

## Local Situational Awareness Panoramic case

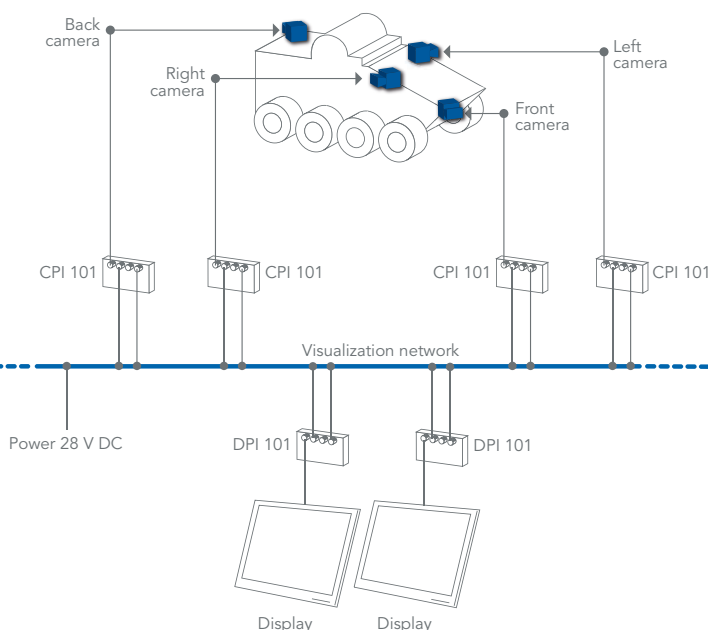
For many years, Local Situation Awareness (LSA) solutions consisted of simple analogue video with one or more cameras displayed in a mosaic layout or switching between camera views. One of the main disadvantages was lacking an overall view of the complete situation, especially knowing where a camera was located. That's why Esterline decided to take LSA into the digital age and use the additional benefits modern visualization technology offers.

### Advanced digital LSA solution

The operational requirements of an advanced system consist of two main objectives:

- Provide a full 360° local surveillance system around the vehicle, typically for a 300 meters perimeter
- Provide automatic alerts in order to assess all potential threats around the vehicle

The advanced LSA solution is based on digitization of all camera sources, routing the information over the network and applying advanced video processing techniques. The system consists in a number of cameras spread over the vehicle. A possible set-up would be:



Camera Processing units (CPI) are used to interface different types of cameras to the video network. These units format the incoming video for streaming on the network and can add local pre-processing to the raw video. Furthermore, CPIs include communication protocols and supply power to the cameras. Display Processing Units (DPI) can be connected to the network for interfacing one or more displays. These units select the video signals to be displayed and compose different perspectives. Interaction with the user is possible with button or touchscreen feedback.

### Esterline LSA: features & benefits

#### 1. Compatibility through open standards

Esterline's open system is compliant with all the required standards (DEF-STAN-0082) for Ethernet video network systems. The system can capture camera sources of up to SXGA resolution. Display outputs are standard DVI-D formats supporting different resolutions (e.g. Vesa XGA/SXGA for the DPI unit). To manage bandwidth across the network, we use JPEG 2000 compression and standard IEEE Ethernet protocols (IGMP, RSTP,...).

#### 2. Higher image quality

Panoramic stitching allows the user to create a wide field of view image of 180° or even up to 360° in one single image. Different screen layouts can be independently defined for each display node. Contrast enhancement will improve image visualization.

#### 3. Stitching & image blending for high quality viewing

The images coming from adjacent cameras (with minimum parallax) and viewing the same scenery can be stitched seamlessly to each other. Smooth transients between different camera images are created using a blending function.

#### 4. Motion detection to automatically alert on threats

In a stationary situation, a motion detection algorithm can be used to detect threats, even when a camera image is not used for displaying. User alerts can be generated, thus allowing multiple actions to be defined. Automatic image switching or overlay windows can be added to inform the user and/or exported to other equipment. The LSA system can track the detected objects. Detection parameters can be changed to fine-tune the sensitivity of the function and avoid false alerts related to noise and small local motions (e.g. the waving leaves of a tree).

**5. Image stabilization for better assessment while driving**

When driving, cameras tend to vibrate and the image becomes unstable and/or blurred. Esterline LSA system provides cost-effective solutions to cope with that issue.

**6. Image fusion for enhanced image quality**

Images coming from Infrared cameras and day light cameras can be superimposed to create one image with higher readability, especially at dusk, dawn, or in smoking conditions. The Esterline solution can match image sizes and position them to improve the fused image quality. Both the raw video images and the fused composition can be made available on the network.



Not visible person in the woods



Not visible plastic object



Example of a fusion of a day camera + IR camera

**7. Expandability**

The Esterline LSA network solution is not limited to a number of dedicated components. More interfaces can be added, including cameras or displays, to expand the functionality.

**8. Redundancy**

The Esterline LSA network solution can be configured into a ring network. Standard Ethernet protocols are used to prevent loops in the video flow and allow automatic rerouting of the streaming data in case one of the connections fails.

**9. Possibility to apply rapid recognition techniques**

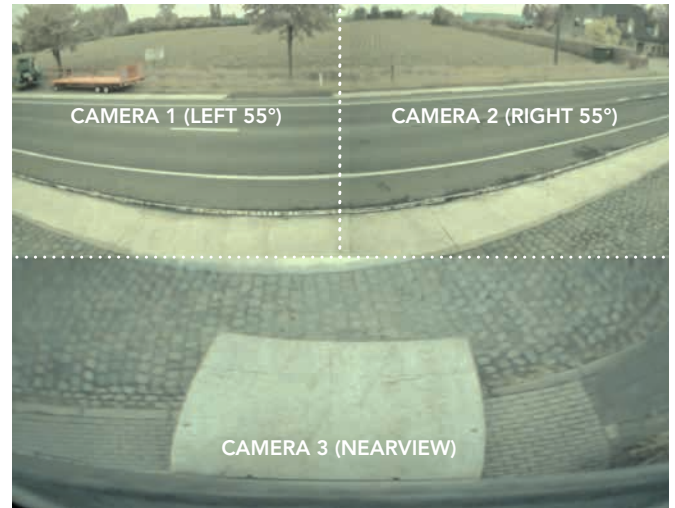
Easy and real-time interaction with the user can be done with a display touchscreen to select camera images or zoom in on a region of interest (ROI). A motion detection algorithm can be added, thus allowing to detect, track and visualize any motion. Information about a detected object can also be made available for external equipment.

Technical specifications are subject to change without prior notice.

**Configuration Management**

For System Integrators, Esterline provides an open platform with a software suite. This user-friendly software tool allows the user to create perspective layouts.

A typical RearView and 360 degrees perspective example are shown below.



A typical rearview perspective example with 3 cameras

CAMERA 1	CAMERA 2	CAMERA 3	CAMERA 4
<div style="border: 1px solid black; padding: 2px; display: inline-block;">ROI for zoom</div>			
ZOOM WINDOW			
CAMERA 5	CAMERA 6	CAMERA 7	CAMERA 8

360 degrees example with 2 tiles of 180° and digital zoom

This tool enables the customer to easily define and organize the perspective layouts. Final project results are then uploaded into the LSA system. Multi-perspective compositions can be checked and selected with different input tools: display buttons, touch screen or customer application software to switch between the different perspectives.