

# Security Solutions

Software for Security and Surveillance Applications



[cambridgepixel.com](http://cambridgepixel.com)

  
**CAMBRIDGE PIXEL**  
SENSOR PROCESSING & DISPLAY SOLUTIONS

# Security Solutions

The use of radars is becoming increasingly widespread in the security and surveillance sectors to complement traditional camera systems. Radars offer greater range and detection coverage than cameras and are therefore an extremely useful addition to security solutions. With its expertise in radar processing and display, as well as specialist camera video processing and graphics capabilities, Cambridge Pixel is uniquely positioned to provide all or part of an advanced security system.



Cambridge Pixel has a suite of software modules for radar and camera interfacing, processing and display, which can form part of a security application. Alternatively, end-user applications can be provided, optionally with source code for extension, localisation and long-term support.

The SPx software interfaces to many industry-standard radar, video and related sensors and provides a comprehensive range of processing and display capabilities.

Starting with acquisition of data as signals or network streams, SPx provides processing, tracking, track fusion, recording and display capabilities, with options for widgets and graphics rendering.

Cambridge Pixel can supply security solution software at four levels:

## Modular

- As a suite of software modules that cover a wide range of security-relevant radar and camera acquisition, processing and display functions offering sensor and hardware-independent modules of expertise. This is aimed at system developers who require core software modules for radar and camera interfacing, processing and control.

## Framework

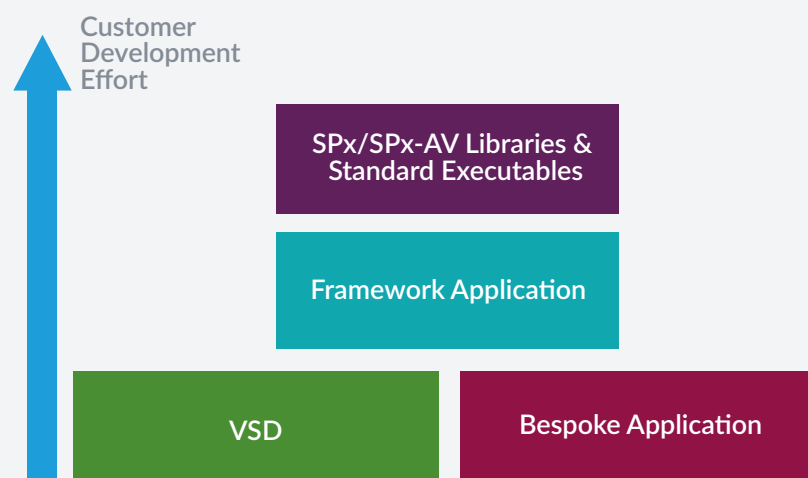
- As a customised framework application (an extended example), demonstrating how to use various modules within the software. This application can then be delivered with source code for optional extension and maintenance by a customer.

## Custom

- As a bespoke application, which is a ready-to-run customised surveillance product that integrates radar and video cameras with threat display, recording and target tracking. This option requires no customer development.

## VSD Product

- In the form of the ready-made VSD application, which meets a number of common user requirements and requires no customer development.



# Software Modules for Developers

Cambridge Pixel's field-proven SPx and SPx-AV software modules for sensor interfacing, processing and display are available for system integrators to use within their wider solutions. These modules are provided as C++ classes that can be built into a Windows or Linux application. A custom client application can combine radar, video and display functions, as required.

A key benefit of the SPx software is that it is not specific to any particular radar hardware and has been used with radars from manufacturers including: Kelvin Hughes, Furuno, Terma, Bligher,

