MARINE CHARTING FOR GOOGLE EARTH

Google Earth Meets the Sea

Google Earth and its related layer language Keyhole Markup Language (KML) have taken the mapping world by storm. Combining an approachable user interface, high-quality satellite imagery, and free cost (for personal use), it has encouraged a thriving developer community for both open source and commercial map applications. Various governmental, academic and commercial organisations have released marine content for Google Earth â€“ particularly in regards to the environment and weather. This article describes how the start-up company EarthNC, Inc. is offering a full vector conversion of the official US Electronic Navigation Chart (ENC) chart catalogue to the native Google Earth format.

In dealing with the sheer volume of Electronic Navigation Chart (ENC) vector data, EarthNC embarked on building a scalable platform for the conversion of large quantities of geo-coded data – with particular attention paid to supporting dynamic layers from enterprise systems. With development complete, the ENC conversion engine is fully automated and allows for the batch conversion of hundreds of ENC files within a few hours. During conversion, the code extracts each unique layer from an ENC file (buoys, wrecks, lights, etc.), constructs the appropriate geometry (point, line, polygon) for Google Earth, formats pop-up window data and labels (object name, depth, etc.), and applies the appropriate 'style' in terms of display colours, icons, and zoom settings. To date, conversion data sets have concentrated on the US ENC charts given their non-copyright status by the US Government, but this will be expanded as licensing agreements are established with other international ENC publishers.

Google Earth provided many opportunities and challenges throughout the software development process. Key to the user experience is the extensive use of 'region coding', which was debuted with Keyhole Markup Language (KML) 2.1 and Google Earth version 4. Region coding is used to define layer visibility based on the user's perspective and zoom in the Google Earth client. Given the rich nature of marine charts, it was critical to manage layer visibility (as a marine chart can have over 180 layers) to convey necessary information without overloading the screen space. To this end, each converted ENC chart is divided into four overall zoom layers, which load/unload without user intervention based on the zoom level.

Another Google Earth feature is the ability to define custom 'styles' or 'formats' for information pop-up windows and icon/label behaviours for each chart layer. Using a proprietary database system, the ENC engine allows style information to be kept separate from the underlying geometry data such that the charts can be 're-purposed' quickly for different institutional users without the need to regenerate large file sets. This database-driven system allows for this re-purposing on a scalable basis. Examples of this include dynamic changes in the look and links within information windows, changing the label behaviour of individual layers, calls to external data sources and more.

While work initially concentrated on the S-57 ENC format, tools were also built for Google Earth conversions from ESRI shapefile, geoTIF images for overlays, XML and plain text. The submission of the KML specification to the Open Geospatial Consortium (OGC) for consideration as a standard underscores the likely longevity of the KML format and increased use in non-Google applications.

Distributing Data via Google Earth
Besides 3D visualisation, Google Earth is also novel in that it acts as a spatial 'web browser' in terms of provisioning data to users. Google Earth KML files can be easily loaded via simple hyperlinks (network links in Google parlance) or via the local disk.

Online Distribution
Online distribution offers publishers the maximum in flexibility by providing KML data in real time based on network requests from client machines. Updates can be managed transparently by simply replacing files and links on the server. Server-side processing can also be used to tailor the user experienced based on location, account type or other factors. "EarthNC Online" (1) is based on this paradigm. Powered by the 'Google Earth Airlines Plugin' (2), it allows Google Earth to run within the browser windows to provide users an easy interface to load charts, National Oceanic and Atmospheric Administration (NOAA) bathymetry overlays, tide prediction data, Automatic Identification System (AIS) feeds, weather, and much more. In development is an additional interface for user submission of point-of-interest data, chart corrections based on local observation, and user-generated routes and trips.

Offline Distribution
Offline distribution is desirable when users are required to access KML data without the guarantee of a stable, high-speed network connection. Offline distribution is complicated by the need to carefully package KML and any supporting files or images such that links are not broken between application components. In the case of marine charts, most on-water uses in today's network environment require the offline assumption. 'EarthNC Plus' packages the full chart catalogue onto a single CD-ROM or as a batch file download for offline use. Used in conjunction with Google Earth's built-in image cache, GooPs GPS software, and a serial/USB GPS, it can be used on-water as a moving map display.

Custom Distributions
For enterprise users, a hybrid approach is often required as major portions of an organisation can often use a private intranet for centralised management, while a subset of users will require offline access for at least portions of the data sets.

The Future

EarthNC is continuing to expand its supported list of Google Earth converted GIS/ENC data with a particular focus on international waterways as well as real-time mapping applications (chart plotting, AIS feed support, etc.). While they hope that more governments and large organisations will ‘open source’ or significantly relax their licensing requirements as consumer demand for spatial data increases, they are building on the increased interest in commercial grade data-conversion projects that are relevant to the hydrographic community.

---

https://www.hydro-international.com/content/article/google-earth-meets-the-sea