaluation process Ingenu has a proven success in building and deploying a Global Networks along with building synergies and partnerships within a Smart City sphere to bring to fruition a full scalable and robust solution.

Cities Example includes, Established in 1950, N.V. Elmar (Naamloze Vennootschap Electriciteit-Maatschappij is the sole provider of electricity to the island of Aruba. It sources its power from WEB Aruba N.V. as well as from solar sources. N.V. Elmar serves over 42,000 residential and commercial customers on the island, providing smart metering, distribution automation, smart street lighting, water monitoring and other smart city services. N.V. ELMAR is the only power distributer on the island.

Although the initial network deployment was designed for smart electric meters, N.V. Elmar wanted to have the ability to scale the network to add additional applications. Because this was essentially a greenfield project, the deployment process would start with a pilot program where various technologies would be evaluated. Cost, network longevity, coverage and reliability were all factors in the selection process.

After evaluating an array of competing technologies, N.V. Elmar selected Ingenu to implement its RPMA (Random Phase Multiple Access) network smart city solution. The initial roll-out took place in late 2013, with just 50 smart electric meters. However, after determining that the robust, scalable and secure network could expand without additional network investment, N.V. Elmar began to implement a myriad of additional applications.

In late 2014, the utility company added distribution line monitors and smart streetlights to the RPMA network, totaling over 4,000 end points. The street lights were supplied by Ingenu partner, LED Roadway Lighting (LRL) which integrated RPMA technology into its NXT Luminaire street light solution. LRL has supplied more than 1,800 luminaries to N.V. Elmar, allowing street lights to be controlled and monitored using the same network as other smart grid devices, reducing both energy and maintenance costs.