Request for Information for Smart Streetlights

RFI No. 2017-0001

IntelliCity's Town Crier

Submitted by:

Tamara Alkhattar; Chase Klingensmith

IntelliCity Sensors
5253 Keystone Street
Pittsburgh, PA 15201
Phone: 412-419-1693
Email: intellicitysensors@gmail.com

To: Thoryn Simpson; Senior Procurement Analyst Office of Management and Budget
City-County Building, Room 502 Pittsburgh, PA 15219
Email: thoryn.simpson@pittsburghpa.gov

We acknowledgement that all responses may be considered public information in accordance with the Commonwealth of Pennsylvania Right to Know Laws as described in Section 5 of this document. The information related to technical specifications of the sensor network and the software algorithm, however, are proprietary information requested to remain confidential.

Project Overview

IntelliCity is a tech-based, umbrella organization aiming to intertwine technology and community engagement to improve overall quality of life for service recipients. Town Crier, its first project, plans to create and deploy a voice activated, camera sensor network onto city light posts that utilizes the existing emergency response ecosystem to help address gaps in crime reporting while also encouraging deterrence from future acts of "silent crimes" (personal theft, armed robbery, assault, rape). The system operates on passive surveillance mode where a microphone sensor will be triggered by one of the following pre-determined words of distress: Help, Fire, Rape, Attack, Danger, 911, Hospital.

Through community information and engagement sessions, other words may be added or replaced depending on feedback. Upon word trigger, the network is activated and live sound recording begins for a set time period, a red LED emergency light illuminates, and a 360-degree camera takes 20-40 burst photographs (with an audible shutter sound to inform those present that recording is taking place) stamped with date/time/location. The information is then transmitted to emergency responders for authentication. Town Crier's software will be embedded onto designated responders' computers and they will be properly trained to handle incidents. Once verified, they dispatching the distress word used to trigger, pictures, and location to the police for accurate real-time incident information before deployment. This design removes the initial responsibility of the victim to retroactively report the crime and allows both the victim and the police to have real-time evidence for better and more effective outcome of catching the perpetrator while creating quantifiable accountability for the police to enhance trust and safety with the local communities.

Currently IntelliCity is in the prototype/proof-of-concept phase, however we are actively seeking funding in order to take this to a pilot testbed and from there we would seek large-scale implementation. Since IntelliCity is introducing new concepts with existing technology used in somewhat similar applications, we feel it is important to perform a satisfactory testing of these capabilities before implemented on a large scale.

Given the recent decision by the Pittsburgh Police Department to prioritize cases with evidence over property crimes lacking evidence, (City of Pittsburgh, Bureau of Police. 2016, August 25. Chief's Order #16-004; see support document attached); we see IntelliCity's Town Crier application as the natural jumping off point for police pursuing evidence-driven criminal activity as well as the perfect birthplace for a new smart city technology that will require integration on a public and private level for smart cities to take off. Pittsburgh's history in innovation as well as its combination of cooperative and forward-thinking local government and composition of excellent institutions of higher learning make us think that it is the perfect place for something new and potentially groundbreaking like this to occur.

For the City's benefit, the platform design positions IntelliCity in an integrator role as a conduit between the City, developers and platform operation for new Smart City initiatives. We are

designing a secure open-source platform that will launch Town Crier as its first project to enhance the safety structures. Serving as an integrator will allow the City to be in a strategic position to have access to the data gathering stream from the projects launched on the platforms. We are the ideal solution for incorporating start-up tech solutions and research interventions to best serve the growth of Pittsburgh's efficiency for traffic, climate, and safety.

Deployment Plan

IntelliCity modules will be installed on street light fixtures and connected to said structures as a power source. As a city, Pittsburgh also has initiatives like PGH Lab that seek to provide a channel for fledgling startups to use the city as a test bed to launch new potentially groundbreaking concepts. IntelliCity would like to capitalize on this existing structure to use as a test bed, while talks with another local potential partner in the Telecommunications industry have led to the canisters in Oakland near the University of Pittsburgh and Carnegie Mellon to be seen as another possible location for an initial pilot deployment. For this stage, we feel that placing a dozen or so prototypes in this area or an area of comparable size would be a sample size that would allow us to draw conclusions that could be adapted to a larger scale.

