Project Summary

Texas Department of Transportation

0-5942: Comprehensive Guide to the Use of IP-Based Video for Traffic Operations

Background

Video is a critical component of Traffic Management Centers (TMCs). Operators use video surveillance to monitor roadways, identify incidents, assist in operations, and support operational decisions. Within the Texas Department of Transportation (TxDOT), a wide range of solutions to the video challenges being experienced by Texas TMCs has been deployed. These solutions employ different technologies, standards, and capabilities. Many existing installations are faced with increasing deployment of surveillance video as a means of extending, improving, and updating their systems. Likewise, emerging districts are developing and deploying video solutions to build out their systems. Additionally, the marketplace is rapidly transitioning to digital solutions and communication networks to handle both data and video. Overall, video deployments face five key challenges in: 1) integration, 2) standards, 3) functional sufficiency, 4) sufficient quality, and 5) cost efficiency. The objective of this research project was to develop a consistent and structured approach for video solutions including the definition of concepts, needs, requirements, technologies, testing, and ongoing operations.

What the Researchers Did

The research team developed a video solutions approach based on systems engineering. While the basic concepts of systems engineering provided a starting point, the modifications made by the Federal Highway Administration (FHWA) to support Intelligent Transportation Systems (ITS) deployments provided an extensive base of information for video deployments. Some modifications to the systems engineering process developed for ITS have been employed for this project. This is in full accordance with the guiding principles of systems engineering, as project- or scope-level modifications to the process are recognized as being necessary by organizations that promote its use.

What They Found

Researchers found that the systems engineering process (SEP) shown in Figure 1 serves the purpose of developing video deployment along a well-known course of action that will meet the needs of the various stakeholders. It accounts for integration into the regional architecture, establishes a concept of operations, and leads to detailed functional requirements—which in turn lead to detailed testing procedures. The consistent and structured approach for video solutions developed in this project was documented in a guidebook.

Research Performed by:

Texas Transportation Institute (TTI),
The Texas A&M University System

Research Supervisor:
Robert E. Brydia, TTI

Researchers:
Byron E. Brackin, TTI
Robert F. De Roche, TTI
Jeremy D. Johnson, TTI
Gary B. Thomas, TTI

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Overall, the guidebook was organized into sections such as:

- A Brief Introduction to Systems Engineering
- Early Phases of the Systems Engineering Process
- The Functional Requirements Phase
- The System Design Phase
- The Testing and System Acceptance Phase
- The Concluding Phases of the Systems Engineering Process
- Procurement to Support Systems Engineering

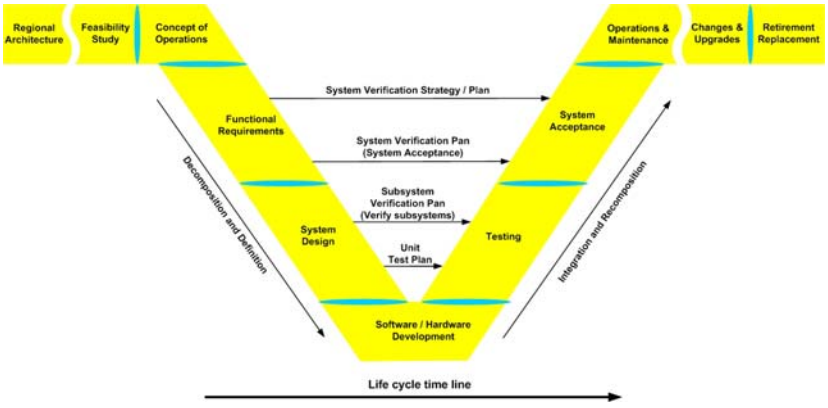

Figure 1. The Systems Engineering Process Developed for this Project.

Throughout the development of the guidebook, several topics were encountered that lent themselves more to a visual explanation than to written text. A typical example is frame rate. While descriptive text was written to convey what a video frame is and what frame rate is, for most people a more intuitive understanding comes from looking at characteristics. For this reason, a supplemental CD-ROM was developed to convey this type of information. Figure 2 shows an example of the introductory screen created for the CD-ROM. With a simple menu interface constructed in standard HyperText Markup Language (HTML), the supplemental CD is a stand-alone component that requires no installation, supporting software, or particular technical expertise to operate.

Figure 2. Screenshot of Introductory Page on Supplemental CD-ROM Developed by Researchers.

What This Means

Engineers with TxDOT who have some level of overview or responsibility for the design and deployment of video solutions now have a consistent and systematic standards-based process for developing and assessing digital video solutions and deployments.

For More Information:
Research Engineer - Wade Odell, TxDOT, 512-465-7403
Project Director - Steve Barnett, TxDOT, 512-506-5113
Research Supervisor - Robert E. Brydia, TTI, 979-845-8140

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Texas Department of Transportation
Research and Technology Implementation Office
P.O. Box 5080
Austin, Texas 78763-5080
512-465-7403

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