

# An Evaluation of Shared Video Integration in Volusia County

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## Introduction

This report summarizes the evaluation of a newly constructed fiber-optic communications network intended to provide video sharing between multiple public agencies responsible for traffic management in the Volusia County, Florida area. The Florida Department of Transportation (FDOT)-District 5, Volusia County Traffic Engineering Department, and the City of Daytona Beach Traffic Engineering Department contracted with Traffic Control Devices, Inc. (TCD) to integrate their three existing unique video monitoring systems into a single “shared” video traffic monitoring system. This shared video system provides each of the participants to view full-motion color video feeds from each of the other agencies cameras, and allows the video to be shared with other transportation agencies like Volusia County Transit (Votran), where it will be used to assist their dispatch center in transit fleet management especially during construction or special events.

The Center for Urban Transportation Research (CUTR) at the University of South Florida (USF) was contracted to serve as an independent evaluator of the shared video integration project, to evaluate and document how well the system met the intended goals. The benefits stated herein are the perceived benefits derived from interviews with the participating stakeholders. The evaluation is primarily based on expert opinion and observation of the researchers. Since the reported benefits are based on interviews with the various stakeholders, they do not necessarily include a complete and exhaustive list of potential benefits that may be derived from the sharing of video traffic streams on a regional basis.

The initial concept of this evaluation was that a discernable change in factors such as incident response time or emergency vehicle travel time would be measured. However, as the project developed, it was determined that this approach to the analysis was really unsuitable due to the fact that there are many variables that affect response time and travel time that are difficult to account for. Thus, it would be impossible to say

conclusively whether any improvement was due to the improved traffic management abilities from the shared video, or due to some other factor.

### Background

Numerous benefits can be expected from the integration and sharing of live video traffic streams among contiguous traffic management agencies. The foremost-anticipated benefit is a more regional approach to traffic management. In addition to improving traffic management on a day-to-day basis, the ability to share live traffic video will help manage traffic during special events and other things including, but not limited to, the following:

- The ongoing multi-year construction of the new I-4 bridge over the St. John's River,
- Events at the Daytona International Speedway,
- Spring Break,
- Bike Week,
- Biketoberfest,
- The Turkey Rod Run,
- Roadway incidents, and
- Hurricane evacuations.

Many of the benefits that can be anticipated from this project will be seen in future years as the agencies gain experience and learn how to respond to the various things that they see on the screens in front of them. Many of these benefits will be in the way of improvements due to the following:

- Integration of freeway management and incident management,
- Integration of freeway management and traveler information, and
- Integration of incident management and transit management.

The benefits enumerated in this study will represent only a small portion of the potential total benefits of the video data sharing. Many of the operational benefits anticipated will be difficult to directly measure and quantify, but are expected to be significant regardless.

These benefits include the following:

- Expedited EMS response,

- Accurate EMS response,
- Accurate real-time traffic information,
- Reduced incident congestion,
- Reduced incident duration,
- Improved communications and relations between stakeholders,
- Close coverage of incidents,
- Real-time freeway coverage,
- Open communications pathways to participating agencies, and
- 24/7 monitoring of the entire network.

At the time that the project was initially conceived, much of the technology now deployed was very expensive or, in some cases, simply not available. The initial project concept is shown in Figure 1. This concept achieved shared video via T-1 connections to the Internet, with all of the video streams being broadcast via the Internet. Due to decreasing costs of technology and continuing technological developments, the project scope was modified and refined as the project developed to take advantage of emerging technology. The final network configuration is shown in Figure 2. The result of these refinements is that the region will have a much more robust and secure data network than what was originally planned. This will lead to much better traffic management by all of the participating agencies.

All of the participating agencies indicated that the ability to share video data feeds would allow them to better manage traffic in their area. Being able to see what is happening upstream and downstream of their area will allow them to anticipate when problems may occur and be better prepared to handle it when it does occur.

