

The Emergence of Open Source Geospatial Software and its Implications for the IT Industry

Geoff Zeiss, PhD
Director of Technology
Autodesk, Inc.
Suite 500, 427 Laurier Ave W
Ottawa, Ontario K1R 7Y2
geoff.zeiss@autodesk.com

ABSTRACT

The geospatial industry is undergoing an unprecedented transformation because of the widespread recognition that geospatial is no longer special and has joined the IT mainstream. One of the dimensions of this phenomenon is the maturing of the open source geospatial community to a point that is reminiscent of the early days of the internet, when major IT vendors like IBM decided that it made more business sense to support the Apache Foundation's web server instead of developing their own. Recently people active in the open source geospatial community decided that the community needed to make some major organizational decisions to move to the next stage in the development of open source geospatial software. This recognition culminated in the formation of the Open Source Geospatial Foundation (www.osgeo.org). This was driven not only by the realization that open source geospatial technology was widely used around the world, but more importantly that companies around the world have developed profitable businesses based on open source geospatial technology. In this presentation we will review the progress of open source geospatial software and discuss the implications of open source geospatial software for the utility and telecommunications industries.

INTRODUCTION: WHY SHOULD YOU CARE ABOUT OPEN SOURCE GEOSPATIAL ?

The formation of the open source geospatial foundation is important for everyone in the IT industry for several reasons.

OPEN STANDARDS ENCOURAGE OPEN SOURCE

One of the important things to recognize is the difference between open standards such as HTTP, XML, SOAP, WSDL, WMS, WFS, and GML, that are supported by both closed source or proprietary software and open source software. Open standards ensure that the pieces fit together but say nothing about how each component is implemented. For example, the WS-I is an organization dedicated to ensuring that Microsoft and J2EE web services interoperate based on the W3C standards for web services.

However, there is a close relationship between open standards and open source software. Open source is most successful at commodity software. For those familiar with Geoffrey Moore's core and context model, open source is best at context, as the *Linux* operating system, *Apache* web server, and *Sendmail* experiences have shown. As a rule of thumb where you find well-developed standards such as POSIX, HTTP, HTML, POP, and SMTP, you are usually dealing with context, and open source is a good place to look for standards-compliant software. For example, *MapServer* has been among the leaders in supporting Open Geospatial Consortium (OGC) open web services standards (OWS) such as WMS and WFS and is one of the top two web mapping servers worldwide.

WEB MAPPING IS BECOMING COMMODITIZED

Many people in the geospatial sector believe that web mapping should also be open source. On the first hand there are clear signs that web mapping is becoming commoditized. There are widely recognized open standards from the W3C and OGC, there is already a large and successful open source web mapping community around *MapServer*, and web map servers are less complex than desktop geospatial applications, which do not show the same advanced signs of being commoditized.

OPEN SOURCE GEOSPATIAL SOFTWARE IS COMMERCIALY SUCCESSFUL

There are two key requirements for successful open source projects, a grass roots developer community and a thriving business sector which relies on the

technology. Both of these realities have been realized by the open source geospatial community. Before February 4, open source geospatial was a "quiet reality". Most people would be quite surprised at how extensive and widespread the use of open source geospatial software is. The formation of the Open Source Geospatial Foundation with the support of a major geospatial vendor reflects the maturity of open source geospatial software and is contributing to bringing open source geospatial software into markets where it has had limited penetration in the past.

OPEN SOURCE GEOSPATIAL FOUNDATION

Feb 4, 2006 was a major milestone for the geospatial IT community, because on that day the geospatial open source community met in Chicago and formed the Open Source Geospatial Foundation (<http://osgeo.org> .)

There are several reasons why this as an important milestone for the geospatial IT community. First the formation of the Open Source Geospatial Foundation (OSGEO) realizes an important milestone in the maturity of the open source geospatial community. Secondly, shortly after the formation of the open source geospatial foundation, Autodesk released the source of MapGuide Open Source (MGOS) to the OSGEO community. This represents a serious commitment by a major geospatial vendor to the OSGEO and to the wider open source community.

WHAT IS THE OSGEO

The *Open Source Geospatial Foundation*, or *OSGeo* for short, is an independent nonprofit legal entity established to support the needs of the open source geospatial community. The foundation has no shareholders, but does have a president and other officers and a board of directors elected by the membership. The membership is composed of users, supporters, promoters, and developers of open source geospatial software. Becoming a member involves joining the OSGEO site and contributing to the foundation goals.