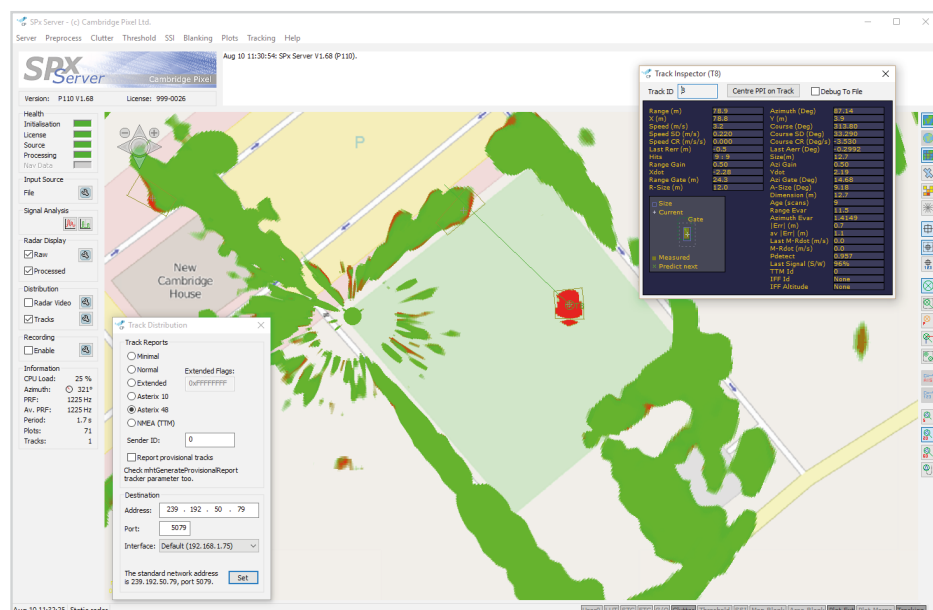
Navtech, JRC, Simrad and Raytheon. Similarly, the software is not tied to any specific camera hardware and numerous analogue video capture devices are supported.

Radar Modules	
Radar Interfacing	Many standard radars can be used in conjunction with the SPx software, either using a network interface (e.g. ASTERIX CAT-240) or radar signals that can be received by an HPx series radar input card.
Radar Control	Selected radars can be controlled using modules in the library.
Processing	Radar video may be enhanced for display or to aid automatic track extraction. Processing includes correlation, filtering, LUT, blanking, thresholding, interference suppression, clutter removal, and scan integration. Custom processing elements can also be incorporated into the processing chain.
Radar Display	High performance radar scan conversion with multiple radars in the same window and multiple windows. Radar may be displayed with map data and overlays and with history trails.
AIS, ADS-B, IFF	Decoding, display and recording of secondary radar data.
Record and Replay	Incoming radar video can be recorded to local or network storage for later analysis or training.
Network Distribution	Radar video can be streamed from a network server to client displays in remote locations. Compression and processing can be used to make optimum use of available network bandwidth.

## Radar Target Tracking

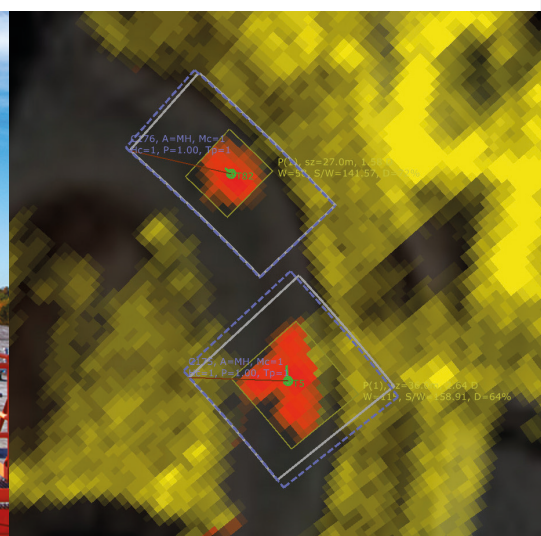
Target tracking is available through the ready-made SPx Server application or as part of framework or bespoke applications developed by Cambridge Pixel. Tracking is not part of the SPx library.

Fully automatic target tracking is available with programmable acquire and no-acquire zones over the radar coverage. The track extractor is highly configurable (based on multi-hypothesis and multi model methods), to accommodate different radar types. Track reports can be provided onto a network, used to control a camera (slew-to-cue) or converted into symbols for overlay display.



