



VSCT DRONE PILOT

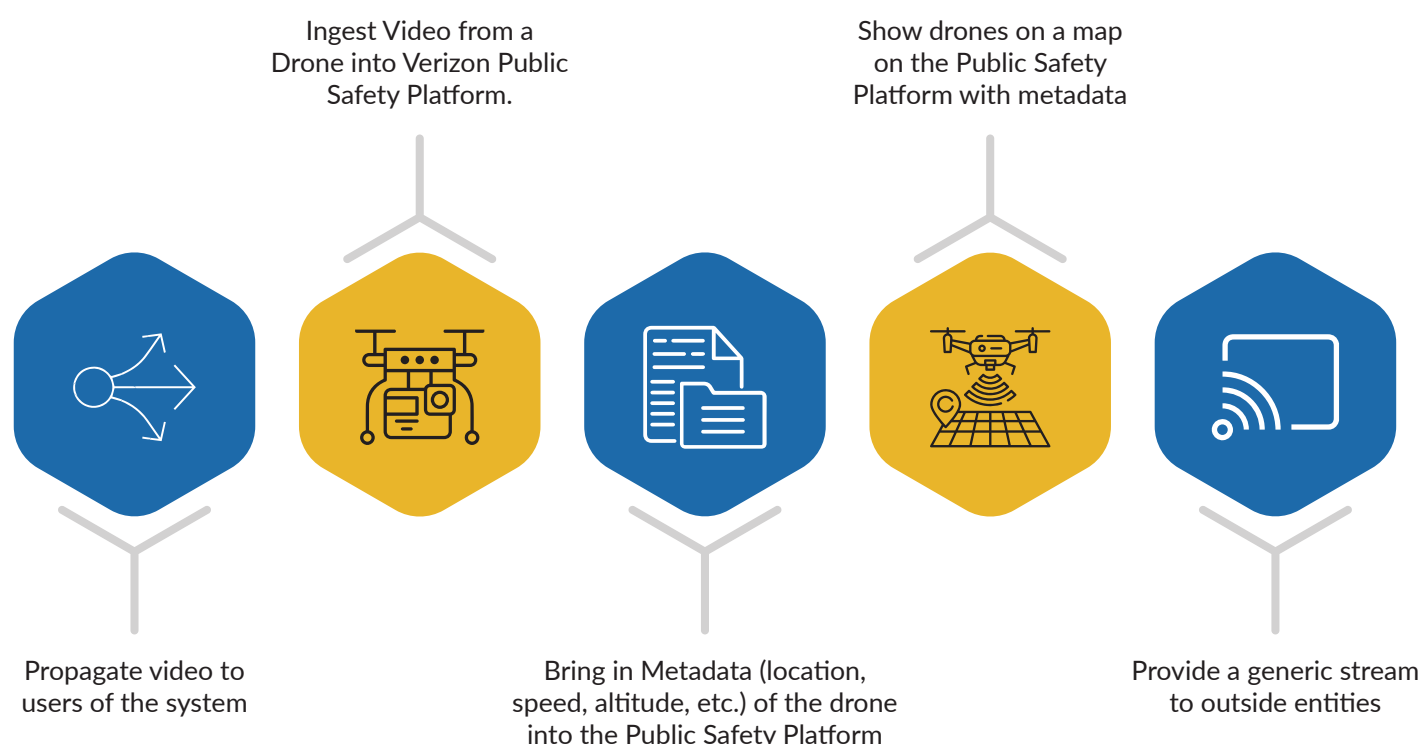
INTRODUCTION

The Virginia Smart Community Testbed (VSCT) has evolved as a true Public-Private Partnership (P3) with the support of the Center for Innovative Technology (CIT) and Stafford County, supporting the Testbed vision and plan to develop smart communities across Virginia. The Testbed is a “live laboratory” to test new smart technology and generate practical, proven solutions that can be used by cities and counties across Virginia. Additionally, the transfer of testbed-generated knowledge and the proof-of-concept will support the Stafford Smart Town Center project and other similar smart municipal projects across Virginia.

To achieve the objectives of the Testbed, we have worked to build a strong team of partners and vendors who will participate in the Testbed. These partners are selected based on their unique capabilities in different technical and business areas, including IoT security; 5G network; Cloud infrastructure and services; cybersecurity; data, flood and environmental sensors; drone systems and technology; data analytics; Artificial Intelligence (AI) and Machine Learning (ML); and complex network integration solutions. The Testbed operating framework is collaborative in its approach, with each industry partner providing “best-of-breed” solutions. These partners are carefully selected based on their specific capabilities, roles and expertise in implementing smart cities around the world, and their willingness to contribute to our collective success. Together we focus on relevant and practical Use Cases to produce implementable solutions using emerging and smart technologies.

