

High-Performance Video in Local Situational Awareness Systems

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Many defense contractors have begun soliciting bids for vetronics solutions based on the GigE Vision standard in an effort to speed design time, reduce risk, and lower costs, while enjoying interoperability and performance benefits. This article provides an overview of the advantages of GigE Vision-compliant video interfaces for manufacturers and end-users of local situational awareness (LSA) systems.

LSA systems rely on analog and digital cameras to enable drivers and crew members to navigate, conduct surveillance, and detect and identify threats. Traditionally, image data has been streamed directly to processing computers (PCs) and panel displays using a legacy analog interface.

These point-to-point connections are costly, complex, difficult to manage, and expensive to scale.

The Gigabit Ethernet (GigE) platform is a natural choice for video transmission in LSA systems due to its networking capabilities, support for a range of different computing platforms, and light-weight, off-the-shelf cabling. GigE Vision[®], which standardizes the delivery of video and control data over GigE, allows compliant cameras, displays, and processing computers to be integrated seamlessly into a networked real-time vision system, simplifying the design of multi-screen applications and eliminating the need for legacy point-to-point interfaces.

Protecting Equipment Investments

As shown in the diagram, the networked vision system integrates advanced cameras and sensors into a common GigE topology, including new equipment and legacy,

high-value analog cameras. For example, an external frame grabber converts analog video from expensive thermal imaging cameras into digital data that is transferred over the GigE network. With all devices connected to a common network, multiple streams of video can be transmitted easily to any combination of mission computers and displays. For example, the video feed from an infra-red sensor can be blended with images from a visible light camera to give crew members more detail on a region of interest.

The backwards compatibility delivered by these external frame grabbers, combined with ability of GigE networks to support almost any connectivity configuration, means the LSA system can be upgraded with newer, more flexible technologies, while preserving investments in expensive legacy cameras.

Upgrading LSA Systems with GigE Vision

In the diagram on the following page (Figure 1), a land-based vehicle is equipped with analog and digital cameras to provide a view of the entire perimeter. Video from analog cameras is converted to GigE Vision at the source by an external frame grabber and streamed simultaneously with low, consistent “glass-to-glass” latency over the multicast Ethernet network to displays and processing equipment at various points within the vehicle.

All the computers used for processing and mission control connect to the network via their standard Ethernet port, eliminating the need for a computing platform with an available peripheral card slot. Freed of this need, system designers can reduce system size, cost, and power consumption by using ruggedized, commercial off-the-shelf (COTS) computers with smaller form factors, such as laptops, embedded PCs, and single-board computers. In addition, both video and communication or control information is transmitted over more flexible,



field-terminated Ethernet cables, which are less expensive and simpler to install and maintain than the bulky cabling and connectors of legacy interfaces.

The external frame grabbers can multicast image data through the network to multiple computing platforms and crew members, who can either view the video or use the on-board mission computer to combine images for use by others in the vehicle. Ethernet's multicast capabilities allow crew members to easily switch between video streams as required.

GigE Vision-compliant external frame grabbers are widely available as COTS solutions, and allow military system architects to maintain their investment in existing cameras, sensors, and optics while gaining the performance, cost, weight, and flexibility advantages of Ethernet. Many camera manufacturers also offer native GigE Vision cameras for military applications. For specialty applications, GigE Vision-compliant embedded video interfaces available for integration with custom sensors or optics.

Beyond LSA systems, GigE Vision-compliant video interface solutions are ideal for vision systems for sighting, threat detection, weapons targeting, and surveillance in ground-based vehicles, naval vessels, manned and unmanned airframes, and standalone systems for persistent surveillance. *

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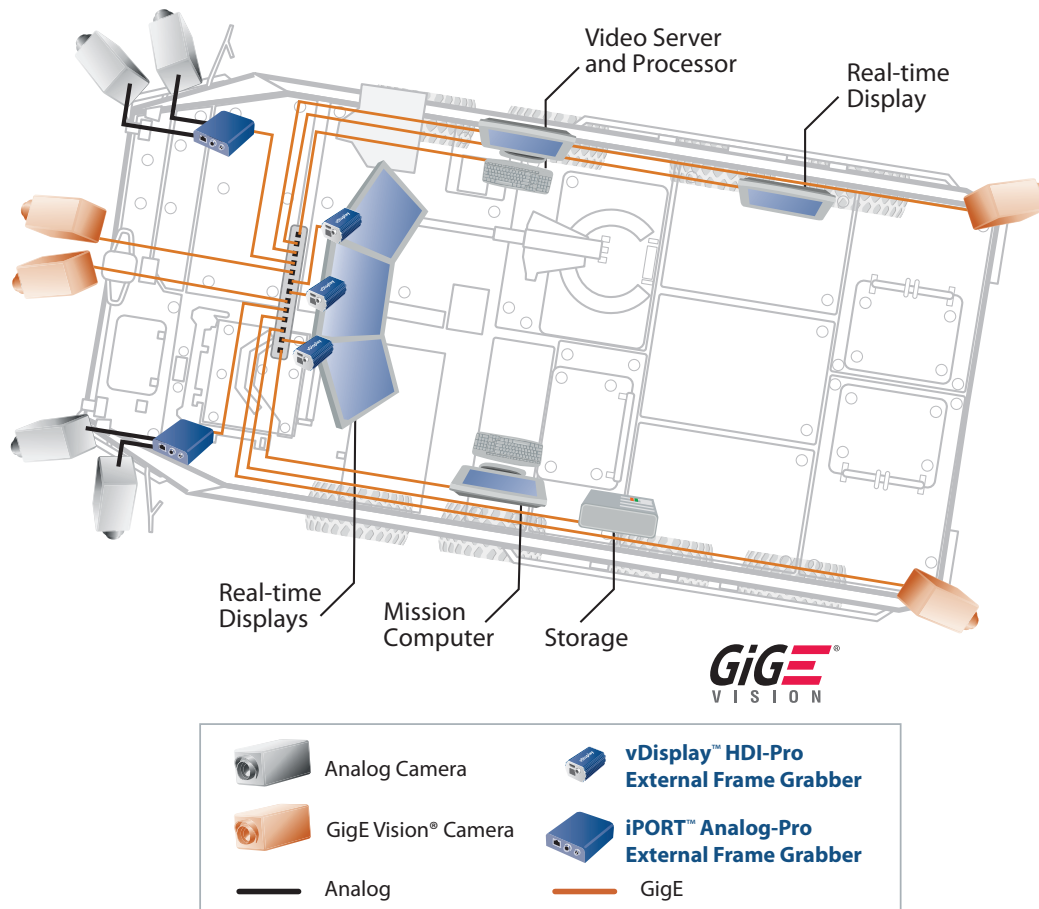


Figure 1: Video converted to GigE Vision by an external frame grabber and streamed over the multicast Ethernet network to displays and processing equipment at various points within the vehicle.