Methodology for Assessing Impact of the Federation of Earth Science Information Partnerships

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This report is the product of an education program, and is intended to serve as partial documentation for the evaluation of academic achievement. This report should not be construed as a working document by the reader.

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Abstract

The Federation of Earth Science Information Partnerships (ESIP) is a consortium of partners that collect earth data from satellites and sensors but they do not have an effective way of obtaining performance indicators about their organization. We analyzed ESIP's website through the use of software systems such as Google Analytics. The results obtained from this IQP were used to help ESIP justify its importance to current funding sources, including NASA and NOAA. We gave recommendations to update the website, use web analytic software, keep good relationships with partners, work with USGEO, and supply a better monthly performance report.

Executive Summary

Organizations that are funded by large grant giving government agencies need to provide performance indicators about themselves to the agencies that fund them. Government agencies further need to justify the money they give to organizations as a worthwhile investment. The Government Performance and Results Act (GPRA) requires federally funded organizations to provide metrics to sponsors in order to assess their program performance. This can be difficult and many agencies that fund organizations cannot obtain metrics they need to evaluate their budget. Organizations need to have an efficient way of monitoring themselves so that they can provide their funding agencies with the performance indicators they need.

Currently, the Federation of Earth Science Information Partnerships (ESIP) and its partners analyze quantitative data such as water temperatures, particulate counts in the atmosphere, and so forth from satellites and earth based sensors. Those types of data can be processed by ESIP, but there is no effective way to show their funding agencies the impact that the data brings. Another problem that ESIP faces is that some relevant data are not quantitative and ESIP's partners are not efficient in providing the correct information of what they have accomplished. People working for ESIP are concerned about the way they can rate their value of so that sponsors, such as NASA and NOAA, can understand and realize if they are getting a good return for their investment.

ESIP needs to determine the importance of the data they provide to the community and express it as quantifiable statistics which could be shared with NASA and NOAA. However,

these data currently do not necessarily gauge how effective the organization is and there had to be a way that systematically searched the sites of ESIP's partners to obtain the necessary data. ESIP needed someone outside of the organization to help them identify their limitations and their effectiveness.

The goal of this project was to develop an effective way to identify and represent performance metrics of ESIP. We desired to create a system that shows the true breadth and depth of the work of the federation so that sponsoring agencies could justify the amount of money invested. We also planned for NASA and NOAA to have a better understanding for the value that ESIP brings to the scientific community and to the general public. The importance of our project will be measured in the long term by viewing how the effectiveness of ESIP is better shown in their annual performance report.

In order to achieve our goal, we developed a methodology that addressed our objectives. The objectives that we accomplished to achieve our goal was to understand the structure and functionality of ESIP's website and determine the effectiveness of ESIP's website so they can produce more useful performance metrics. For the purpose of determining the structure of the website, we interviewed the webmaster to give us a tour about their website. In order to determine the effectiveness of ESIP's website, we used web analyzing software and captured data from partners. Through the analysis of web statistics, we gave recommendations on how ESIP's website can be used as a tool to indicate their success.

During this project we recommended to ESIP that they should install Google Analytics HTML code in every tab of their website, so it keeps track of every detail visit. Furthermore, after our research of software we found that they should use Google Analytics with AWStats in

order to get accurate results about the exact locations of visitors on the map and also the IP addresses of people visiting the webpage. However, in case they changed their server to a new one that does not support AWStats, we recommended Piwik which is another tracking device that does the job of Google Analytics and AWStats at the same time in any server. We also recommended that ESIP communicate with partners so that they can stay as an effective consortium. Finally, we recommended that ESIP focus its attention on using the tracking software and helping to implement a universal reading software. They should also continue to work with USGEO in an attempt to help USGEO's functionality and incorporate more of the scientific community.

Chapter One: Introduction

Federal government agencies sometimes give grants to organizations to carry out research or projects consistent with the federal agencies' missions. Government agencies need to justify the money they grant to organizations as a worthwhile investment. However, many of the funding agencies cannot obtain specific metrics from their grantees that are needed to evaluate the worth of the grants. These organizations need to have an efficient way of monitoring themselves so that they can provide their funding agencies with the appropriate metrics. Sometimes, this information can be hard to acquire.

Federation of Earth Science Information Partnerships (ESIP) is a collective organization that is funded primarily by the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA). The Federation is a broad-based consortium of earth scientists who represent the entire research spectrum from data collection, to research and applications development (Federation of Earth Science Information Partnerships, 2006). The consortium consists of a wide variety of partners that collect, organize and analyze data. They span the range from NASA, NOAA, Environmental Protection Agency, United States Geological Survey, and Department of Energy research-funded groups. The partners who represent the federation differ in profiles and vary in size, infrastructure, mission, and services (Komlodi & Plaisant, 2010). This diversity among the partners makes it difficult for ESIP to be a successful conduit organization. There has been many obstacles in obtaining an effective methodology for collecting evaluation metrics to show NASA and NOAA the benefits

and progress. In order for the sponsors to notice the usefulness of the program, ESIP needs to assess their performance as a conduit organization. There also needs a method of tracking users on ESIP's website so that they can provide these users with specific earth data they may be searching for on their website.

