

# USING THE INTERNET TO MANAGE AND DISTRIBUTE CABLE AWARENESS CHARTS AND RPL DATA TO THE FISHING INDUSTRY

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## 1. ABSTRACT

Thales Survey, formerly Racal Pelagos, has been providing Internet-based mapping, data management and data distribution systems to the marine cable industry for the past two years. During this period, Thales Survey has described a conceptual system that would provide fishermen and other interested parties with “cable awareness charts” over the Internet. In 2000, the National Oceanographic and Atmospheric Administration (NOAA) introduced an Internet-based, electronic commerce system to support print-on-demand nautical charts and other nautical products. This means that accurate and up-to-date cable awareness charts could be displayed on the Internet and provided, on-demand, in either paper or electronic format. As the number of cable systems continues to increase, such an approach to cable protection will be extremely important to both fishermen and cable owners.

NOAA, like most other hydrographic offices, has traditionally printed nautical charts in batch mode, stored them, and sold them from an aging inventory as they were ordered. This meant that charts were 2, 3 or more years out of date when they were sold. As a result, all Notice to Mariners updates had to be added manually by either the chart agent or the chart owner. Additionally, cable owners often updated the charts to show the latest cable route position list (RPL) data. With continuously maintained digital files and print on demand technology, paper charts showing RPLs could be printed, as required, when they are ordered.

It is now possible for Thales Survey to establish, operate and maintain an Internet-based Cable Protection system on behalf of the cable owner. This paper looks at how recent advancements in data management, Geographic Information Systems (GIS), the Internet, and NOAA’s introduction of an e-commerce system for nautical charting products have created an environment that could significantly improve the manner in which RPL data and cable awareness charts are managed and distributed. The result would be an Internet-based delivery system that provides users with immediate and instantaneous access to various cable data, superimposed on nautical charts.

## 2. INTRODUCTION

Traditionally, commercial fishermen have relied on paper charts and Loran type positioning systems to

assist in maritime safety and provide repeatable access to fishing grounds. More recently, the introduction of Global Positioning System (GPS) and electronic chart technologies onboard fishing vessels has improved the accuracy and reliability of the information being utilized. Often, however, the information that fishermen have regarding the location of submarine cable systems is inaccurate or out-of-date.

The increasing number of submarine cable systems that are currently being developed and installed throughout the world exaggerates this problem. Cable protection as part of the maintenance of these systems is more important now than ever before. At the same time as submarine cable owners and operators install cables at an unprecedented rate, fishermen worldwide are developing practices that involve the deployment of heavier equipment in deeper water. This of course will further threaten the integrity of submarine cable systems in the continental shelf. Damaged cables result in significant revenue losses to the cable owners, while damaged or lost fishing gear results in significant revenue losses to the fisherman who may have snagged a submarine cable.

Beyond financial risk, there are also safety issues involved. Fishing gear that becomes entangled with a submarine cable is capable of capsizing a fishing vessel and creating a significant risk to human life. Furthermore, submarine cables often carry up to 11,000 volts of electricity, which could prove lethal if attempts are made to cut them. Thus, the main goal of a cable awareness chart is to minimize the likelihood that fishing gear will become entangled with a submarine cable. This of course will translate into protected property and lives.

The primary goal of an Internet-based distribution system for cable awareness charts is to efficiently manage and distribute up to date charts. This in turn will reduce management and production costs. The efficiency gained through the use of an Internet interface reduces the amount of manpower dedicated to the task and eliminates the expense of silkscreen printing of cable awareness charts.

The traditional methods of RPL data management are no longer adequate for the “fast-track” nature of submarine cable projects. Thales Survey’s work in creating an Internet-based distribution system with a relational database foundation can be readily applied to

the production of cable awareness charts to greatly increase the effectiveness of this media.

### **3. TECHNICAL BACKGROUND**

Thales Survey has been at the forefront of applying high technology systems to the submarine cable industry since the late 1980's. The company pioneered the development of cable-specific integrated navigation systems for cable installation operations and the on-board documentation of as-laid cable data. More recently, Thales Survey has developed and delivered submarine cable data management systems, based on GIS technology to several major submarine cable owners and operators. The company has also created and is operating a comprehensive, cable data distribution site on the World Wide Web. These successful initiatives, combined with the development of a sophisticated submarine cable data model have placed Thales Survey in an excellent position to address the data management and distribution issues now facing the submarine cable industry.

While Thales Survey is well positioned to manage and distribute cable data via the Internet, it has only been recently that issues related to the display and distribution of nautical charts over the Internet have been resolved. NOAA recently introduced an Internet-based e-commerce system to support the distribution of paper nautical charts, including the new print-on-demand charts that are made in partnership with OceanGrafix, LLC. Similarly, electronic charts are made and distributed under a partnership between NOAA and Maptech, Inc. A combination of Thales Survey's GIS-based cable data management technologies and NOAA's Internet-based e-commerce system for nautical chart products has permitted the evolution of an advanced cable awareness chart distribution system in the United States

The five technologies that permit the Internet distribution of cable awareness charts are summarized in the following sections.

