



SMART VTS vs CONVENTIONAL VTS

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- **CONVENTIONAL VTS - focus on the sensor systems, only collate and display sensor data.**
- **SMART VTS - designed to help VTS operator, to make his work more efficient and effective.**



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Modular-

easy to:

- isolate,
- update,
- Restart,
- Service,
- upgrade, ...

ADVANCE COMMUNICATION

- voice, text, written comm.
 - phone, radio, e-mail,
- Safety information broadcast
all fused into a
Single information base

ADVANCE SENSOR SYSTEMS

Radar, AIS, optical, rdf
satellite, weather, long
Range Identification
and tracking,

**Easy and effective
scheduled
Information
dissemination**

Automatic text to speech
conversation

SMART VTS

SMART COLLABORATION

VERTICAL-vts centre, pilot
centre, harbour office, police,
Security, ...

HORIZONTAL – other vts centres

SMART MONITORING

Automatic Alert to any fault,
potential Collision, grounding,
other danger (pollution)

INTEGRATION OF OPERATIONS

Vts operator access integrated
Operation platform through a
single human-machine interface



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PROPOSAL

- In this presentation is proposed how to built a new improved surveillance system which will detect danger events and automatically sound alarm to VTS operater.
- Surveillance system automatically receives data about movement of specific vessel.



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- **VTS operater send predefined fixed route (as per master decision).**
- **Predefined route is sent to any ship which entering surveillance zone.**
- **If sensors detect that ship following route there is no alarm.**
- **If detecet any deviations there are 2 types of alarm:**
 - **alarm 1 and alarm 2.**



TYPES OF ALARMS

- **ALARM 1** is low level alarm (will be activated if ship has delay between the sectors)
- **ALARM 2** is high level alarm (will be activated if ship not following specific course and speed, and time requested between the sectors which are defined by VTS operator)
- The alarms will be triggered by surveillance system.



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SURVEILLANCE SYSTEM FOR FUTURE VTS

- **The main task “*how to introduce surveillance system*”.**
- **Proposal is to divide surveillance area on sectors.**
- **Input data are received from sensors such as AIS, ARPA RADAR, ECDIS, AIS AtoN, communication system etc...**
- **Surveillance system separate danger situation and gives alarm to VTS operater.**



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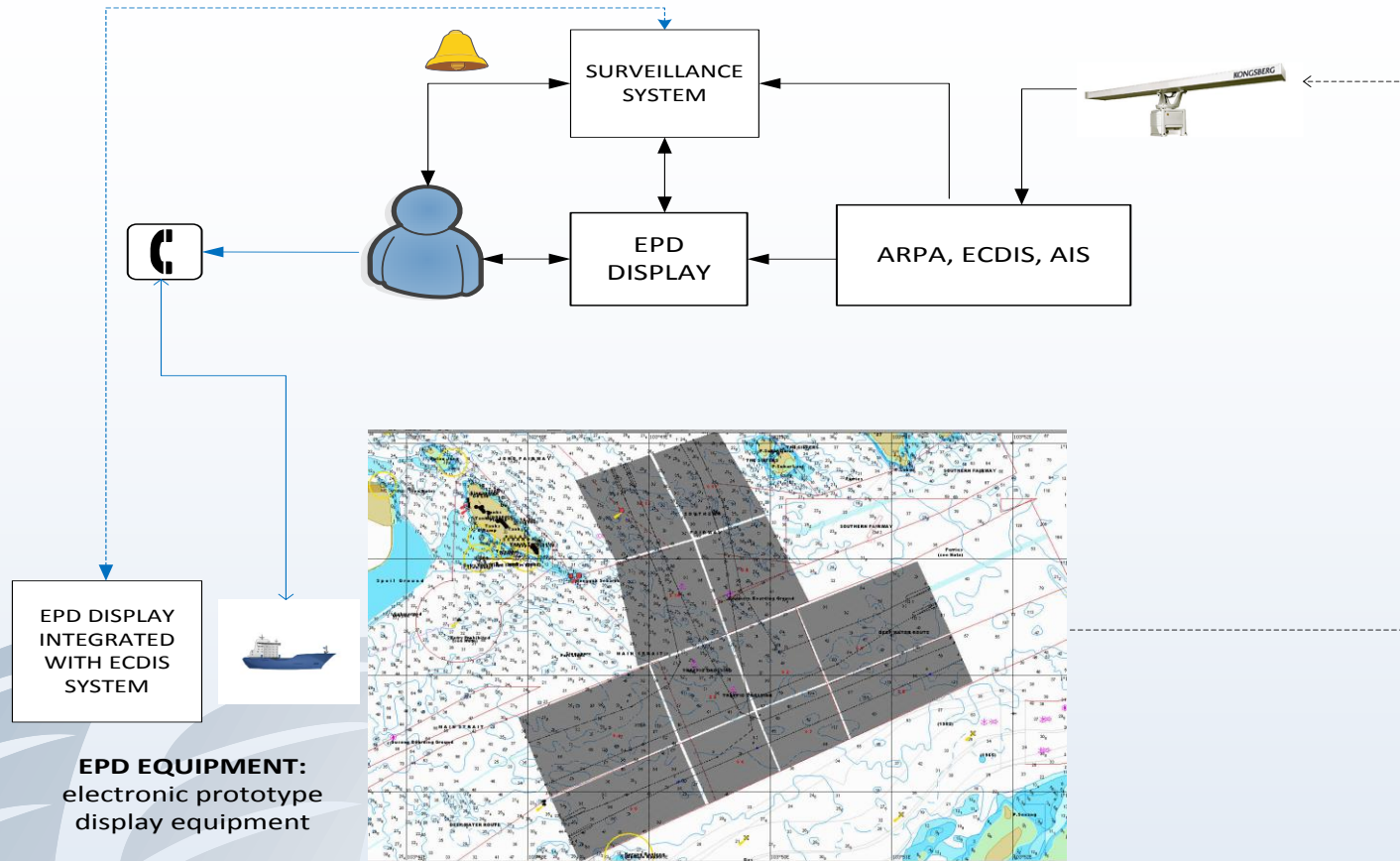


