



# Generation 2 Body-Worn Cameras and the Evidence EcoSystem™



## Letter from the Utility CEO

The purpose of this paper is to point out what is possible today in body-worn camera technology, and how it fits into the overall Evidence EcoSystem™. No specific product names are mentioned in this paper, and no specific vendor product capabilities are compared, because that was not our purpose. Generation 2 body-worn cameras can provide many benefits for Public Safety and Public Privacy Rights. Generation 1 body-worn cameras were a useful first step, but so much more is possible, practical, and cost-effective.

The “Internet of Things” (IoT) is spreading throughout Public Safety. IoT is composed of data gathering devices and sensors automatically reporting video, audio, and telemetry data over real-time IP-based wired and wireless networks to the rest of the Evidence EcoSystem™. As an example of what is possible, crime in the City of Atlanta is down 25% since 2009. Certainly the primary driver was the political leadership of Mayor Kasim Reed to get more police officers on the street. Civic leadership from the Atlanta Police Foundation, APF CEO Dave Wilkinson, and the Loudermilk family contribution of funding for new police technology such as the APD Video Integration Center was essential. I am proud to say that our company has provided some of the IoT software and technology being used by Atlanta Police today. Atlanta’s tangible crime reduction results are representative of what is possible when Political, Civic, and Technology leadership come together. But Mayor Reed would likely tell you the crime rate is still too high. Technology that encourages everyone to be on their best behavior, and avoids a Situation turning into an Incident, is the best possible outcome. Generation 2 body-worn cameras are an inevitable part of Public Safety IoT.

Automatic recording triggers, real-time IP-based Internet connectivity, GPS and Motion sensors, and secure video file formats make body-worn cameras truly effective for Police Officers and for protecting Public Privacy Rights. Body-worn cameras also are a significant investment for Police Agencies and the Taxpayer. The good news is Generation 2 body-worn cameras cost no more than Generation 1 body-worn cameras, yet provide reliable data capture, Internet connectivity, and secure video storage. Police Officers, Citizens, and the Taxpayer should get the full benefit of what is practical and cost-effective today in Generation 2 body-worn cameras.

Sincerely,



Robert S. McKeeman  
Chief Executive Officer  
Utility

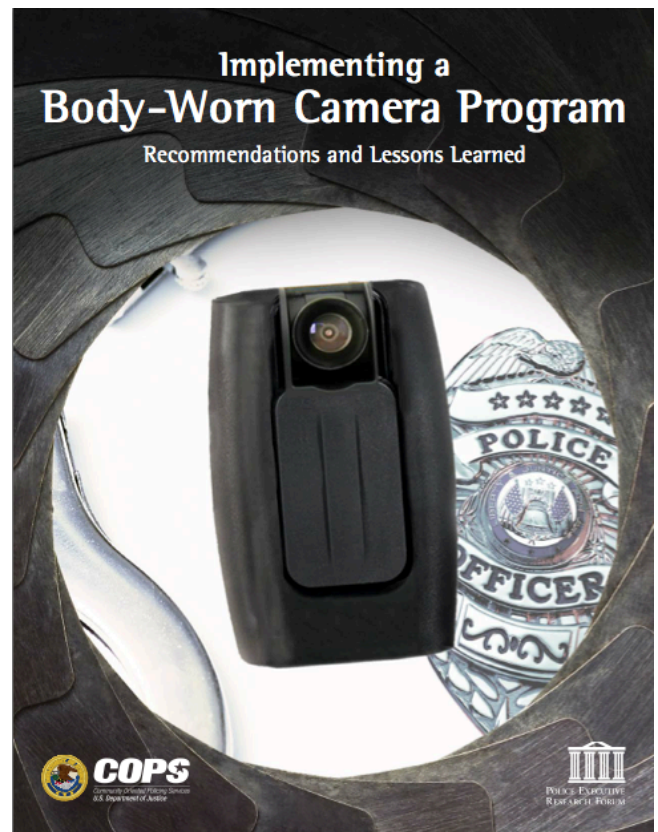
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## Introduction

Utility embraces the Recommendations and Lessons Learned in the report “Implementing a Body-Worn Camera Program”, jointly issued by the US Department of Justice Office of Community Oriented Policing Services, and by the Police Executive Research Forum. This report is a landmark in guiding the discussion about body-worn cameras. Our key takeaways from this report include:

- Police Actions are a matter of Public Record
- Powerful Need to Demonstrate Transparency, Openness, and Accountability
- Privacy and Trust are paramount to Community Policing
- Increasingly there are already multiple citizen video cameras at an Incident scene
- Citizens have important Privacy Rights
- Not all Citizen interaction should be recorded
- Police Officers should have Discretion with Accountability to not Record
- Maintaining the Public Trust is paramount



Underlying all these takeaways, it is imperative that body-worn video be collected reliably and stored securely. At the same time, it is important to recognize that Incidents do not necessarily stay where they start. Location and other metadata are a key part of evidence.

However, as good as the Report is, the Recommendations in this report were based upon the state of body-worn camera technology that existed in September 2013, and still exists today - what we describe as Generation 1 body-worn cameras. Generation 1 body-worn cameras have significant technology limitations that reduce their effectiveness in meeting the Report Recommendations. Generation 1 body-worn cameras in reality are not much different than GoPro®-type consumer body-worn cameras. Recording has to be manually started and can be manually stopped at any time. Video is stored in open common video file formats that can be directly uploaded to YouTube and Social Media sites. Generation 1 body-worn cameras have no Internet connectivity or internal GPS. Many Generation 1 body-worn cameras are low resolution 640 x 480 VGA – they do not even capture High Definition video like a GoPro® does. Furthermore, some Generation 1 body-worn cameras record all the time, which compromises Citizen Privacy and Officer Discretion. In contrast, Generation 2 body-worn camera recording can be started automatically as an Incident starts, can be configured so they can't be stopped manually, record at the same High Definition as consumer cell phones, leverage wireless IP-based connectivity to support real-time Situational Awareness and broadband IoT, and are

practical, reliable and cost-effective today. Generation 1 body-worn camera weaknesses and a description of Generation 2 body-worn camera technical advantages are described on the following pages. Generation 2 body-worn cameras will allow Police departments to realize the significant benefits that body-worn cameras can bring to Public Safety and Citizen Trust. There is no reason to accept the limitations of existing Generation 1 body-worn cameras.

