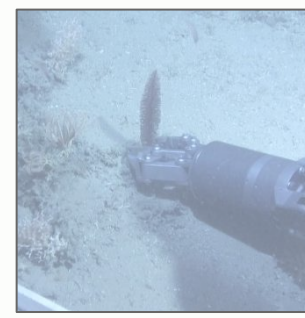
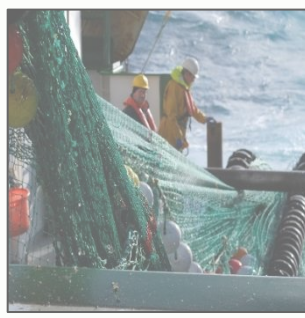




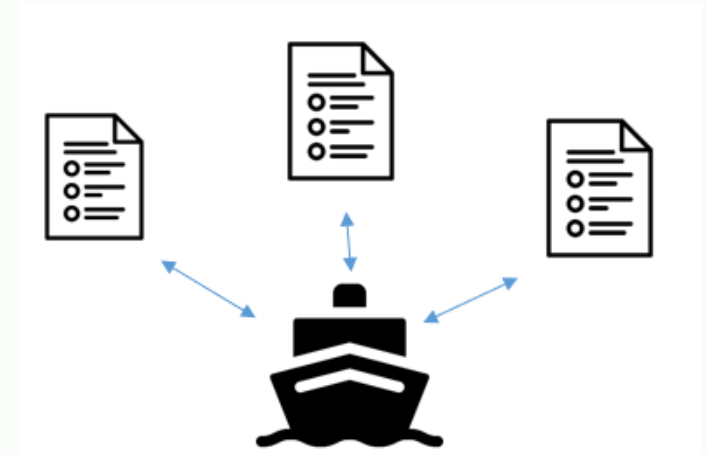
Vessel Data transfer protocols – challenges faced & automation as the solution?

Rosemarie Butler,
Scientific & Technical Officer
ERVO 27th Meeting – Faroe Islands,
4th June 2025



Vessel Data Transfer Protocols - Overview

- ✓ Marine Institute vessels
- ✓ Available WAN options
- ✓ Key challenges faced in terms of vessel data transfer
- ✓ Types of Surveys/Instrumentation utilised
- ✓ Vessel instrumentation/Continuous Data Logging
- ✓ IT systems/protocols currently in place
- ✓ How do we improve the current systems?
- ✓ Automation as the solution?



Ireland's RV Fleet: RV Celtic Explorer & R.V. Tom Crean

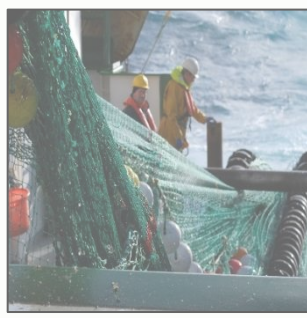
Celtic Explorer

- Built in 2002. Came into service in 2003
- Length: 65 m Beam (width): 15 m.
- Maximum Speed: 16 knots (29 km an hour, service speed 10 knots).
- Accommodation: 35 (20 scientists/15 crew).
- 3 acoustically mounted Engines (2 x diesel-electric), bow and stern thrusters. ICES 209 compliant
- Dynamic Positioning (DP).
- Wide array of scientific instrumentation.
- Endurance 35 days at sea (max).