Unmanned Aircraft Systems (UAS) can be valuable tools in public safety and emergency response. They leverage human capital, accelerate response and increase the safety of first responders and people in crisis. While small drones are becoming ubiquitous in other fields, they are not yet used widely in emergency response due to concerns with deconfliction with conventional (manned) helicopters performing low altitude search and rescue missions. Beyond Visual Line of Sight UAS (BVLOS UAS) operating at medium altitudes have also shown great promise in responding to emergency and disasters. With the FAA approval for routine BVLOS UAS operations in the National Airspace System (NAS) emerging as a near-term FAA priority, the use of UAS in real-world emergency and disaster response has become a real prospect.

In this report, we briefly describe the pilot project related to the using Verizon Public Safety and Verizon wholly owned subsidiary Skyward services to retrieve video and metadata from drones. The Phase One pilot project was concluded for nine months with final public demonstration on May 25, 2021. It consisted of a controlled systematic process to achieve stated test objectives and maintain scientific and empirical rigor and standards in conducting drone pilot projects. Overall goals of the Phase One Pilot Project included:



ACTORS AND PILOT PROJECT

There were four main actors in this pilot project: Verizon and its wholly owned subsidiary, Skyward; Stafford County Department of Public safety; CIT; and OST, Inc. OST served as systems integrator and overall pilot project coordinator. The pilot project was developed and implemented in three detailed phases:

Phase 1

- Create detailed deployment and test plan
- Perform on location discovery of targeted drone
- Bring in Metadata (location, speed, altitude, etc.) of the drone into Skyward Platform
- Ingest Video into Streaming Platform
- Visualize the Video and Drone Location Metadata

Phase 2

- Integrate API Metadata into Verizon Public Safety Platform
- Integrate RTSP Video Stream into the Verizon Public Safety Platform
- Show drone on map on Public Safety Platform with metadata
- Propagate video to users of the system and provide a generic stream to outside entities

Phase 3

- Demonstrate fully integrated system and conduct final testing and demonstration
- Conduct final testing and demonstration

OBJECTIVES, TASKS AND SCOPE

OBJECTIVES

This pilot project had two specific objectives:



Verizon Video Management System ("VMS"): Verizon's VMS is a video application designed to provide near real time awareness. The system is used for advanced video monitoring and edge-based analytics to trigger alerts capture video and transfer relevant video to the cloud-hosted Video Management System for viewing and archival purposes.

This Intelligent Video Service monitors indoor and outdoor environments by capturing and storing video, and triggering alerts based on near real time video analytics. The advanced video monitoring and edge-based analytics will trigger alerts, capture video and transfer relevant video to the cloud-hosted Video Management System for viewing and archival purposes securely. Only privilege-authorized personnel will have access to the video.

For VMS platform integration, Verizon provided access to a cloud-hosted instance of Verizon Intelligent Video. This platform is able to integrate datasets from Skyward's API Integration to Verizon Intelligent Video Service including location, speed, and altitude of drone plotted on an IV mapping function. The solution can support up to 10 drones subject to the following conditions:

- The solution must be online to receive any metadata information.
- When the telemetry information is not available, no overlay will be shown.
- Video from the drone will be archived for 30 days.
- The selected Real Time Streaming Protocol (RTSP) encoder MUST be compatible with Security Center.
- If a recording is deleted then all the metadata that was inserted will be deleted as well.

Skyward Service:

Verizon provided the pilot users with access to Skyward Inc., a Verizon affiliate company, ("Skyward") software as a service (SaaS) platform for drone operations management. Pilot users had access to Skyward's platform and mobile application. The Skyward Service integrated with the Verizon Intelligent Video Service to receive data transmissions from Verizon-provided or User-provided Equipment and provided such data transmissions to Verizon-provided Equipment and Video Management System.