## **Generation 1 Body-Worn Camera Weaknesses and Limitations**

Current Generation 1 body-worn cameras include one or more of the following limitations:

- No automatic triggers to start recording – the Officer has to remember to manually start video recording
- The Officer can stop recording at any time for any reason by manually pressing a button
- Video is stored in a common video file format that can be uploaded directly to YouTube and Social Media web sites
- No live Video Streaming to Central Dispatch, Supervisors or Video Integration Centers
- Low-resolution video capture – 640 x 480 VGA or lower resolution that compromises citizen identification, believability of video evidence by Juries, and facial recognition technology operation. Low-resolution fuzzy video that does not clearly show what actually happened, and is not usable by facial recognition systems, is less useful.
- No connectivity with In-Car Video Recording Systems
- No integration with In-Car Video Recording systems, or with video tracks also being collected on In-Car Video Recording systems
- No ability to immediately mark and comment on body-worn video along with In-Car Video front and rear camera video tracks as part of an integrated video, audio, and metadata evidence dataset within one minute after completing recording.
- No ability for Central Dispatch to remotely start body-worn video or audio recording
- No internal GPS to report location, speed, and heading
- No internal Accelerometer for measuring G-Forces
- No ability for Central Dispatch to immediately start recording of all body-worn video cameras located within a GeoFence zone.
- Control buttons are exposed on the front of the camera
- No speech recognition to provide hands-free operation
- No audio announcements of body-worn recording capacity remaining and battery status
- No ability to download and display BOLO, Silver, Amber, and other alert text and pictures
- No audio only recording mode
- Officer has to travel to a central location to dock the body-worn to offload video
- Video remains only on the body-worn video camera until it is docked, and is at risk of being lost, damaged, or stolen before it can be uploaded
- No ability to automatically upload video wirelessly to In-Car Video Camera systems as the body-worn video is being recorded.

## Generation 2 Body-Worn Camera Advantages

History shows technology improves every year. The “State of the Art” in September 2013 is not the State of the Art today. Body-worn cameras today do not have to suffer from Generation 1 body-worn camera limitations. Generation 2 body-worn cameras based upon proven software, hardware, and IP-based wireless connectivity are reliable, secure, and cost-effective, and are available for volume purchase immediately after the IACP Conference ends on October 28, 2014.

- Automatic triggers to start recording – without the Officer having to remember to press a manual Start Recording button.
  - Integrated with In-Car Video Recording system automated triggers such as the siren, light bar, door, weapons rack, and other automatic recording triggers. When the In-Car Video system starts recording, all body-worn cameras in the vicinity are triggered to also automatically start recording.
  - Automatically triggered to start recording when the internal accelerometer senses the Officer is running or is involved in a struggle
  - Automatically triggered to start recording when an Officer comes onto an Incident scene and another Officer’s In-Car Video Camera system or body-worn camera is already recording.
- Video can be stored in a secure file format that cannot be uploaded directly to YouTube and other Social Media sites, and cannot be viewed, edited, or copied by video player software found on any Windows or Mac computer. Video and audio can only be accessed using specialized viewer software that only Police Departments have.
- Live Video can be streamed directly from the body-worn video camera to Central Dispatch, Supervisors, or to a Video Integration Center, without the body-worn video camera having to be linked to a companion device.
- Alerts from other Evidence EcoSystem™ IoT sensors and systems can be streamed real-time to the Generation 2 body-worn camera
- High Definition video recording of at least 720p that provides recognizable evidence that Police can use to identify suspects and repeat offenders, Juries can agree is compelling, and allows facial recognition technology to work effectively. Police Officers should have video recording as good as a Citizen has with an average cell phone.
- Ability for the Officer to stop recording at any time, but the body-worn camera can automatically make an audio announcement that recording is being stopped, and the audio announcement is captured as part of the video and audio before data capture actually stops. So the Officer and any nearby Citizens can have positive audio confirmation that video recording has been stopped. There does not have to be unexplained gaps in the video and audio where the video and audio just stops.
- Control buttons do not have to be exposed on the front of the body-worn video camera
- Multiple secure Control Buttons can be operated without the Officer having to look at the body-worn video camera, or take his eyes off one or more nearby Citizens
- The body-worn video camera can provide positive tactile button selection out of view of nearby Citizens



- Vibrations of various pulses and duration confirming to the Officer that a body-worn camera command has been recognized and performed.
- Direct broadband IP-based data connectivity and integration with In-Car Video Recording Systems provide automatic two-way triggering and data integration
- Immediately mark and add comments to one or more body-worn videos along with In-Car Video front and rear camera video tracks in one integrated video evidence set
- Central Dispatch and Supervisors can remotely start or stop video or audio recording on the body-worn camera
- Central Dispatch can broadcast BOLO, Silver, Amber and other alerts with pictures directly to the body-worn camera screen to be viewed by Officers on the scene. Alerts can be broadcast to one body-worn camera, to all body-worn cameras within a GeoFence zone, or to every body-worn camera in the department.
- There can be an internal GPS in the body-worn video camera
- There can be an internal Accelerometer in the body-worn video camera to detect motion and acceleration such as running or a physical struggle
- Central Dispatch can immediately start recording of all body-worn video cameras located within a pre-defined or ad hoc GeoFence polygon zone.
- Central Dispatch can have a voice announcement play on all body-worn video cameras located within a pre-defined or ad hoc GeoFence polygon zone.
- Speech recognition command controls can provide hands-free operation of the body-worn video camera without the Officer having to take eyes off the Citizen
- The body-worn camera can be trained to recognize an Officer's voice, so that only the Officer can operate the body-worn video camera using his voice commands.
- The body-worn video camera can make audio announcements of available recording capacity, remaining battery life, and other body-worn camera status
- The body-worn video camera can be set to audio-only recording mode
- Upload of video and audio data does not have to wait until the end of a shift or when the body-worn video camera is manually placed in an Upload docking station. Video and audio data can be immediately uploaded to In-Car Video Camera Systems, to Central Records Management systems, or to Cloud Storage. The video, audio, and metadata does not have to be at risk of being stolen, lost or compromised because it is only stored on the body-worn video camera until the end of a shift when the device is manually docked.
- The body-worn video camera can be used to send and receive secure voice and text messages when within range of an In-Car wireless communications router.

