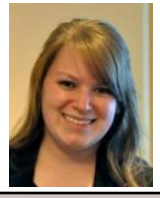
What is the Problem?

www.washingtonpost.com

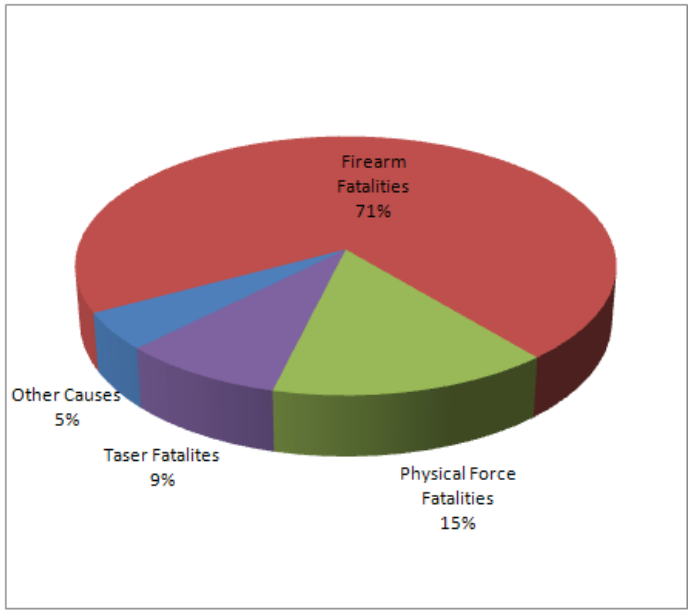
- Recent fatal and high profile incidents lack concrete evidence to establish accountability
- Current wearable cameras lack auto-activation measures
- Systemic police misconduct
- Instances of false accusations of police misconduct



How significant is the problem?

From January to December 2010, the National Police Misconduct Statistics and Reporting Project recorded:

- **4,861** – Reports of police misconduct tracked
- **6,613** - Number of law enforcement officers involved
- **354** - Of above number were chiefs or sheriffs
- **6,826** - Number of alleged victims involved
- **247** – Number of fatalities associated with tracked reports
- **$346,512,800** – Estimated amount spent on misconduct-related civil judgments and settlements excluding sealed settlements, court costs, and attorney fees.



www.policemisconduct.net

Context: Effect on Groups

- In an experiment performed on the Rialto Police Department in 2012, all the frontline officers were randomly assigned to either wear a highly visible camera or not
  - Mid-sized police department
  - Services 28.5 square miles and population of 100,000
  - Approximately 3,000 property crimes and 500 violent crimes annually
  - 6 to 7 homicides per year
- 50% reduction in total number of use of force incidents
- Ten times fewer citizen complaints than the twelve months prior to the experiment