The Government Performance and Results Act (GPRA) was developed in 1993 due to complaints regarding inefficiency in federal programs (Komlodi & Plaisant, 2010). It was initiated because many federal programs consisted of vague program goals and inadequate information on their progress. This act requires metrics from organizations and federal agencies in order to assess program performance. One way to assess performance is to understand outcomes-based management which measures the impact of an organization. Understanding the effectiveness of websites can also help in determining a way to successfully evaluate the work of ESIP.

With the proper ways of capturing data, ESIP will be able to provide their sponsoring agencies with the information they need so that they can evaluate the extent of the organization. Website evaluation tools need to be reviewed before a framework for evaluation can be generated.

The goal of this project was to develop an effective way to capture performance metrics of ESIP. We created a system that shows the true breadth and depth of the work of ESIP. Our objective was to analyze the work of ESIP and the various partners that collect and organize earth data. We conducted interviews with webmasters of ESIP and their partners in order to obtain their feedback about the website. Using Google Analytics, we analyzed the website's usage and gave recommendations on how ESIP can present their performance more effectively

so their sponsors know the impact that is brought. We also provided ESIP with various recommendations.

Chapter Two: Background

As stated in Chapter One, organizations are required to evaluate themselves and provide performance indicators to agencies so that they can successfully analyze the organizations they fund. This chapter will discuss the history of ESIP and their sponsoring agencies as well as the funding that ESIP receives to provide their non-profit services. We will also discuss ways that organizations need to utilize in order to evaluate themselves. Non-profit organizations exist to bring a change in individuals and in society, but in order to portray the work that ESIP does well, their website needs to show the extent of their work to agencies and the general public. This chapter will discuss the ways to determine the effectiveness of a website and how websites can be monitored so that organizations can evaluate their own work and improve their website.

Evaluating the Work of Organizations

Every organization and their sponsoring federal agencies in the United States need to be evaluated so the government knows how well the organization is progressing (United States General Accounting Office: General Government Division, 1998). In order to establish a system by which organizations successfully evaluate their goals for program performance and measure their results, organizations must apply the Government Performance and Results Act (United States General Accounting Office: General Government Division, 1998). It seeks to improve the management of programs as well as their effectiveness and efficiency. Komlodi & Plaisant

(2010) believe that organizations need to apply The Results Act because it measures and assess outputs, services, and outcomes through the data gathered from successful evaluation. The Results Act requires organizations to engage in tasks such as setting goals, measuring results, and reporting progress. They also believe that organizations and agencies must summarize the extent to which they are meeting their annual performance goals and depict the steps needed to revise any unmet goals. Grobman (1999) agrees and states that nonprofit organizations rely on a performance margin and measure success by the difference they make and not by the amount of money they make. Even though non-profit organizations seek donations, the performance and results of an organization are most important, as required by the Results Act.

Many organizations have difficulties in establishing an effective methodology for evaluation and thus cannot identify standard performance measures (United States General Accounting Office: General Government Division, 1998). As early as the 1990's, Peter F. Drucker (1990) stated that most nonprofit organizations did not give priority to performance and results because they were difficult to measure and control. Adding on that claim, The United States General Accounting Office (1998) believes that this was because evaluating an organization requires abundant time and effort.

Evaluation of an organization's performance is very important to its success. According to Carter McNamara (2010), evaluation is helpful in understanding the impact of the organization's services, which thus can be used to improve the efficiency of their accomplishments. Some major types of evaluation include goals-based evaluation, outcomes-based evaluation and process-based evaluations but outcomes-based evaluations are most important when taking The Results Act in consideration.

Outcomes-Based Management

Outcomes-based management focuses on the outcomes of an organization rather than the quantitative data presented so that funding agencies can determine if they are getting a fair return on their investment (Grobman, 1999). Leaders of large organizations do not have the ability to assess their organizations just by engaging in conversation with members. Gary M. Grobman states that many forward thinking organizations are applying outcomes based management so that they can give efficient and accurate data to the funders. Although funders are looking to find out if the services are being delivered in a cost-effective manner, they are also increasingly looking to find out if the services are actually accomplishing their mission. Outcomes based management can answer questions regarding the poor investment of funders in a specific service. Carter McNamara (2010) extends that claim by stating that outcomes based management does not only help to indicate whether or not agencies are getting a fair return for their investments, but it also helps ensure the focus of an organization to meet needs of the funders. With this focus, organizations such as ESIP can improve their management in order to obtain better results given to funding agencies. Since ESIP currently has trouble in evaluating their impact, they need to determine a methodology in obtaining valid results.