These capabilities are all representative of what the "Internet of Things" (IoT) can bring to Public Safety. Smart devices automatically reporting relevant data, so the Police Officer can focus on the situation, and his or her personal safety. Other responding Police Officers can approach an Incident with Situational Awareness of what is happening. Certainly the Police Officer should not be distracted by having to remember to manually turn on a body-worn camera. All the IoT technology included within the Evidence EcoSystem™ should be integrated to support the Police Officer and Public Safety.

Several of these capabilities warrant further explanation as described on the following pages.

## Generation 2 Body-Worn Camera Capabilities

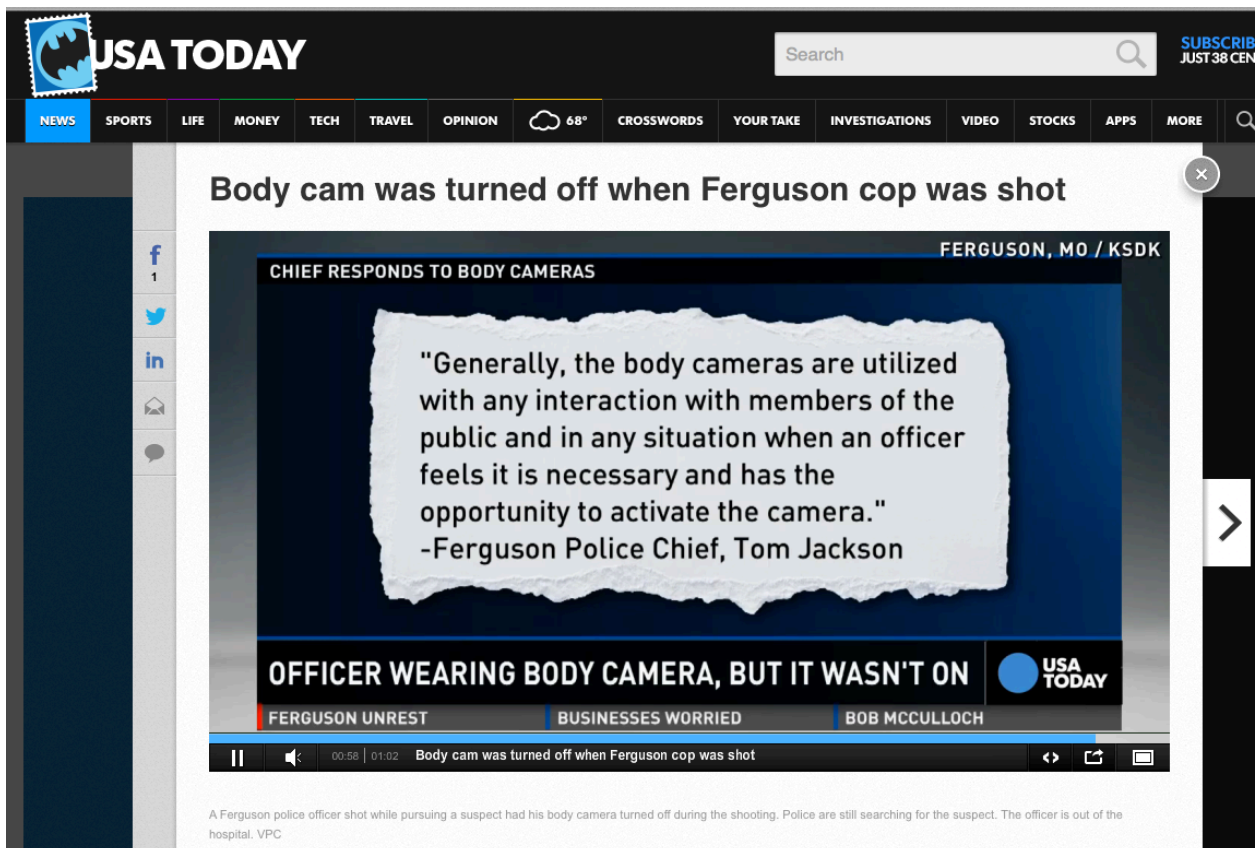
The primary Generation 2 body-worn camera advantages are real-time IP-based Internet connectivity, high-resolution video, and internal GPS. Most all Generation 2 body-worn camera capabilities flow from these three fundamental technical capabilities.

### Recording is triggered automatically

Once an Incident begins, the Police Officer should focus all attention on the Incident and their personal safety, and not be distracted by having to remember to turn on their body-worn camera.

“You want activating the camera to be a reflexive decision, not something that officers have to evaluate with each new situation. If officers have to determine what type of incident it is before recording, there are going to be a lot of situations in which a recording might have exonerated an officer, but the recording was never made.” Report Page 12.

Just this past Saturday September 27, 2014, a Ferguson, Missouri police officer was wearing a body-worn camera and was shot. However, the Generation 1 body-worn camera was not turned on, so there was no video of the Incident.



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### Body cam was turned off when Ferguson cop was shot

FERGUSON, MO / KSDK

CHIEF RESPONDS TO BODY CAMERAS

"Generally, the body cameras are utilized with any interaction with members of the public and in any situation when an officer feels it is necessary and has the opportunity to activate the camera."  
-Ferguson Police Chief, Tom Jackson

**OFFICER WEARING BODY CAMERA, BUT IT WASN'T ON** 

FERGUSON UNREST BUSINESSSES WORRIED BOB MCCULLOCH

00:58 | 01:02 Body cam was turned off when Ferguson cop was shot

A Ferguson police officer shot while pursuing a suspect had his body camera turned off during the shooting. Police are still searching for the suspect. The officer is out of the hospital. VPC

<http://www.usatoday.com/videos/news/2014/09/29/16415595/>



St. Louis County Police spokesman was quoted as saying: “he didn’t know why the body camera the wounded officer was wearing was turned off during the shooting”.

<http://stlouis.cbslocal.com/2014/09/28/body-camera-wasnt-on-when-ferguson-officer-was-shot/>

Another recent tragic example of what can happen is the San Francisco Bay Area Rapid Transit (BART) Police Officer death in January 2014. Two BART officers were investigating a robbery and entered an apartment. One BART Officer accidentally shot and killed the other BART Officer. Both Officers were wearing Generation 1 body-worn cameras. However, neither Generation 1 body-worn camera was turned on.

