

# PORT SENTRY



**X-K BAND**



**EOSS**

## INTEGRATED SURFACE AND UNDERWATER SURVEILLANCE SYSTEMS

A common factor in all missions that impact ports security, harbour defence, and coastal sea control, is the need for a robust capability for interdiction at sea.

The Port Sentry integrated system provides the use of equipment and data fusion software that will automatically detect and track water-borne threats, aid operators with surface threat classification and assessment, direct and vector patrol boats to intercept threats, aid response forces with subsurface threats assessment, and record events.

A fully functioning integrated real time system will provide a C4I and display element that will be integrated with a variety of sonar, radar, infra-red sensor and camera systems.

The open architecture of the system allows the integration of many sensors from various suppliers. Typical sensor of Port Sentry integrated system includes:

Command and Control System, Maritime Surface Search Radar, Ka Band Surface Search, Radar, Underwater Intruder Detection, Infra-red Imaging Sensor, AIS Base Station System, Closed Circuit Television Cameras, Direction Finding Sensor, Microwave Communication Equipment, Telecommunication Equipment.

Harbour protection against surface and underwater threats has become a critical element in Homeland Security to protect vital military and civilian "targets of opportunity". To satisfy this important mission, GEM elettronica has developed an Integrated Surface and Underwater Surveillance System (PORT SENTRY) that utilizes the company's proven Infrared Red/Electro-Optical (IR/EO) system with the newly developed X-Ka Surveillance radar in conjunction with new generation swimmer detection sonar. The surveillance sensors are fully integrated to make available to the operators real-time situational awareness both above and underwater. Early detection of possible threats will provide "actionable data" to launch prompt response missions and counter measures.



**GEM elettronica PORT SENTRY** has been also designed for ease of installation and use. The combination of off-the-shelf systems with state-of-the-art sensor techniques makes PORT SENTRY a totally affordable, accurate and reliable port surveillance system. GEM elettronica PORT SENTRY has successfully participated in NATO Harbour Protection Trials 2007, held in Taranto (Italy) and will be featured at NATO Defence Against Terrorism Programme of Work - MCG/3 Harbour Protection Trials 2008 which will be held in Eckernforde on September 2008 (Germany).

**X-K<sub>a</sub> UPMAST RADAR SENSOR**



The GEM elettronica dual band compact radar is capable of precise detection of targets at virtually any range.

This clearly yields optimum performance, high reliability and interfacing made easy due to standard protocols used.

It exploits dual band benefits:

- **K<sub>a</sub>** : optimum radar performances at short-to-medium ranges
- **X** : optimum radar performances at medium-to-long ranges

**ELECTRO OPTICAL SURVEILLANCE SYSTEM**



New optronic systems EOSS-300, especially designed for shore and on-board applications such as SAR (Search-and-Rescue), day&night optical surveillance, passive target detection and identification.



## Software Package Break-down

The overall mission is subdivided in 4 sub-tasks:

• **Surveillance Task**

Goal of the Surveillance Task is to achieve an unified picture of the whole system (White Picture), and to develop operations typical of a Vessel Traffic Monitoring System (area control, route control, ship identification and interrogation, etc.)

• **Classification Task**

Goal of the Classification Task is to add specific and expertise information to the previous picture in order to identify the possible threat scenario (Recognized Picture)

• **Identification Task**

Goal of the Identification Task is to select the assessed threat subset in the overall recognized scenario

• **Action Task**

Goal of the Action Task is, based on the Threat Picture and counter-measure database, to support decision about the best-of-all counter-action to be acted

In order to develop the above specified tasks, the software package is organized in software managers:

- **Multi-Radar Vessel Tracking Manager (MRM)** {Surveillance Task}
- **Threat Assessment Manager (TAM)** {Classification and Identification Task}
- **Threat Resolution Manager (TRM)** {Action Task}