Video Modules	
Camera Interfacing	Cameras providing network data or standard analogue or digital signals are supported.
Camera Control	Control of Chess and Pelco-D based cameras is supported as standard. The camera control supports manual adjustment of camera position (e.g. from a user interface) or automatic adjustment (e.g. from a processor or video tracker).
Video Display	Video data may be displayed in a window with optional overlays.
Record and Replay	Video data may be recorded to local or network storage for later incident review.
Processing	Video data can be enhanced for improved display quality.
Compression and Streaming	Video can be compressed (GPU-based) to standard H.264 and distributed over a network with control over bandwidth and quality of service.
Slew-to-cue	Camera may be moved based on track positions reported by radar tracker.
Motion Stabilisation	Software modules analyse video from frame to frame and automatically stabilise the image with respect to vibrations or motions of the camera platform.
Video Tracking	Video tracking permits one or more objects to be tracked in real-time, with the results being used to report a target's position and/or move a camera to keep the target in the field of view.

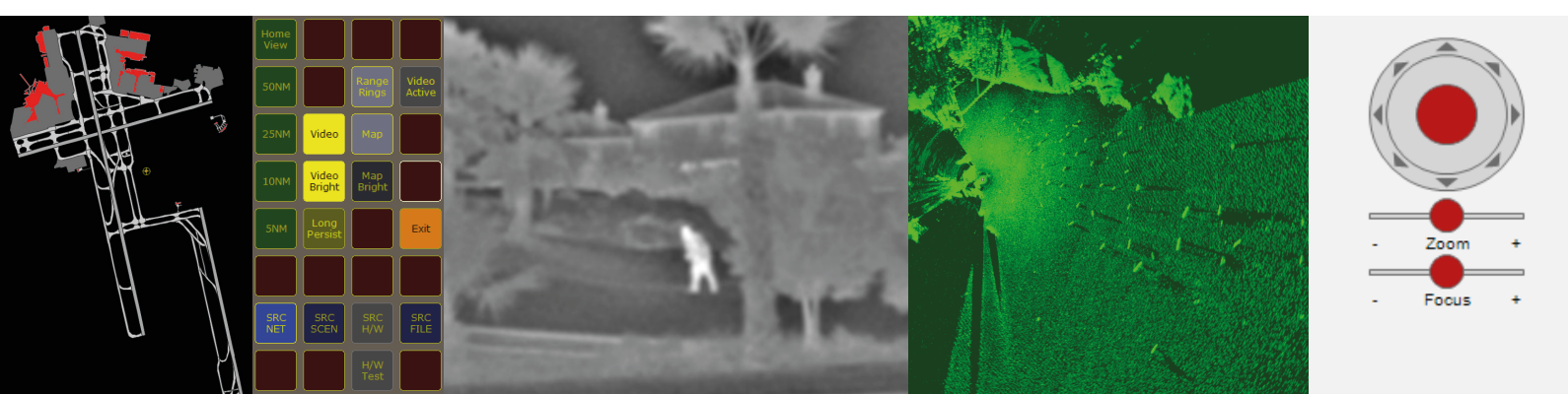
Display Modules	
Map Display	High-resolution geo-referenced maps as world vector shoreline, tiled map (Internet sources) or NASA terrain.
Track Display	Target derived from a tracker or other external source (including AIS) may be displayed with built-in symbology.
Screen Recording	The screen display may be captured and recorded to file to preserve the operator display for incident analysis or training. Screen recordings may then be replayed on the same or other system.
Radar Video Display	Multiple radar videos can be displayed in the same window, along with maps and overlays. Radar video is transparently mixed with underlays. Up to six radar videos in one window.
Video Display	Camera video may be displayed with real-time overlays.
View Control	Software modules support intuitive view control adjustment using a mouse or touch screen, including pinch-to-zoom and drag to pan.
Button Box	User interface control for buttons.
Display Markers	Range rings, electronic bearing line (EBL), variable range marker (VRM), parallel index lines.
Alarms	Alarms may be configured to detect targets moving in specified areas.





# Framework Applications

The principle of a framework application is that it fulfils many of the common requirements of a display application and serves as a solid starting point for the final, deployed application. Framework applications can be developed against relatively broad, general requirements and therefore it is a very cost-effective option. The top-level application source code is delivered, allowing the customer to modify, extend and maintain the application as required.