[http://www.mercurynews.com/crime-courts/ci\\_25866927/da-no-charges-will-be-filed-fatal-shooting](http://www.mercurynews.com/crime-courts/ci_25866927/da-no-charges-will-be-filed-fatal-shooting)

A Generation 2 body-worn camera will activate and start recording automatically when turning on the vehicle siren or lightbar at a routine traffic stop, or being dispatched to a 911 call and then opening the car door, without the Officer having to remember to do anything. All but the most routine Incidents are high risk and high stress to a Police Officer. Having to remember to turn on a body-worn camera is a distraction the Officer does not need. History shows that often the Officer does get distracted and forgets to manually turn on his or her body-worn camera.

With real-time wireless connectivity to In-Car Video Recording systems and to Central Dispatch, a body-worn camera can be automatically triggered to record at the same time the In-Car Video Recorder is automatically triggered to record. When the patrol vehicle siren or light bar is turned on, any nearby body-worn camera automatically starts recording as well. Generation 2 body-worn cameras can also be triggered by other inputs such as internal Accelerometer high G Force events resulting from running and physical struggles. The Generation 2 body-worn camera will start recording if it is not recording already. Field Supervisors, Central Dispatch, and Video Integration Center operations officers can use internet connectivity to also remotely start recording on a Generation 2 body-worn camera.

With real-time connectivity to other nearby devices, a Generation 2 body-worn camera can signal to other nearby Generation 2 body-worn cameras that an Incident is in progress, and cause all other nearby Generation 2 body-worn cameras to also start recording. The Police Officer does not have to take any manual action to start Generation 2 body-worn camera recording. Other nearby In-Car Video systems can also be triggered to start recording.

### **Record in High Definition**

A primary takeaway from the Boston Marathon Bombing is the limited value of low-resolution video. The Boston Police and FBI were stumped because the video of the two suspected bombers was so poor that the suspects could not be identified. Facial recognition software did not work on the low-resolution images the Boston PD collected. Despite having several videos of the two primary suspects, and the efforts of photo enhancement experts, the suspect identities remained a mystery for three full days. If better quality images had been able to identify the suspects sooner, MIT police officer Sean Collier might not have been killed.



FBI Press conference three days after the Bombing showing pictures of the two suspects:



Enhanced but still poor quality Suspect images from a surveillance video from a business located on Boylston Street.



After these FBI images were released, citizen David Green provided the following high-resolution photo taken with his iPhone 4s to the FBI. “White Cap Suspect # 2” is seen in the bottom left corner of this picture.



Because the iPhone 4s camera was much higher resolution than any other video or picture the FBI had, it was possible to zoom in on a much clearer picture of the suspect.



In the NY Times article by Ravy Somaiya and Jeremy Zilar published on April 18, 2013, David Green reported FBI agents stated "his picture was the best they had, because it was taken from a better camera than the others that were posted".

The Boston Marathon Bombing clearly demonstrated that low-resolution video was not able to reliably identify suspects. Police Officer body-worn cameras should have the same high-resolution video and image capabilities of the average Citizen cell phone.

### **Stream Live Video**

Without requiring any ancillary device, Generation 2 body-worn cameras can stream live video to In-Car Video Recording systems, Supervisors, and to Central Dispatch. WiFi-enabled Generation 2 body-worn cameras can stream live Incident video from several hundred feet away to the police car or to authorized WiFi Access Point. From the police car or Access Point, the video can then be streamed to Central Dispatch or to a Supervisor vehicle for immediate display. Generation 2 body-worn cameras with cellular connectivity can stream video directly to Central Dispatch and to Supervisors in the field.

### **Cannot be turned off during an Incident**

Generation 1 body-worn cameras are manually controlled, so they can be manually turned off at any time for any reason - good or bad. This raises the troubling potential of video not being captured on purpose. In the New Orleans officer-involved shooting of Armond Bennett in early August 2014, Generation 1 body-worn cameras were turned off deliberately. "Not only did she turn her camera off, her partner turned his off, too," Bennett Attorney Nandi Campbell stated.

<http://www.wdsu.com/news/local-news/new-orleans/use-of-bodyworn-cameras-questioned-in-new-report/27903998#ixzz3EGslaFKV>

Once an Incident has started, Generation 2 body-worn cameras can be configured to only turn off when the In-Car Video Recording system is turned off, by a command from a nearby Supervisor Generation 2 body-worn camera, or remotely by Central Dispatch when it is determined the Incident is over. As the Body-Worn Camera Recommendation report points out, Officers must have Discretion and Accountability. If the body-worn camera can be manually turned off at any time with just the push of a button, there will always be a question of whether all relevant video for the Incident was captured.

A Generation 2 body-worn camera can audibly announce that it has stopped recording, so that both the Police Officer and nearby Citizens have positive audio confirmation of body-worn camera has in fact stopped recording. Furthermore, the audio announcement can be included as the last part of the Evidence recording. GPS location, date and time metadata are always recorded in a Generation 2 body-worn camera. So there is hard evidence that the recording was stopped on purpose, the Public was notified that recording was stopped, and the location and time when recording was stopped is also recorded. A Generation 2 body-worn camera can make sure there are no unexplained gaps in the video recording.

## Includes integrated GPS

Generation 2 body-worn cameras have an internal GPS, so all video and audio is automatically tagged with GPS location metadata. Generation 1 body-worn cameras that have no GPS, or rely upon a second Bluetooth-connected device or other source of GPS location data are inherently unreliable compared to a Gen 2 body-worn device that has GPS built-in.

