

PART 4

INTELLIGENCE COLLABORATION AND ENHANCED DECISION-MAKING

INTELLIGENCE ANALYSTS, TEAMS, AND ORGANIZATIONS use GIS software to effectively collaborate on integrating intelligence in real time. GIS supports a collaborative model for the dissemination of intelligence and raw information. These collaborations can be distributed across multiple organizations and even taken into the field for disconnected operations. Intelligence leaders can then use dynamic services to integrate the latest intelligence into their decision-making cycles.

Disseminating the analysis

Modern intelligence products are dynamic and interactive. ArcGIS software provides tools for communicating analytic results through simple applications, such as the following:

- Situational awareness dashboards
- ArcGIS StoryMaps stories

- Analytic dashboards
- Intelligence briefings
- Apps that are integrated into Microsoft Office

Using this approach keeps integrated intelligence products up-to-date. These products maintain their relationship to the source data and tradecraft, so reproducing and integrating the intelligence is streamlined.

Supporting policymaking

Intelligence professionals use GIS to create long-term intelligence estimates and daily briefings. With dynamic access to data and simple analytic tools, staff can quickly answer unanticipated questions from decision-makers. The collaborative tools in GIS allow teams and shift workers to assemble products rapidly, using the best available intelligence. When estimates and briefings are shared, the link to the original data and analysis is preserved, making it easier for subordinate commands to incorporate the official estimates in their workflows.

Supporting situational awareness

Intelligence analysts can use GIS to integrate intelligence data into the common operating picture. In addition to providing the status and location of an adversary, analysts can produce running estimates of threats based on recent activity. Threat analysis based on capabilities and tactics provides key information to commanders and staff when preparing for and conducting operations. These dynamic layers of information can be queried to aid in understanding the impact of threats on operational plans.

Supporting planning

Intelligence data provides the context and framework for the intelligence planning process. GIS has tools for intelligence preparation in the operational environment. Instead of producing static products, GIS turns intelligence into easily shared dynamic information layers. Intelligence professionals attain greater knowledge of the battle space and adversaries and can share it with all commanders and staff.

Fostering cross-functional collaboration

GIS provides a collaboration framework for teams that want to create and share intelligence information products throughout the intelligence cycle. GIS also supports cross-organizational collaboration to unite key intelligence from multiple agencies. Intelligence analysts are often organized by geography, topic, or specialty area. To develop integrated intelligence and decision-making products, analysts need to effectively collaborate with their teams and across organizational boundaries.

GIS in action

The rest of this section presents real-life stories about how intelligence organizations use GIS to support integration and dissemination of intelligence.

GUARDING AGAINST FISH POACHERS

Prefectura Naval

SHORTLY AFTER DAWN IN LATE FEBRUARY 2018, A CHINESE fishing boat raced to rejoin its fleet off the coast of Argentina. Prefectura Naval, the Argentine coast guard, emerged through the fog in hot pursuit to intercept the boat, which had been fishing illegally in its waters. Despite shots fired, the foreign vessel evaded Prefectura Naval by surrounding itself with other Chinese fishing boats and reentering international waters.

Prefectura Naval patrols its coast nonstop during the annual spawning run of the Argentine shortfin squid—February through April. Conflicts with poachers are common. In a similar incident in 2016, Prefectura Naval sank a Chinese fishing boat that tried to ram its patrol ship in a desperate attempt to escape.

With 90 percent of the world's fisheries fully exploited or facing collapse, according to the United Nations, fishing vessels from around the world converge on places like the coast of Argentina where stocks are still abundant. As many as 2.2 billion pounds of this squid (*Illex argentinus*) have been caught in one season, making Argentina's coastal waters the second-largest fishery in the world by weight. Most of the catch ends up as fried calamari, a popular item on restaurant menus worldwide.

Most squid jiggers operate in unrestricted areas just outside Argentina's exclusive economic zone (EEZ), which extends 200 nautical miles from the country's coastline. But many ship captains dare to dip inside the EEZ boundary, thinking they can quickly fill their holds without getting caught.

Prefectura Naval deploys patrol boats, helicopters, and airplane spotters to protect its economic interests and guard against the decline of its fishery. Until recently, if they didn't catch fishing in the



With the mass of squid jiggers, the bright lights used to draw squid to the surface at night can be seen from space as shown in this NASA image.

act, they had no means to prove illegal actions. This emboldened captains to take the same risk that the Chinese captain attempted, weighing the odds that Prefectura Naval's patrol boats cannot cover the entire coastline.

“Before, we had to investigate all the ships,” said Ernesto Miguel Klocker, director of informatics and communications at Prefectura Naval. “Now, we receive an alarm when a ship enters our waters.”

A new season

Prefectura Naval recently launched a real-time tracking system called Guardacostas Pro that combines vessel signals and satellite imaging. This system is what allowed Prefectura Naval to detect and chase the Chinese vessel in February, and to capture many other unauthorized ships throughout the season.

Along with this system, Prefectura Naval keeps a close watch

on existing conditions, monitoring environmental variables and fish migration. This data and the activities of vessels guide immediate actions and long-term policy decisions.

The official squid fishing season typically starts February 1, but in 2018, the start was moved to January 10 in response to hundreds of ships gathering outside the EEZ. Armed with its new system, Prefectura Naval can act quickly when poachers enter its waters.

“This year, when a Spanish vessel entered into our EEZ for a short time and returned into international waters, we could track it,” Klocker said. “This allowed us to catch the ship and escort it to port, where it was impounded until a fine of 7.5 million pesos (roughly \$360,000) was paid. The cargo of processed fish, worth roughly \$380,000, was also confiscated.”

The Spanish captain had little recourse to refuse the fine because Prefectura Naval had the data to prove the infraction.