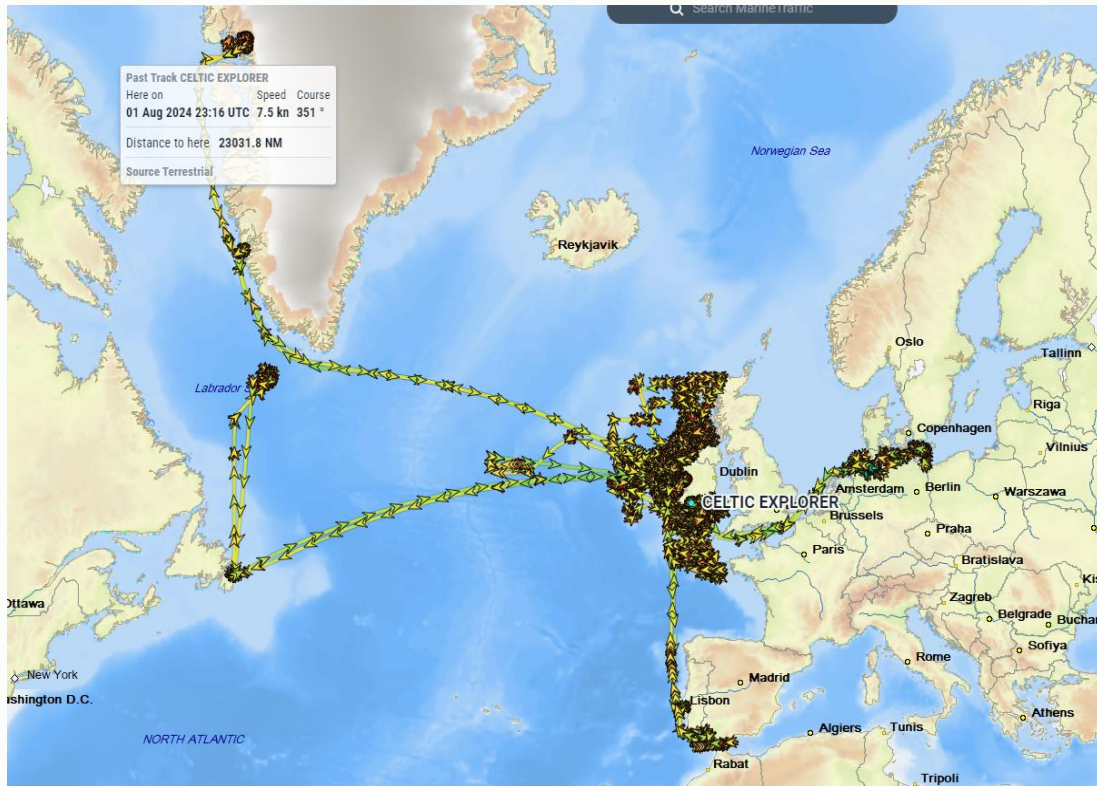
Tom Crean

- Operational since July 2022.
- Diesel electric vessel with 3 generators @ c. 3MW (Ultra low sulphur MGO/HVO)
- 52.8 m length
- Dynamic Positioning (DP)
- Silent vessel (ICES 209)
- Accommodation for 13 crew and 13 scientists
- Endurance of 21 days