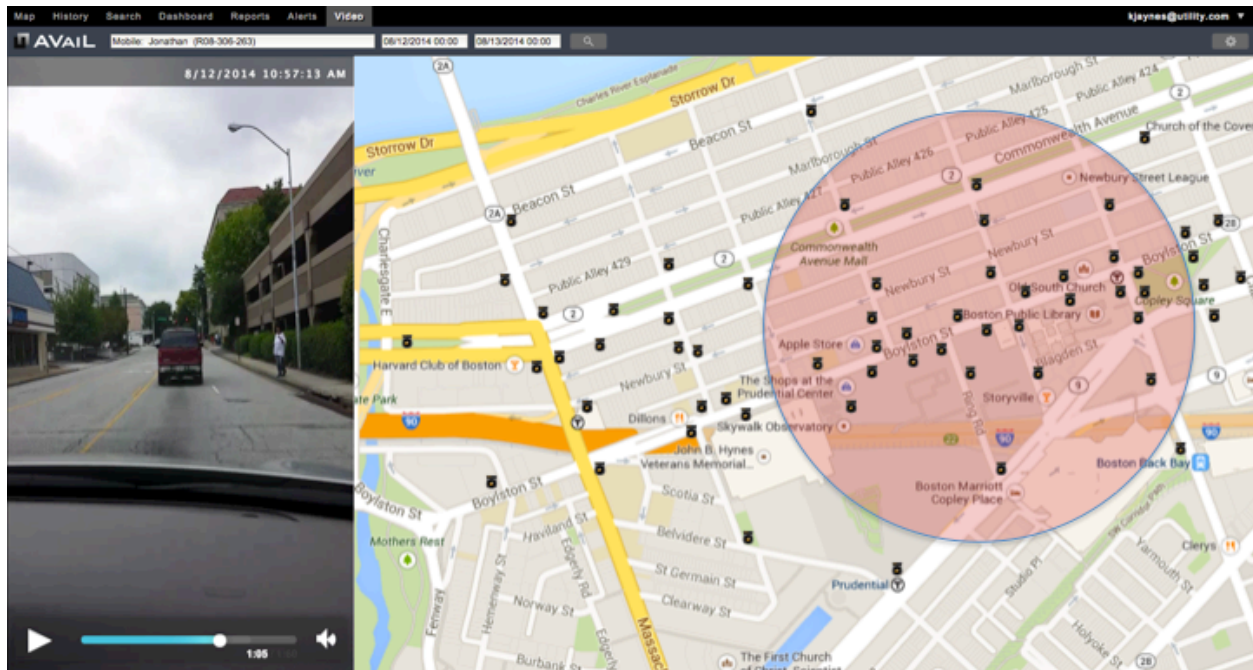
Because Incidents can change location, and can spread out once the Incident starts (Suspects take off running in different directions, the Citizen vehicle flees the scene after a stop, etc.), having direct GPS location metadata of exactly where the video was captured is important legal evidence. The Generation 2 body-worn camera moving away – i.e. the Officer moving away - from patrol car location can also be an automatic trigger to begin recording.

## Includes integrated 3-Axis Accelerometer

Generation 2 body-worn cameras have an integrated 3-Axis Accelerometer that can report rapid G Force motions such as the Officer running and physical struggles. This can be another automatic trigger to start recording if the body-worn camera is not already recording.

## Start recording all body-worn cameras within a GeoFence

With all Generation 2 body-worn cameras communicating GPS location to Central Dispatch on a real-time basis, it is possible to remotely start video recording on all devices within a GeoFence zone. As an example, if Boston Police had Gen 2 body-worn cameras, a Dispatcher could have drawn a GeoFence around the location of the Boston Marathon Bombing, and immediately cause all body-worn and In-Car systems in the GeoFence zone to start recording.





Furthermore, a Generation 2 body-worn camera can announce a Central Dispatch audio message such as “An Emergency is in progress – do not turn off your body-worn camera”. Real-time location reporting and wireless connectivity provides First Responder Situational Awareness and Command & Control capabilities that Generation 1 body-worn cameras can never provide.

### **Upload recorded video immediately**

Video from a Generation 2 body-worn camera can be immediately streamed to an In-Car Video Recorder or to an authorized Access Point whenever in wireless range of the vehicle, which is almost always the case. The body-worn video can be stored on the In-Car Video server along with front and back seat camera video feeds in an integrated video set. The Generation 2 body-worn video is then immediately viewable on the In-Car Video Recorder system display, and can be annotated and marked along with video from the In-Car Video front and back seat cameras. The Officer does not have to wait until the end of the shift to manually dock the body-worn camera to then be able to add notes to the body-worn camera video. If the body-worn has cellular connectivity, the video can be immediately uploaded from anywhere in cell coverage. Central CAD Dispatchers and Supervisors have the ability to view Generation 2 evidence video as it is collected and uploaded to the In-Car Video system or to “the Cloud”.

Because body-worn video is uploaded immediately as it is captured, the video is not at risk of being lost, damaged, stolen, or tampered with before the end of the shift. Suspects are less likely to attempt to seize and destroy video evidence on Generation 2 body-worn cameras once they know the video is immediately uploaded as it is recorded. Once word gets around that Generation 1 body-worn video is not uploaded until the end of a shift – as word certainly will get around – bad actors will have a powerful incentive to seize and destroy the body-worn video evidence before it gets uploaded. On the plus side, Supervisors do not have to take control of Generation 2 body-worn cameras immediately after an Incident, since the video evidence is automatically uploaded as it is captured. There is no opportunity for the Officer to tamper with or lose the video evidence. Immediately uploading body-worn camera video increases Officer Safety and Public Trust. With Generation 1 body-worn cameras, video evidence is completely at risk of being tampered with or lost until the manual upload at the end of the shift – often several hours later -- is completed. Once all parties understand that video is being immediately and securely uploaded, all parties are more likely to be careful about their behavior. The best outcome is for a Situation to be defused and to never turn into an Incident. The best Incident is the one that never happens.

Once video is automatically uploaded to central storage and the Chain of Custody of the video has been validated, the video can be deleted from the Generation 2 body-worn camera just like video is automatically deleted from In-Car Video Recording systems. This immediate Chain of Custody validation process for Generation 2 body-worn cameras frees up body-worn camera video storage space. No video is permanently retained on the Generation 2 body-worn camera. So there is no reason for the body-worn video camera to be retained for an Open Records Request, and the video can't be leaked to unauthorized third parties.



## Recorded Video cannot be uploaded to YouTube and Social Media Web Sites

Since video is not retained on a Generation 2 body-worn camera, it cannot be later uploaded to unauthorized 3<sup>rd</sup> party web sites. In addition, Generation 2 body-worn cameras do not store video in open video file formats such as .MOV and .AVI. Generation 1 body-worn cameras often store video in open, common video file formats that can be uploaded to YouTube and other Social Media sites, and the video can be played and copied by consumer video player software found on any Windows or Mac computer.

The January 2014 Asiana Airlines crash at the San Francisco airport is an example. A camera mounted on a firefighter helmet recorded video of a San Francisco Airport fire truck running over and killing an injured passenger who had survived the crash. The video was leaked to CNN and posted on YouTube within hours after the crash.



<https://www.youtube.com/watch?v=9BHDfzKMHM0>

<http://www.cnn.com/2014/01/15/us/asiana-crash-new-video/>

No Elected Official or Police Department wants body-worn camera video leaked to YouTube or Social Media sites. Capturing and storing video in a secure non-consumer video file format is the only sure way to prevent unauthorized postings of evidence video to YouTube and other Social Media sites, or to be shared in a way that infringes on Public Privacy Rights.