Figure 1. proposed surveillance system for future VTS

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- **Via received informations operator will warn duty officer by comm system shore-ship.**
- **STCC operater define fixed predefined routes.**
- **STCC operater define priority and importance for any ships in surveillanc zone**
- **Priority is numerical value marked as P and ranging from P1 to P3**
- **Importance is numerical value W ranging from W1 to W3.**



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- **Surveillance system would coordinate for ships as per assigned criterium.**
- **The supervisor react as per assign importance and priority.**
- **For example:**
 - **if in crossing zone inside the sector are military and cargo ship and both has same priority because their ETA is same;**
 - **in this case beside priority is assigned and importance (so called weight in program used for researching) $W=2$;**
 - **this importance is going to block the sector untill military ship is in sector;**



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PROPOSAL FOR DEVELOPED SMART VTS

- **Surveillance system consists from following modul:**
 - 1. Modul for real condition**
 - 2. Modul for allowed condition and**
 - 3. Modul – supervisor for specific route crossing/overlapping**

Modul real condition is modul which follow real movements of ships

The set of all conditions in modul include all allowed and unallowed movements of ships

Allowed movements for particular vessel

Unallowed movements for particular vessel (if vessel crossing in wrong sector)



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- **Modul for allowed condition is modul which follow changing in sector.**
- **Changing in sectors are happened based on estimating time for transition between the sectors.**
- **This modul “estimate” next allowed condition for ship and required time for specific condition.**



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- **Modul supervisor for crossing is connected with modul allowed condition.**
- **This modul restrict number of ships in crossing and obtain priority and importance for ships.**
- **Modul for real condition and modul for allowed condition forming supervisor of sector.**
- **Supervisor of sector and supervisor of crossing forming surveillance system**



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SURVEILLANCE SYSTEM FOR FUTURE STCC

