CIDCO

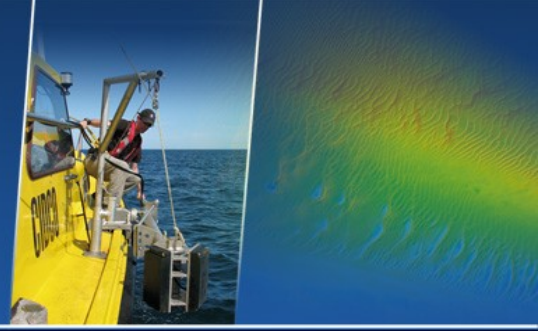
Centre interdisciplinaire de développement en cartographie des océans

Interdisciplinary Centre for the Development of Ocean mapping

# CSB project summaries and updates

June 29th 2020 (9th CSBWG Meeting 29 June-2 July 2020)

# Projects since CSBWG7



- CSBNC project conclusion
- HydroBox installation on Laurentia Desgagnés (collab with CHS)
- Capacity building with Arviat in Northern Canada
- Development of new CSB technologies: HydroBlock

# CSBNC project

## Crowd-sourced bathymetry in Northern Canada

COMREN
Canadian Ocean Research & Education Network

RéCREH
Réseau Canadien de Recherche et d'Enseignement en Hydrographie

# CSBNC project

In 2017, the Ocean and Freshwater Science Contribution Program (OFSCP) from DFO funded a 2 year project for CSB in the Arctic. The project concluded in March 2019.

- Pre-qualified systems (HydroBall / HydroBox)
  *** Fully integrated systems with GNSS L1/L2 capabilities, inclinometer and SBES**
- Collaboration with Local communities
- Automatic data processing and dissemination

**More reactive and cost effective than**

- Survey teams from the South
- Conventional hydrographic tools

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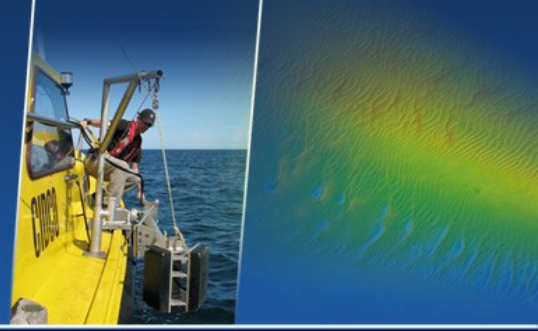
# Project results



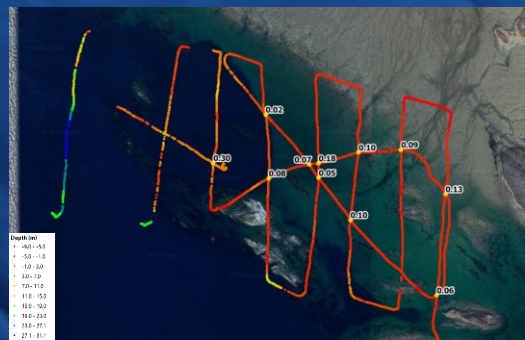
Systems were developed allowing **non experts** to **collect Hydrographic data:**

- Pre qualified systems: HydroBall and Hydrobox

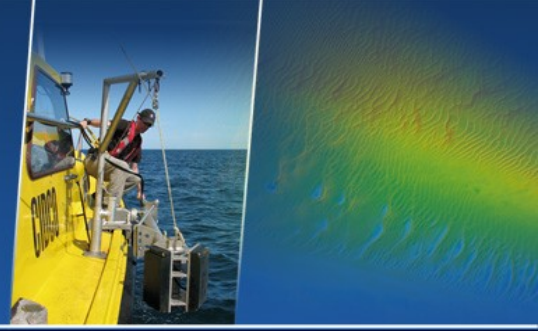
**Training** was successfully provided to **indigenous communities**

A **workflow** to **automatically process bathymetric data** was put in place:

- GNSS PPP (NRCan CSRS-PPP)
- SVP modelling (Hycom)
- Automatic filtering



# Lessons learned



- A **reliable project coordinator** is mandatory
- Chosen trainees need to **be motivated**
- **Community members** need to have greater **involvement** in the project.
- **Need to ensure robustness of processing workflow.**
- **Efficient dissemination of the data is needed.**

# Next steps:

The main objective: provide a **scalable turn key solution** for the **life cycle of hydrographic data**.