ARRAY MODEL	X-BAND	Ka-BAND
Length	9 feet	8 feet
Type	Slotted waveguide	
Frequency band	9.365 - 9.455 GHz	33.4 - 34.2 GHz
Polarization	H/C	V/C
Horizontal beamwidth to -3dB	≤ 0.85°	≤ 0.23°
Vertical beamwidth to -3dB	< 25°	< 7.5°
Gain	≥ 31 dBi	≥ 38.4 dBi
Rotation speed	22 or 60 rpm	
Tolerable relative wind speed	100 knots	

TRANSCEIVER UNIT PERFORMANCE	X-BAND	Ka-BAND
Peak power (nominal):	25 kW (nominal)	6 kW (nominal)
Radiation frequency:	9.365 - 9.455 GHz	33.4 - 34.2 GHz
Pulse Width:	PRF (Hz)    PW/ns	PRF (Hz)    PW/ns
	500            1200	2500         150
	800            600	10000        40
	1600          300	
	3200          80	

Modulator:	fully solid state	
Dynamic range:	100 dB	
Intermediate Frequency (I.F.):	60 MHz ± 2 MHz	
I.F. bandwidth:	20 MHz for short and medium pulse 4 MHz for long and extralong pulse (with ± 10% tolerance)	33 MHz for short pulse 7 MHz for long pulse (with ± 10% tolerance)
Front End:	microwave integrated circuit	
Noise figure:	< 4 dB	< 5 dB
Duplexer:	ferrite circulator with solid state limiter diode	
Sector blanking:	available	

**ENVIRONMENTAL PERFORMANCES**

Operating temperature range:	From -25°C to + 70°C
Relative humidity:	Up to 95% at + 40%
Vibrations	In accordance with IEC-945
Vibrations/shocks	1 g from 0 to 50 Hz

## EOSS-300

**CONFIGURATION**

**OPTRONIC TURRET**

3 axes stabilized system (2 active and 1 passive), including servomotor, angular sensor, brake and mechanical end-stops.

Azimuth group, including servomotor, angular sensor, brake and slip-ring for continuous Nx360° operation.

Payload, consisting of IR and TV cameras, ELRF (option)

2 gyroscopes.

Pedestal base. (option)

Elevation: ± 40 deg

Position accuracy: 5'

Slewing velocity: > 80 °/s

Stall acceleration at 30°C: > 200 °/s<sup>2</sup>

Stabilization accuracy: 0.2 mRad (1 sigma)

**CONTROL UNIT**

Rugged chassis

Driver for servomotors

Stabilizing software with drift compensation

Power supply management unit

Remote panel interface

15" or 19" display console (optional)

Keyboard with joystick (optional)

Automatic Video Tracker VTU-110 (optional)

**IR CAMERA**

Spectral waveband	3-5 μm
Wide Field of View	9x6 deg
Narrow Filed of View	3x2 deg
Detector	Cooled type FPA InSb resolution 320x256
NETD (sensitivity)	< 50 mK
Control interface	RS 422 serial data link
Video output	PAL

