Marine Web Mapping Services: a new era in marine data delivery

Overcoming the technical challenge of delivering marine mapping data 'on demand' paves the way for online services in support of a key European Union 2020 initiative. But new thinking is also needed, say John Coleman and John Pepper

The world of GIS is changing rapidly. Users of desktop and mobile applications are increasingly demanding services that free them from the need to source, order and store spatial data. What they require are fast, efficient and reliable online-delivered data feeds.

The proliferation of Web Mapping services (e.g. WMS, WCS and WFS) in response to this need has been dramatic and has been facilitated both by the adoption of these open standards by GIS vendors and, in particular, by the Open Source Software community.

Applying such advances in GIS data to the marine environment, however, has been hampered by the fact that datasets were frequently hard to source and often encoded and difficult to access for non-navigational purposes. It was also collected and maintained by a range of different organisations that often failed to communicate with one another and were bound by issues relating to national security and navigational safety.

But as the oceans become more widely used, calls for timely and accurate marine data increase. Initiatives driven by national and pan-national bodies such as the UK's Marine Environmental Data and Information Network (MEDIN)[1] have emphasised the need for marine users to have access to these datasets. In response, many leading Hydrographic Organisations have recognised that more data is essential for GIS analysis, creating contextual layers for applications such as Automatic Identification System (AIS) tracking, and for making anti-piracy websites more effective.

The technical challenge

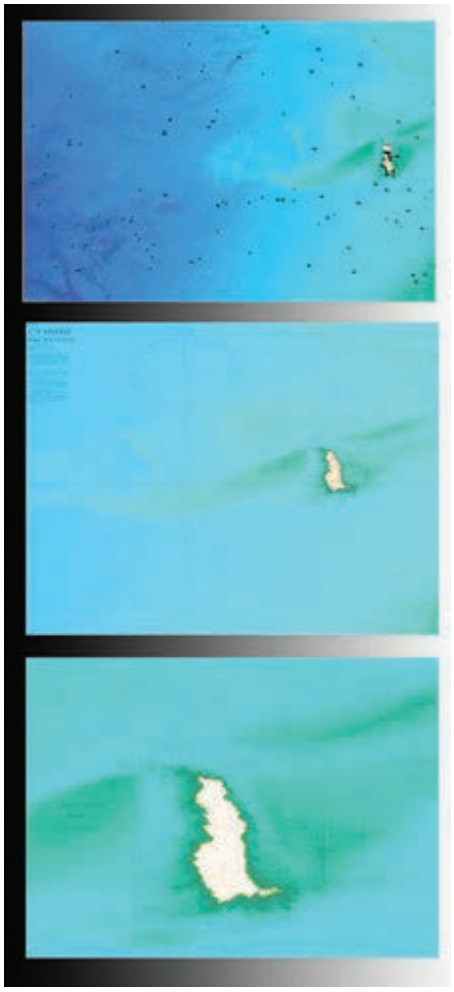
Due to the disparate nature of traditional marine data collection and its division into oceanic, coastal approach and ports and harbour-level responsibilities, the challenges of integrating data into a uniform spatial data layer can be considerable. For example, compiling a scaled WMS feed of UKHO Raster Charts requires the compilation and de-confliction of hundreds of individual files. The exact display order must be carefully determined to develop a useable and cohesive map background. Similar de-confliction is also needed with vector data derived from an electronic version of the Raster Chart. Only once these issues are fully resolved does it become possible to deliver consistent Marine Mapping data to the user community in a meaningful format.

The technical challenges of 'on demand' Marine Mapping data delivery are similar to those faced for terrestrial data. Data bandwidth issues must be addressed; data must be optimised for efficient delivery; server infrastructure must be efficiently and robustly configured and, most importantly, data access and security must be assured.

Previously, many applications have compromised a 'halfway house' between immediate data access, security and user operability. Examples include dongle-based applications that can take encoded data and serve it into a GIS environment. However, none of these solutions can truly provide the marine data user the many benefits of delivery over the Internet. These benefits include immediacy, flexibility, efficiency and cost savings in both product terms and also in reduced personnel and storage costs.

The new era

Doing business in the marine environment involves using incredibly expensive and sophisticated technology in some of the world's most challenging locations. This needs to be supported by data distribution, web-based technologies and deployment. However, users of marine data are poorly served in these areas when compared with users of terrestrial data and much of the problem lies with institutional inertia and lack of competition.



