SMART VTS vs CONVENTIONAL VTS

Rino Bošnjak
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.
**CONFERENCE ON INTEGRATED MARITIME SERVICES FOR A MORE SAFE, SECURE AND CLEAN ENVIRONMENT**

Rijeka, 23 – 24 August 2016

<table>
<thead>
<tr>
<th><strong>Modular</strong></th>
<th><strong>ADVANCE COMMUNICATION</strong></th>
<th><strong>ADVANCE SENSOR SYSTEMS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>easy to:</td>
<td>-voice, text, written comm.</td>
<td>Radar, AIS, optical, rdf</td>
</tr>
<tr>
<td>-isolate,</td>
<td>-phone, radio, e-mail,</td>
<td>satellite, weather, long</td>
</tr>
<tr>
<td>-update,</td>
<td>Safety information broadcast</td>
<td>Range Identification</td>
</tr>
<tr>
<td>-Restart,</td>
<td>all fused into a</td>
<td>and tracking,</td>
</tr>
<tr>
<td>-Service,</td>
<td>Single information base</td>
<td></td>
</tr>
<tr>
<td>- upgrade,</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 platfrom through a single human-machine interface
PROPOSAL

- In this presentation is proposed how to build a new improved surveillance system which will detect danger events and automatically sound alarm to VTS operator.

- Surveillance system automatically receives data about movement of specific vessel.
VTS operator 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 detect 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.
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 operator.
Figure 1. proposed surveillance system for future VTS
Via received informations operator will warn duty officer by comm system shore-ship.

STCC operator define fixed predefined routes.

STCC operator define priority and importance for any ships in surveillance zone

Priority is numerical value marked as P and ranging from P1 to P3

Importance is numerical value W ranging from W1 to W3.
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 until military ship is in sector;
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)
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.
➢ 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
SURVEILLANCE SYSTEM FOR FUTURE STCC

Figure 2. Surveillance system in future STCC

- PRIORITY OF SHIPS
- IMPORTANCE OF SHIPS
- DEFINES ROUTES

INFORMATION FROM EQUIPMENT SUCH AS:
- AIS
- ECDIS
- ARPA
- SENSORS

SUPERVISOR FOR CROSSING

SUPERVISOR FOR SECTOR

MODUL FOR ALLOWED CONDITION

MODUL FOR REAL CONDITION
Figure 2 presents the block scheme for the surveillance system.

It is obvious from the picture that the operator makes input in the surveillance system:

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

The surveillance system compares the difference between the modules for the real condition and the allowed condition.

Any deviations of the real condition from the allowed condition present an alarm that is audio and visually presented to the operator onshore and to the officer on the 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...
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 applicable 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.