Cognitive Mobile Edge Computing: Video Analytics Use Case

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PSCR

SPECTRONN

BROOKLINE POLICE MASS.

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Public Safety Video Applications

METRO

Every beat cop in NYPD now has a body camera

By Tina Moore and Max Jaeger

March 6, 2019 | 12:11pm | Updated

NEWS

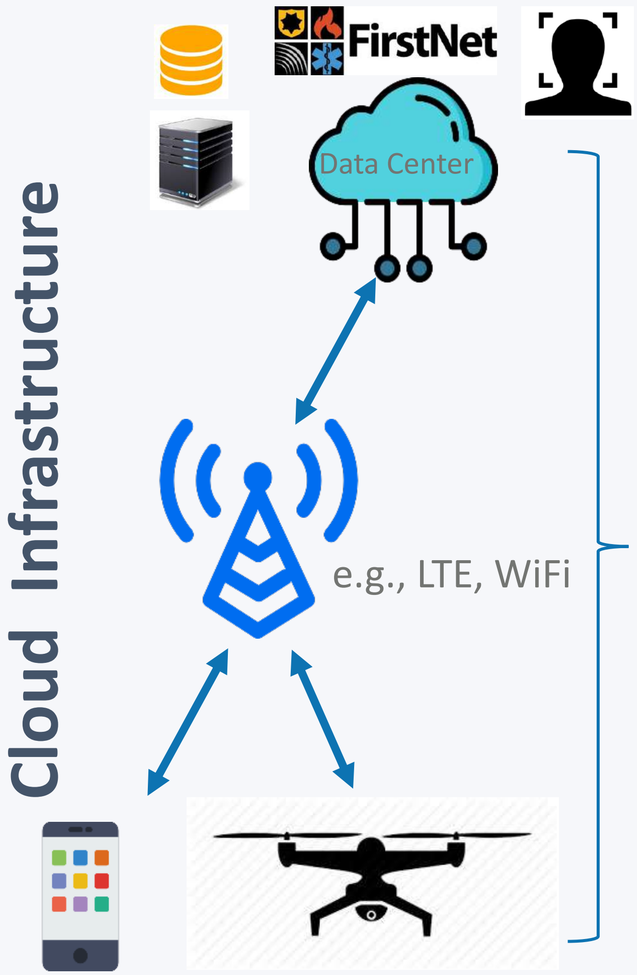
500 Detroit businesses now part of Project Green Light safety initiative

Initiative reaches milestone

By Larry Spruill - Reporter, Natasha Dado

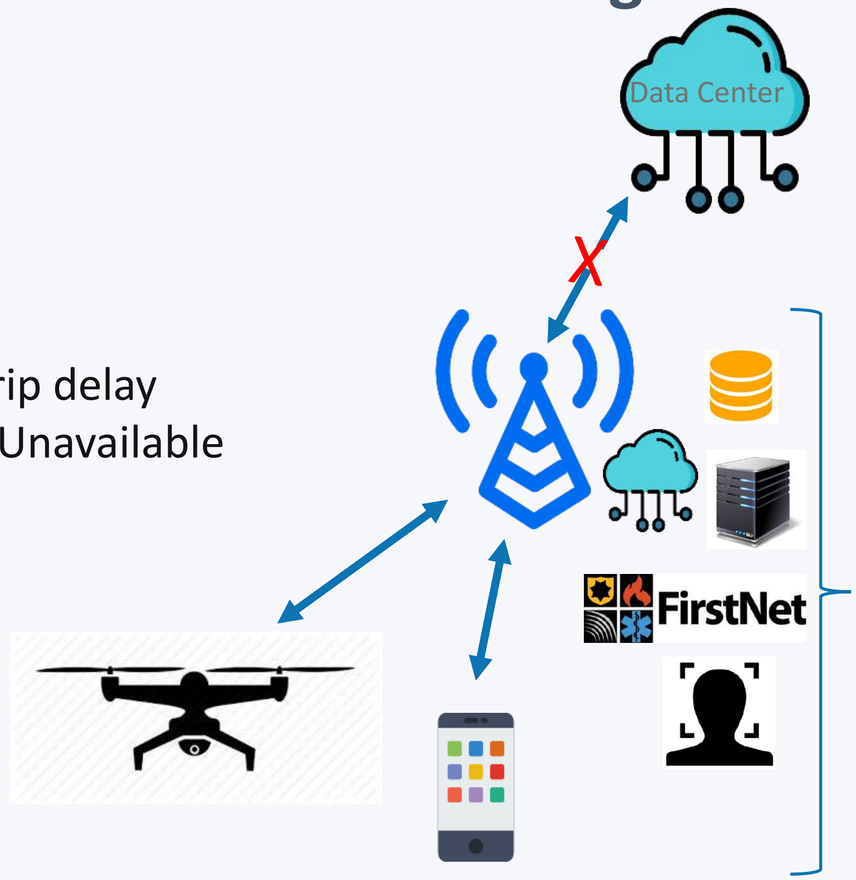
Posted: 6:07 PM, March 11, 2019
Updated: 6:07 PM, March 11, 2019

