Geospatial interoperability: Maritime security policy imperative

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Introduction

All nations and port authorities can benefit from a coordinated policy for maritime security activities that involve cooperation with foreign governments, international and regional organisations, and the private sector.

The oceans are the largest part of the surface of our planet, a continuous domain with few visible traces of nations' 'territorial seas' and 'exclusive economic zones.' The oceans are largely borderless, and in countries with coastlines the many agencies responsible for maritime security have overlapping territories and mandates, which makes coordination and information sharing absolutely necessary in today's security environment.

Different nations' agencies assign security roles in different ways, but the need for information sharing is the same. In the US, the Department of Defense (DOD), which includes the Navy, is the lead federal agency for homeland defense (HLD), while the Department of Homeland Security (DHS), which includes the Coast Guard, is the lead federal agency for homeland security (HLS). However, several Navy activities contribute to both HLS and HLD, and the need for Navy coordination and information sharing with the Coast Guard and with non-federal agencies such as harbour police, in HLS and HLD, in intelligence gathering and other operations, is obvious. In intelligence activities as well as disaster situations, there is also an obvious need for coordination and information sharing with civil agencies like the Federal Bureau of Investigation, Federal Emergency Management Agency (FEMA) and state and local agencies. A large number of US maritime security policy documents explicitly state the need for cooperation with the agencies of other governments and with scores of international, regional and industry organisations, many of which are listed in an appendix to the US State Department's International Outreach and Coordination Strategy for the National Strategy for Maritime Security (NSMS), released in November 2005.

Plans for port security programmes include terms like 'maritime intelligence integration,' 'coordinated response,' and 'standardised procedures.' The previously mentioned document includes this sentence "maritime domain awareness will be achieved by improving our ability to collect, fuse, analyse, display, and disseminate actionable information and intelligence to operational commanders and decision makers." This language implicitly calls for geospatial interoperability.

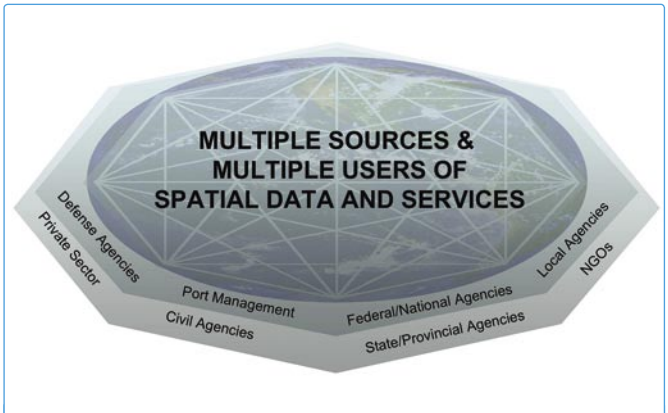


Figure 1. Port security depends on diverse stakeholders sharing geospatial data.

Geospatial interoperability refers to the ability of diverse systems to transparently exchange diverse kinds of geospatial information and services and to support the query/response mechanisms of geospatial Web services. Such communication depends on transmitting or exchanging through a common system of interfaces and encodings. Standardisation means 'agreeing on a common system,' so standardisation on interface and encoding specifications is a maritime security, and port security, requirement.

Criminals and individual terrorists who belong to international networks are more likely to be noticed by civil sector agencies than by defense agencies. Because maritime domain awareness requires that both defense and civil sector agencies be able to "collect, fuse, analyse, display, and disseminate actionable information and intelligence," it is important that the same geospatial standards are being agreed upon by both types of agencies.

In the US in 2005, the Federal Geographic Data Committee (FGDC), the National Geospatial Programs Office, and the federal Chief Information Officer (CIO) Council's Architecture and Infrastructure Committee began addressing the need for a common geospatial perspective among collaborating US federal and non-federal organisations. On May 2, 2005 they held the kick-off meeting for an inclusive 'Geospatial Community of Practice' whose members worked to integrate and promote geospatial concepts in the context of enterprise architecture practices. To quote from the Geospatial Community of Practice web site (http://colab.cim3.net/cgi-bin/wiki.pl?GeoSpatialCommunityofPractice):

"At the highest level, such guidance and recommendations would constitute a Geospatial Profile of the Federal Enterprise Architecture (FEA) that supports proven and emerging practices of the National Spatial Data Infrastructure (NSDI). Equally important is the ability for enterprise architecture practices to be compatible within and among collaborating federal, state, and local jurisdictions. Consistency in approach for addressing geospatial content and services in the context of Enterprise Architecture will help organisations:

- Internally recognise and re-use geospatial capabilities as a key resource in business processes
- Move from projects and stovepipes to integrated interoperable solutions
- Promote a cross-agency architecture that supports geospatial enablement of mission capabilities."