www.policefoundation.org

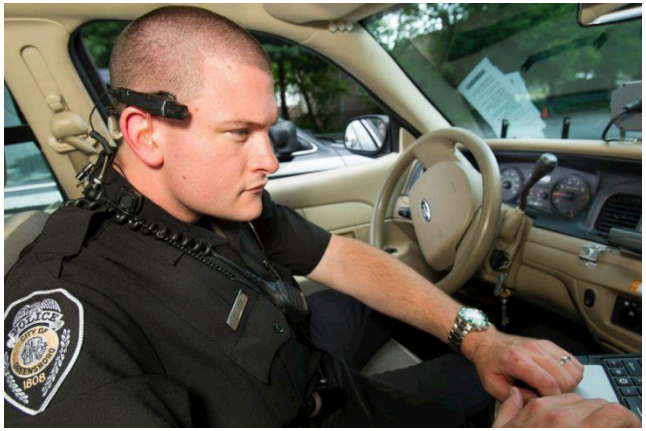
www.smarter watching.com

Current Products on the Market

DigitalAlly FirstVu

Wolfcom Body Cameras

Taser

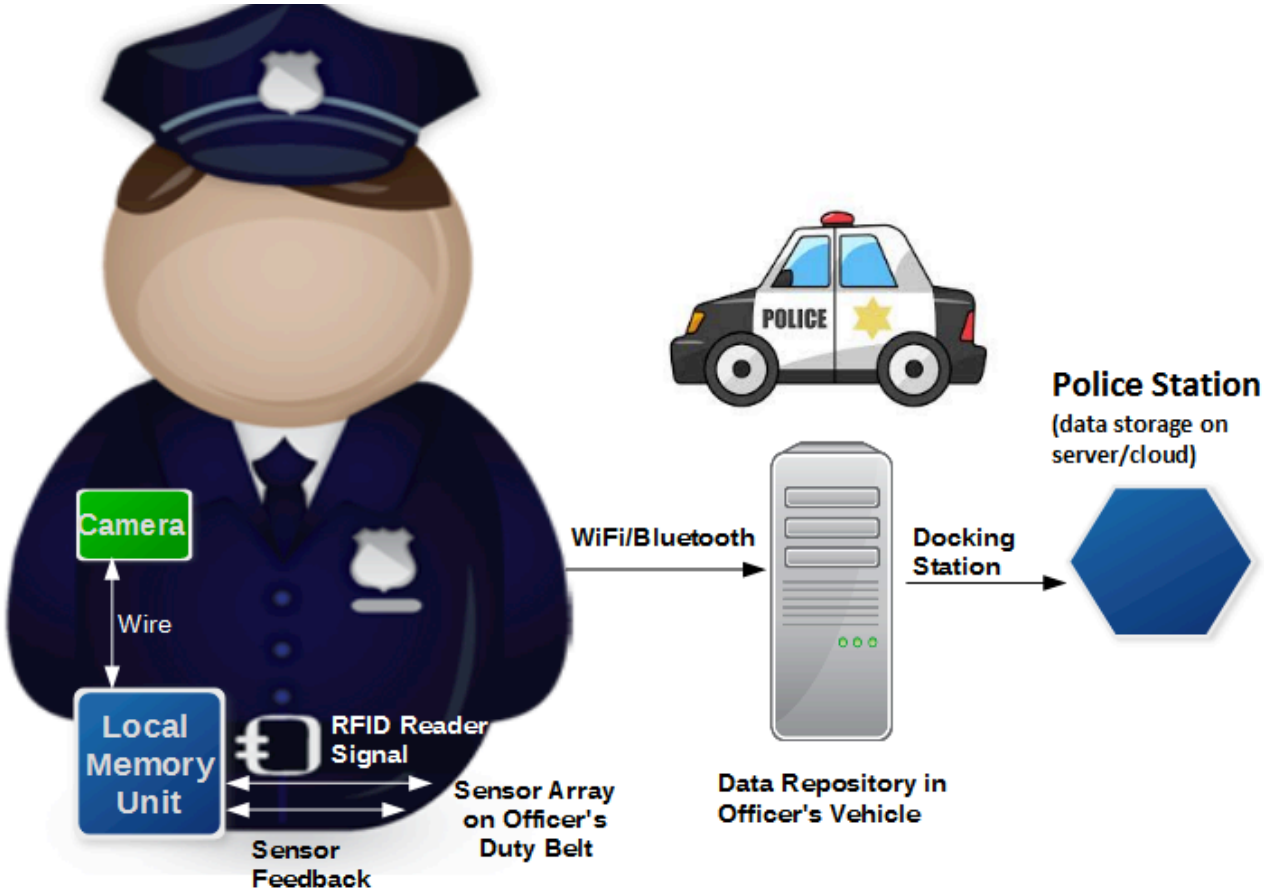


Our Solution: F.I.R.E.

DigitalAlly FirstVu

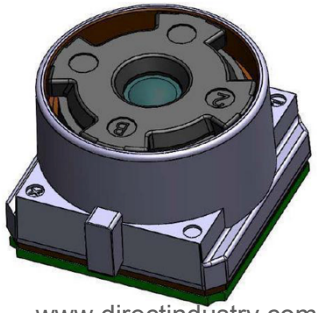
- Wearable camera that is user and sensor activated
- Protect citizens by promoting police accountability
- Reduce false police misconduct claims to save time and money
- Auto-activation and simple data drop for increased ease of use

Our Solution: Block Diagram



Requirements Analysis: Specifications

- Wearable, sensor-activated audio/video recording device



www.directindustry.com

www.pre-us.com

- Local processing and storage unit

www.gmdcomputers.com

- Encrypted storage unit at police station with docking port

Design Alternatives

Included:

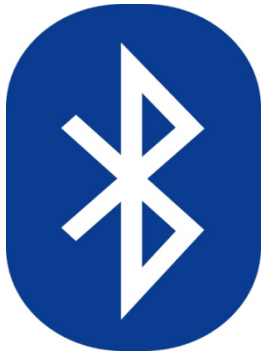
- Wired communication between local memory unit and camera
- Vehicle data repository
- Local encrypted and compressed storage
- Software to create catalogue of videos which can be accessed and searched for by officers.
- RFID Sensing

Excluded:

- BlueTooth data transmission between local memory unit and camera
- All-in-one unit (camera and local memory unit)
- Proximity capacitive touch sensors
- Eyeglasses mounted

Optional:

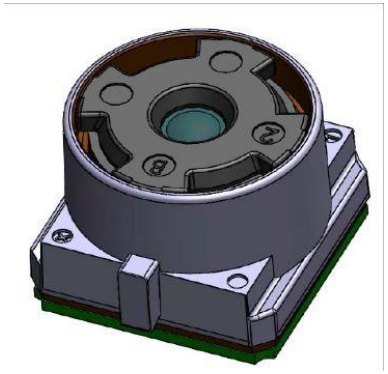
- 4G capability / live-streaming



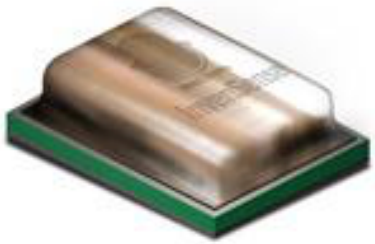
www.luntianlaboratory.com

Block 1: Camera Unit

VX6953CB - Camera Unit



INMP621 - Microphone



Requirements:

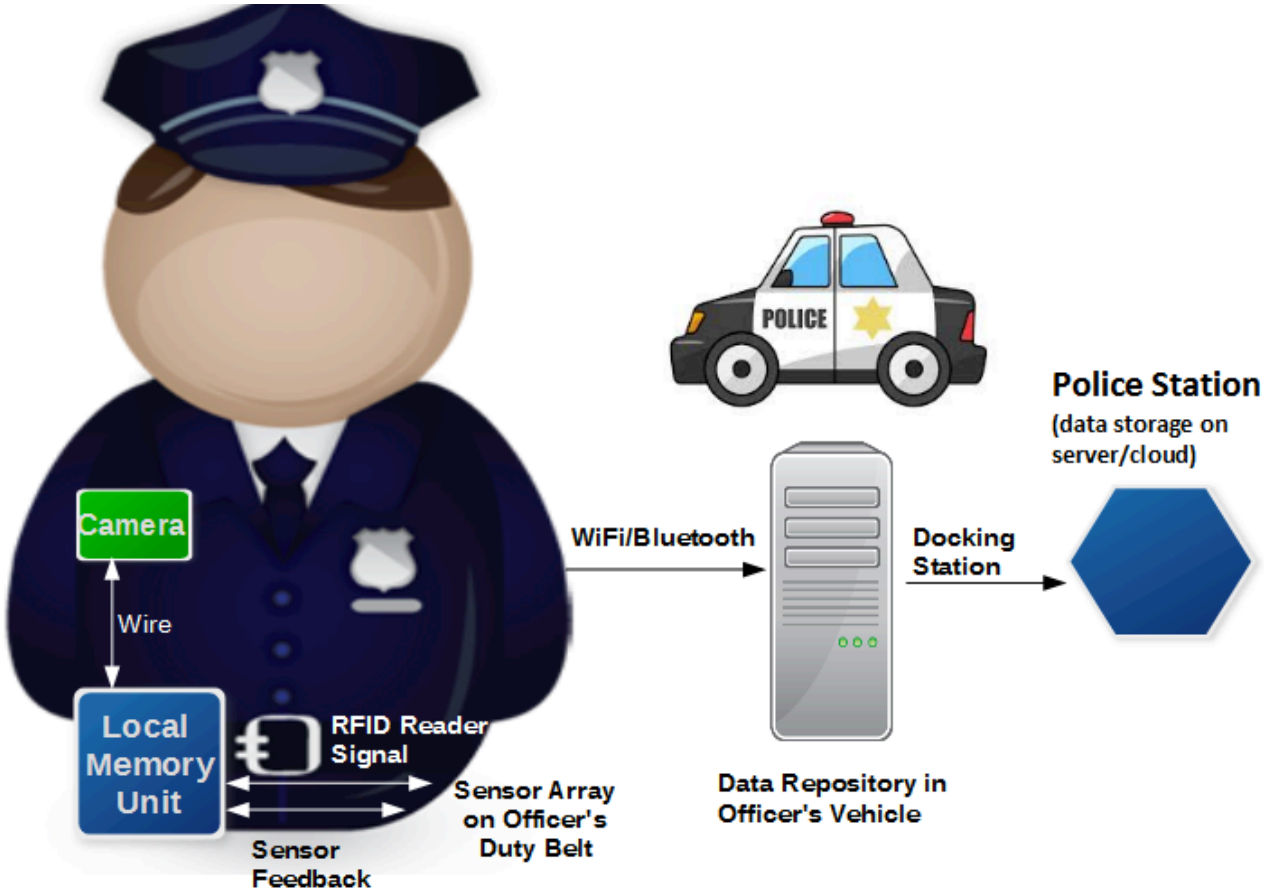
- Mounts and powers camera and microphone
- Streams video and audio data to the local memory unit for processing and storage
- Activates manually or upon sensor array command
- As small and lightweight as possible

