

Prepare Ships newsletter July 2020

This is the first newsletter for the Prepare Ships project that started in December 2019. With this newsletter, which we will give out every quarter from now on, we would like to inform all stakeholders on the progress of the project. The project has received funding from the European GNSS Agency under the European Union's Horizon 2020 research and innovation program under grant agreement No 870239. The project as successfully finalized the first work package on technical requirements and testing set-up for the whole Prepare System. The work contained definition of Ship Application Use Cases and Application Scenarios. Interfaces between the various software and hardware components provided by the partners have been defined. A functional safety analysis has been performed based on the system description, which is in our perspective a must for making more sophisticated decision support tools for the maritime industry.

Precise Positioning Solutions

ANAVS is actively working on developments for Precise Point Positioning. Work includes the creation of the basic structure, incorporation of precise orbit & clock products, accounting for earth tides, preparation of ambiguity fixing and iterative Kalman-Filters. Lantmäteriet works on the RTK correction and expand the coverage of their network RTK infrastructure to include the test area of Prepare Ships project by establishing four new reference stations. The four reference stations will be in Vinga, Stysö, Hällsvik, and Tistlarna (this station is still under discussion). Work is in progress to connect these stations to their control processing center to be part of our infrastructure which generate the GNSS corrections for the GNSS receiver onboard the ship. Lantmäteriet has also decided to distribute the correction data in broadcast mode (one-way stream) using their modern technique (casters), and they are implementing a new distribution



stream via VDES to the ship. In VDES application, where only one of the available VDES slots (with limited bandwidth (650 byte/sec)) can be used for transmission of GNSS correction data, Lantmäteriet has to minimize the size of messages while keeping the accuracy as required for Prepare-Ship positioning.



Dynamic Real Time Prediction

The work package started its activity on March 2020 as planned. The architecture of the predictor system is finalized and details regarding its interfaces are being defined. Three modules are to provide the envisioned functionalities of the predictor system: the dynamic predictor, the machine learning coefficient tuner, and the predictions monitor. Functioning prototypes for the dynamic predictor and the machine learning coefficient tuner are currently being developed. The development of the prediction monitor will start after the summer.

Ship-to-ship and Ship-to-shore Communication

The development of Communication Architecture has started and a preliminary architecture has been proposed. Prototype HW/SW implementation has started with design of basic communication blocks needed for the VDES communication.

Perception/ ECDIS

The work was started with focus to determine prerequisites for the coming development that covered the following activities,

- Status of S-100 (S102 and S-129) product standard collaboration with IHO/UKHO and CIRM ECDIS WG.
- Status of new ECDIS kernel that can support S-100 products collaboration with ChartWorld/7Cs
- Start design of architecture for exchange of prediction data.
- Collaboration with the predictor and VDES communications on interfaces and protocols.

Testing



The test infrastructure is prepared to allow for preliminary data collection and tests. Vessels that will be used are a former pilot boat, a Stena ferry as well as a yacht. These vessels are prepared for data collection and equipment installation. Some more details on the Lantmäteriet work is found in this newsletter as well as some short questions to Anders Bagge from SAAB TransponderTech. We hope that you get a good overview on the Prepare Ships project status and progress. If you would like to get further details and information, please reach out to us!

Greetings and have a good summer!

Johannes Hüffmeier, Project Manager Prepare Ships, RISE Research Institutes of Sweden.



Developments

The use of multiple GNSS constellations (GPS, GLO-NASS, Galileo, BeiDou,..) has been beneficiary to positioning performances and reliability in recent times, especially in low cost mass-market setups, and each one of these includes several satellites and each satellite send several signals (L1,L2, L5,..), which means that our correction data will have high bandwidth requirements. This sometimes presents limitations for the use of our services in some applications. Minimizing the bandwidth utilization of our NRTK correction (RTCM messages) while keeping the required accuracy is thereby of crucial importance in the development in Lantmäteriet, as it allows more efficient usage of our solutions.

Industry trends

In our Prepare Ship project we look forward to develop (or at least to test) a PPP (Precise Point Positioning) service to understand how we will fuse (integrate) our services with it. From other hand we would like to bring forward the utilization of correction integrity data in the project.

Four questions to Anders Bagge, Saab TransponderTech

What is your role in the project?

"I am project manager for the Saab contribution in the project, which means that I coordinate the internal Saab project tasks with the overall project needs to meet the targets of the overall project plan. The main Saab responsibilities is WP 4 Ship-to-Ship and Ship-to-Shore communication and active participation during the trials in WP 6".

Which challenges are there in your perspective in the project?

The main challenges from Saab perspective is to secure the availability of fully functional prototypes in time for the trials in spring 2021. The VDES transponder prototypes must be possible to install on board the three vessels that will be used in the trials and also one VDES base station must be available and installed in the trial area. One other challenge identified is the definition of the new message formats needed for exchange of predictor information and RTK correction data. It is important that these formats also can be candidates for the final VDES standard. Saab is participating in several of the concerned standardisation working groups and will actively promote the Prepare ships view of required messages types.

Which potential does the project have?

The project aims at demonstrating a system for coo-

peration between autonomous units in the maritime domain. Historically AIS has proven to be a very reliable communication link ship-to-ship and ship-toshore. However AIS does not provide the bandwidth needed for the information exchange required in Prepare Ships but the succeeding VDES standard that is currently under development will provide sufficient capacity. Since the definition of VDES is ongoing in the concerned committees within IALA and IEC a successful Prepare Ships project will be a valuable input to this work.

How does the project fit into the business development strategy of your organisation?

It is important for Saab to participate in projects where VDES is used on advanced application layers. VDES has the capacity to provide much more than AIS, but it is necessary to understand the new applications made possible by its increase in transfer capacity. All-in-all VDES acts as a "modem" for transfer of information, but it's a complex task for all parties to understand where VDES can or not can do the task for communicating resilient and safe information. Saab has the ambition to be leading in the development of VDES based products and therefore participation in Prepare ships is an important contribution to our VDES engagement.

About

Prepare Ships is creating a smart positioning solution by developing and demonstrating a data fusion of different sensor and signal sources to enable a robust navigation application. The idea is that vessels with accurate positioning based on EGNSS, data and machine-learning should be able to predict future positions of nearby vessels. Besides a decreased risk for collisions, this also means additional benefits in the form of a more energy effective manoeuvring of the vessels, something which can also reduce the environmental impact of shipping in line with IMO's targets.

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Would you like to recieve the Prepare Ships newsletter?

Prepare Ships Increased Safety and Efficiency in Shipping

The Prepare Ships project integrates a new precise positioning system based on the features of Galileo and EGNSS signals. It enables merchant ships to plan and execute safe ship passages of other vessels in challenging fairways by advanced decision support.

- EGNSS and RTK resilience positioning
- Real-time dynamic predictor based on machine learning
- Ship-to-ship / ship-to-shore communication (VDES)

LANTMÄTERIET

ANAVS

• Geo-fencing and "go" areas, all available in ECDIS for enhanced decision support

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