## **Video file format supports metadata**

The open Generation 1 body-worn camera video file formats generally do not have a separate metadata storage capability. So metadata such as date, time, and GPS coordinates have to be overlaid on top the video image itself. This overlaying of metadata on top of the video image obscures the image behind the metadata overlay. Important evidence can be obscured.

Generation 2 body-worn cameras use a video file storage format that includes a separate metadata storage track. This separate metadata track stores time, date, GPS location, and other metadata such as 3-Axis accelerometer data indicating when and where the video was recorded, where the Officer was running, or where the Officer was involved in a struggle. The metadata track is automatically synchronized with the video and audio, so the time and location relationship of video, audio, and metadata is assured.

## **Distribute BOLO, Amber, Silver and other Alerts and Pictures to Bodyworns**

With real-time two-way wireless connectivity and a display screen included as part of a Generation 2 body-worn camera, Central Dispatch can broadcast BOLO, Amber, Silver, or other alert to a Generation 2 body-worn camera. Alerts are immediately available to the Police Officer. Alerts can be sent to a single body-worn camera, a group of body-worn cameras, to all body-worn cameras within a GeoFence area regardless of what groups they may belong to, or to all body-worn cameras across the Department. The alerts and pictures are displayed on the Generation 2 body-worn camera Alerts status screen.

## **Evidence is automatically Indexed**

All evidence captured “on the fly” by Generation 2 body-worn cameras with internal GPS, Accelerometer, and real-time communications can be automatically indexed so that all evidence from all nearby Generation 2 body-worn cameras and In-Car Video recording systems are all tied to the Incident. All Incident video, audio, and metadata is searchable and available to Police Officers, Supervisors, Prosecutors, Defense Attorneys, the Courts and to the Public after appropriate Evidence Disclosure and Citizen Privacy issues are addressed. Generation 2 body-worn cameras with real-time wireless cellular broadband, WiFi, RFID, and Bluetooth connectivity to other devices and to Central Dispatch can immediately index all video, audio, and metadata evidence to the Incident.

## **Securely Authenticate with In-Car Video using NFC**

Generation 2 body-worn cameras with a Near Field Communications (NFC) link capability can be linked to an In-Car Video system through a simple NFC chip touch process. An NFC chip in the vehicle positively identifies the vehicle. There is no need for a manual login process to “assign” a Generation 2 body-worn camera to a vehicle. Touching the Generation 2 body-worn camera with NFC reader capability to a vehicle NFC chip can automatically initiate an encrypted authentication credentials process to establish a secure VPN link between the Generation 2 body-worn camera and the vehicle In-Car Video Recording system.

## Incidents are not always stationary

It is important to note that Incidents are often not stationary. An Incident may start as a traffic stop, but then turn into a suspect fleeing the scene on foot, or fleeing in their vehicle in a high-speed car chase. These types of Incidents almost always involve multiple Officers who get involved in the Incident, all on an ad hoc basis. The Evidence EcoSystem™ (described in the following pages) engages all available Officers and all mobile and fixed location evidence-gathering devices in the vicinity of an Incident, and along the route of travel of an Incident, wherever the Incident may evolve and travel. It is never possible to predict how an Incident may evolve, or what Officers, vehicles, and other IoT evidence-gathering assets might become engaged in an Incident.

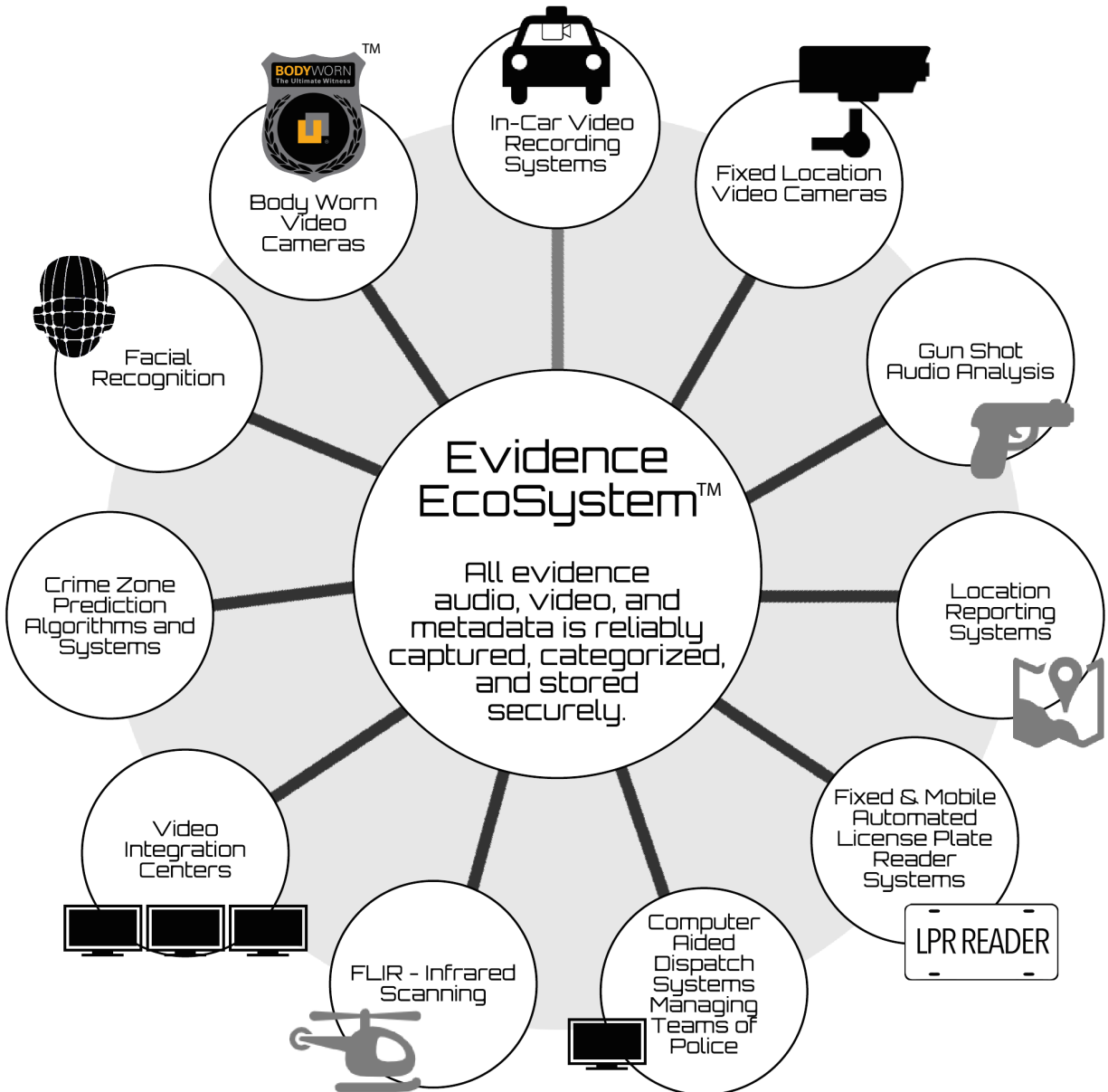
It is therefore necessary for the Evidence EcoSystem™ to be self-organizing and automatically engage all In-Car Video recording systems, Officer body-worn cameras, fixed location cameras, and other relevant IoT evidence gathering assets “on the fly” as an Incident evolves and travels from location to location. Generation 2 body-worn cameras within a designated area around an incident can all be triggered by Central Dispatch to begin collecting evidence. Furthermore, Generation 2 body-worn cameras can communicate with each other and the Evidence EcoSystem™ so that recording is triggered automatically in all nearby Evidence EcoSystem™ devices. GPS position report metadata includes Speed and Heading, so In-Car and Officer body-worn cameras can provide the direction data necessary to activate fixed location cameras and other police vehicles along the current route of travel for the Incident.