2024 Vessel Tracks: RV Celtic Explorer & R.V. Tom Crean



Celtic Explorer: Operational for 301 days

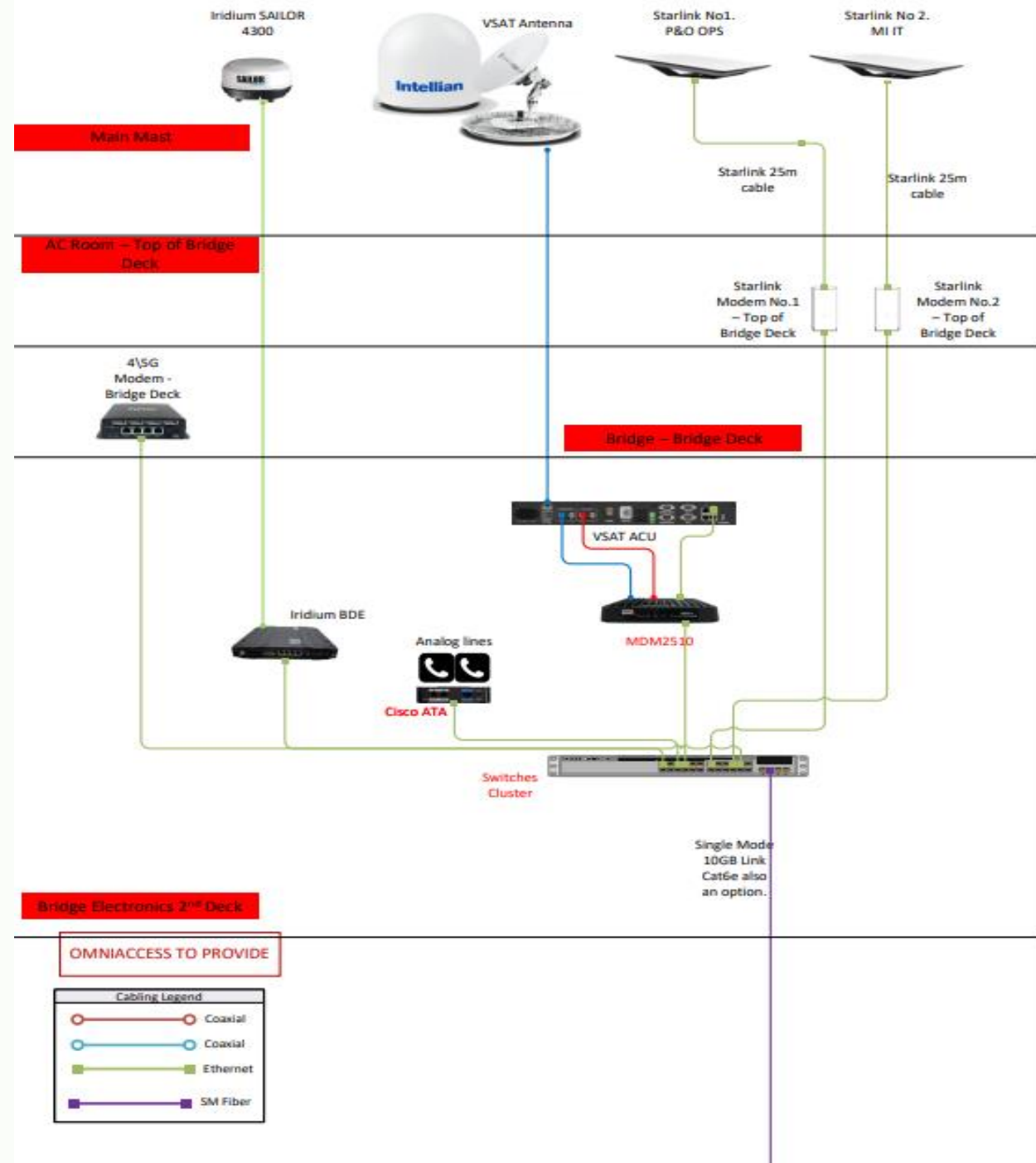


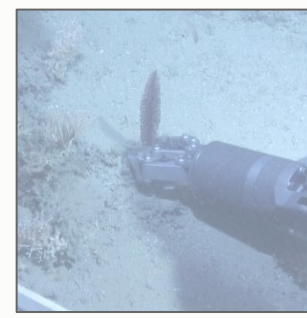
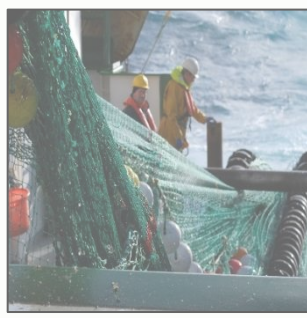
Tom Crean: Operational for 323 days

What are the Wide Area Networks (WAN) options currently available on the vessels?

- **Iridium** – 704/176kbps (Emergency support connection only)
- **VSAT Antenna Ku** - MIR 3/0.5 & CIR 0.75/0.25Mbps (Unlimited data per month)
- **Starlink 1 for Operations** – 220/20Mbps (Capped at 1TB per month)
- **Starlink 2 for Science** - 220/20Mbps (Capped at 1TB per month).

*CIR: Committed Information Rate
* MIR: Maximum Information Rate





What are the big challenges we face?

What are the local challenges we face?

Maritime
industry –
limited
WAN
options



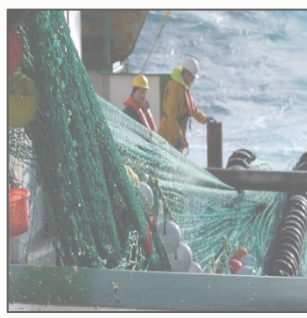
Limited WAN
capabilities >
limited data
transfer
capabilities

