

# **Local Data – Local Clouds: Creating Hierarchical Cloud Resources for Crime Prevention**

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## **Background**

Flint, Michigan is a designated US Ignite site, and Kettering University is the lead institution in developing high-speed internet capability within the Flint/Genesee County region. The region has the fiber infrastructure in place for a 10gb regional network that connects every educational institution -- K-12, community colleges, and universities. Kettering University has a GENI rack that can effectively “pull the edge of the cloud to the greater Flint region” to provide more direct access to large data, but it can also serve as the hub of a local cloud capability for more immediate applications. As the recipient of an NSF-MRI grant for an LTE/LTE Advanced wireless network, the Computer Science Department at Kettering will add an enhanced wireless capability to the GENI community at large, as well as provide researchers and students with a development platform to study high-speed networking applications that incorporate mobile and opportunistic networks.

In addition, Kettering University has partnered with Michigan State University, the University of Michigan, the University of Michigan-Flint, local community organizations, and the City of Flint to win a Department of Justice Byrne Criminal Justice Innovation Grant targeted at crime reduction in the University Avenue Corridor Community (UACC) – at the center of which lies Kettering University and the hub of US Ignite/high-speed networking initiatives. Computer Science plays a key role in the Byrne Grant, as researchers will utilize technology – advanced sensors, intelligent lighting, autonomous surveillance vehicles, and “big data analysis” – to help reduce crime in the UACC. Researchers at Michigan State University and the University of Michigan have accumulated vast amounts of crime data that can be drawn on in generating informed, technology driven solutions for crime reduction in the UACC.

It is the unique confluence of multiple NSF/DoJ initiatives that provides Computer Science researchers at Kettering University and (potentially) University of Michigan-Flint with a unique environment to investigate the use of cloud computing technologies

## **Problem Statement**

We envision a large, distributed, heterogeneous, highly dynamic network consisting of remote, fixed sensors and high definition surveillance cameras, manned and autonomous mobile surveillance vehicles, sub-networks of opportunistic networked devices, as well as V2V communications providing information and being informed/controlled by real-time events. The

existent GENI rack at Kettering University will be central to the creation of a local cloud infrastructure able to respond to the needs of the networked devices, in addition to being the “high-speed on-ramp” to the larger cloud. It will be utilized to create virtual pipelines for public safety, but in addition, some of the problems that need to be addressed:

- What is the persistence of data within this structure; which data is transitory, which data to ctransitory period?
- Which decision making aspects of the data gathering and analysis should be left to mobile devices, shifted to the local cloud, or pushed to the larger cloud? How are these activities synchronized?
- Can local nodes of this network synchronize actions amongst themselves, or do such activities have to be coordinated within the local cloud?
- Since reaction to events impacts responders to potential criminal events, the ability to create secure virtual networks within the cloud is an important issue. In addition, the integrity of data being download must be assured. These issues will be investigated.

As the proposed network and cloud are created, numerous additional questions will arise.