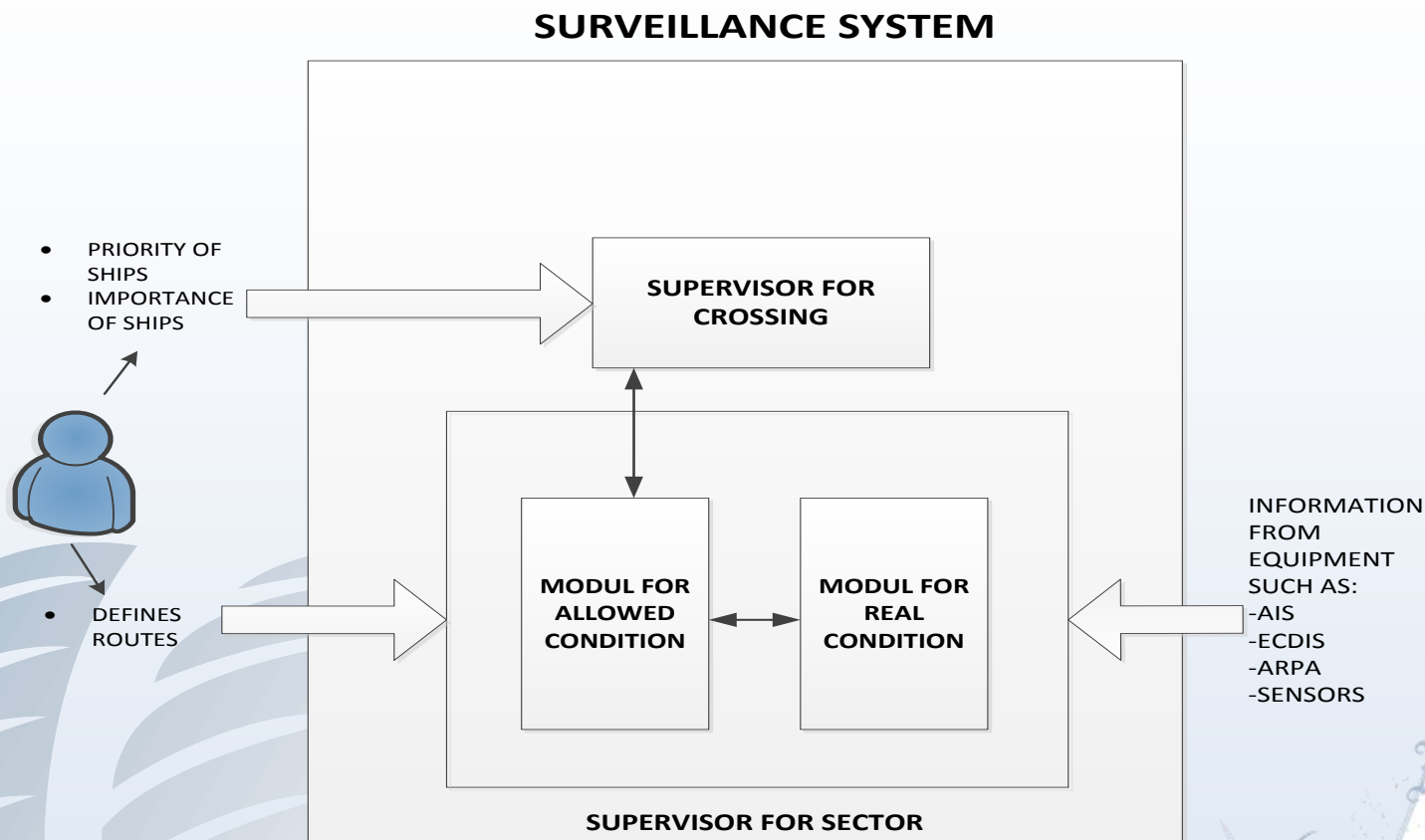


Figure 2. Surveillance system in future STCC



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- **Figure 2 present block scheme for surveillance system**
- **It is obvious from picture that operater make input in surveillance system:**

- 1. Data about routes**
- 2. Priority for ships**
- 3. Importance for ships**

- **Surveillance system compare difference between moduls for real condition and for allowed condition.**
- **Any deviations of real condition from allowed condition presents alarm which audio and visually presents to the operater on shore and to officer on ship.**



➤ **The above mentioned system provide informations:**

- 1. Navigation in allowed route**
- 2. Restrictions about number of ships in particular part of route**
- 3. Sequential transitions of ships between the sectors in specific time (if exists deviation between real and predicted time)**
- 4. Maximum allowed number of ships in crossings**
- 5. About priority of ships in crossings etc...**



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CONCLUSION

- The main aim of this presentation is to propose how to enhance existing VTS system by implementing surveillance system in form of program which would automatically control and warn on prohibited situations during navigation at sea.
- The surveillance system is applicative for all straits and entrances to ports where ships are navigating on predefined routes
- This system is possible to implement by developing program on existing VTS system.



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