Mobile Edge Computing



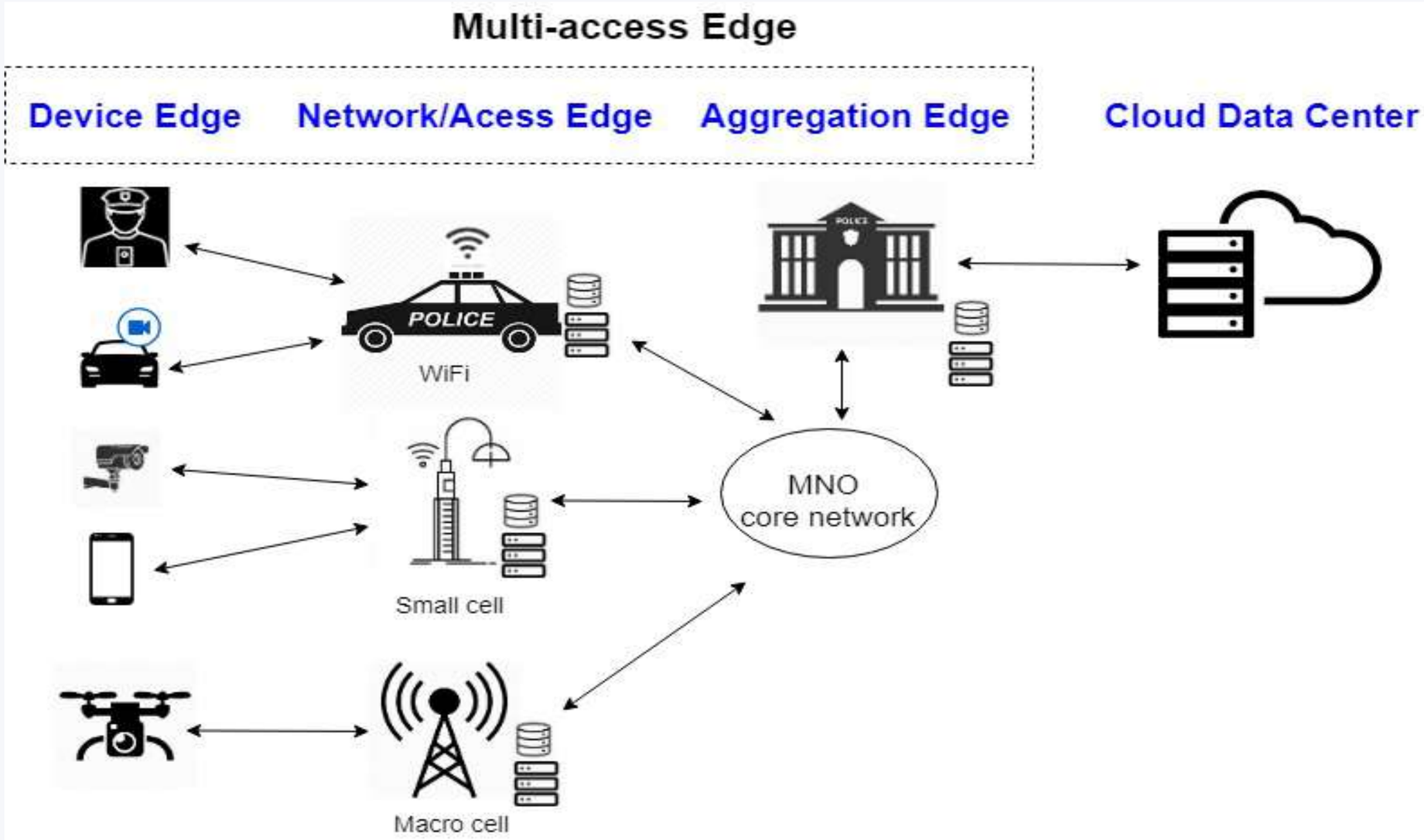
-Large roundtrip delay
-Intermittent/Unavailable backhaul

