Satellite AIS (A,B) and monitoring of Inland Water Transport

LPGAN for Inland Water Transport applications

(SC.3) Working Party on Inland Water Transport (62nd session)
3 - 5 October 2018
- 117 river ports.
- More than 200 companies involved in cargo handling.
- More than 140,000 km of waterways is used.
- European part of waterways is well equipped with shore AIS stations.
- Asia part of waterways has a small number of shore AIS stations. Monitoring can be made with satellite AIS technology only.
“MoRe” – monitoring system collects ships reports from different sources.
Satellite AIS technology

Constellation
• Low Earth Orbiting Satellites
• High Detection Technology

Earth Stations
• Distributed globally
• On every continent including Antarctica

Data Center
• Located in highly secure facility
• Signals processed into AIS messages

Customer Delivery
• Industry standard formats
• Multiple delivery methods

End-to-End Solution for Increased Maritime Domain Awareness
“Morsviazsputnik” company (MARSAT) – more than 10 years experience of collecting ship reports from different sources (LRIT, AIS, different Sat-AIS systems, SSAS, commercial monitoring with different Inmarsat/Iridium equipment).

- Sat AIS monitoring of AIS-A shipborne equipment – good quality, with Iridium Next constellation time of delivery near 2-3 minutes. Pole-to-Pole. Problem – it is difficult to make sat-AIS monitoring in intensive navigation areas.

- Sat AIS monitoring of AIS-B shipborne equipment – bad quality without special technology of AIS signals processing and a special version of AIS-B shipborne transceiver.

- One of the methods to improve satellite AIS-B detection - to use ASM 1 frequency (patented exactTrax technology by Canadian company exactEarth)
Shipborne AIS transceiver transmits an AIS Message 8 (binary message) on the ASM-1 frequency, with a specially formulated payload that significantly improves the chances of message detection by exactEarth’s orbiting satellites. Once detected, exactEarth’s data processing system decodes the Message 8 payload and uses the contents to reconstitute a standard Message 18.

**exactTrax technology:**

Local manufacturer of AIS-B transceivers **exactTrax technology:**

“Radioterminal” – company

- AIS transponder class B (2-5 Wt)
- 5,6” LCD
- GPS/GLONASS
- 10,5 – 35 VDC, <500 mA, 12VDC
- AIS1, AIS2 + ASM-1
- SD slot

**VEGA VG-3944R / VG-3944T**
Source of GNSS data to be used for ship monitoring?

<table>
<thead>
<tr>
<th>GNSS system</th>
<th>IMO resolution</th>
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<tr>
<td>GPS</td>
<td>MSC.112(73)</td>
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<tr>
<td>GLONASS</td>
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<td>Galileo</td>
<td>MSC.233(82)</td>
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In Russia, government supports development of GLONASS/GPS receivers and promote mandatory equipping governmental users with combined GLONASS/GPS receivers.

**IMO Resolution MSC 95/22/Add.2:**

“A multi-system receiver using navigation signals from two or more GNSS, with or without augmentation, provides improved position, velocity, and time data. An improved resistance to intentional and unintentional radio frequency interference is achieved when two or more independent or frequency diverse radionavigation systems are used. Such a combined approach also provides redundancy to mitigate the loss of a single system.”
PPP (Precise Point Positioning) technology, tests made by NovAtel:

PPP correction source

- TerraStar-C (GPS/GLONASS)
- TerraStar-C (GPS only)

Horizontal RMS Error (cm)
- 5.3
- 6.4

Vertical RMS Error (cm)
- 7.6
- 9.7

RMS - Root Mean Square (error)
Summary:

- Sat-AIS technology can be used for ships equipped with AIS class B transceiver.
- Sat-AIS technology works equally unstably for AIS-A and AIS-B in intensive navigation areas.
- In intensive navigation areas Sat-AIS data should be combine with shore AIS data.
- Sat-AIS monitoring is a need for inland waterways areas where it is impossible to build shore AIS infrastructure or no economical reason to do it.
- Sat-AIS technology is not working in a proper way near big cities due to difficult electromagnetic situation.
Low Power Global Area Network (LPGAN) for Inland Water Transport applications

**Hiber LPGAN modem**

- Frequency band – 399-401 MHz
- Customer payload 1152 bits - free to send any data.
- Accumulator – up to 10 years (3.3 V).
- Integrated GPS receiver.
Low Power Global Area Network (LPGAN) for Inland Water Transport applications

- Low price for hardware and service
- Any stationary or slow moving object can be monitored
- Pole-to-Pole coverage
- Extremely low power consumption

Controller for the modem you should develop yourselves
- Time of message delivery on the first stage will be 16 hours
- Message size limited to 1152 bits, more messages more payment
- You should develop your own software to process messages
Low Power Global Area Network (LPGAN) for Inland Water Transport applications

Areas of applications
THANK YOU!

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