Generation 2 body-worn cameras that automatically report GPS location also provide a significant safety benefit for an Officer involved in a foot chase. It will not take long for a foot chase to take an Officer out of visual sight range of other police officers. Central Dispatch, Supervisors, Police Helicopters, and other Officers want to know where other Officers are located on a real-time basis so they have Situational Awareness so they can best assist the Officer. Real-time GPS location data of all Officers can help avoid a friendly fire situation from turning into a tragedy. If an Officer is injured during a foot chase, a Generation 2 body-worn camera reporting real-time officer location and with a real-time emergency reporting capability could save his life.

There are many reasons why a Police organization wants the real-time location reporting data that a Generation 2 GPS enabled body-worn camera with real-time internet connectivity can provide. Incidents often do not stay where they start.

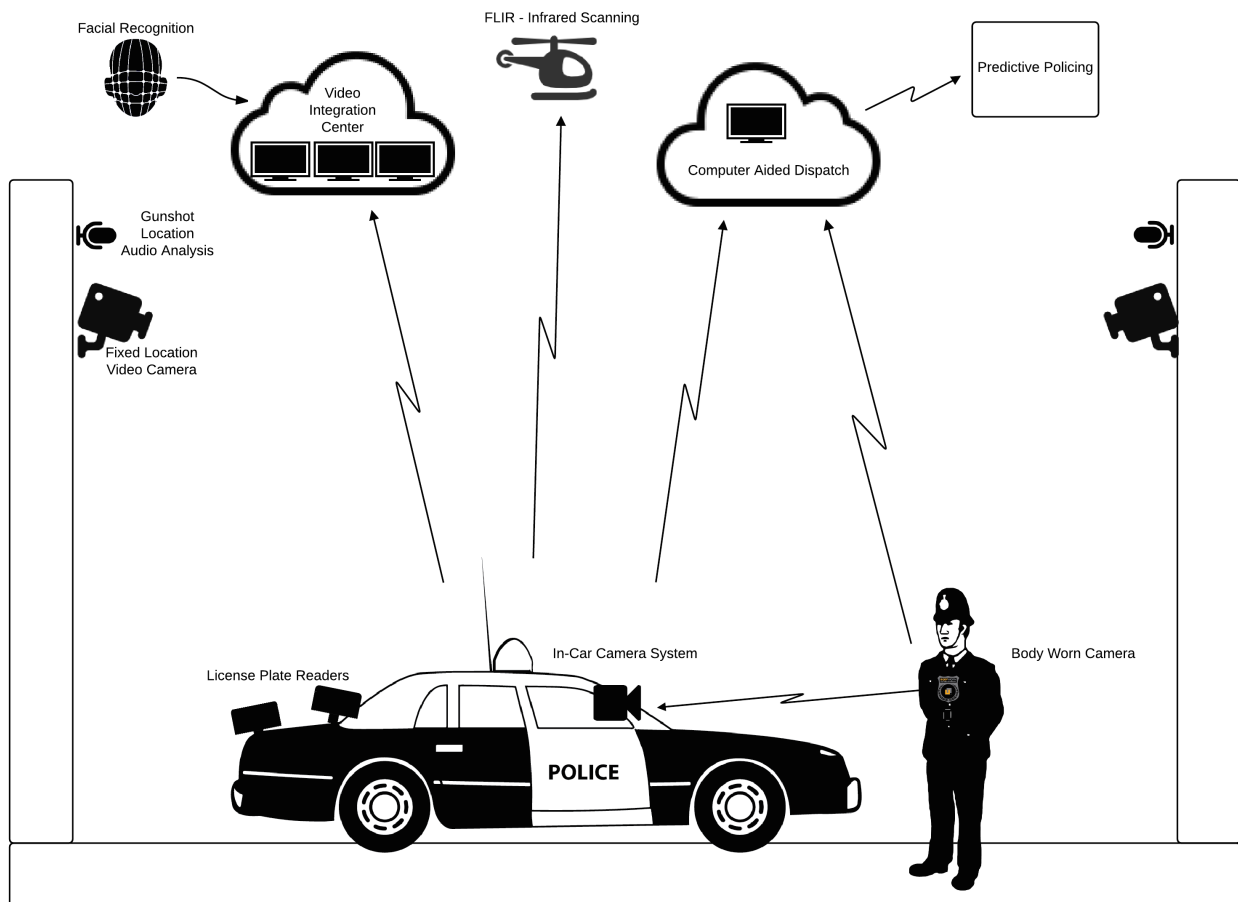
## Evidence EcoSystem™ – IoT and the Future of Public Safety

Generation 2 Bodyworn cameras are an integral part of an overall Evidence EcoSystem™. An Evidence EcoSystem™ is the real-time Internet of Things (IoT) interconnection of all evidence capturing devices, along with real-time connectivity, data analysis, and data storage involved in an Incident. An Incident is any kind of event where evidence might be collected for use in a future court case and for Public Safety.