Mobile Edge Infrastructure

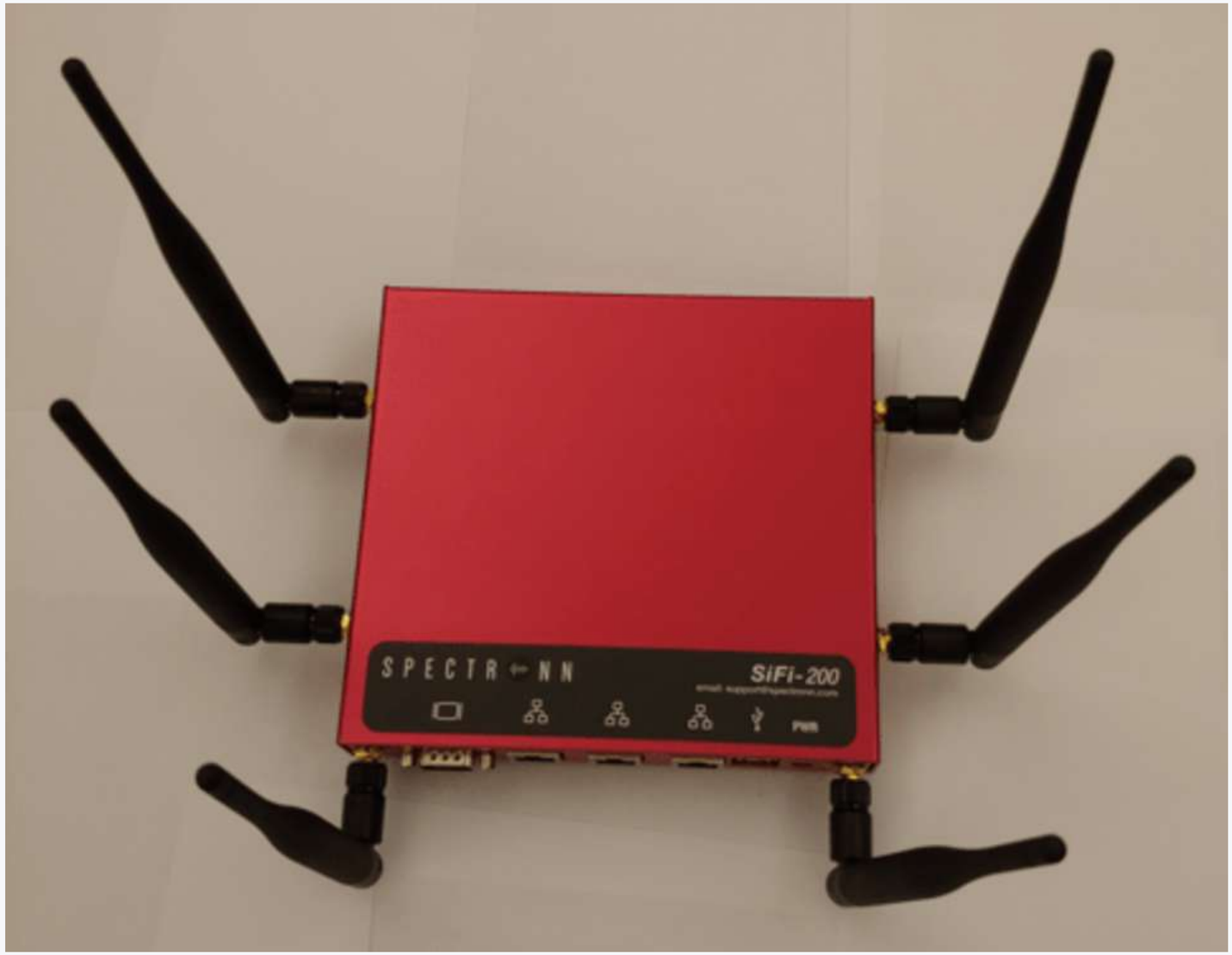


-Small roundtrip delay
-Backhaul failure resistant
-Local/edge computing
-Edge storage