We would like to pilot Town Crier around the Oakland and Shadyside neighborhoods due to high incidences of assaults in the area and then use the information gathered to expand throughout the city, with implementation plans following a similar plan as the city's LED light expansion program in order to cut down on labor costs. After the initial test bed, we look to scale this to all major smart LED lights in Shadyside, Oakland, Squirrel Hill areas. Finally, we look to deploy the project into Downtown and neighboring areas of interest: Lincoln - Larimer, Homestead, and others as the project gains traction. Following the project's main launch directly to emergency responder systems, Town Crier will integrate the community further with the creation of an app that utilized the "Community Watch" structure. We will have designated volunteers be set with the system as Safety Advocates. The app will notify them if an alert was triggered in their area and ask them to report anything they find. Further growth will allow citizens to also have access to the app to report other crimes they happen to notice in the city with picture, video, audio recordings instantaneously to help emergency responders have the most up to date and accurate information to respond accordingly.

Our long-term installation plans build off of those started by Pittsburgh's Office of Sustainability and Energy Efficiency, led by James Sloss, which has undertaken projects to make energy infrastructure more affordable and efficient with its LED Conversion project. Since these installation plans are already underway, it is our goal to provide an easily-installed unit that technicians would be able to install with a minimal amount of time and effort.

Initial installation will both provide a shotspotter like service as well as an open platform that would otherwise be much more expensive to implement, leading to savings across future applications that are able to take advantage of that system without having to front expensive installation costs.

Technical Specifications

IntelliCity modules will connect to street lights being updated in the larger LED conversion program being performed by the City of Pittsburgh. Each pole also contains ANSI connectors and voltage varying from 120v to 220v to 270v, which would make it possible for the light poles to support hardware. Our hardware unit uses these connectors as a power source, with each unit containing a raspberry pi and arduino mini for processing as well as a night vision camera and microphone to detect stimuli and a bright red LED to inform those detected that they are being watched at that time so there is no speculation as to whether one is being filmed or not. Our hope is that with this path we can introduce a concept of passive surveillance where surveillance is only activated when a trigger causes it to be and where those being recorded are made aware of it. They system will operating using a proprietary language-learning algorithm that will be the main holder behind the system's functions and the desktop app to be used on emergency responders computers.   The data will be transmitted via 3G communication chips through the sensor networks from the street lights to the software interface with the emergency responders, then the metadata transmitted to storage servers. In pursuing this route, we're hoping that the presence of IntelliCity units will help to deter future crimes.

The usage of Arduino and Raspberry Pi components represents an open architecture supporting inclusion of a variety of sensors to accomplish a number of goals. It is our intention to continue an approach that is plug-and-play and as open to innovation in its design as possible. The design of each sensor kit on the street light will be modular in design to ensure easy upgrades to individual parts without cost or time to replacing the entire kit. Whether this continues with the current type of microcontroller remains to be seen even if openness with regards to additional future sensors and applications remains a core component of IntelliCity.

While incidents will relay details of incidents to first responders and police, a copy of what is essentially metadata will be sent back to our servers indicating where, when and what type of event took place. In keeping a copy of this information and providing it to citizen organizations, we hope to facilitate a conversation between police and the communities they serve where an objective metric can be used. Ideally insights will be able to gleaned from this anonymized data in order to improve city planning and crime prevention efforts.

Operational Considerations

In its current state, we estimate that an IntelliCity module would last for 3-5 years, which is about half of the estimated maintenance lifecycle of 10 years that we see on the average LED street light. We plan on lining the major upgrades with the maintenance cycles, but at this point it will likely have to be a partnership undertaken by the municipality and IntelliCity, with the municipality

performing the initial installation and maintenance once every decade and IntelliCity contracting maintenance out for the years in between. Since we are still extremely early stage it is our goal as we develop to create a system that allows for remote monitoring of processes and improved hardware to more efficiently maintain individual units. Considering the modular design of the sensor network it will make maintenance/upgrade easier and more cost effective to handle smaller transitions at a time. In the final 10 year cycle change is the ideal time to do a complete product upgrade product components of the network to shoulder that burden of cost replacement.