The Evidence EcoSystem™ includes not only Generation 2 Body-worn video cameras. It also includes In-Car Video recording systems, fixed location video cameras, gun shot audio analysis and location reporting systems, fixed location and mobile Automated License Plate Reader (ALPR) systems, Central Dispatch 911 and Computer-Aided Dispatch (CAD) systems

managing teams of police officers, Video Integration Centers (VIC) gathering and displaying video feeds from fixed location and mobile video cameras in a region, real-time connectivity to the National Crime Information Center and other federal and state databases, crime zone prediction algorithms and systems, and video, audio, and metadata evidence storage and distribution systems to provide evidence video to Courts, Prosecutors, Defense Attorneys, Citizens involved in an Incident, and to the Public through open records requests. Evidence video, audio, and metadata in the Evidence EcoSystem™ are reliably captured, categorized, and stored securely. Central Dispatch and Field Supervisors have real-time Situational Awareness of Incident events from all data capturing devices in the vicinity of the Incident. All IoT components in the Evidence EcoSystem™ can be interconnected, and communicate video, audio, location and other metadata on a real-time basis. This integration provides reliable capture of the facts, while enhancing Officer safety and protecting Citizen Privacy Rights.



Generation 1 body-worn cameras with no connectivity to the overall Evidence EcoSystem™, where video has to be manually uploaded at the end of a shift, does have utility. But only if the Officer remembers to turn on the Generation 1 body-worn camera at the start of an Incident. Generation 1 body-worn cameras have data capture reliability, connectivity, and video storage security flaws that Generation 2 body-worn cameras overcome through real-time connectivity, secure video file storage, and internal GPS technology.

## Threat to Citizen Privacy Rights – Always on “Pre-Event” Recording

The Body-Worn Camera Recommendations report states body-worn cameras raise important questions about Citizen Privacy Rights and Trust. Privacy is the first topic mentioned in the report’s “Chapter 2 - Considerations for Implementation”. Determining “When to Record” was cited as the issue with the greatest Privacy implications. PERF believes “requiring officers to record every encounter with the public would sometimes undermine community members’ privacy rights and damage important police-community relationships”. We agree that Officer discretion is needed, and that body-worn cameras should not record at all times.

PERF further reported that very few departments have adopted a policy of recording all encounters with the Public. From Page 13 - “The more common approach is to require officers to activate their cameras when responding to calls for service and during law enforcement-related encounters and activities, such as traffic stops, arrests, searches, interrogations, and pursuits.”

As this paper has shown, Generation 2 body-worn cameras can be automatically triggered to start recording when an Officer is dispatched to a call, when an In-Car Video Recording system is triggered by a siren or a light bar, when another Generation 2 body-worn camera in the vicinity starts recording, or through any number of other automatic recording triggers. In all cases, the Generation 2 body-worn camera is not recording until it is automatically triggered to record, without distracting the Officer, thus protecting Citizen Privacy Rights and supporting the PERF recommendation.

However, some Generation 1 body-worn cameras advertise the ability to do “Pre-Event Recording”. This means the body-worn camera is always recording, so that a prior 30 or 60 seconds of video can be saved once the Officer manually presses the Start Record button. A body-worn camera that is always recording is completely at odds with the PERF recommendation to not record all encounters, is a threat to Citizen Privacy Rights, and has a potential negative impact on Community Relations.

As a practical matter regarding Pre-Event Recording, in many cases the Officer is in a patrol car. Turning on the siren or lightbar, or some other automatic trigger, starts the In-Car Video Recording system. Subsequently opening the police car door can trigger the Generation 2 body-worn camera to start recording. The body-worn camera in the preferred chest mount position is pointed at the car steering wheel and front dash until the Officer exits the vehicle. 30 seconds of “Pre-Event” video of the steering wheel and front dashboard of the vehicle at the start of an Incident does not provide useful evidence. Getting out of the patrol car is not the time the Officer needs to be distracted with having to remember start his body-worn camera. A Generation 2 body-worn camera can automatically start recording when the Officer opens the police car door – without the Officer having to remember to manually start anything.



In cases where the Officer is on foot patrol, a Call for Service from Central Dispatch can remotely start body-worn camera recording. Central Dispatch can start body-worn camera recording at any time. Voice Recognition commands, running, loud sounds, or a manual control press can also start recording. With Generation 1 body-worn cameras, if the Officer is distracted, or gets into an altercation, and does not remember to manually start the body-worn camera, or is not able to manually start recording on the Generation 1 body-worn camera, no video evidence is ever collected. The advantages of Community Policing and having a relationship with Citizens in the community will be lost when the public understands that a Generation 1 body-worn camera is always recording to capture “Pre-Event” recording.

Pre-Event Recording is useful if 30 seconds or less into an Incident, an Officer remembers he forgot to turn on his body-worn. If he remembers within 30 seconds, manually pressing the record start button on a Gen 1 body-worn will capture the start of the Incident. Otherwise the start of the Incident is lost. The far better approach for Officer safety and Public Privacy Rights is to have a Generation 2 body-worn camera that starts recording automatically based upon an Evidence EcoSystem™ IoT trigger. Human error should not prevent Incident video capture.

As the PERF report states on page 13 about Community-oriented Policing -- “Their goal, always, is to maintain an open dialogue with community members and preserve the trust in their relationships”. To maintain Public Trust, Police departments should always be transparent to the Public about how public safety technology actually works.

## Conclusions

The Reliability, Security, and additional capabilities of Generation 2 body-worn cameras are compelling for increasing Officer Safety and maintaining Public Trust, and will be a key part of the overall Evidence EcoSystem™. The overall goal is to have technology that encourages everyone to stay on their best behavior, so that a Situation does not turn into an Incident. The best Incident is one that never happens.

History has shown that too often the Police Officer does not remember to turn on a manually controlled Generation 1 body-worn camera. Automatic triggering of video recording is an essential part of a minimum viable body-worn camera.

Generation 2 body-worn technology is proven, reliable, and costs no more than Generation 1 body-worn cameras. Generation 2 body-worn cameras with real-time internet connectivity, high resolution cameras, secure video storage, automatic location and sensor capability such as GPS and G Force Motion Accelerometers, and real-time IoT integration into the Evidence EcoSystem™ make Generation 1 manually controlled, unconnected body-worn cameras obsolete. This paper has pointed out many compelling reasons why police departments considering body-worn camera technology should invest in Generation 2 body-worn cameras.