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Delivering a 'Maritime Information Infrastructure' to ports and harbours

Mike Osborne explains how OceanWise has woven data policies and management systems, stakeholder engagement and new technologies such as GIS into an infrastructure capable of taking port and harbour operations to the next level

Ports and harbours are multi-faceted business, encompassing land and marine operations, asset management, engineering, safety, security and environment protection, plus many more activities (see Box). In order to maintain efficiency, port integrity and legislative compliance, ports employ interlocking organisational and management processes and workflows. Access to appropriate and fit for purpose data and information is essential to the smooth running of these processes and hence port operations. Traditionally however, what data there is has been locked into a particular application, stored locally, or tied to a proprietary format, making the sharing of this data, and ultimately access, either at best inefficient or at worst impossible.

OceanWise has been working closely with numerous UK ports for the past three years and has been addressing many of these important issues by introducing data policies and management systems, engaging with stakeholders and introducing new technologies, such as GIS. In doing so, OceanWise has developed the concept of a 'Maritime Information Infrastructure (MII)' (see Fig.1).

Cornerstones

Maritime Information Infrastructure (MII) is based on good data management principles and applies lean process management from manufacturing to the flow of information through the port. It is built on the 'four cornerstones' of a Spatial Data Infrastructure (see Fig.2) and applies these at the enterprise level. It involves engaging and educating port personnel and contractors (people), applying open systems and technical standards, utilising existing or, where

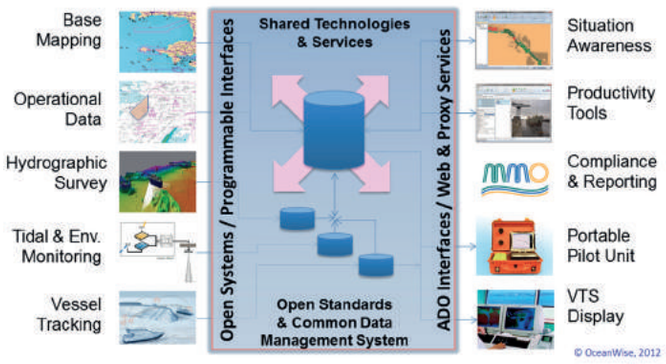

Fig.1: Maritime Information Infrastructure © OceanWise, 2012

required, improving ICT infrastructure, introducing registries and metadata, and strengthening data. As a result it is not only fit for its original purpose but can also be shared and used more extensively and efficiently.

Data, which is up to date and managed close to source, can be easily exchanged across many departments, without the need for protracted discussion between personnel, input/output routines, producing redundant replicate copies and inefficient reformatting. Importantly to the port, necessarily cautious about introducing new technology in case it becomes "a beast that needs to be fed", the entire approach works by retaining current practices and software whilst ensuring that these work together more effectively.

Much of the data and information in use within a port environment is spatial information i.e. it either represents a geographic feature (e.g. building, gate, wreck, navigational aid, sounding) or is attributed to a geographic feature (e.g. occupier, inspection date, sample value). As a consequence, it is often desirable to access and portray this data in GIS and to use the power of the functionality of GIS to produce outputs in the form of maps or reports. These can be used internally within the port or externally (e.g. in the form of a submission to a regulator or the provision of information to the public). The maps and reports can be provided in formats for use in specialist systems (e.g. Portable Pilot Units), as web services, as digital document (e.g. PDF) or in printed form on paper.

Common factor

GIS is a powerful means of associating seemingly disparate datasets (and potentially processes) using location as the common factor. Location may be defined in projected units (e.g. British National Grid); geodetic units (i.e. Latitude and Longitude) or as a reference to a spatial object which has its locational data stored elsewhere (e.g. in a central database). In the latter case, a unique identifier (UID) provides a 'link' between the spatial object and associated data that resides in one or many different databases across the port. By doing this different departments can link different datasets to a common foundation or 'baseline'.

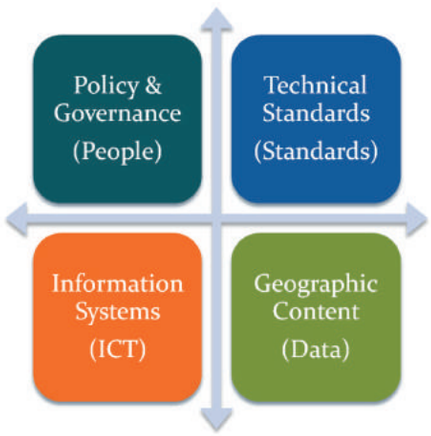

Fig.2: The four cornerstones or components of a Spatial Data Infrastructure (SDI)

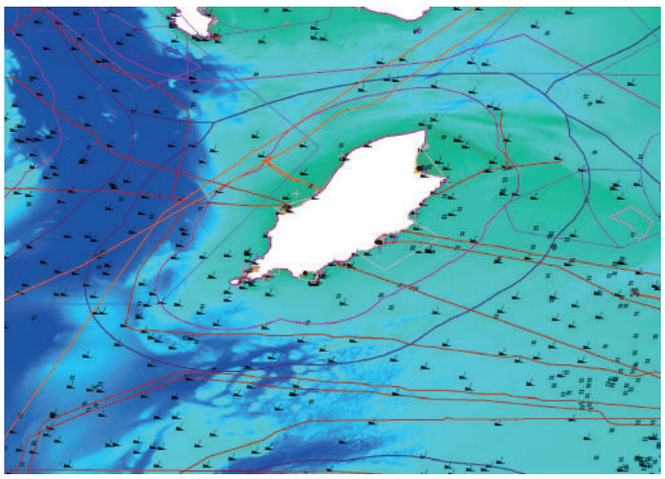

Fig.3: OceanWise Marine Themes provides marine base mapping for GIS applications

The baseline is managed centrally within the port using its own spatial data, data from an external supplier (e.g. Ordnance Survey or OceanWise – see Fig.3) or, usually, a combination of both. Location, and hence GIS, provides the common beneficial relationship through which master data can be queried and used.

GIS roadmap

OceanWise's work starts with an analysis of existing practices and systems that results in the preparation of a data management or GIS 'roadmap' and the development of a Spatial and Environmental Data Management System.

The company's understanding of the marine domain and maritime operations combine with its relationship with specialist maritime equipment providers (e.g. Valeport, Teledyne, Reson and Caris) to allow interfaces to be developed within mainstream GIS (e.g. Esri ArcGIS and Cadcorp SIS). With this approach, the value and benefits derived from the data can be maximised and efficiencies gained in across multiple operations (see Fig.1).

At the centre of the infrastructure is Ocean Database (ODB) installed on Microsoft SQL Server or other comparable RDBMS. GIS connects directly to Ocean Database, with additional functionality provided by OceanWise Maritime Toolbar.

Specific workflow requirements are addressed by installing Extensions to Maritime Toolbar for Hydrographic Survey, Dredging and Licensing, and Environmental Samples Management. Additional OceanWise Extensions are available for recording, displaying and maintaining Infrastructure and Assets (e.g. Navigational Aids, Wrecks and Obstructions, Moorings) and to write out data for use in Portable Pilot Units (PPUs) and Vessel Traffic Services (VTS) as Bathymetry and Port ENCs.

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