

Operational Status of Polish AIS Network

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ABSTRACT: This paper is the report on operational and legal status of the Polish AIS network established by Polish Maritime Administration. Existing structure of base stations, telecommunication network as well as current radio coverage within a Helsinki Commission (HELCOM) area is described [2]. Authors present the current status and practical operational applications of the AIS-PL to control a marine traffic within the area of responsibility of Maritime Safety Centre in Gdynia and/or VTS Gulf of Gdansk.

1 BACKGROUND

Polish national AIS network was established during a period of 2002-2006 in response to requirement of Copenhagen Declaration signed by Baltic countries in September 2001, which was followed by EC decision expressed in Directive EU 2002/59/EC.

Maritime Office in Gdynia was appointed by ministry of maritime administration to be a coordinator of the Polish project and became the member of international HELCOM AIS EWG (Expert Working Group). As a result, the first effectively working international AIS network consisting of 10 national systems was created with a common server and database in Copenhagen. All regulatory issues, such as data formats and FATDMA distribution plan were solved according to IALA guidance and ITU-R standard [1]. The Agreement on data standard and data distribution principles was signed. Finally, HELCOM network is the primary source of information about SOLAS ships traffic on Baltic area, consisting of about 110 AIS base stations delivering data from 3000 ships every 6 minutes.

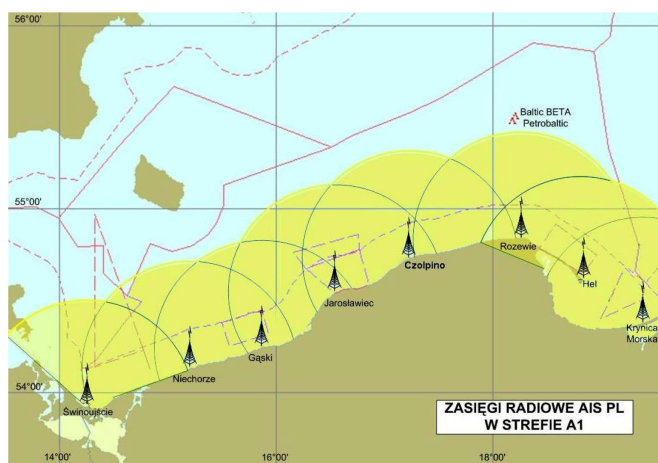


Fig. 1. AIS-PL shore base station coverage area (worst case scenario) [3]

2 AIS-PL SYSTEM LAYOUT

Polish AIS system (AIS-PL) consists of 11 land based (8 marine and 3 inland) stations linked via national server to the HELCOM network. Although stations spatial distribution was designed to broadcast VHF signals in A1 zone, the whole Polish responsibility area is not permanently covered (Fig. 1).

Required levels of system performance were established in order to satisfy traffic surveillance and maritime safety requests. There is evidence that effective AIS coverage depends on propagation conditions due to weather and pressure. However, anomalous propagation, which results in extended VHF range, is relatively rare. There are days when single station range increases from 35 to 200 miles and the opposite side of Baltic is accessible. Major traffic regions, such as VTS Gulf of Gdansk and VTMS Pomeranian Bay, were designed to have extra coverage redundancy in case of system outages or poor propagation. For that purpose, there are alternative base stations and additional communication links. Stations names and respective positions were listed in Table I:

Station name	Lat	Long	MMSI	Antenna height [m]
Szczecin	54°26'N	14°35'E	2610700	22
Police	54°34'N	14°35'E	2611800	64
Świnoujście	54°55'N	14°17'E	2610800	43
Kikut	53°58'N	14°34'E	2614800	95
Niechorze	54°05'N	15°03'E	2614700	65
Gąski	54°14'N	15°52'E	2614500	50
Jarosławiec	54°32'N	16°32'E	2614400	51
Czołpino	54°33'N	17°13'E	2614300	75
Rozewie	54°50'N	18°20'E	2614200	85
Hel	54°36'N	18°49'E	2611700	33
Krynica Morska	54°23'N	17°27'E	2614100	53

Most of the network can be controlled from Maritime Safety Centre in Gdynia (MSC) where also a real-time database of AIS-PL has been created. Data from the system is being distributed to authorized institutions only such as Maritime Administration, Polish Border Guard, Navy or SAR centre.