## RadarVision

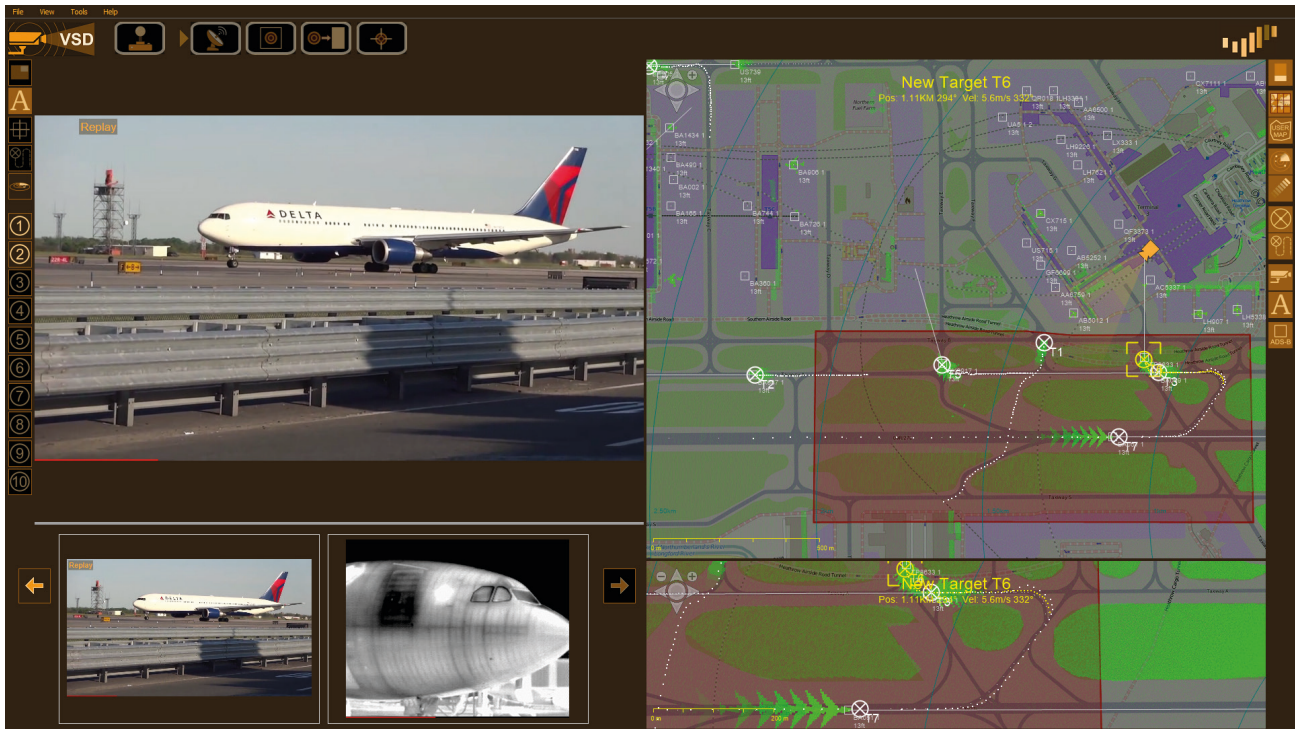
RadarVision converts radar data into a video stream that can be displayed by a Video Management System (VMS). This permits security radars to be integrated with cameras with minimal changes to the display application.

RadarVision creates a picture of the radar using video or tracks overlaid on maps. This image is then converted to a H.264 IP video stream, so that the input to the VMS looks like a camera. The operator of the VMS may manipulate the radar view through a PELCO-D interface, allowing zoom and panning in a way that is consistent with camera controls.



# VSD Application

The VSD application software is a complete end-user display application that interfaces to radars and cameras and provides a ready-made functional situational awareness display. The application is provided for Windows (7, 8, 8.1, 10) and simply installs on a standard PC.