Business Model

IntelliCity will be registered as an L3C Company run as a for-profit social enterprise. Town Crier will function as an initial project under the umbrella organization. This hybrid structure was chosen as it widens our sources of funds while not compromising on our social mission. It provides the flexibility in raising initial capital from private investors as well as foundations/grants/trusts and grants in initial funding. By having this structure we would be able to also start individual projects with entities like the City of Pittsburgh or Pittsburgh universities in order to accomplish individual goals and create unique parameters that accurately reflect the needs of the institutions involved. It is our hope that by doing this we can create a robust and responsive smart city platform that continues to create value for the city after its initial investment.

Revenue will be generated by way of municipal contracts during the early stages, however as projects develop anonymized incident data and advertising will help to defray costs of future projects while also bringing in additional sources of revenue. IntelliCity doesn't seek to keep the actual contents of a call or incident, aside from what is essentially the metadata. Instead IntelliCity functions as the platform that communicates by way of the Town Crier application to first responders. The first responders will handle the personal information, while IntelliCity will retain information that shows a certain type of incident occurred at a certain time.
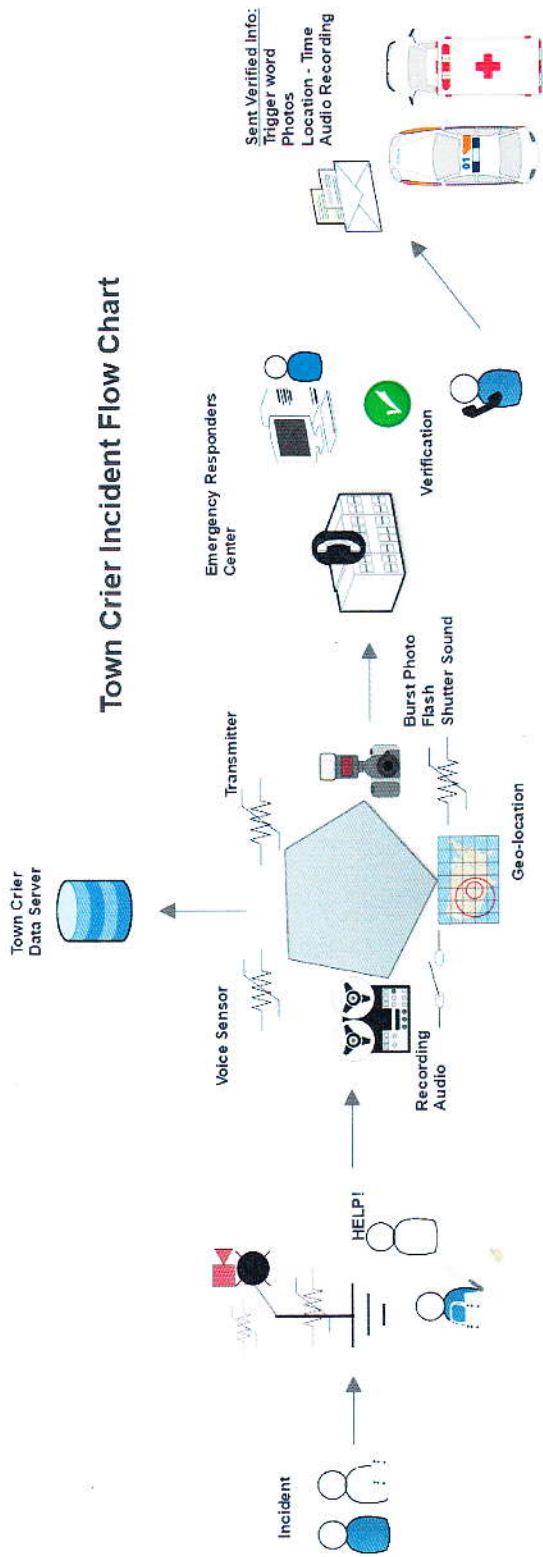
Evaluation

IntelliCity's strengths lie in its ability to apply techniques that have a history of successful application and synthesizing them to address new problems. By voice-activated passive security devices and implementing machine learning to refine the process we hope to advance security while being mindful of privacy. In having a two-form authentication and machine learning application we're also able to have a system that trains itself to decrease the chances of a false positive. The fact that our system takes photographs when activated will allow us to easily determine when a car is backfiring or a firearm is being discharged, which is still a source of uncertainty on audio-only gunshot detection systems. On the public safety front, data collected will provide an additional crime metric by which the number of instances and police response can be measured. We recommend the City guage the data in a way to assess the downward trend in "silent crime" cases occurring in areas where Town Crier is deployed.