- Upgrade data acquisition **sensors**
- Improve **community engagement**
- Ensure **robustness of data processing** workflow
- **Disseminate** the data to: **web-portal and IHO DCDB**
- **Expand** to other **Northern Communities**

Currently a newly proposed project has been accepted by DRDC (Defense Research and Development Canada). But unfortunately funding is currently unavailable. If additonnal funds become available within the next 2 years it may get funded.

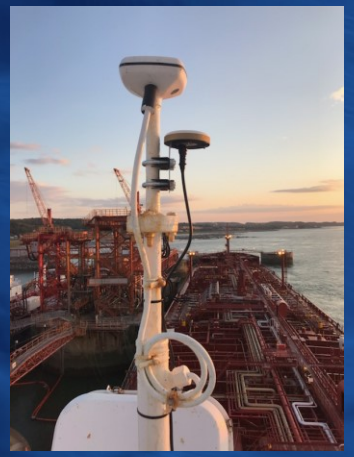
# HydroBox

## HydroBox installation on Laurentia Desgagnés (in collaboration with CHS)

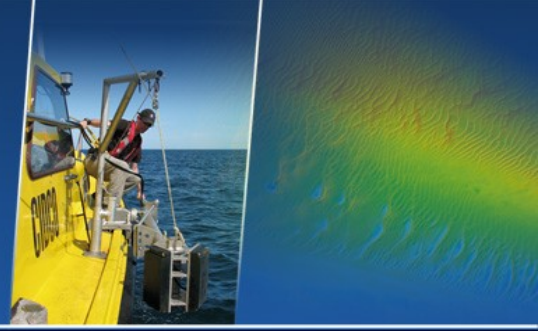
# HydroBox

CHS: installed Hydrobox on Laurentia Desgagnés oil tanker for water depths measurements during winter season

- Ship transits from Montreal to Quebec city every week
- Saint-Lawrence water way not charted during winter season: it will allow to follow-up during winter period

# Capacity building in Arviat, NU



# Capacity building in Arviat, NU

2019:

Request from the community to learn bathymetric data acquisition

- CHS lent a HydroBall system to the community for the summer 2019
- CIDCO provided operationnal training for HydroBall use to acquire bathymetric data during summer 2019.
- Members of the community were able to collect a few days of bathymetric data.


# Capacity building in Arviat, NU

2020:

Request from the community to purchase a HydroBox system and to build capacity for data processing.

- Training was supposed to be held in the community of Arviat in the coming weeks for data acquisition + processing.
  - Because of COVID, the objectives have been reviewed and the training will take place in two parts:
    - 1 virtual training for installation and operational training of the HydroBox system.
    - A training will be planned at a latter date for data processing when COVID restrictions for travel in the North will be removed.
    - Close communication will be done with members of the community to ensure good survey techniques are used and to ensure the quality of the data.

**The objective will be do provide comprehensive instructions so the community can build capacity for hydrographic data collection and processing.**

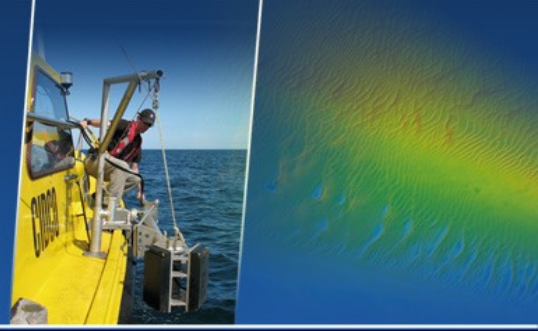
# Capacity building

- The case of Arviat consists of a perfect scenario where we are approached by a community to build their capacity in hydrographic data collection.
- With the easy to use pre-qualified tools the idea is for them to collect data either through dedicated surveys or with a more CSB approach where they vague to their normal occupations (fishing, camping, navigation).
- The hope is for other Northern Communities to follow suite and that the Arviat scenario will repeat itself in other communities of the North.