3 NETWORK TOPOLOGY

Base stations are connected through a wide area network to three regional servers located in Maritime Offices in Szczecin, Slupsk and Gdynia respectively [Fig. 2]. Depending on local circumstances, they use several transmission media: wired lines (copper, fibre optics links) and/or wireless (GPRS, microwave E1 links).

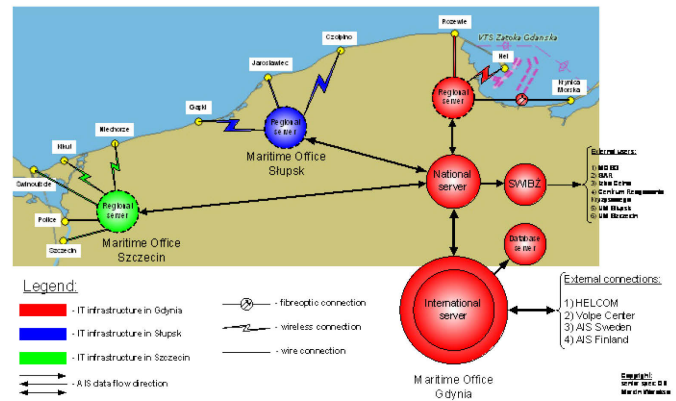


Fig. 2. AIS-PL data flow

Regional servers are connected to a national server in MSC Gdynia where also an international server of AIS-PL and database server are installed.

Ships AIS data transmissions, received by shore stations after data processing in regional servers, are sent to the national server – where they are integrated into one AIS-PL data stream to be sent to external authorities or local applications (e.g. GateHouse Statistics, AIS Display, Adveto, MarSSIES). AIS-PL data stream is down sampled in international server before being sent to the HELCOM server (Copenhagen, Denmark). There data from Poland is integrated with other AIS streams from Germany, Denmark, Russia, Lithuania, Latvia, Estonia, Finland, Sweden and Norway. Finally, the data stream is delivered back to all HELCOM members and Norway.

AIS-PL real time and HELCOM sampled data packets are stored in database server for traffic management, statistics, track plotting, post processing studies or evidence proceedings. Stored data is periodically backed up onto a tape storage system.

The whole system is protected by several firewalls. Additionally – data transmission from/to HELCOM server is encrypted for security reasons by Secure Socket Layer protocol.

4 AIS IN VESSEL TRAFFIC SERVICES

Radar was the most important and basic sensor in VTS, but AIS introduction is a new tool used for the Vessel Traffic Monitoring especially outside the VTS Gulf of Gdansk area. System MarSSIES – Maritime Safety and Security Information Exchange System is used in Poland for the purpose of traffic monitoring and exchange of safety and security related information. The MarSSIES became also one of display software of the AIS data, both from National and HELCOM networks.