### Project Participants

There are six primary agencies that are, or will be, a part of the Volusia County Intelligent Transportation System (VITS) shared video project – The City of Daytona Beach Traffic Management Center, Votran Operations Center, the Volusia County Emergency Operations Center, FDOT District 5 Traffic Operations, Volusia County

Traffic Engineering, and Volusia County's Holly Hill traffic operations center. The link to the FDOT District 5 headquarters brings linkage to the St. John's River Bridge construction project video images and linkage to the Orlando Regional Transportation Management Center (RTMC). This network configuration provides an integrated wide-area network that is essential to true regional traffic management. Each of the major stakeholders will now have one gigabit per second connections to the backbone, and/or the Camera Cameleon or Vbrick Streamplayer Software. Per the FDOT agreement with Volusia County, the eight images originating from the Volusia County Holly Hill site will not be on the network. These images are acquired with Monitron equipment over dial-up connection and as such lack the video quality of the other network cameras. However, Volusia County will continue to receive video from the other members on the network. In the future, Volusia County will integrate their Video Network to the requirements of the Areawide Network.

#### Network Performance

The Volusia County Shared Video network is a nominal gigabit Ethernet configuration that provides a substantial data backbone for the connected agencies. Due to the nature of Ethernet communications, the amount of bandwidth utilized is independent of the number of cameras or devices deployed, but instead is dependant on the number of different video images simultaneously requested. Due to the network topology and the ***multicasting*** abilities of the deployed system, if two or three agencies are requesting the same video feed simultaneously, it may not require additional bandwidth depending on where they lie in the network topography.

A worst-case loading of the present network would have 36 images being viewed by the Orlando area RTMC, four images being viewed at the FDOT District 5 office in DeLand, and one image viewed by each of the other participants (City of Daytona Beach, the Emergency Operations Center, Volusia County Traffic Engineering, and Votran). If these 44 images were all unique (no two monitors looking at the same video image) the resulting worst-case network load would be 264 MB/s (based on 6 MB/s per video feed). This represents utilization of less than 30% of the available communications bandwidth.

Due to the routing and switching capabilities of the Ethernet network, however, the total network data traffic does not have to be carried over the whole network. Thus the real bandwidth utilization that we would experience throughout the network would likely be significantly less than the 264 MB/s, resulting in even greater bandwidth availability.

It is important to note that Quality of Service (QoS) for Ethernet-based networks have historically shown to drop when the sustained data loading exceeds 80% of the rated capacity. However, at the worst-case loading of 264 MB/s indicated above, the data traffic could presumably triple before the network begins to break down. Thus there is substantial bandwidth availability for future video streams or for other digital data streams to be shared between the agencies. It is important to reiterate that this future bandwidth availability is not limited by the number of cameras that are deployed, but by the number of different video images that are simultaneously requested by any of the participating agencies.

### Conclusions

In discussions with the project stakeholders it has become apparent that all of the stakeholders are very satisfied with the final outcome of the project. All have commented how the project refinements proffered by the Project Partners during the course of the project have worked to make for a much better data network structure. And with the “missing link” connection, the Orlando RTMC will be able to utilize video streams from Volusia County and Daytona Beach. Since the RTMS is a 24-hour operation, this will have a dramatic impact on the ability of the agencies to do regional traffic management and respond to many of the very large special events and large incidents that affect traffic on a regional basis. This will also facilitate regional traffic management during hurricane evacuations or other regional/national emergencies.

The end result of this project is that the Volusia County region has a high-speed, high-capacity communications backbone to provide shared video between multiple agencies and to facilitate future regional ITS deployments. Communications is widely recognized as the foundation of any good ITS system, and the gigabit Ethernet network deployed

here will serve to enhance the abilities of all of the participating agencies to better manage the transportation network on a regional basis. The deployed network will allow for future expansions to the regional ITS system, and will allow for other ITS applications to become a reality in the future including real-time center-to-center communications. With the VITS Areawide approach, the information sharing abilities of the participating agencies is virtually limitless.