Cost –
limited
funds
available

Expectation

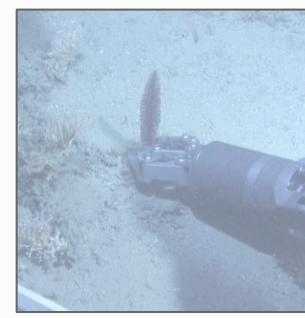
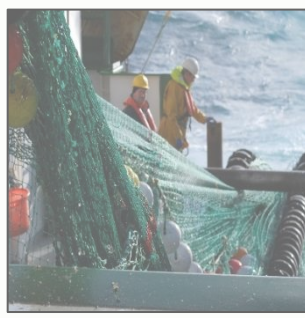
Additional
work on
Vessel
technicians

Finding the
right
automation
process



Survey Type/Instrumentation Utilised

Vessel(s)	Survey Type	Instrument/Data acquired
Celtic Explorer and/or Tom Crean	Seabed Mapping/Seismic	Kongsberg EM2040; EM302; EM712; Knudsen SBP, sparker data acquisition
Celtic Explorer	Pelagic fishing: Blue Whiting Acoustic survey/ WESPAS/ Celtic Sea herring	Kongsberg Simrad EK80; EK60 data; Kongsberg Simrad SU93/SU92
Celtic Explorer	Demersal fishing: Irish Groundfish survey (IGFS)	Marport sensors
Celtic Explorer and/or Tom Crean	ROV surveys	HD video; digi stills; Sonardyne USBL data
Celtic Explorer and/or Tom Crean	Oceanography	SBE911 CTD; ADCP



What are the vessel data transfer processes in place for survey specific datasets?

- The chief scientist will bring onboard a survey specific server and hard drive(s) e.g. Nasdrive. Taken the data off the vessel at the end of the survey.
- Back up system in place on the vessel.
- The data is acquired onto the 'CLIENT' PC, onto the C drive. The data is **manually** transferred over to the 'FileServer', ships PC.
- Involves:
 - (i) the technician having the correct file structure set up on the 'FileServer' PC
 - (ii) The chief scientist mapping the 'CLIENT' PC to the 'FileServer' PC.
- Happens every 12 hrs for example.

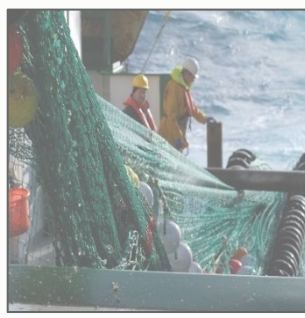
Importance of the server infrastructure on a vessel:

1. 2 x different UPS
2. 2 x different power supplies on each server
3. Raid 5 disk redundancy
4. Comm Vault – hourly back ups to disks
5. Daily LTP back ups

CLIENT C drive data e.g. EK60 PC → Ships FILE SERVER

This is a manual process.

Step 1 to improve vessel data transfer processes would be **automating** this process.