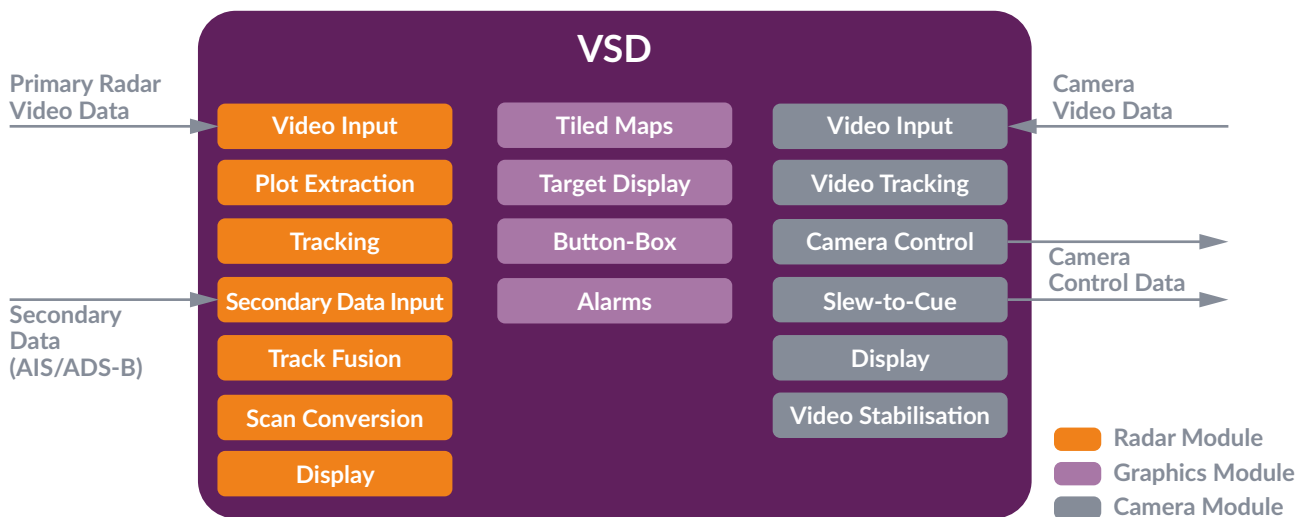


VSD provides a clear display of the camera videos and radar data. The intuitive user interface has been designed with touchscreen devices in mind. The most commonly used controls are readily accessible within the main application window and are adjustable via large graphical control elements.

The radar portion of the display provides a geographic overview of the situation, showing all of the available radar videos, tracks and secondary data, overlaid on a clear tiled map. The camera video portion of the window shows a large display of the video from the currently selected camera, optionally with video from a co-located camera shown as a picture-in-picture. Thumbnails of all available camera feeds allow rapid and easy selection of a specific camera.

Cambridge Pixel's field-proven radar tracking process is fully integrated within VSD, allowing target tracks to be extracted from each primary radar video input. VSD also includes a track fusion process, which is capable of combining the primary tracks from multiple radar sources and secondary data, such as ADS-B and AIS. Since only cooperative (i.e. friendly) targets will generally provide secondary transponder data, VSD may automatically alert the operator to primary targets that do not have a corresponding secondary response.

VSD is built using modules from the SPx libraries, in the same way as custom applications and bespoke applications. VSD is therefore an excellent example of what can be achieved with the SPx software.



A key feature of the VSD application is its ability to control a camera to follow a selected radar track automatically. This capability is known as slew-to-cue and is further improved in VSD by the built-in video tracking function. Video tracking uses analysis of the camera video imagery to determine the target direction. Once a track has been designated within the radar display, video tracking can provide more accurate camera positioning for enhanced slew-to-cue.