Also, the data will be useful in tracking the completion and closing rate of cases where alleged perpetrators are caught. Furthermore, there will be accountability tracking to ensure each incident is handled in a timely and appropriate matter. Police force can also analyze the data trends to gauge and justify any need for additional resources, officers, or shift/location changes as needed. The data presented to first responders is recommended to be analyzed as a quantifiable measure in policymaking decisions. Anonymized records of events provide a potential revenue stream as a data set to try and isolate the impacts of policy decisions or various other influences.

IntelliCity's weaknesses right now are the large scale nature of it and the question of financing. A project like this requires experiments and prototyping before launching it into the field. Pittsburgh's PGH Lab and other testbeds mention earlier in this submission help to address this need but support from the city in terms of access to equipment as well as finances is ideal for us. Since social innovation is key to IntelliCity's mission and structure, we feel that it is important to seek public funding sources above private investors. By following this approach we hope to not have a smart city project that steamrolls over privacy concerns or loses track of our goal of creating value for all community members. We hope to create value for the city by creating a variety of metrics that will aid the city in several ways while also helping to establish an open platform that will foster other future projects that help continue Pittsburgh's reinvention as a hub for innovation.

Supplemental Materials

Town Crier Incident Flow Chart

Incident

HELP!

Voice Sensor

Recording Audio

Town Crier Data Server

Transmitter

Geo-location

Burst Photo
Flash
Shutter Sound

Emergency Responders Center

Verification

Sent Verified Info:
Trigger word
Photos
Location - Time
Audio Recording

CITY OF PITTSBURGH
BUREAU OF POLICE
Chief of Police
"... honor, integrity, courage, respect and compassion."

CHIEF'S ORDER #16-004

TO:	All Personnel	**UNIT:** Bureau of Police
FROM:	Cameron S. McLay, Chief	**UNIT:** Bureau of Police
DATE:	August 25, 2016	
SUBJECT:	Telephone Reporting Unit ~ No Refusal	

In an effort to minimize impact on the patrol officer's daily duties & responsibilities, while maximizing the capacity to respond to priority calls for service and/or other proactive policing strategies, calls for service that are classified as "telephone reports" will be handled by the "Telephone Reporting Unit". Effective immediately, a complainant will *no longer* be given the preference to refuse a telephone report & have an officer respond to the scene.

The following criteria will be followed to remain consistent with General Order 67-01, "Telephone Reports – Central Records and Reports Unit":

- Reports that qualify for telephone reports
    - Burglary-SUPPLEMENT ONLY
    - Criminal mischief –EXCEPT FOR GRAFFITI
    - Simple assault
    - Harassment
    - Terroristic threats-if there is no immediate danger
    - Accidents involving damage to attended vehicle or property-no injuries or tows
    - Accidents involving damage to unattended vehicle or property-no injuries or tows
    - Theft (excluding firearms)
    - Identity theft
    - Access device fraud
    - Theft of property lost, mislaid, or delivered by mistake
    - Theft from vehicle – (excluding firearms or serial events)
    - Unauthorized use of automobiles and other vehicles
    - Missing juvenile reports from the following agencies (these agencies are located in the City of Pittsburgh and are affiliated with the Allegheny County Children, Youth, and Families):
        - Abraxis House
        - Pressley Ridge
        - Whale's Tale
        - Rivers Youth
        - Hasina House
        - Circle C
        - Access Foster Care
        - Alternative Program Associates
        - Craig House

This Standard Operating Practice will occur when the Telephone Reporting Unit personnel are working. When TRU is not staffed, calls for service will be dispatched to patrol units as available.

In the event a complainant refuses to file a telephone report & demands to speak to a supervisor, they should be referred to the Shift Lieutenant of the affected zone. The Shift Supervisor shall direct the complainant to the nearest Police Station, or an extraordinary circumstances, direct a police unit to respond.

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Cameron S. McLay
Chief of Police

CSM:tmc
cc: Director Wendell Hissrich, Dept. Public Safety
    Policy