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Intellectual Property, Patents, and Web Mapping: Historical Perspective

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Abstract

An interesting situation has arisen with respect to Web mapping: Certain recently granted patents appear to give the patent owners rights with respect to almost all Web mapping software, as well as location services and Web-based distributed geoprocessing. The prospect of any group of individuals having a "lock" on such an important set of technologies is disconcerting, to say the least. A review of the history of Web mapping suggests that these patents should never have been granted and are unlikely to survive a legal challenge. An important step in securing the openness of the Spatial Web, with all its benefits for users, is to have information on prior art and inventions from our industry available to all OGC members and to the public. This is the purpose of this article.

Introduction

There is an increasing emphasis on using the Web in general, and Web Services in particular, as the preferred mechanism to deliver geospatial services and data to the end user. In my last GIM article [FLORIS ET AL, PLEASE PROVIDE REFERENCE!], I discussed the OpenGIS® interoperability and technology approach for geospatially enabled Web Services that the OpenGIS® Consortium (OGC) has developed. In this article, I discuss Prior Art, Intellectual Property and Patents related to Web mapping. The situation involving Web mapping illustrates broader issues that are central to the viability of and democratic access to the Internet and the Web.

History is critical to resolving issues related to patents. One needs to understand the reason patents are instituted and one also needs to understand the state of the art at the time a patent is applied for. A key issue is whether or not the invention described is actually an innovation.

I wish to state that I am not against a company protecting the value of its intellectual property[1]. At the same time, I believe one must question patents that are directed at the core technologies and growth areas in our industry. In this case, our industry is, in my opinion, not in great danger, because the patents at issue are not, in fact, innovations..

The Problem

In 2000 and 2001, patents related to making maps on the Internet (or something like the Internet) were awarded to a company in the UK called MultiMap (www.multimap.com). These are European Patent EP0845124B and US Patent US6240360. There is also a patent awarded in Australia.

The US Patent has a total of 47 claims and the European patent has a total of 21 claims. The original European Patent PCT (PCT stands for "Patent Cooperation Treaty") was filed in August 1996 and granted in May 2000. The U.S. PCT was filed in August 1996 with the formal filing February 1998 and granted in May 2001.

The MultiMap patent[2] claims rights to the the technology described as:

A map of the area of a client computer is requested from a map server. Information relating to a place of interest is requested from an information server by the client computer. The information is superimposed or overlaid on a map image at a position on the map image corresponding to the location of the place of interest on the map. The information (or "overlay") server may contain details of, for example, hotels, restaurants, shops or the like, associated with the geographical coordinates of each location. The map server contains map data, including coordinate data representing the spatial coordinates of at least one point on the area represented by the map.

The balance of this paper outlines how a patent can be evaluated and provides a series of references and short descriptions of Web mapping applications that predate the patents. This previous work is known as prior art.

About Patents and the Concept of Prior Art and Invention

The scope of protection provided by a patent is defined by its claims, and so, the validity of the patent depends on the definition of the invention provided by the claims. If the

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[1] Neither the author not the OpenGIS® Consortium (OGC) is in anyway attempting to restrict the operating and business principals of any organization and 2.) The OGC will not put forth a formal position statement regarding this or any other patent.

[2] MultiMap patent “Computer system for identifying local resources (US Patent 6240360 and European Patent EP 0845124 B1)

invention as defined by the claims does not meet the requirements for patentability (in particular, if it is not a new invention, or would have been obvious at the priority date of the patent application), then the patent is invalid and may be revoked.

Patents are defined by their claims, "the invention" the patent holder asserts they developed. The validity of the patent depends on the definitions within the patent. If the invention defined by the claims does not meet the requirements for patentability (in particular, if it is not a new invention, or would have been obvious at the time the patent application was filed), then the patent is invalid and may be revoked

For a patent claim to be valid, the invention defined by the claim has to meet two criteria: it has to be novel (new) and inventive (not obvious). These criteria have to be judged against information that was publicly available at the date the patent application was filed -- the "priority date." (for the MultiMap patent, 16 August 1995). Any information that was in the public domain prior to that date is known as "prior art" and may be relevant to the validity of the patent. Any information that became public only after that date does not constitute prior art and does not affect the validity of the patent.

The prior art in this case therefore includes any documents that were published before 16 August 1995, including conference papers, dissertations and published patents, as well any information disclosed through public use or sale of similar systems. It does not, however, include any information that was confidential at that date, for example information arising from prior secret use of a similar system.

Historical Perspective

While the use of the Web is relatively new, the use of geography as an integrating framework for analysis and visualization is not. For example, Guerry[3] (1832) studied the spatial distribution of criminal activity using shaded maps. He then cross-correlated criminal activity with socio-economic factors to look for trends. In 1854, Dr. Snow analyzed cholera deaths using a map during an outbreak in London[4]. If one put a Web interface on these two applications, they would not be much different from so many Web mapping applications in use today!