The OSGEO's goal is to provide a legal and administrative framework to better support the ongoing development and promotion of open source geospatial technologies. The OSGEO will be an organizing body, a public technology commons, a development community manager, and event sponsor. It is expected that the foundation will emulate certain features of the governance models employed by other successful open source projects such as the Apache Foundation. Foundation projects such as MapServer, GDAL, GRASS, and MapGuide are expected to be governed by their own Project Steering Committees (PSCs), which will be appointed by the foundation's Board of Directors.

INTERNATIONAL CHAPTERS OF OSGEO

At the time of writing, local OSGEO chapters have been formed in Japan, China, India, and Ottawa. Chapters are in the process of being formed in Brazil and for the German and French languages.

COMMON MISCONCEPTIONS ABOUT OPEN SOURCE SOFTWARE

Open source is a relatively new concept for many people in IT, so it is worthwhile discussing some common misconceptions about open source.

Misconception 1. Open source is only a small part of the software industry.

There are over 100,000 projects hosted by Source Forge, which is only one of many sites hosting open source projects. Over 70% of the world's web sites run the Apache Foundation's web server software. Most of the Fortune 500 companies have deployed open source software including Linux, Apache, MySQL, PHP, Perl, Python, Sendmail, and others. As another example, the latest data from IDC show that worldwide server revenue for Linux servers was \$5.7 billion in 2005, a 20.8% increase year over year. This represents the 14th consecutive quarter of double digit growth for Linux servers. The reality is that open source represents a large and increasing share of the software market.

Misconception 2. The opposite of open source software is commercial software.

The reality is that there are two types of commercial software, open source and closed source (often called proprietary). Many commercial companies base their business entirely around open source software. Commercial open source companies include Red Hat and MySQL, which are internationally well-known examples. In the geospatial realm, DMSolutions (Canada) and Orkney (Japan)

are examples of companies that have based a very successful business entirely around open source geospatial software. Some companies support both closed and open source software, for example, Novell (who acquired SUSE), Oracle (who just acquired Innodb and Sleepycat), Sun (who sell Star Office which is based on Open Office), IBM (who distribute Apache web server and Eclipse), Autodesk (who developed MapGuide Open Source), and others.

A simple way to summarize the situation is that the commercial software industry uses two models, closed and open source, and that both play an important role in delivering solutions to the IT industry. Some software companies prefer the closed source model, some the open, and some rely on both.

Misconception 3. Also common is the misconception that all open source projects are comprised of volunteers working at home in the evenings or on weekends. The implication is that the quality of open source software is not up to the standards of closed source software.

At the last MapServer User Meeting in Minneapolis, Dirk-Willem van Gulik, President of the Apache Foundation presented a fascinating overview of the Apache Foundation. One of the things he mentioned is that of the more than one thousand Apache committers (developers who can create and modify Apache code), only one of them is a volunteer. The rest are full-time developers employed by major corporations to work full or part-time on Apache. In the geospatial arena Autodesk's contribution to the Open Source Geospatial Foundation was developed, and will continue to be maintained, by full-time, professional Autodesk developers.

With respect to quality, as we alluded to earlier, many of the world's major corporations have deployed open source software. Open source proponents like Eric Raymond argue plausibly that open source is capable of achieving higher standards of quality because more developers look at the code – more eyes means better code. The reality is that, like closed source software, each open source project or product has to be assessed based on its own merits.

Misconception 4. Another common misconception is that you're left to your own devices when it comes to support.

The reality is that there are many companies that provide support for open source software. Perhaps the best known is Red Hat whose primary business is providing support for Linux. The last time we checked Red Hat's market capitalization was \$4.3B. Similarly in the geospatial arena firms are providing support for open source geospatial products.

Misconception 4. A common misconception relates to licensing.

There is a concern that if you mix your own proprietary code with code covered by an open source license, and plan to make the resulting product available to third parties, you have to make your own code publicly available under an open source license.

The reality is that there are over 40 open source copyright licenses recognized by the *Open Source Initiative* (<http://www.opensource.org/>). They range from the *Gnu Public License (GPL)* which is restrictive in the sense described above, through the *Lesser Gnu Public License (LGPL)*, which permits mixing of closed and open source libraries, to *MIT* and *BSD* licenses which are non-restrictive and only require that you include the copyright notification with the open source code you use.