5G Multi-access Edge Computing for Public Safety Video Analytics

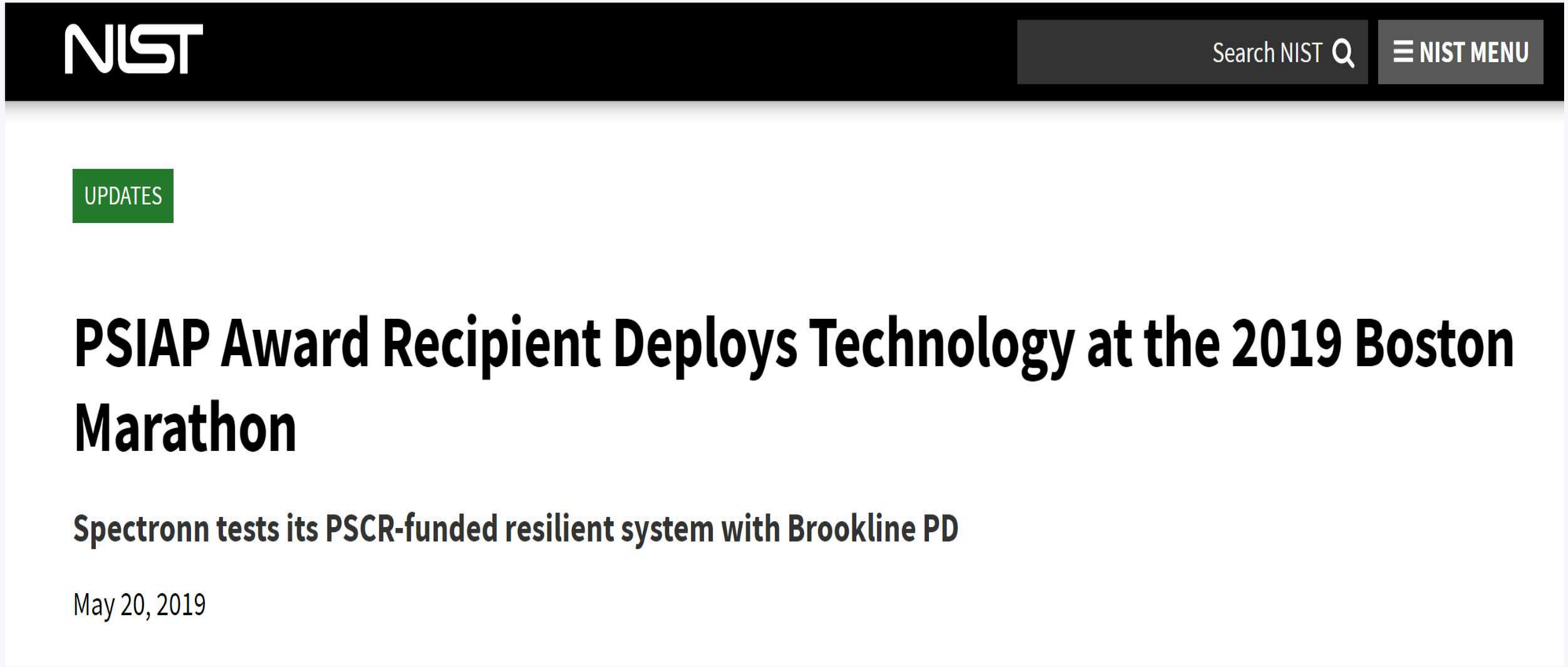


SiFi 200: Integrated Mobile Edge Computing and Networking Router



- 2 cellular backhaul links for bandwidth aggregation and session persistent offloading
- 1 dual-band WiFi for access
- Integrated smart video management system (VMS)
  - 250 GB for 1-month local video storage
  - Live video streaming over local WiFi
  - Cloud video streaming and integration with any proprietary camera VMS
  - AI-based video analytics and alerts
  - Distributed mobile edge computing