#### **3.1 Geographic Information Systems (GIS)**

Commercial GIS systems provide a range of data management functions, including the graphical presentation of geographical data, spatial analysis functions, and charting. Due to the spatial nature of cable data, it is most efficiently used in a geographic information system. The new distributed GIS technologies currently available provide mechanisms for sharing cable data both within a local workgroup or widely distributed over the Internet. A key aspect of Thales Survey's development strategy is the company's close working relationship with ESRI, the chosen vendor of GIS technologies for this project. Thales

Survey in San Diego is a consultant partner as well as business partner with ESRI.

#### **3.2 The Internet and Internet-Based Mapping**

Web servers and service-based, Internet map servers have advanced enough to now permit the publishing of cable-related data in conjunction with high-quality maps on the Internet. These technologies thus enable the distribution of "up-to-the minute" RPL or cable route data to restricted groups, semi-restricted groups or the general public. Technical experts can use this capability for a wide variety of purposes, including permitting programs, collaborative route-selection between project partners and route review. Thales Survey has applied this technology for cable-awareness chart production purposes. The system utilizes ESRI's ArcIMS software to bring the data to the Internet and to deliver maps through the Web.

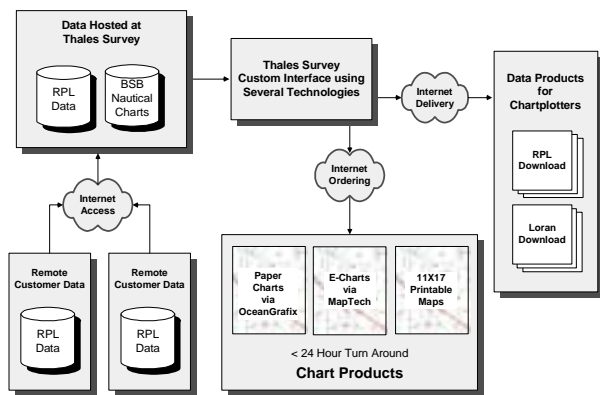
#### **3.3 Relational Database Management Systems**

Commercial Relational Database Management System (RDBMS) software is at the heart of any modern data management strategy. It is a mature means of handling large volumes of complex data and is used in many different industries, such as inventory control, insurance, banking and transaction processing. Commercial scale databases bring a level of formality, control and security to data management that is not possible with a file-based system, regardless of how organized that system may be. Oracle, which has focussed on integrating applications and databases for Internet business, has been selected for this project and the use of an established RDBMS is considered an important factor in the delivery of cable awareness charts over the Internet.

#### **3.4 Customized Software Development**

In order to efficiently synchronize the use of various off-the-shelf GIS, RDBMS, and web server systems, it is necessary to maintain control over the inter-system communication and the user interface of the overall system. This is accomplished through the use of the C++ and Visual Basic programming languages, as well as several web-scripting languages. Customized software can therefore be the 'glue' that holds the overall system in place as a single, coherent technology. Thales Survey has over fifteen years of programming experience and this was critical to the development of the system.





**Figure 2 Data Flow and Delivery**

The cable owner would supply the latest RPL information for the submarine cable. This would be loaded, after verification, into the RPL database. A separate database would hold the latest nautical charts. These would be updated continually as per the latest Notice to Mariners updates.

The user would access the cable awareness web site and be allowed to print a medium resolution chart with limited extents to a local printer.

Additional products available via the web would be an ASCII or Excel download of limited RPL data as well as a download of the appropriate Loran C lane values for existing cables.

Navigation quality charts could also be ordered and distributed directly to the fisherman from the appropriate NOAA agency with billing sent directly to appropriate cable maintenance authority.

#### 4. CONCLUSIONS

The proposed system has demonstrated the ability to create and deliver accurate and up-to-date cable awareness charts to the public over the World Wide Web. It has utilized the latest technology from NOAA that provides an electronic commerce system to support print-on-demand nautical charts and other digital chart products to fisherman in the USA.

The combination of these products being delivered up-to-date and in a timely manner will undoubtedly provide added security to submarine cables worldwide and hopefully save the equipment and lives of the fishermen who work the seabed near them.

A demonstration of this concept can be viewed at the web site: <http://www.cableawareness.com>. This web site has been set up to demonstrate some of the general concepts outlined in this paper and a pilot project is planned for use by the Oregon Fishermen's Cable Committee.

#### 5. ACKNOWLEDGEMENTS

Thales Survey and NOAA would like to thank the Oregon Fishermen's Cable Committee, Maptech and OceanGrafix for their participation in this project. It is hoped that this project will gradually be extended to include all the western United States and eventually the entire country. As other mapping agencies around the world adopt this "print-on-demand" philosophy, the system can be extended beyond the United States.

#### 6. REFERENCES

Drew, Stephen C. and Hopper, Alan G., *Fishing and Submarine Cables Working Together*, International Cable Protection Committee, October 1997.

Enabnit, David B. and Jadcowski, Mark, *Electronic Update Service for Digital Charts*, Sea Technology, Volume 41, No. 3, March 2000.

Enabnit, David B. and Linza, Joseph, *Electronic Commerce for Nautical Charting Products*.

Millar, David; Gilmour, Bill; and Caswell, David, *Using the Internet to Manage and Distribute Geospatial Submarine Cable Data*, ICPC Plenary, Copenhagen, Denmark, May 2000.