Team Member: Andrew Kelley (EE)

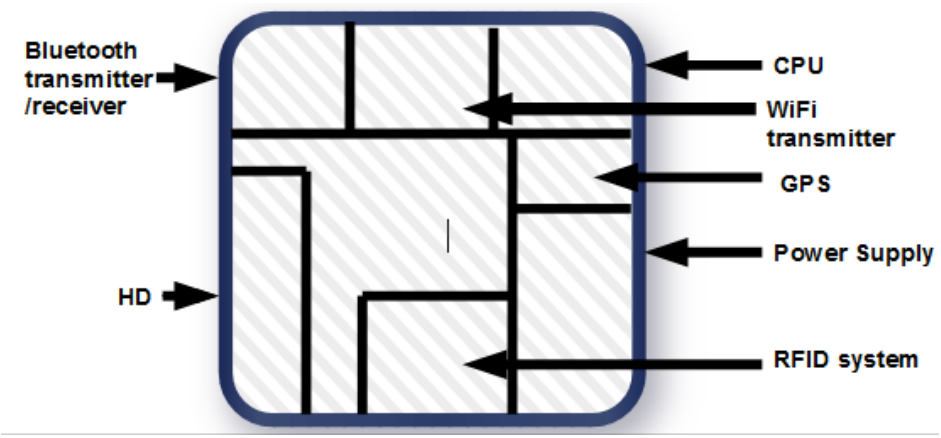
Block 1: Camera Unit Work Plan

- STMicroelectronics Camera Module and Digital Microphone assembled onto PCB
- Appropriate power and data cable types to be selected and implemented
- Outer case to be 3-D printed

Our Solution: Block Diagram



Block 2: Local Memory Unit



Requirements:

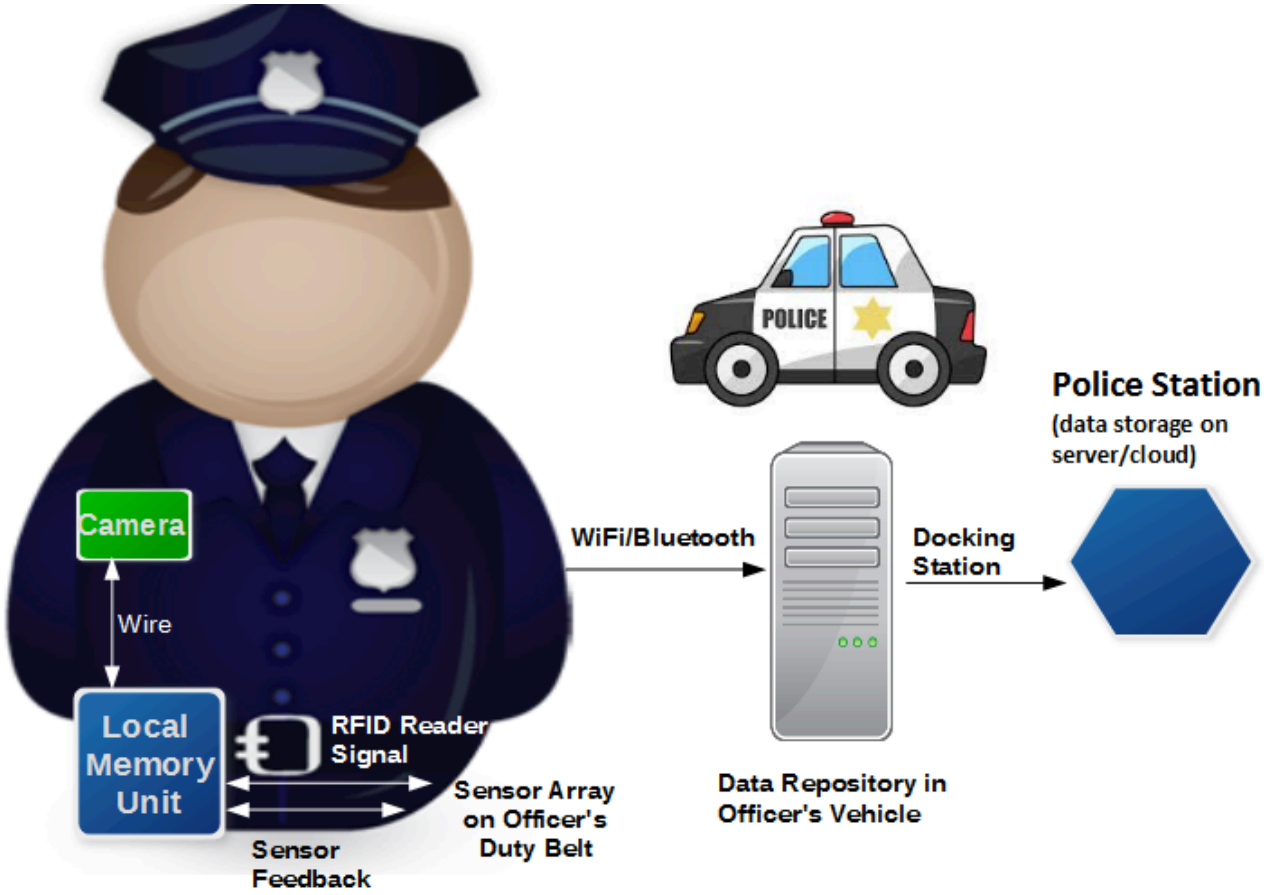
- Contains processor needed to receive and store feed from camera
- Also included will be USB connectivity hardware, RFID reader, WiFi communications, and a GPS receiver
- Wired connection directly from memory unit to camera
- Tamper proofing will be implemented by securing unit with locking device to be accessible only by authorized personnel

Team Member: Shane Ryan (EE)

Block 2: Local Memory Unit Work Plan

1. Determine processing power requirements
2. Determine processor(s)
3. Build circuit prototype on breadboard
4. Design PCB using EAGLE
5. Manufacture PCB
6. Create case and locking mechanism

Our Solution: Block Diagram



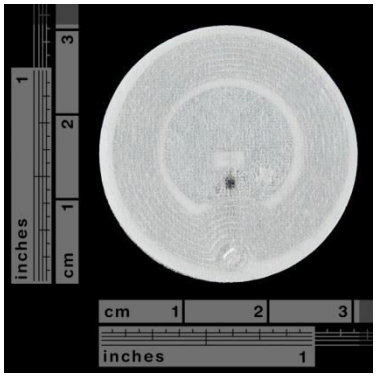
Block 3: Activation Sensors

funintelligenttraining.com

Requirements:

- RFID sensor array on officer's duty belt
- Detects when an item has been removed from holster

Adhesive RFID Tag



www.sparkfun.com

RFID Reader

www.sparkfun.com

Team Member: Jacquelyn Ingemi (EE)

Block 3: Radio Communications

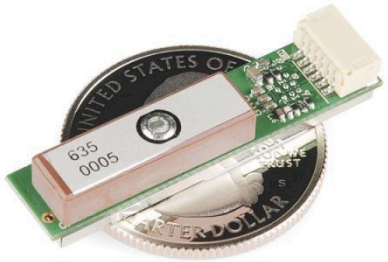
WiFi/Bluetooth Transmitter/ Receiver SoC

www.mouser.com

Requirements:

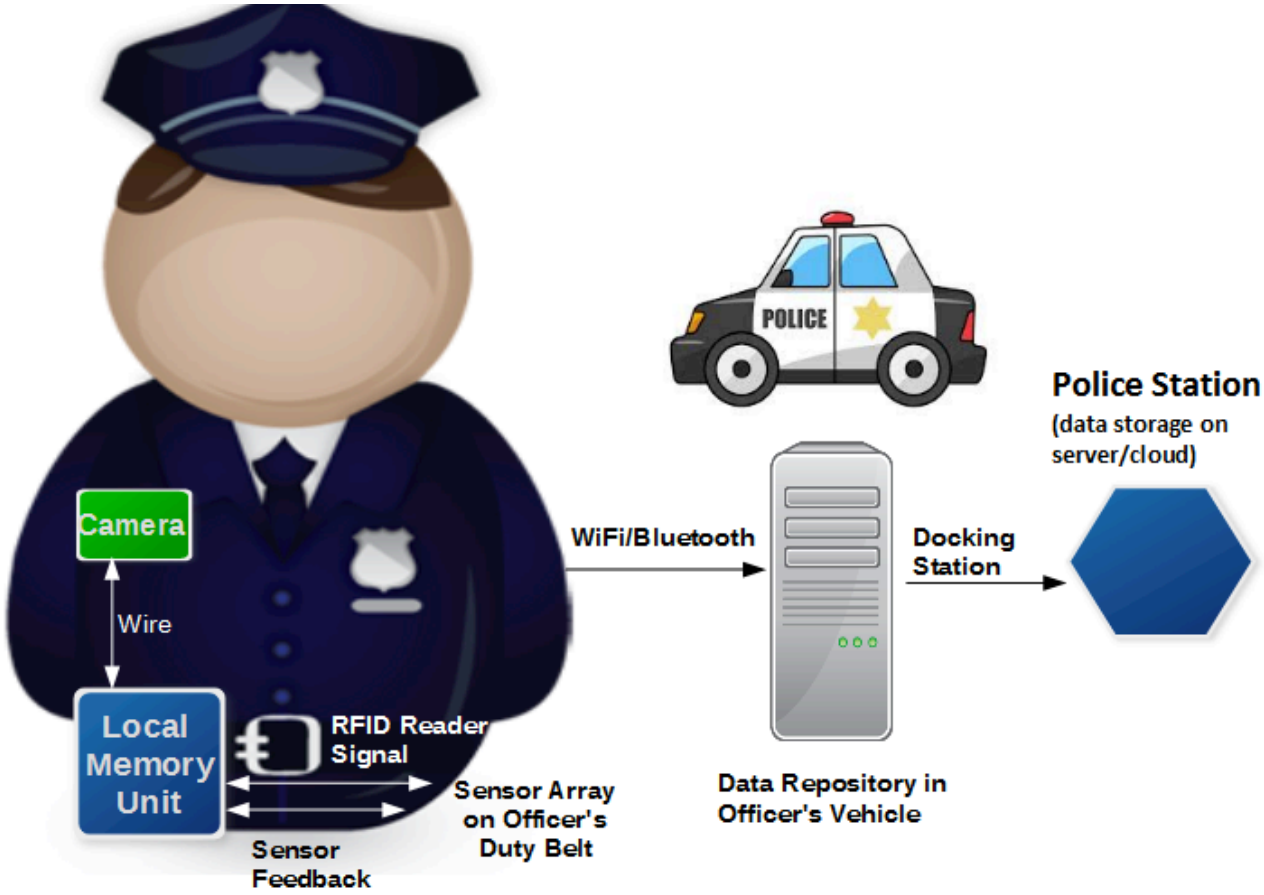
- WiFi Receiver
- Bluetooth Transmitter/ Receiver
- GPS Receiver

GPS Receiver



www.sparkfun.com

Our Solution: Block Diagram



Block 4: Software / Storage

amazon web services™ | S3

Wolfcom

Storage Requirements:

- Cheap
- Reliable
- Secure
- Scalable

Software Requirements:

- Compression / Encryption algorithms
- Embedded systems hardware programming

- Control panel application
- Archive/view videos

Team Member: Brian Gleadle (CSE)

Block 4: Software / Storage Work Plan

Wolfcom

Storage Requirements:

Amazon Simple Storage Service

- $.03 Per GB / 1 TB
- Redundant backups
- Amazon S3 Server Side Encryption with Customer-Provided Keys
- From 1GB to 100TB

Software Requirements:

- MPEG-4 Compression
- SHA-3 Encryption
- RFID sensors control camera

- Control panel
- Interface with S3 to securely access videos

MDR Deliverables

- Prototype for RFID sensor array on officer duty belt
- Components of local memory unit connected via breadboard
- Camera unit functional and mounting option decided upon
- Software at the police station prototype