When I worked at Genasys, in 1993 and 1994 my company began working with applications that combined HTML forms with access to the GenaMap GIS client server architecture. Working with E-Systems (now Raytheon), we undertook our first Web project in 1994. The pilot project, for the Department of Agriculture, was a Web interface that combined mapping with the ability to search for and find documents of interest for

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[3] Guerry, A.M., 1833. Essai Sur la Statistique Morale de la France. Paris.

[4] From the "Power of Mapping", GIS Lounge, 2002.

given geographic regions. This was not nearly as sophisticated as the early projects in the 19th century! This work led to the development of the Genasys Spatial Web Broker in 1995. The Web Broker was released commercially in early 1996. The Web Broker provided access to all the GenaMap vector and raster processing capabilities.

Specific Examples of Prior Art

The following section provides a number of well-documented references that represent Web Mapping prior art and invention. All of these examples were developed, demonstrated, and/or documented before August 1995. All documentation and Intellectual Property Rights (IPR) for these early implementations was placed into the public domain. Further information for each of the examples can be found either on the Web or in the author's personal archives.

1993 – Xerox ParcMap[5].

This is perhaps the definitive reference for Web Mapping. In June 1993, Steve Putz of Xerox created the Xerox PARC Map Viewer. This work was done as an experiment to provide interactive information retrieval via the World Wide Web. A paper describing the Map Viewer was presented in May 1994 at the First International World-Wide Web Conference.

The Map Viewer was implemented as a perl script that accepted requests for map renderings and returned an HTML document including an in line GIF image of the requested map.

The map images were generated on the fly by the *mapwriter* program, a stand-alone Unix command which produced raster map images from either of two publicly available vector map databases. Options controlling the map renderings were encoded into the URL strings and passed as command line arguments to the mapwriter program.

1994 - NAISMAP

NAISMAP was an early operational and interactive Web-based mapping service released on-line by the National Atlas Information Service (Natural Resources Canada) in September 1994. It featured map layer selection, ordering and overlays; customization of line work and area fill symbology; national and regional views. The maps were rendered as GIF images from vector data maintained by the National Atlas. One application of the NAISMap software was an online service that allowed the client application to pass a

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[5] ParcMap was available on-line from late 1993 until early 2002. Xerox has recently removed the application from its web site.

coordinate (i.e., city location) to the NAISMap server application and then have a map returned which highlighted this location.

The original 1994 announcement stated, "*NAISMap is the first interactive GIS on the web. NAISMap allows you to select data layers, order them, set their fill and outline colours, fill patterns, outline types, etc. NAISMap uses a vector database from the National Atlas Information Service which it renders into GIF as per the users instructions. NAISMap produces national as well as regional views of the generated maps.*

1994: Geoweb[6]

Geoweb is an early and excellent example of documentation and research using the Web for geospatial data sharing, using a clearinghouse and metadata. To prove the concepts outlined in a paper by Brandon Plewe, the developers organized the Geoweb pilot, a working clearinghouse that demonstrated the concepts outlined in the paper.

From the paper:

"The second interface implemented was a map-based approach, where users can use a map of the United States in a WWW browser to specify the desired area. This map can be zoomed in and out, and panned in any direction, until the user finds the region needed. This is done using a link to the Xerox MapViewer that generates simple GIF-format maps based on user-supplied criteria. The mapbrowse script receives basic criteria from a query (i.e. "*http://...?lat=40 lon=-90 width=5")* and generates an html page including the appropriate MapViewer image, and graphical "buttons" for panning (i.e. the left button re-requests the same mapbrowse script, but with lon=lon-width/2 to pan half a screen to the West) and zooming (i.e. "zoom in" re-requests the script with width=width*2). A small form allows users to enter the three pertinent criteria directly, and there is a link to the above gazetteer interface to center the map on an actual place. Using a combination of the interactive graphics, direct entry, and keyword lookup approaches, the user should be able to easily find the desired region."

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[6] Electronic Proceedings of "Second World Wide Web Conference '94: Mosaic and the Web"(October 18-20, 1994) – Branden Plewe

1994-1995 AGCRC - 4-Dimensional Geodynamic Modeling System[7]

The goals of the 4D project are compilation and integration of broad-scale geoscience datasets, developing 3-dimensional geology modeling techniques and visualizing project results. In the 1994-5 time period, GRASS was implemented as the analytical and visualization engine.

The AGCRC system extended Sue Huse's GRASSLinks (see below) by supporting queries of point data – e.g. you could display the location of mineral deposits or earthquake epicenter, then click on a point to get the parameters returned (including lat/long). It was originally implemented using a Bourne Shell version in late 1994 or early 1995.

1995 (July) – Delivering GIS on the Web

In 1995, Bill Thoen did a survey of implementations of GIS on the Web. He wrote an article describing the results of the survey (http://www.gisnet.com/notebook/webgis.html). This is an excellent reference for early work in Web mapping and Web GIS and actually references several of the systems mentioned in this report. As he states in the introduction, "Thanks to everyone who responded to my query about GIS toys and tools on the web last July. Comments from the group on comp.infosystems.gis and the GeoWeb list clearly indicated that Web-based technology to deliver spatial information online has a [lot] of potential in it. This became such an interesting subject that I decided to make it the subject of my GIS Online column in the October 1995 issue of GIS World." Note the use of the word "potential."

