SEMTECH

LoRa®

SMART CITIES USE CASE

Calgary

Remote and Real-time Acoustic Monitoring

IMPROVING NOISE MONITORING IN URBAN ENVIRONMENTS

IMPROVING QUALITY OF LIFE FOR CITIZENS

Noise pollution is a persistent problem for residents in urban environments. Recent studies have estimated that nine in 10 people in major cities are exposed to noise levels exceeding international guidelines daily. The negative health effects of excess noise include disturbed sleep, hearing loss, cognitive disorders, and high blood pressure.

Municipal noise ordinances aim to reduce noise pollution, but assessments of noise and monitoring are performed infrequently and are primarily complaint-driven. The City of Calgary set out to build a network of affordable acoustic sensors to enable continuous monitoring in its urban environment.

"Measuring noise is important to everyone's quality of life. Noise monitoring is difficult to characterize and has traditionally been expensive."

– Nan Xie, Sr. IT Engineer, City of Calgary

INNOVATING WITH SEMTECH'S LoRa® DEVICES

The Urban Alliance, a research partnership between the City of Calgary and the University of Calgary, was created to eliminate legal and financial red tape, and coordinate the transfer of technology and research for the community's benefit. Dr. Henry Leung, Ph.D., heads the Robotics and Sensor Networks Group in the Department of Electrical Computer Engineering at the University of Calgary. His team collaborated with the Urban Alliance to build a LoRa-based sensor using Edge analytics to characterize noise and initiate a pilot use case on Calgary's public LoRaWAN® network.

"Our inspiration was the result of analyzing existing smart city noise monitoring applications. In New York City, they approached it using Wi-Fi and live streaming. This was rather expensive and took significant resources to reliably operate and sustain," said Leung. "We proposed developing our own solution without an electrical power supply to the device – just a battery."

Leung's team's first contribution to the project was the hardware design of the sensor. Their fabrication used low power wide area radio transceivers to enable data transmission between the nodes and network server. The LoRa-based sensors are battery operated for ease of deployment, low power to limit network maintenance, robust for continuous operation in extreme weather conditions, and possess a limited amount of in-situ data processing.

The second contribution by the team was the development and testing of analytic algorithms allowing sensors to autonomously detect and classify acoustic events. The researchers plan to use machine learning to distinguish between noise sources such as construction, traffic, gunshots, and music.

LoRa® Use Case

IoT Challenge

- Cost-effective solutions for continuous and real-time monitoring of noise
- Development of acoustic sensors with embedded intelligence
- Detection at multiple frequencies and characterization of sound

LoRa Devices Used

- Semtech's LoRa devices used for sound propagation acoustic sensing
- City-owned LoRaWAN-based network achieves unrivaled range and scale
- Ability for machine learning to be implemented at the sensor level

Business Value

- Proactively address common non-emergency hotline noise complaints, saving time and money
- Ability to support city noise ordinance violations with accurate data
- Plans for historic sound metric score map to be provided for home purchasing

For More Information

About Semtech's LoRa devices for smart city applications, visit

semtech.com/LoRa

About Urban Alliance

calgary.ca

TEST, INVEST & ITERATE

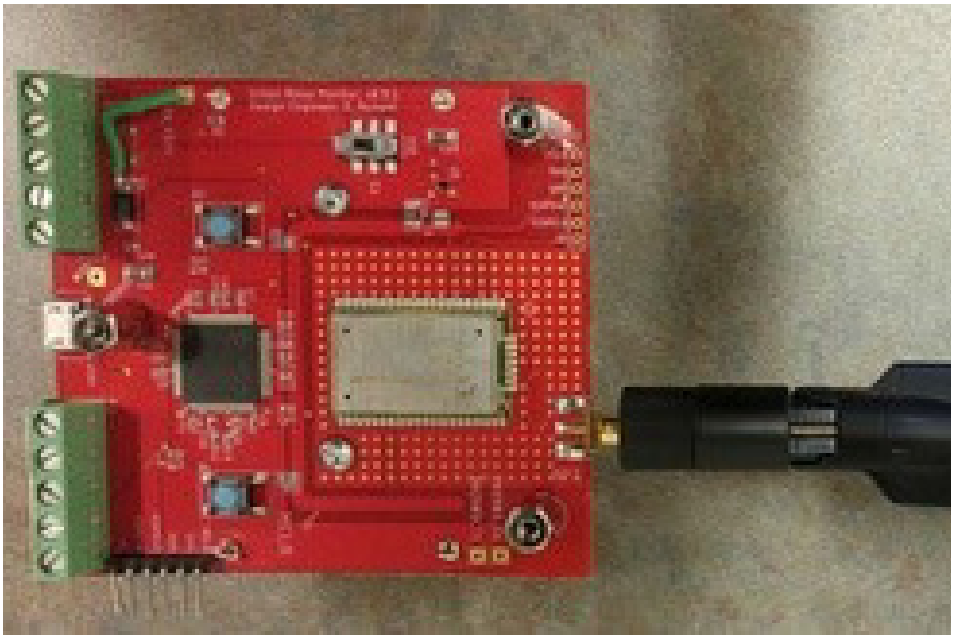
To put these innovations to test, several of the new LoRa-based sensors were placed at the Circle Carnival event at Shaw Millennium Park in September 2018. Installed at different locations around the park, the sensors were programmed to compute the average noise level every three minutes. When the noise level rose above 85dBC, the sensors sent a warning packet over the LoRaWAN network. In the future, this feedback can be proactively provided to concert promoters to ensure noise restriction compliance.