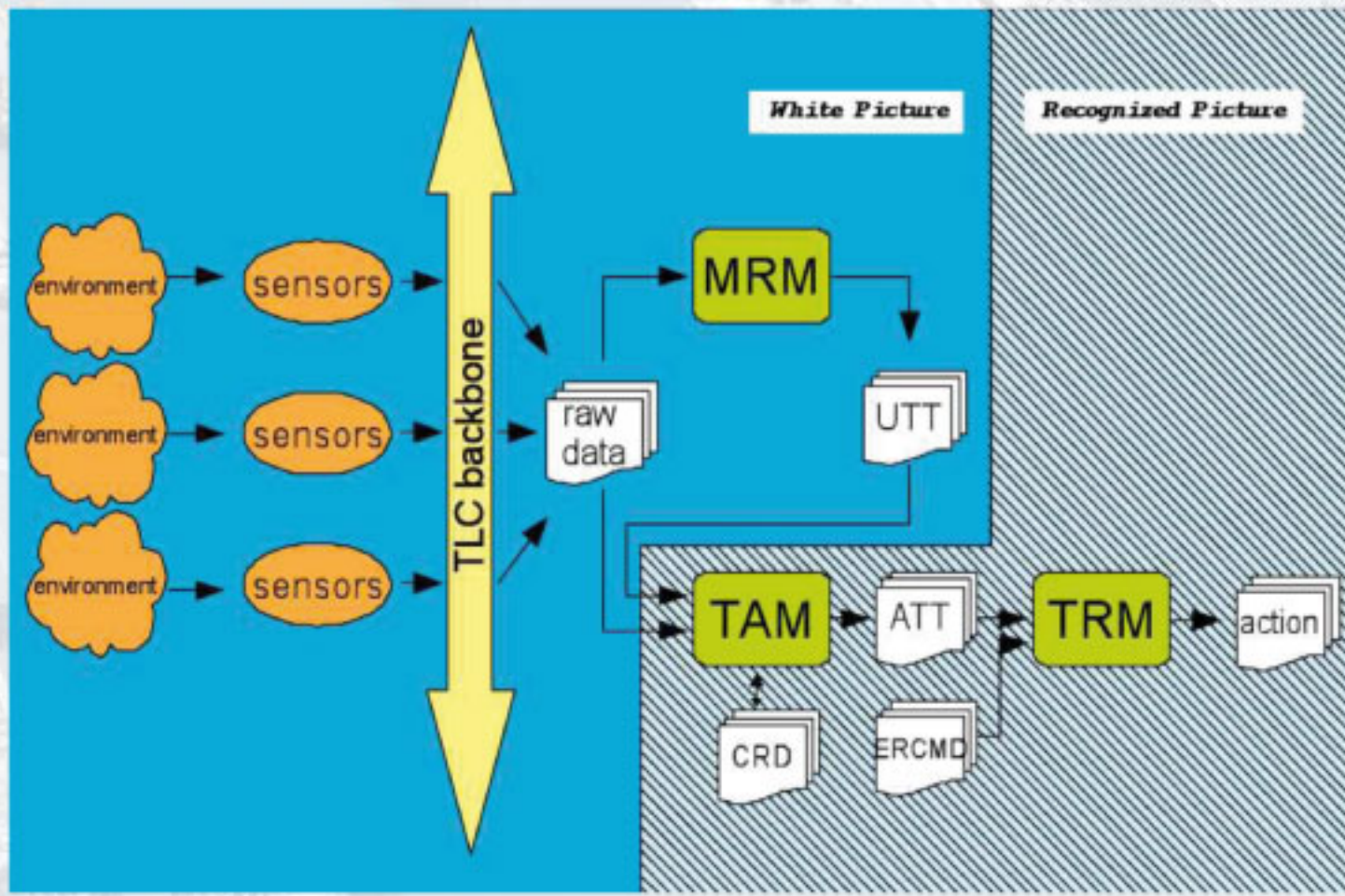
**TV CAMERA**

Type of detector	1/4" Day&Night CCD
Lens	Continuous variable zoom
Resolution	Full PAL or NTSC standard
Signal-to-Noise ratio	> 50 dB
Field of view	57.8° to 1.7° horizontal range
Zoom ratio	36:1 optical, 12:1 digital
Sensor gain	Automatic / Manual
Video output	PAL

**ENVIRONMENTAL AND ELECTRICAL FEATURES**

Operative temperature range:	-25° / +55°C (external unit)
Relative humidity:	up to 95%
EMI / vibrations:	IEC-945
Power absorption (peak):	24 Vdc, 1KW peak