Mid 1995 Clinch River Environmental Restoration Program (CRERP)

The Clinch River Environmental Restoration Program (CRERP) wa designed to address the transport, fate, and distribution of waterborne contaminants from the U.S. Department of Energy's (DOE's) Oak Ridge Reservation (ORR) and to assess potential risks to human health and the environment associated with these contaminants. This server allowed the Web-surfer to see a 3D view of the river from any point along its course. If you had a fast connection and your browser was configured to view MPEG video, you could also view movies of a fly-over of the "Virtual Clinch" and its valley.

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[7] http://www.agcrc.csiro.au/publications/reports/AnnualReport94-95/section9.html

http://www.agcrc.csiro.au/publications/reports/AnnualReport95-96/section2.html

Early 1995 - GeoHarness[8]

GeoHarness was the result of work done in the larger GeoScope project. The goal of the GeoScope project was to make NASA's remote sensing imagery and other geospatial data available to the broader public on the Internet, while simultaneously providing a framework for resolving network and data interoperability issues.

The work on GeoHarness was predated by a project called Infoharness (1994) that used the same architecture but was text based.

1995 – World Map Maker[9]

The World Map Maker, developed at Charles Stuart University, was an interactive on-line service designed as an interface into the Generic Mapping Tools (GMT) package. The aim of this project was to provide an on-line service that would allow the user the greatest possible control over the creation of a map, as well as the ability to overlay user defined data, using the GMT package. The service was implemented using HTML forms and CGI scripts.

The user keyed in parameters via n HTML form, which populated various GMT commands. The output from these commands was captured in a PERL scalar variable. The contents of this variable were then written to a temporary PostScript file, which was converted to the GIF format by the GhostScript Program and sent to the HTML form.

1995: Grasslinks

In her PhD thesis, Sue Huse describes (and provides source code for) a Web Interface to GRASS called Grasslinks (http://www.regis.berkeley.edu/sue/phd/).

In the introduction she states, "GRASSLinks provides access to the data, software and hardware of GIS over the Internet via the World Wide Web (http://www.regis.berkeley.edu/grasslinks/). For the first time, users who have little or no experience in GIS, but who have access to a networked computer and a Web browser, can retrieve and manipulate spatial data quickly and easily.."

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[8] "Web Access to NASA's Remote Sensing Data through *GeoHarness"*, http://www.cs.rutgers.edu/~shklar/www4/shklar.html .

[9] Steinke, A.P. (1995). *World Map Maker.* http://life.csu.edu.au/cgi-bin/gis/Map

Not only did Grasslinks provide access to map display and display controls, it also provided access to many of the analytical tools available in GRASS. This is one of the first known instances of Web access to GIS analysis capability.

1995 Tiger Map Surfer

The Map Surfer (or TIGER Map Service) was built in 1995 as a **proof of concept** to see what it took to build a basic Web mapping application. It remains on the web because there are people who still find it useful in spite of its limitations.

The Map Surfer can be found at http://tiger.census.gov/cgi-bin/mapsurfer and is still in use today.

Conclusion

There was considerable activity in developing Web-mapping applications in the early to mid 1990's. And, because most of this work was done by Government Agencies, the work is in the public domain. The documents referenced for each of these early implementations provide an interesting history of a powerful, and then new technology.

The Web mapping patents referenced in this article may be viewed as representative of a generic threat to the Web. If the law favors such patent holders, innovations now enjoyed by the public as part of the commonwealth may become subject to "tolls". The danger that other, as yet unknown, patents and intellectual property may emerge has a chilling effect on future innovation. Such a threat can potentially impede the development of true interoperability within the Web environment in general, and the geospatial world in particular. If these particular patent claims threaten to disrupt the already well established and rapidly growing Web mapping market, they need to be addressed by all Web mapping stakeholders.

This particular instance is an OGC problem, but it exemplifies a problem faced by all consortia dedicated to IT interoperability. Do the standards and specifications organizations take intellectual property seriously? Yes. Currently, many standards and specifications organizations are reviewing and redefining their process, procedures, and licensing approaches for IPR. The recent Web Services market thrust has caused the issue of IPR (and the patents that protect a company's or individual's IPR) to become a central concern not just for the OGC but also for other organizations such as the IETF (Internet Engineering Task Force) and the W3C (World Wide Web Consortium). The OGC just rewrote its IPR policy. A recent Open Group conference on Web Services had a keynote presentation on IPR and Web Services. The IETF, the grandfather of all the Internet and Web standards and specifications organizations, has a working group (http://www.ietf.org/html.charters/ipr-charter.html) chartered with updating and clarifying its intellectual property rights policies. . The W3C is constantly monitoring its IPR policy and requires that statements about possible patents related to any specification

document be identified and documented. And lastly, all of these organizations are now talking to each other about IPR to determine best practices for the organizations, their members, and most importantly, the community.

Both the OGC and our members work together to ensure that all of our specifications are unencumbered and therefore freely open and available to all for implementation, without fear of legal and/or financial reprisal.

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