The movement toward open geospatial standards is a logical outcome of industry trends, standards efforts, and various governments' Information and Communications Technology (ICT) policies that have been maturing for a long time. Enterprise architecture design has matured and stabilised significantly from the ad hoc 'systems analysis' of twenty years ago.

The new geospatial interoperability frameworks derive from foundational concepts in the Open Systems Interconnection (OSI) Seven Layer Reference Model, The Institute of Electrical & Electronics Engineers (IEEE) Guide to the POSIX Open Systems Environment (OSE), the Society of Automotive Engineers (SAE) Generic Open Architecture (GOA) Model, and the Open Geospatial Consortium's (OGC) OpenGIS® Reference Model (ORM).

Not surprisingly, the new 'Architecture for European e-Government Services' draws from these and similar sources, as do the official frameworks in Canada and Australia. Other nations are in the process of adopting the same open standards, and the need for sharing intelligence information is among the strong motivators for this cooperation.

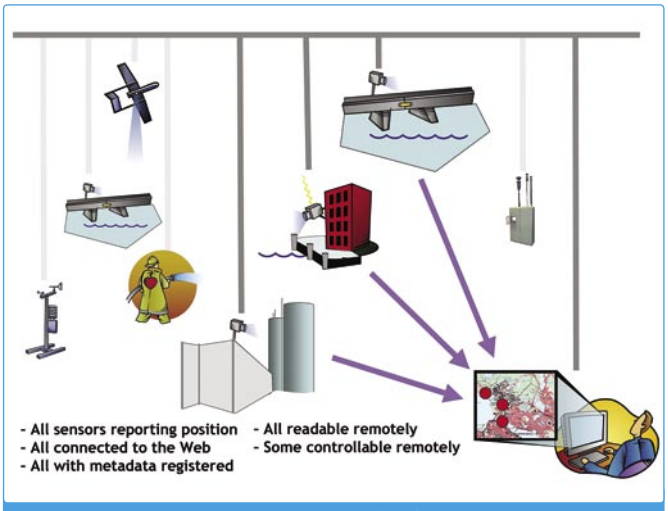
Sensor networks

Consider the importance of standards for one kind of geospatial information that people often don't think of as geospatial: video images and other sensor outputs.

Imagine a large port in which different video monitoring systems have been set up by the main port authority, companies, and local, state, provincial, and national agencies. Imagine that many of these systems are connected to the World Wide Web. Imagine a harbour manager using a map display interface to select harbour locations the manager wants to view using video. The monitors have been installed independently at different times by different vendors using different equipment and software, but all the vendors have implemented a set of standards that enable the harbour manager's application to discover, control and access all of the monitors in the same way, as shown in Figure 1.

Remarkably, many of those standards, including the OGC Sensor Web Enablement (SWE) standards, are already available and are beginning to be deployed in solutions.

The OGC has undertaken the standardisation of interfaces and related encodings for Web-resident sensors because location is an important parameter for most such sensors. The standards make it easy for software developers to set up applications that use the Web to access and display readings from devices such as flood gauges, chemical sensors, and temperature sensors as well as video cameras and airborne or satellite borne imaging devices.



Courtesy of the OGC.

Figure 2. The OGC's Sensor Web Enablement (SWE) standards enable any kind of sensor system to be deployed on the Web in a way that makes the sensors discoverable and useable through open standard interfaces.

These SWE standards are consistent with the OGC and International Organization for Standardization (ISO) standards that enable communication between different vendors' Geographic Information Systems, navigation systems, and other geospatial software systems.

Conclusion

The potential to find and use multiple online video cameras is just one example of the kind of interoperability that is increasingly being considered when port authorities establish information system policies related to port security. It should be kept in mind that port security should not depend only on systems – such as security cameras – that are deployed specifically for security purposes. Geospatial information systems that support environmental management, logistics, navigation, harbour safety, planning, construction, facilities management and other functions all produce data that can be helpful in maintaining port security. Buying and building systems with interfaces that implement open standards is the key to being able to share these information resources in real time over the Web.

ABOUT THE AUTHOR

Sam Bacharach joined the Open Geospatial Consortium, Inc., in April 2000. He was a user of mapping data for many years as an Army officer, and then supervised terrain analysis and mapping production as a Topographic Officer before retiring from the service. He spent 5 1/2 years in the industry and became convinced that open standards, specifically those from the OGC's open consensus process, were a requirement for geospatial knowledge to ever make its way out of the basement to full integration with information and communication technology. He holds a Bachelor of Science degree and a Master of Science, Geography, from the University of Idaho.

ABOUT THE ORGANISATION

The **Open Geospatial Consortium, Inc.** (OGC) is a non-profit, international, voluntary consensus standards organisation that is leading the development of standards for geospatial and location based services. Through our member driven consensus programmes, OGC works with government, private industry, and academia to create open and extensible software application programming interfaces for geographic information systems (GIS) and other mainstream technologies.

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