This image from the bridge of Prefectura Naval’s patrol boat captures the pursuit of the Chinese fishing vessel.

Sound the alarm

Now, anytime a vessel illegally enters the EEZ, the Guardacostas Pro system sounds an alarm and Prefectura Naval ships rush to confront the intruder.

The system takes in signals from the automatic identification system (AIS), a radio signal that each vessel transmits to avoid collisions. Data feeds come from 40 AIS receiving stations that Prefectura Naval maintains onshore and from two companies, exactEarth Ltd. and Orbcomm, that have satellites capturing signals on a global scale. Transmissions provide the vessel type, flag, location (latitude and longitude), speed, and course of every vessel.

AIS data alone proved insufficient as international rules don't require all vessels to have this system. The system also integrates feeds from a satellite fishing monitoring system, a long-range identification and tracking system, and radio reports from the ships operating in the EEZ.

In addition, automated workflows process satellite-based synthetic aperture radar (SAR) imagery, ideal for detecting vessels because it cuts through clouds and darkness. The images expose a vessel's size, and if it's moving, its wake, which can reveal its speed and direction. Prefectura Naval processes 250 SAR images per month to cover more than 200,000 square kilometers of the EEZ boundary every day.

Multiple inputs fused in a central GIS improve accuracy for Guardacostas Pro. It also helps detect whether a vessel turned off AIS to stop transmitting its position—a common tactic of those intent on poaching.

Added awareness changed everything for Prefectura Naval.

“As of five years ago, we had very little information about the use of our seas,” Klocker said. “Now we have a good picture, which

Architecting a modern real-time system

Advancements in sensors and systems allow Argentina to guard its coasts and boundaries in real time. Within the past five years, global satellites have become equipped with sensors that track vessel signals, and dynamic assets can now be tracked for real-time situational awareness.

Argentina uses a cluster of servers to process more than 1,000 position points per second, running 11 analysis operations on every position. The servers connect to any data stream, showing the latest information as it occurs. Changes in location, patterns, or other specified criteria trigger automatic, simultaneous alerts that reach stakeholders wherever they are and update a shared map.

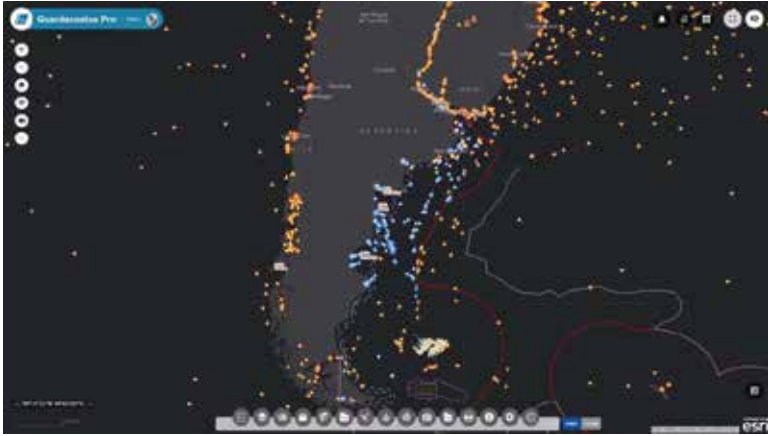
The system architecture, designed by Aeroterra SA alongside Prefectura Naval, pushes the boundaries of what's possible for the processing of high-volume data feeds. Aeroterra, Esri's distributor in Argentina and Uruguay, deployed multiple nodes of ArcGIS GeoEvent Server to track dynamic assets. This data then integrates into ArcGIS Enterprise to create the common operating picture on maps and dashboards for distribution to patrol vessels, aircraft, and operations centers.

gives us electronic control of the sea, allowing us to send our air and naval units directly to the places where ships operate.”

Declining stocks

The Guardacostas system serves the dual purpose of guarding the country's economic and environmental interests.

More than poachers threaten the ocean's fish supply. Modern fishing practices, with factory ships that process and immediately flash freeze their take, have damaged once-abundant fisheries. Techniques include miles-long drift nets, longlines baited with thousands of hooks, and the thousands of hooks deployed on automated winches. Industrial ships transfer tons of squid to huge refrigerator



Prefectura Naval's real-time tracking system, Guardacostas Pro, combines vessel signals, satellite imaging, and other inputs to track vessel traffic worldwide.

ships and get refueled and resupplied at sea so that they can fish without pause. It takes a toll.

In Argentina, fishery researchers and managers suggest that as much as 300,000 tons of *Illex argentinus* is harvested by unlicensed and unregulated fishing vessels every year. Prefectura Naval has turned to its new system to not only catch poachers in the act but also to amass data that tracks the activities of vessels over time. On average, it processes 1,000 records per second, performing 11 analysis functions for the information in real time. In less than six months, the database has recorded more than 3.5 billion vessel positions. This data allows it to reconstruct old incidents or use historical information to discover new patterns.

Now that Prefectura Naval has a solid system for the sea, it has moved this capability on shore. The system has become a multi-agency tool to aid the Ministry of Security's homeland security mission.

Prefectura Naval cooperates with other federal forces: the

federal police, airport security police, and the Gendarmería (National Guard). It tracks the location of all operating units through mobile phones, radios, vehicles with location sensors, and search and rescue aircraft. Knowing the last position of a ship or unit, regardless of the sensor or the system that reports it, gives the Ministry of Security a new security capacity with full awareness of the deployment of its staff.

“Before, people would say Argentina has little control of the sea,” Klocker said. “Now, word is getting out about our tracking system, and it is harder for offenders to try to fool us.”

This story by Adam Reedy originally appeared as “Argentina Guards against Fish Poachers” on the *Esri Blog* on September 5, 2018.