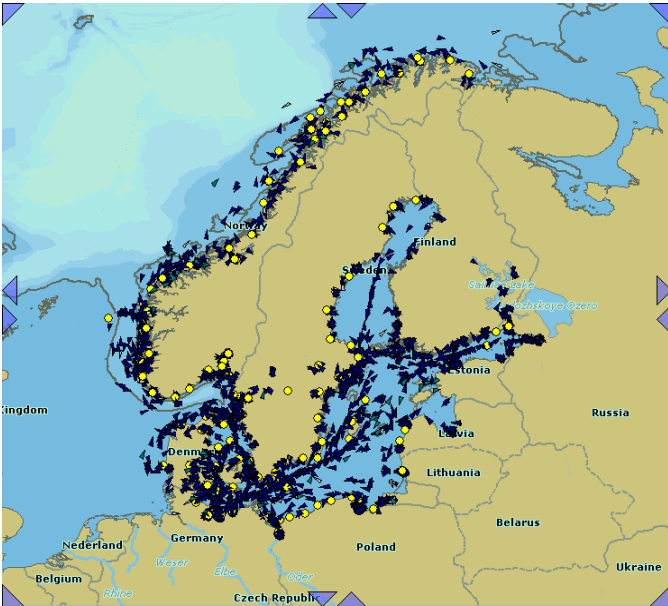


Fig. 3. HELCOM coverage area

Polish Maritime Administration, Customs, Polish Navy, Coastguard, Crisis Centres are those authorized users for whom AIS data is available on the local and central levels. AIS Display based on ENC is an important module in the system which gives VTS and other allied services access to the comprehensive traffic overview. Referring to duties of the VTS Gulf of Gdansk and Maritime Safety Centre, AIS data became the crucial tool in crisis management at sea, maritime office fleet management supports pollution combating operations, polluter tracing or SAR operations coordination. Not only does it give a detailed historical track of the vessels but it also serves as a data source for statistical analysis. For example the traffic assessment of the commonly used routes within Polish Sea Areas was based and conducted on the AIS data and VTS statistics.

Due to the fact that some of the static or voyage related AIS data might be incorrect, VTSO (Vessel Traffic Service Operator) workload has been extended. The most commonly detected errors were: incorrect or not updated destination, incorrect spelling of the destination, not updated navigation status. Vessels are requested by VTS to correct data according to IALA VTS22/05-549 recommendation on 05 September 2005. In case of the outbound vessel with incorrect position, her destination port and transit countries' authorities should be notified. VTS performs a very close co-operation with Port State Control in this matter. VTS authority estimates that about 20-30% of vessels with at least one of the AIS data incorrect elements enter Polish Ports.

General benefit of the AIS in VTS has improved detection and identification of the AIS vessels. Additionally, communication and reporting procedures were reduced due to the content of AIS

static and voyage related data, while safety related messages are used very seldom. AIS along with radar data have become a major part of the national traffic monitoring system. Safety of the vessels equipped with AIS transponder has considerably been improved thanks to the total coverage of the AIS on the Baltic Sea. VTS and Traffic Monitoring Services are also looking forward for fishing vessels over 15 meters to be equipped with AIS transponders according to new UE regulations. Thanks to this legislation VTS, SAR and Coastguard services will receive a comprehensive traffic overview which may be treated as an initial step towards new e-Navigation idea.

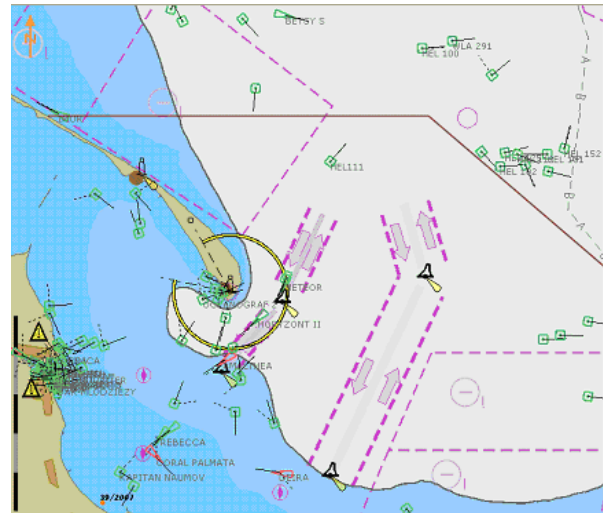


Fig. 4. AIS and radar echoes integrated in one screen

5 CONCLUSIONS

- AIS-PL is operational in A1 zone.
- Existing network should be based on unified fibre optics links.
- There is a need to set-up a new database which would consist of AIS real-time data.
- Future e-NAV requires farther AIS and radar data integration.
- AIS data became the main source of information for traffic analysis, FSA and evidence purposes

REFERENCES

- Recommendation ITU-R M.1371-1, "Technical Characteristics for a Universal Shipborne Automatic Identification System using Time Division Multiple Access in the VHF maritime mobile band."
- <http://www.helcom.fi> - Helsinki Commission website
- "Koncepcja budowy krajowej sieci stacji bazowych AIS"- prepared by ELECOM, Instytut Łączności Oddział Wrocław, 08/2004