Pictured from top: digitising maps; combining bathymetry, raster and chart for WMS feed; detail from combined data WMS feed. ***Photo: OceanWise***

Happily, the considerable efforts of companies such as OceanWise are driving change for the better. The British company has secured access to a variety of marine data sources for non-navigational uses, clearing the way for a new range of online digital services developed in conjunction with its London-based online mapping specialist, FIND Mapping. With more than 10 years' experience, OceanWise has developed its Marine Themes digital mapping and Digital Elevation Model (DEM) suitable for desk-top GIS and web applications such as:

Marine Raster Charts Service (WMS): This gives instant online access to a variety of digitised raster charts from the user's desktop or mobile GIS. The service is a fully de-conflicted and nested chart dataset providing a seamless backdrop at a number of scales levels. The Raster Charts Services may be combined with shaded elevation maps to contextual marine bathymetry at a variety of scales.

Marine Web Map (TMS): An increasing range of users are demanding access to contextual Marine Mapping data for delivery in online web applications that have been developed using mapping API's such as those provided by Google and Microsoft. Application areas include everything from Wind Farm Monitoring, Vessel Management and AIS applications. FIND Mapping is currently deploying data in this format for a Fisheries Management and Marine Conservation task.

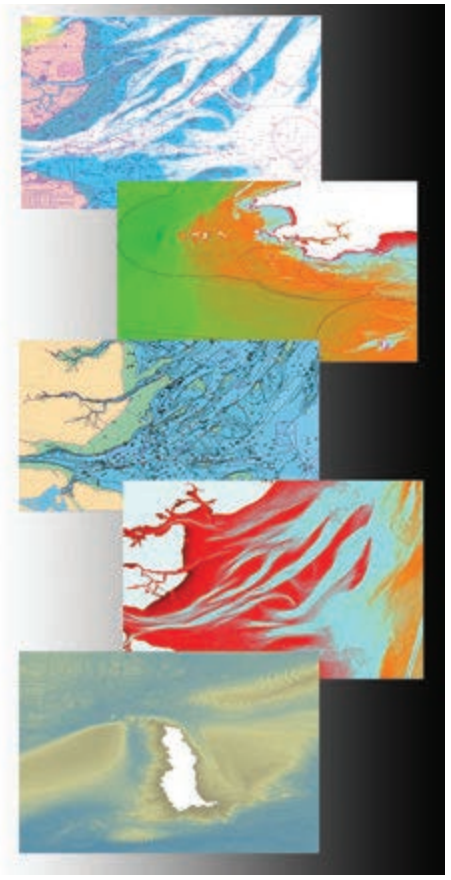
Marine Themes Feature Services (WFS): With fully de-conflicted vector data such as OceanWise's Marine Themes, it is possible to provide fully attributed online vector feeds into desktop GIS. Such feeds can be configured to allow subscribers to conduct spatial queries and analysis using information delivered over the Internet. The benefits of this to many organisations will be considerable. These external feeds can be used alongside internal WFS feeds that facilitate the rapid communication of information between project groups speeding up both decision making and project execution.

Marine Coverage Services (WCS): The delivery of fully attributed raster data such as Marine Themes DEM allows high volume high value data to be accessed and analysed immediately by the subscriber with the same flexibility and functionality as data hosted on a local drive.

Vision 2020

In the context of this New Era it is worth reviewing some of the drivers of the use, distribution and application of Marine Data. One of these key ones, certainly in the European context, is the European Union Marine Knowledge 2020 Programme.[2] The Green Paper[3] with its consultation document has recently been released and states that the drivers behind the vision are that by:

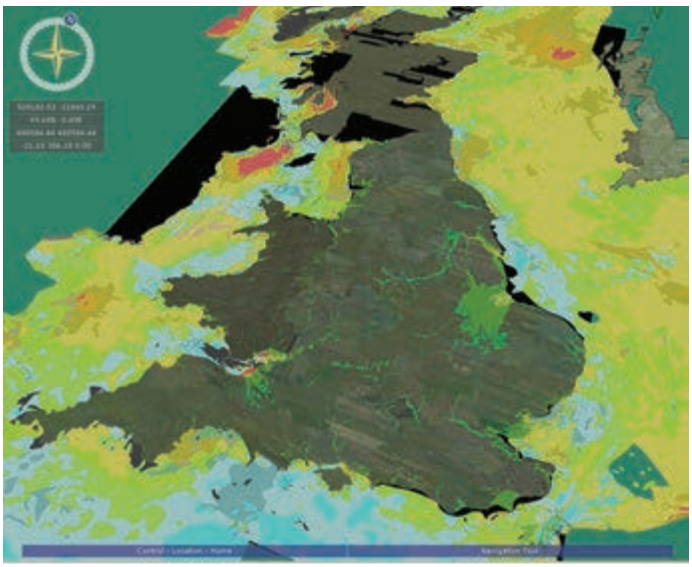
1. Reducing operational costs and delays for those who use marine data, it will help private industry compete in the global economy and meet the challenges of sustainability; improve the quality of decision making at all levels, and strengthen marine scientific research
2. Increase competition and innovation amongst users and re-users of marine data by providing wider access to quality checked, rapidly available coherent marine data
3. Reduce uncertainty in knowledge of the oceans and the seas and so provide a sounder basis for managing future change



Examples of marine geodata (from top) raster chart; seamless Feature Layers overlaying Marine Themes DEM; Marine Themes; seabed DEM; bathymetry. ***Photo: OceanWise/FIND Mapping***

An important statistic from the Green Paper is that savings of over €300 M per annum could be realised by existing marine data users providing more efficient distribution, communication and availability of data. It further recognises that the current regime is in many ways anti-competitive and that wider distribution and accessibility to data held within 'data repositories' will stimulate competition and ensure wider use of this data. Inevitably this will have an impact on pricing of Marine Data. It could be argued that the historical high prices for accessing Marine Data has inhibited its more widespread use, and fostered a culture of 'Do we really need this?'

Undoubtedly, the distribution of data via a wealth of online services will significantly contribute towards achievement of the Marine Knowledge 2020 programme. Competition will increase and data users will benefit from a wider range of new services and applications. Some



Here, GeoVisionary combines UK height data with flood and seabed analysis datasets. ***Photo: Virtalis***

GeoVisionary enables the visualisation of high detail GIS source data, and allows other data, such as geoscience, geotechnical, environmental, sub-surface, geochemical and other specialised information to be overlaid. ***Photo: British Geological Survey***

of these are already a reality; some will likely be achieved by 2020. For example:

Increasingly, the limitations of 2D GIS and 2D web applications are being revealed. The world is now 3D and increasingly 4D and this is critically important in the marine environment where we can have multiple activities occurring at different depths in the water column. Revolutionary software such as Virtalis Geovisionary[4] – developed originally for terrestrial use in association with the British Geological Survey – can support true 3D in the marine space. This allows both visualisation and design in a true 3D environment. True Virtual Reality has long been the cornerstone of well drilling in oil and gas projects, however, the EU 2020 programme should ensure its much wider adoption and utilisation in the marine community.

Institutional challenges

The drive to online delivery of Marine Mapping data, new consumption models and the advancement of cloud computing can bring huge increases in efficiency and cost savings for the Marine Industry. But to realise these advantages several challenges need to be addressed. These are not so much technical but institutional. Rapid progress is being made in many territories, but for the vision of harmonised, global, marine data to become a reality then the adoption of an Open Data approach needs to be much more widespread (with the important acknowledgement that Open does not always mean free).

Marine data needs to be maintained and sustained and appropriate revenue returned to the data owner. Online data provision is entirely compatible with such existing business models, but it does require a shift in mind-set from both data owners and consumers to realise the full potential. But with a variety of services now available, the opportunity to consume online data is real and the opportunity now tangible.

As emphasised here, the same level of innovation that has been applied to terrestrial data needs to be applied to widely available marine datasets. Once this is achieved, as discussed, the mechanisms exist to quickly distribute throughout the Marine data community. Users and data providers alike will benefit, as will data distributors and aggregators. These are indeed exciting times!

WEB LINKS

1 www.oceannet.org
2 http://ec.europa.eu/dgs/maritimeaffairs_fisheries/consultations/marine-knowledge-2020/index_en.htm
3 http://ec.europa.eu/maritimeaffairs/policy/marine_knowledge_2020/documents/ com_2012_473_en.pdf
4 www.virtalis.com/geovisionary/

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