2019 Boston Marathon Technology Deployment with Brookline PD



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UPDATES

PSIAP Award Recipient Deploys Technology at the 2019 Boston Marathon

Spectronn tests its PSCR-funded resilient system with Brookline PD

May 20, 2019

> “I haven’t heard of anybody who’s doing a project like this…other [agencies] want to wait until something has been done and proven, but by that time there’s another ‘new thing’ – and you’re already behind.”
>
> – Scott Wilder, Brookline PD

Birmingham Operation Shaken Fury Deployment with DHS S&T

News Release: DHS S&T Partners with Industry and Alabama Emergency Responders to Evaluate Technology Integration

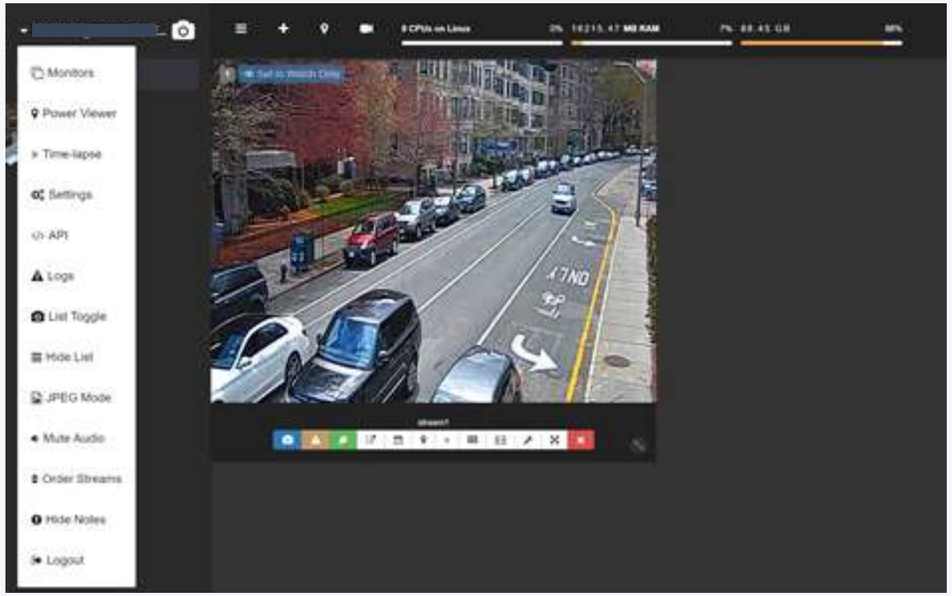
Release Date: June 10, 2019

For Immediate Release:
DHS S&T Press Office, 202-254-2385

Boston Marathon (April 15, 2019) Deployment Case Study

SiFi 200 deployment location

Integrated VMS dashboard



Boston Marathon (April 15, 2019) Deployment Case Study

Deployment Strategy

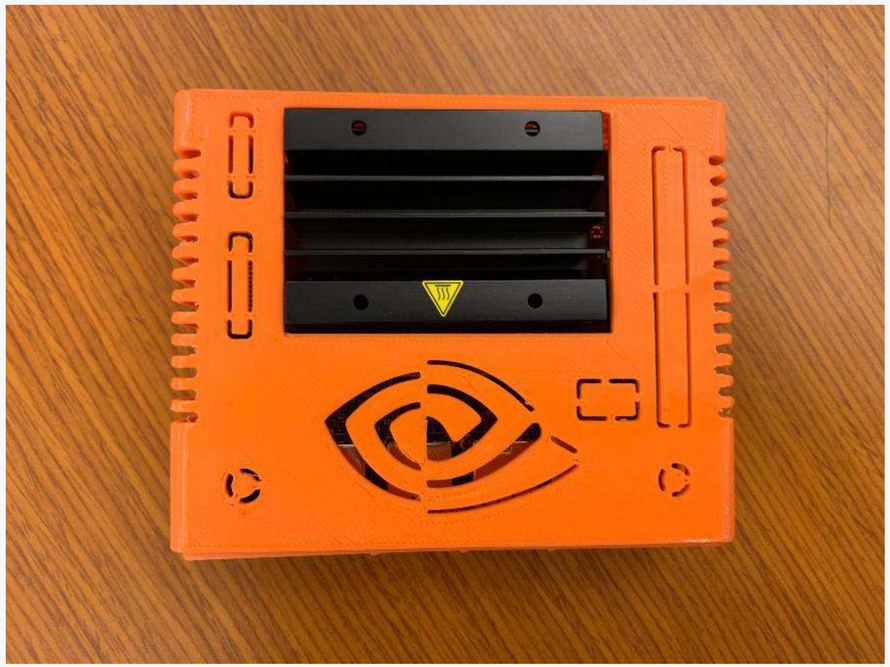
- SiFi 200 device directly connected to a FLIR camera
- Measured and tested Verizon, AT&T, and FirstNet as potential backhaul links – chose FirstNet (6 Mbps DL and 3 Mbps UL, ave.) as primary backhaul
- FirstNet SIM card provided by Brookline PD