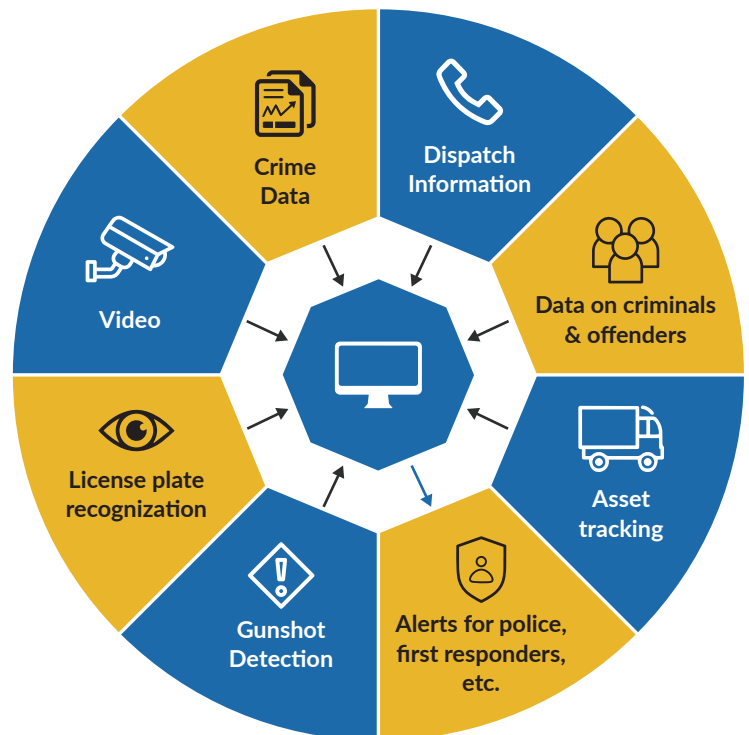
The following were the key demonstration objectives for this pilot:

1. Verizon Public Safety Platform to pick up streams from third party platforms using generic cameras.
2. Drone metadata / telemetry sent to Skyward Platform. Skyward to normalize the data and make it available via API. Verizon Public Safety Platform integrated with Skyward to pull metadata.
3. Verizon Public Safety Platform to distribute information to User
4. Video transmission via Security Desk and Web Interface
5. Mapping and drone tracking via Security Desk
6. Outside entities provided RTSP streams

SCOPE

The Verizon Real-Time Response System and Skyward Platform using Drone Video Surveillance System were used to demonstrate how the Law Enforcement Agencies could use such system in near real time. The solution helped visualize near real time video captured from the drone surveillance camera as well as the GIS Location of the drone.

Real-Time Response System (RTRS) is a CJIS-ready, decision-support solution that integrates and compiles data from multiple sources, such as computer-aided dispatch, video sensors, record management systems, etc., providing a consolidated and accurate real-time view of the city or an event. The overall goal of the solution was to map the captured video from the Drone to the location of the drone on a map and facilitate streaming of the video to other entities.



VISUAL MODEL

We developed a use case for this pilot to demonstrate drone integration and the use of Verizon products for public safety. This included using Skyward services to retrieve video and metadata from drones, and then send video to a third-party streaming platform. The Verizon Public Safety Platform picked up streams from third party platforms using generic cameras. Drone metadata and telemetry were sent to the Skyward Platform. Skyward normalized the data and made it available via API. The Verizon Public Safety Platform integrates with Skyward to receive and process metadata. This architecture is shown in Exhibit below. Using this architecture, the Verizon Public Safety Platform distributed information to the customer, with video provided via Security Desk and web interfaces. Mapping and drone tracking was conducted using Security Desk, and outside entities provided real-time streaming protocol (RTSP) streams.



CONCLUSION

The use of drones for public safety pilot projects is an ongoing effort to design and build effective drone systems for public safety and emergency management in Stafford County. Virginia Smart Community Testbed is an extraordinary opportunity to develop proof of concept and solutions for establishing a modern and effective drone system and platform in Stafford County. Other counties and cities can benefit from this unique approach and proven solution. We expect to further test and refine these solutions including the integration of 5G in Phase Two of the drone pilot project.

There were many lessons learned from this Phase One pilot project:

- Technology and systems integration remains a significant challenge for establishing modern drone program for public safety.
- Management of data is a critical component of any successful drone program
- Effective use of drone management platforms can provide low latency (as was the case in this pilot) for real time video transmission
- Training of public safety personnel is critical to making an effective use of these modern systems
- To conduct drone pilot projects, it is critical to have face- to- face interaction between technical and public safety personnel. Integration of technology done virtually (due to the pandemic) was an impediment to conducting effective systems integration and pilot project.
- The Drone Management Platform must be seamless because public safety personnel work under tremendous time constraints.