## Key Features:

- Up to four radars and 16 cameras supported
- Radar interfacing (multiple radars)
- Target tracking
- Radar video and track display
- Map display
  - Tiled maps
  - User maps
- Secondary data (AIS, ADS-B) interfacing, decoding and display
- Fusion of primary and secondary track data
- Camera display (multiple cameras)
- Record and replay
- MGRS coordinate support
- Built-in Help for operators
- Camera control
  - Slew-to-cue from selected radar target
  - From video tracking
  - Manual (GUI control or joystick device)
- Slew-to-cue
  - Manually designated target
  - Newest target
  - Nearest target
  - Cyclic
- Video tracking (option)
- Alarm zones and operator alerts
- Geofence alarms
- Proximity alarms (coast, point)
- Track Table
- Various logging options



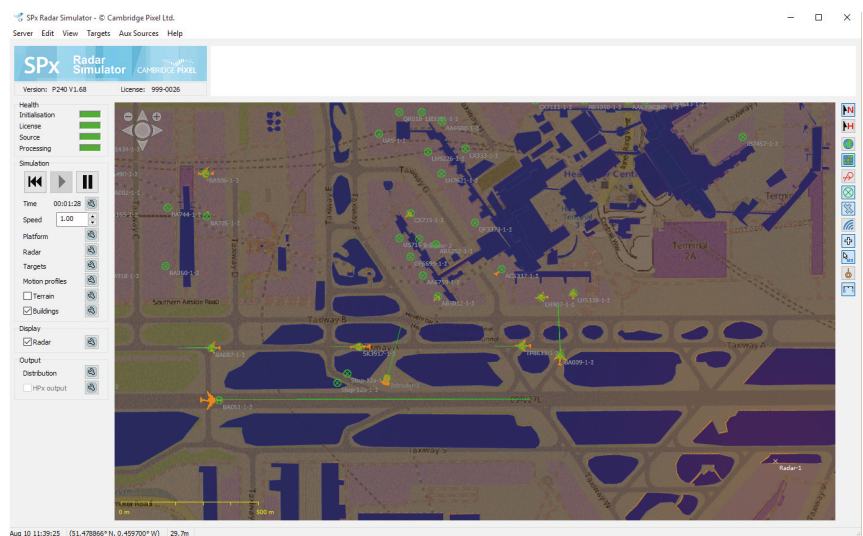
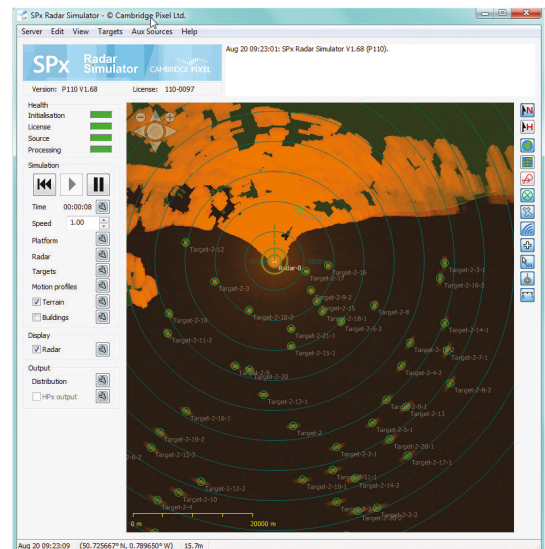
# Simulation

Radar video, primary and secondary track data can all be simulated using Cambridge Pixel's SPx Radar Simulator software. The simulation can be programmed with a scenario for multiple air and surface targets, radar video and/or track data may then be output as data messages on the network. Additionally, representative radar signals may be output via an HPx-300 radar output card.

The simulation includes a consideration of terrain local to the radar, which permits land returns to be visible in the radar video as well as ensuring that the visibility (or otherwise) of targets is correctly represented. Related data from secondary radar (IFF, AIS, ADS-B) can be simulated and output in synchronism with the primary radar data.

Multiple overlapping radars can be simulated to represent a security scenario, with targets of interest moving from one radar coverage to another. Each radar can have different characteristics, for example to simulate short-medium and long range radars. The characteristics of the radars can be changed at runtime via the application GUI or network interface.

For more information on SPx Simulator, see Cambridge Pixel's website.



New Cambridge House, Litlington  
Royston, Hertfordshire, SG8 0SS UK

T: +44 (0) 1763 852749  
E: [enquiries@cambridgepixel.com](mailto:enquiries@cambridgepixel.com)  
W: [cambridgepixel.com](http://cambridgepixel.com)