- Live video stream stored locally in the SiFi 200 router and also pushed to AWS GovCloud
- Live video streaming over the SiFi 200 WiFi hotspot; outside the hotspot via streaming server on GovCloud
- Video bit rate, frame rate, etc. optimized for FirstNet
- Camera and the SiFi 200 device moved to the final site from a trial site by Lan-Tel Communications after finalizing network architecture, camera configuration, device configuration, etc.

Value-add for Brookline PD

- *Solves poor microwave backhaul* coverage/reliability problems (6GB of uninterrupted marathon video streamed)
- Local WiFi edge streaming capability for best video quality even *without any backhaul links*
- Multiple backhaul links provide *very high reliability for mission critical video*
- *Easy integration* with any proprietary VMS
- Support for *multiple video streaming protocols and video formats*
- *Plug-and-play* technology

AI-driven Mobile Edge Video Analytics

Low Cost NVIDIA Jetson Nano GPU for Device Edge Computing



AI-driven Mobile Edge Video Analytics

CPU (Intel Core i7-7700) + GPU (NVIDIA GTX 1080) for Aggregation Edge Computing

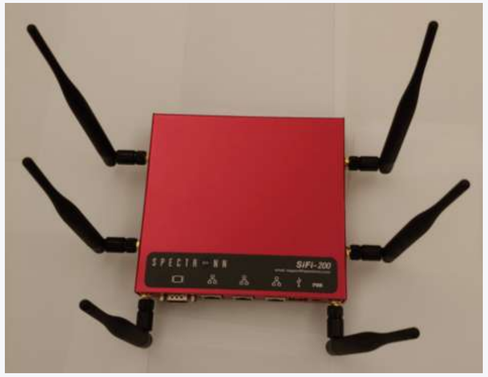
Resilient and Distributed Edge Computing Network Architecture

Wired

Wireless

Street camera

Device edge computing
(Quick and lightweight analytics)



