

Marine Management Organisation (MMO)

Working together to monitor the detection of illegal, unregulated and unreported (IUU) fishing.

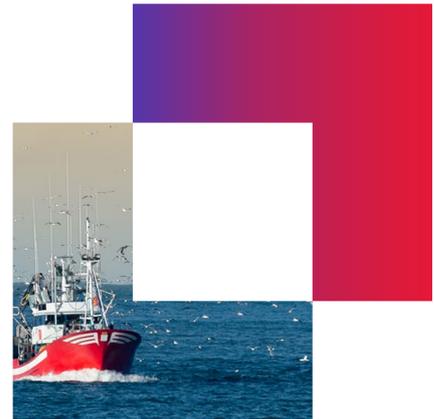
The UK government pledged £20m in 2016 to establish the Blue Belt Programme to protect precious marine habitats around the UK's 14 Overseas Territories (UKOTs). By 2020, over 4 million square kilometres of British waters will be protected. These waters are home to globally significant biodiversity, for example containing 85% of the Critically Endangered Species for which the UK Government is responsible.

Within these aims, a critical challenge was addressing illegal, unregulated and unreported (IUU) fishing activities. Globally, IUU is estimated to cost \$20bn per year. Considering the Blue Belt Programme's aims, IUU fishing:

- Risks the management of sensitive marine environments and populations
- Undermines local economic activities
- Threatens the stability of coastal communities

Through 2017 and 2018, the Blue Belt Programme worked to establish capabilities to identify illegal maritime activities. These capabilities included the National Maritime Information Centre. The Programme also invested in feasibility studies and trials of surveillance and analysis using satellite earth observation data, particularly Synthetic Aperture Radar (SAR) using a combination of commercial and open data sources including European Space Agency (ESA) Sentinel missions.

The objective was to build capabilities delivered on behalf of the UKOTs on an affordable basis in the future. Part of the work was to determine whether low-cost/no-cost satellite data could provide an effective surveillance tool for IUU. It was also to develop a capability that could operate beyond the life of the Blue Belt Programme, while understanding the direction of development in satellite technology and the advantages, it could bring.



CGI working with MMO

- Proof of Concept for low cost monitoring of fishing vessels in remote locations
- Automation using integration of machine learning and [CGI GeoApp](#)
- Proved free / low cost earth observation data was an effective approach

The proof of concept

To meet the objectives, CGI delivered a proof of concept (PoC) with the following key features required to realise a low-cost, affordable on-going service:

- Automation of data processing and visualisation of data for analysis purposes
- Flexibility to evolve and enhance the solution to take advantage of future developments in satellite earth observation technologies, including those which were highlighted in the Horizon Scan report completed as part of phase 1)
- Efficient technical design to allow rapid processing of large volumes of data without incurring large operating costs
- Sensitive to realities of conditions in UKOT offices, e.g. limited, unreliable internet connectivity



We achieved this by integrating two of our existing, proven technology solutions that addressed many of the stated requirements:

- Rapid Vessel Detection (RVD) tool - a best-in-class vessel detection tool proven to detect even small vessels successfully. Previously used with Sentinel data in challenging environments such as the British Virgin Islands
- CGI GeoApp - a web-based geo-portal framework, proven in operational use with a range of central government and commercial clients

CGI addressed the issue by enhancing and integrating our RVD software and CGI GeoApp web map user portal, along with a supporting data management workflow, suiting the conditions of the project. The solution was designed and implemented on a cloud platform with a consideration of minimising operational costs.

“Working with CGI we have established that a service for identifying illegal, unregulated and unreported fishing in Britain’s overseas territories is operationally feasible. This is a significant step forward in protecting these vital marine habitats. Thank you for working with us and guiding us through the agile delivery process.”

Katie McPherson

Principal Marine Environment
Manager at Marine
Management Organisation

The RVD software developed by CGI was adapted to the specific problem of detecting vessels that may be engaged in IUU fishing. RVD is software that has been in development in CGI for vessel detection with Sentinel-1 and Sentinel-2. During the course of this project, it was generalised to accept more modes and polarisations of Sentinel-1 data than previously used. RVD was supplemented by a module that performed AIS correlations so dark vessels would be detected. The software was location agnostic, though it required tuning to optimise it for the various modes and polarisations.

During the second phase of this project, we demonstrated that we could successfully:

- Detect vessels of over 20m (the resolution limit of the data)
- Detect vessels in the 'fishing' class 40m – 80m
- Detect vessels in the 'reefer/bunker' class 80m – 180m
- Correlate vessels with AIS data
- Detect 'dark' vessels in the classes of interest that are not transmitting AIS signals

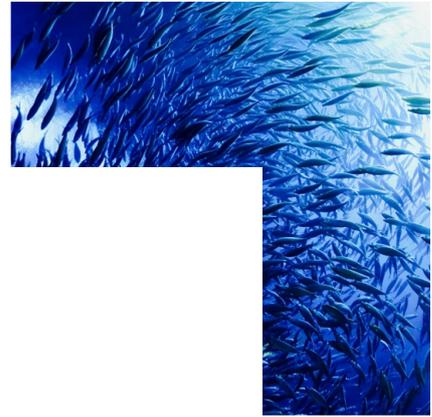
Additionally, the outputs from the vessel detection process were visualised through a map-based user portal to allow users to analyse and interpret findings. We extended the portal to cater to the low bandwidth and high latency conditions experienced in the Overseas Territories.

The result

The PoC was a success, and CGI proved that low cost/no-cost satellite data could be used to identify IUU fishing. Furthermore, we have developed a PoC that is capable of being scaled to provide an operational service that meets the specific demands of working in the overseas territories. We are now looking at the steps needed to turn into a fully produced system.

In summary, the outcomes of the PoC demonstrated:

- It was technically feasible to develop a service
- Sentinel 1 and 2 data are appropriate data sources
- Vessels of an appropriate size could be detected and correlated against other data sources



About CGI

Insights you can act on

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world.

We are insights-driven and outcomes-based to help accelerate returns on your investments. Across 21 industry sectors in 400 locations worldwide, our 77,000 professionals provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

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