WHY OPEN SOURCE WEB MAPPING ?

We see an analogy between the current situation in web mapping and the early days of the web when the initial web servers were being developed.

In the mid 90's eight core contributors supporting the NCSA HTTP Server got together for the purpose of coordinating their changes (called "patches") and formed the original Apache Group, which was little more than a shared mailing list. The industry including major IT players like IBM and others had to decide whether to develop and support their own proprietary web servers and compete in this arena. In 1999, with IBM encouragement, the members of the Apache Group formed the Apache Software Foundation, a legal entity, to provide organizational, legal, and financial support for the Apache web server. Since then the Apache HTTP Server has been adopted by IBM and others and is running on over 70% of the world's web servers.

Many people in the geospatial sector believe that web mapping should also be open source. On the first hand there are clear signs that web mapping is becoming commoditized. There are widely recognized open standards from the W3C and OGC, there is already a large and successful open source web mapping community around *MapServer*, and web map servers are less complex than desktop geospatial applications, which do not show the same advanced signs of being commoditized.

The benefits to the geospatial community of open source web mapping is better support for standards, an open development platform that supports more frequent releases, opportunities for entrepreneurs in the geospatial web mapping

sector to get started with no financial barrier to entry, and lower cost of ownership.

WEB 2.0 AND OPEN SOURCE WEB MAPPING

Tim O'Reilly in his seminal paper *What is Web 2.0 ?* attempted to identify the characteristics that distinguish Web 2.0.

First of all for the internet, a single monolithic approach controlled by a single vendor is no longer the solution. What is required is the *internet as platform*, a system without an owner with interoperability defined by open standards such as HTTP, HTML, and others.

A second key aspect of Web 2.0 is *participation* and perhaps the best known example of this is Wikipedia, which is arguably the largest encyclopedia, available in multiple languages, the world has ever known. Prior to the advent of Web 2.0, the web was primarily a publishing platform. Web 2.0 provides a platform for harnessing the collective intelligence. For example, open source itself is a Web 2.0 phenomenon because it is an example of using the web to harness collective intelligence. We see web mapping as another arena where Web 2.0 is already having a major impact in the broad consumer world, for example, *Google Maps/Earth*, *Microsoft Virtual Earth*, and others where *mashups* enable users to share data and applications.

IMPACT ON UTILITIES, TELCOMMUNICATIONS FIRMS AND MUNICIPAL GOVERNMENTS

Open source web mapping and Web 2.0 have important implications for infrastructure management at utilities, telecommunications firms and municipal government.

One of the most serious challenges facing organizations responsible for managing network infrastructure, including water, waste water, power, gas, telecommunications, roads, and highways, is increasing the productivity of the field force. This challenge has become particularly urgent in North America where, as a recent study of the power utility industry documented, industry is facing the problem of an aging field force. Within the next few years half of the field force, with their deep knowledge of network facilities, will retire to be replaced by young, inexperienced workers. In some sectors the situation is dire. One of us recently chatted with an employee of an Arizona utility, who said that 50% of the work force at his firm is eligible to retire this year. This will represent a huge loss of collective intelligence.

The challenge for organizations responsible for network infrastructure over the next few years is to transfer the knowledge about the network infrastructure currently resident in the heads of experienced (and soon to retire) field workers into the organization's collective knowledge base, so that the collective intelligence can be harnessed by all workers, but most critically, younger workers, to improve productivity in the future. Open source web mapping using Web 2.0 technologies will be a key technology to make this happen. Of course this will require other technologies such as wireless (city-wide WiFi, 3G telephony, and WiMAX) connectivity and new forms of handhelds such as UMPCs.

CONCLUSION

There are clear indications that there is a parallel between that what happened in the emerging internet phenomenon in the late 90's and the current situation in geospatial industry. First of all open geospatial standards from the OGC and others have been widely adopted. Secondly, there already exists a large and active open source geospatial community. The best example is MapServer which many people believe is used for 50% of the world's web mapping servers. There is a commercially successful geospatial sector that is forming around open source geospatial software. Finally, 2006 saw the recognition that the open source geospatial community had reached a level of maturity, where the community decided to form a legal entity, the OSGEO, analogous to the Apache Foundation which was formed in the late 90's, which enabled a major geospatial technology vendor to announce support for open source geospatial software. The combination of open source geospatial software and Web 2.0 has important implications for infrastructure management at utilities, telecommunications firms and municipal government.