# HydroBlock™

## Open source bathymetry data logger

# HydroBlock™

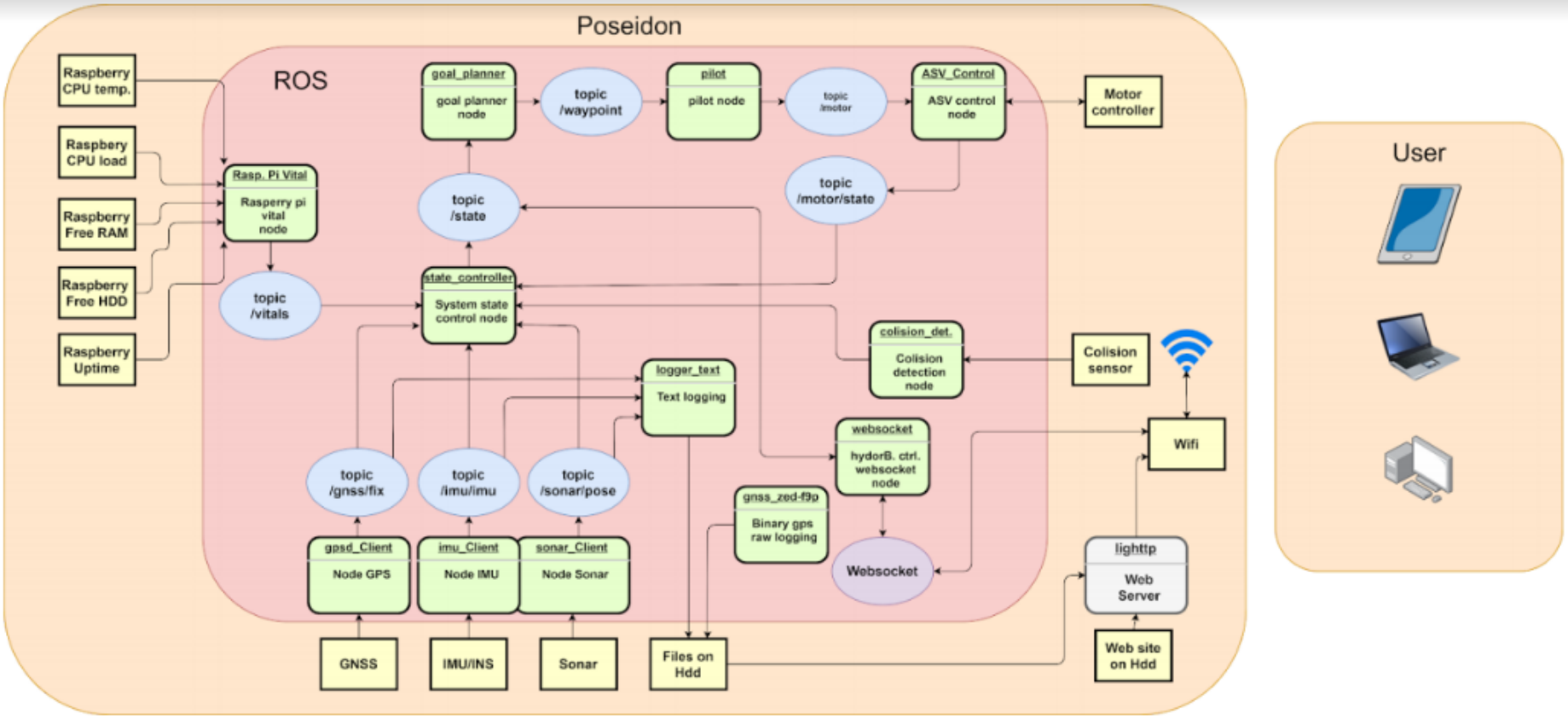


## Overview

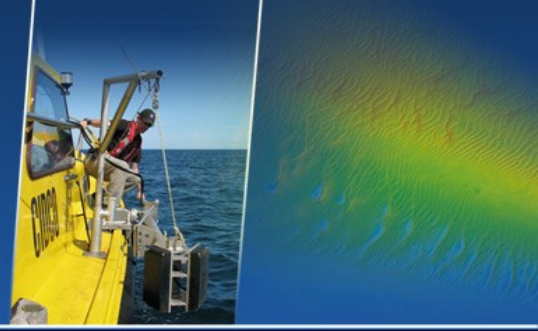
The operationalization of collaborative bathymetry solutions often require tailor-made solutions to the opportunity vessels used for data collection. This poses a technical problem in terms of standardization and streamlining of hardware, software and downstream data processing integration. In order to facilitate this, CIDCO is developing an open-source platform to facilitate integration and data acquisition for CSB scenarios.

# HydroBlock™

## System diagram



# HydroBlock™



## Technical characteristics

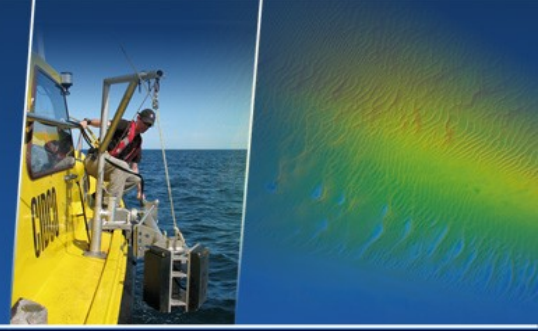
The system is built with interoperability, transparence, and maximum flexibility from the ground up. The custom open-source data acquisition software is made to be executed as nodes inside the Robot Operating System (ROS), which is running on a Linux operating system. This software stack is embedded inside a Raspberry Pi computer, a very flexible, accessible, and thoroughly documented open-hardware platform. External sensors such as GNSS, IMU and sonars can then be integrated to the data acquisition system with minimal changes.

# Components

## 1. Hydrographic data acquisition nodes

Hardware-specific program routines can be tailor-made to the needs of specific hydrographic sensors, and integrated to the ROS to create a hardware abstraction to the data logging facilities. This makes it easy to provide a wide array of compatible hardware such as NMEA-0183 sonars over RS-232, RS-485, RS-422, NMEA 2000, SeaTalk, or even proprietary formats such as the Imagenex 852 for scientific-applications.

# Components



## 2. Robot operating system (ROS)

Additional downstream processing capabilities can be integrated into the popular robotics platform eponymously called the Robot Operating System (ROS) to augment the system's data processing capabilities and overall intelligence. This includes control programs, QA routines, ASV control and navigation stacks, and many more.

# Components

## 3. Linux base system

A Linux base system provides a web-based environment to interface with the system, providing a flexible platform for integration with complex system for complex use cases such as automatic data warehousing, mesh networking, and many more.

## 4. Raspberry PI hardware

A staple of the power of open-hardware, the Raspberry Pi platform provides an easy to modify platform for power users wishing to add additional functionality that can be integrated upstream into the project in the spirit of open-source collaborative development.

# HydroBlock™

## Community driven

The goal of the project is to provide a scalable CSB swiss-knife solution that can be tailor-made to complex acquisition scenarios comprised of thousands of data logging nodes. We invite anyone interested in keeping in touch and/or joining the effort to join the mailing list at https://mailchi.mp/101a4fb79eb2/hydrographic-free-software

# Thank you