Vessel Instrumentation & Continuous Data Logging

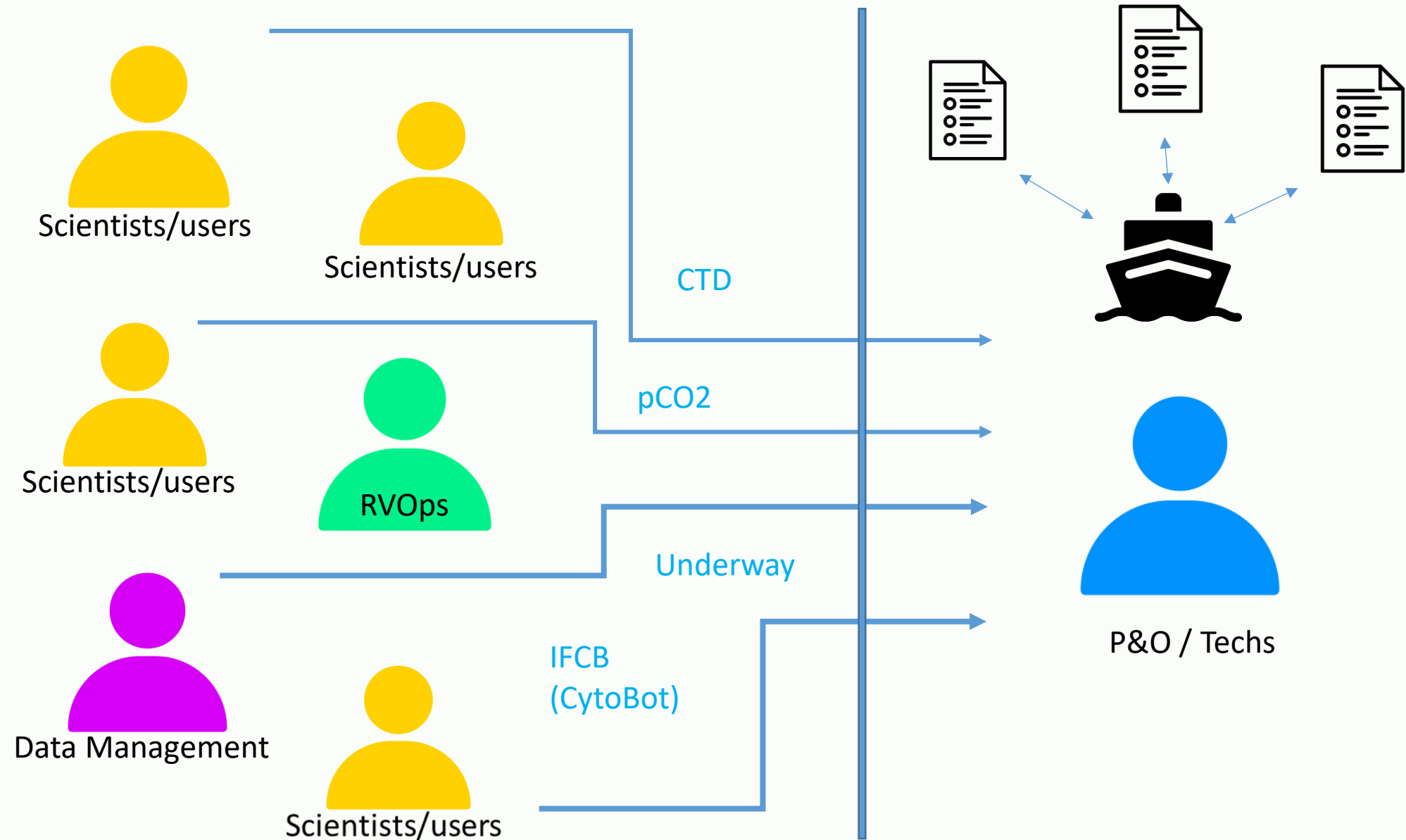
- There are the instruments on the vessels continuously logging data.
- Examples include:
 1. SCS underway – both vessels
 2. pCO₂ – both vessels
 3. ADCP – both vessels
 4. SoRad hyperspectral data – Celtic Explorer
 5. Imaging Flow CytoBot (IFCB) – Tom Crean
- The technician transfers the data while in port to the Marine Institute SharePoint.
- Connection to 4G or 5G while in port.
- The exception is the pCO₂ data – MI IT developed a script; an automated process for sending data to MI SharePoint daily.

IMAGING FLOW CYTOBOT (IFCB)

- The average data size per sample is about 4,000KB per 20 mins.
- Depends on the level of phytoplankton in the water.
- Range is about 1400KB to 8000KB per hour.



Currently:

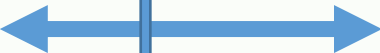
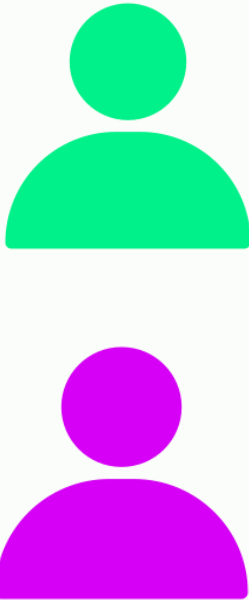
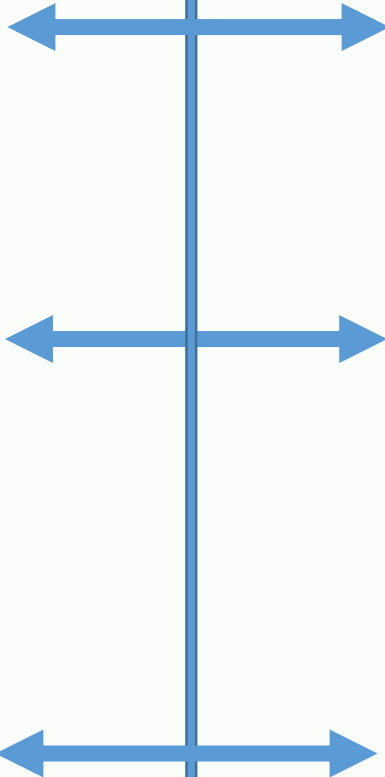
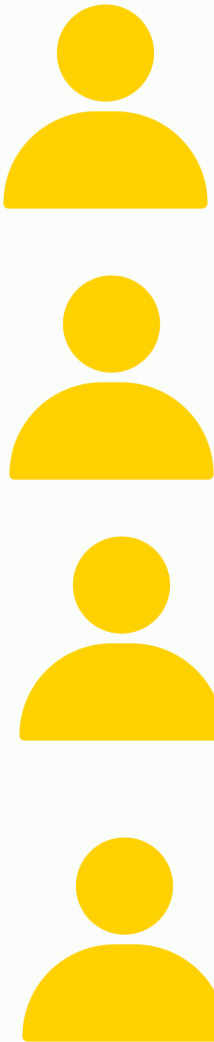


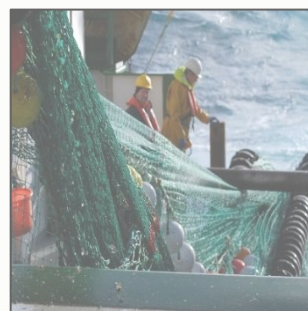
Future State: Where We Want to Be

Scientists/users

IS&D and RVOps

P&O /Research vessel

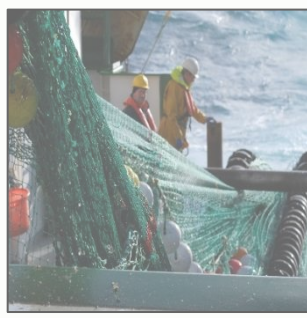




How are we improving the vessel data transfer processes?

- Gathering information from users on (i) data type; (ii) data size coming from the vessels
- Need to look at which WAN will work most efficiently for each specific dataset – use a combination of Starlink, Ku-Band and 4G/5G for cost efficiency and to avoid overall loading on Starlink and/or Ku.
- Looking at products which will automate the process of sending data from ship to shore:
 1. IPERIUS
 2. BINFER
 3. Microsoft Azure IoT Hub

Data Type	Current transfer method	Real time	Frequency	Data Size	Ku VSAT (Unlimited but slow) 3/0.5MB MIR. 0.75/0.25MB CIR	Starlink 2 (1TB monthly) 220/20MB MIR. No CIR	4\5G (Unlimited in Ireland) Have seen 350MB down.
SCS.bak (Port call) - seabird still on CE.	Sharepoint		end of survey - next phase - real time	1GB (3.90 GB)	No	No	Yes
SCS SAMOS Mail (Daily)	Sharepoint			Kb to MB	Yes	Yes	Yes
IFCB (Daily)				1GB	No	Yes	Yes
CTD (2 Hourly – live)	Sharepoint	yes for GTS	Within an hour of a cast being finished - all CTDs	###MB? Max 80mb a day . Average 40- 50		Yes	Yes
ADCP (Daily Email for QC)	Sharepoint	no	end of survey		Y	Yes	Yes
ADCP (Monthly TBC)	Sharepoint	no	end of survey	2GB	No	Yes	Yes
SooRAD UV (Daily)/hyperspec.				###MB?	?	Yes	Yes



Products to Automate the Vessel Data Transfer Process

- **IPERIUS** – tried and tested. There were some teething issues. May be a good option in the interim.
- **BINFER SYNC** – looks like a great option. Maritime specific. Lower data consumption due to compression of data achieved.
- **Microsoft Azure IoT cloud Hub** – to be tested over the coming months on Spiddal Test site, Co. Galway. Proof of Concept.
- Would be delighted to hear feedback/recommendations from other vessel operators!
 - THANK YOU.