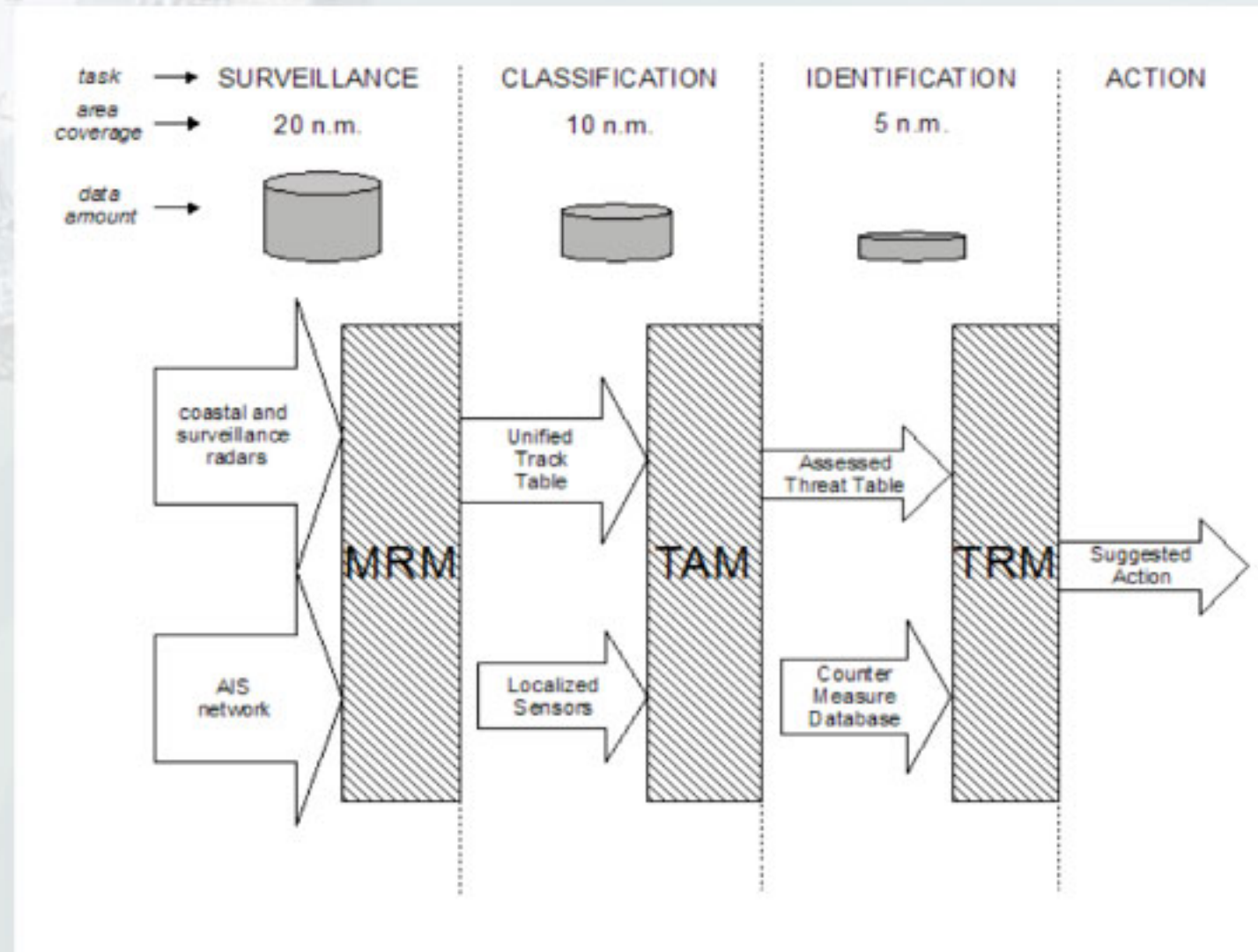
In the following it is given a schematic diagram of the subsystem and a detailed explanation of the software managers.



Interconnection Diagram of the C4I subsystem

### Software data flow management

The required performance is obtained with a pipelined data flow between the various components of the system: the output of one component becomes the input of the successive one. The progressive selective approach (data reduction) gives to each operator a filtered picture, clear and exactly tuned on the single operator task. Another benefit of this selective approach is the minimization of the system response time. The following illustration shows how the process works.



Data reduction concept

The purpose of the proposed software system is to perform the semi-automatic active protection of high valuable and sensible objectives located in a maritime environment against hostile attacks by surface, underwater and (in some extent) air threats. The requirement is achieved by an ensemble of hardware and software resources able to detect, track and display the behaviour of all moving objects in the surrounding areas in order to timely identify potential threats of any kind.



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