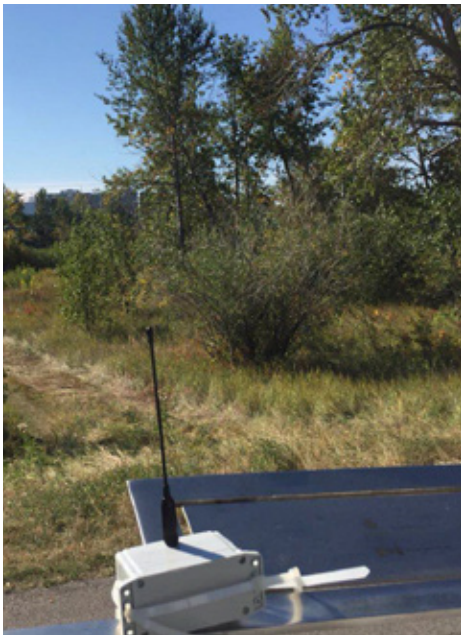
"From this testing, we observed that LoRa-based sensors are very easy to deploy with minimum infrastructure requirements. We were able to accurately detect noise thresholds without false alarm triggers."

– Henry Leung, Ph.D., Professor, Schulich School of Engineering, University of Calgary

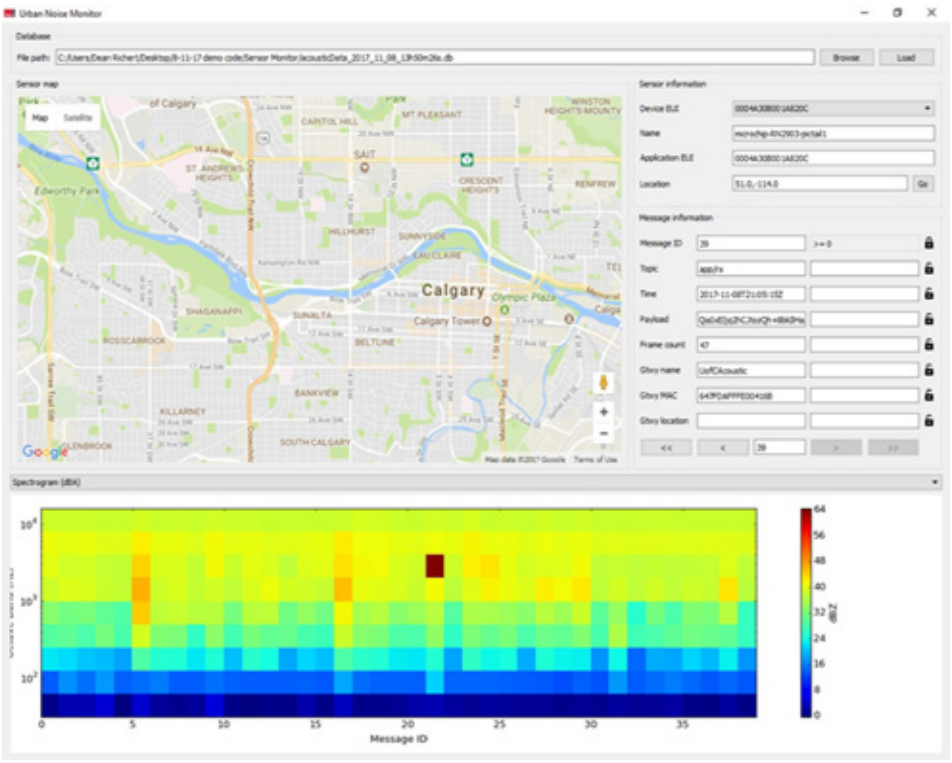
HOW IT WORKS: THE CITY OF CALGARY

The step-by-step process of the City of Calgary's LoRa-enabled solution





Above is an image of the LoRa-based sensor used by the Urban Alliance



Above is an example of noise measurements

The next evolution will be categorizing sounds such as trains, road noise, drag racing, gun shots, and construction, and spatially correlating it over time and location. This data will help improve noise management and enforcement during public events by automatically alerting law enforcement when noise thresholds are exceeded, saving the City time and money.

For more information on the Urban Alliance visit calgary.ca

Contact Us

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LoRa®

Semtech's LoRa devices is a widely adopted long range, low power solution for IoT that gives telecom companies, IoT application makers and system integrators the feature set necessary to deploy interoperable IoT networks, gateways, sensors, module products, and IoT services worldwide. IoT networks based on the LoRaWAN® specification have been deployed in over 100 countries and Semtech is a founding member of the LoRa Alliance®, the fastest growing IoT Alliance for LPWAN applications.

SEMTECH

Semtech Corporation is a leading supplier of high performance analog, mixed-signal semiconductors and advanced algorithms for high-end consumer, enterprise computing, communications, and industrial equipment. Semtech, publicly traded since 1967, is listed on the Global Select Market under the symbol SMTC and has more than 32 sales and application support offices in 14 countries as well as representatives and distribution support locations in more than 30 countries. Semtech is dedicated to providing proprietary platforms, differentiated by innovation, size, efficiency, performance, and reach.

LoRa Alliance®

The LoRa Alliance is an open, nonprofit association that has become one of the largest and fastest-growing alliances in the technology sector since its inception in 2015. Its members closely collaborate and share experiences to promote the LoRaWAN protocol as the leading open global standard for secure, carrier-grade IoT LPWAN connectivity. With the technical flexibility to address a broad range of IoT applications, both static and mobile, and a certification program to guarantee interoperability, the LoRaWAN protocol has already been deployed by major mobile network operators globally and connectivity is available in over 100 countries, with continuing expansion ongoing.