Smart edge gateway

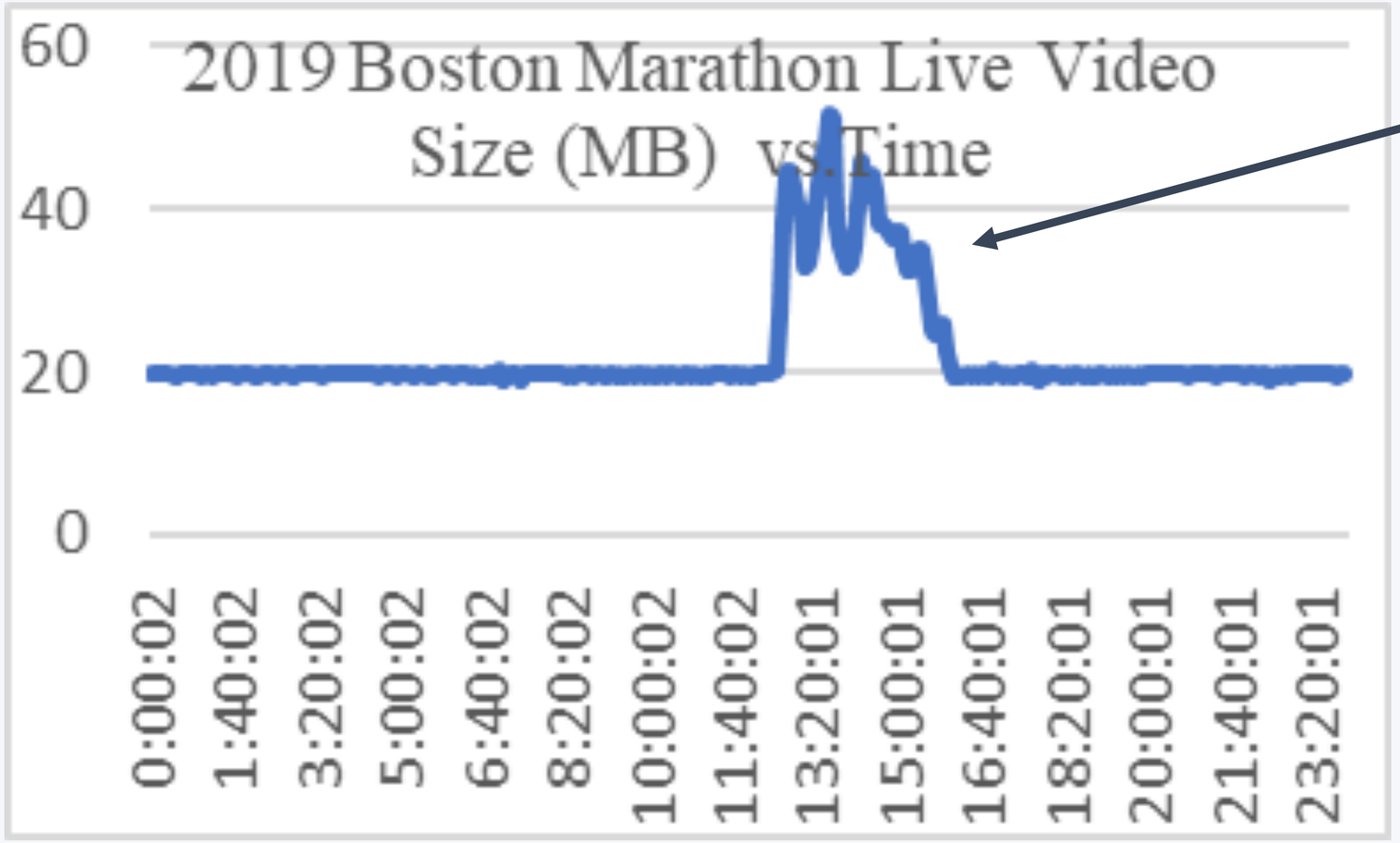
FirstNet
(Primary link)

AT&T/Verizon
(Secondary link)

Aggregation edge computing
(Complex and deep analytics)

Example Edge Video Analytics

Example Edge Metadata Analytics



Marathon runners in camera's view

First Responder Video Analytics Use Case

Joint work with Andrew Weinert, MIT Lincoln Labs and William Drew, NJOHSP

Goal: Reduce cognitive overload on first responders via video analytics on the (device or network) edge.

-bodycam video, street side camera feed, drone video, etc.

Generate alert only if:

(a) night-time and (b) a police officer is lying on the street and (c) crawling

First Responder Edge Video Analytics Use Case

Video dataset collected and shared by MIT Lincoln Labs/NJOHSP - NIST PSIAP project

Person inside car at night

Person outside car at night

Person walking

Person running

Person crawling

First Responder Edge Video Analytics Use Case

- Trained deep machine learning algorithms to model different scenarios from video datasets
- Developed machine learning classification algorithms for situational awareness from video feed
- Generate alerts only if threat detected according to preset policies
- High inference accuracies (>90%) on the available tagged video datasets
- Reduces cognitive overload significantly for first responders
- Transitioned software toolkit to MIT Lincoln Labs

Demos

July 10th 10am to 10:45am and 4:20pm to 5:30pm

Resilient Multiaccess Edge Computing for Video Analytics

Public Safety Video Analytics (with MIT Lincoln Labs and NJOHSP)

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Next Session

3:30 PM