Assessing an Outcomes-Based Organization: Data Collection

In order to determine the data requirements to assess performance, the (Performance-Based Management Special Interest Group, 2010 believes that it is important to list performance objectives and develop a data collection plan). The group also states that it is essential to have a data collection plan in which the data collected will support the

performance objectives. According to the Performance-Based Management Special Interest Group (2010), a data collection plan should define performance measures, performance objectives, performance evaluation methods, and data sources. Establishing a data collection plan can give insight on the kinds of data that need to be collected as well as a plan on capturing them.

The data collected by ESIP needs to be used to assess performance. According to the Performance-Based Management Special Interest Group (2010), data should be high quality so that organizations can be properly evaluated. The Performance-Based Management Special Interest Group (2010) also believes that poor quality in data can have a negative impact on the organization because many important decisions are based on quantitative data. ESIP needs to make sure they provide funding agencies with high quality metrics. Analyzing poor data can be time consuming and also be costly. Furthermore, inaccurate and incomplete data increases the risk of incorrect reporting. Data regarding an organizations performance need to be carefully collected.

Impact Metrics to Funding Agencies

According to the National Science Foundation (NSF) (2007), understanding the broader impacts of an organization helps advance that organization's mission. NSF funds research and education in most fields of science and engineering. They also consider proposals that are submitted by organizations in most areas of research. For example, NSF's (2007) current mission is "To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes". Some questions that NSF

needs to address are if proposed activities advance understanding while promoting teaching and learning, if the activity would enhance infrastructure for research and education, and what are the benefits of the proposed activity to society.

Similarly, ESIP needs to also address issues regarding impact with their partner. ESIP needs to make sure that they are accomplishing their goal of providing data and applications to the wider scientific community for societal benefits.

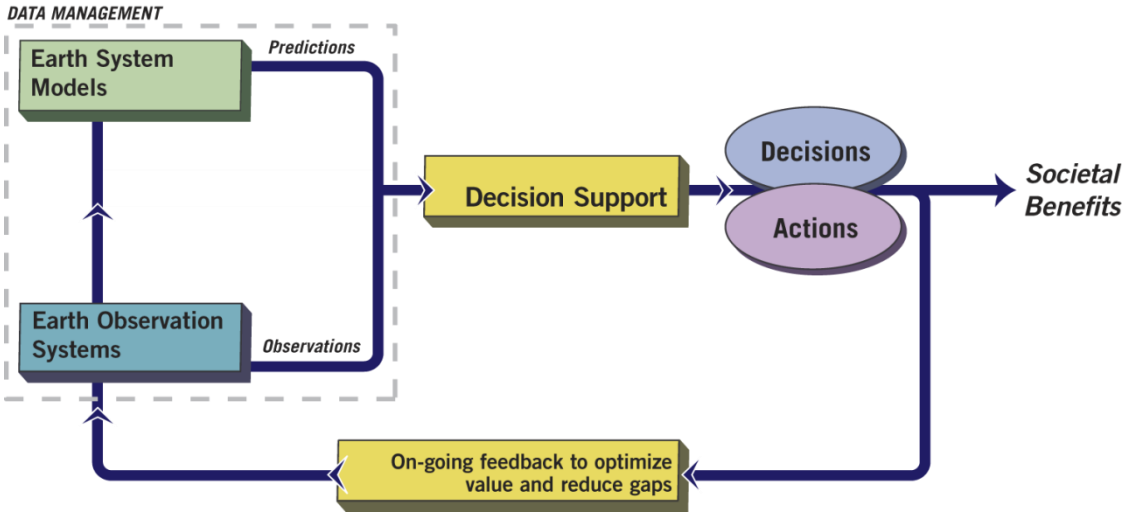


Figure 1: Data leading to Societal Benefits

The diagram above portrays the goal of ESIP as they intend to combine earth data for the wider scientific community. The data can then be used by individuals or groups in order to make informative decisions regarding the environment. The aspect that ESIP needs to focus on is whether or not the data that they provide from various partners leads to societal benefits. However, as mentioned before, ESIP has struggled in developing an effective way to show their sponsors the extent of their work.

Information about ESIP's Sponsors

The Federation of Earth Sciences Information Partnership (ESIP) (2006) is made up of many partners, but has only two sponsors. The sponsors of ESIP consist of the *National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA). (Federation of Earth Science Information Partnerships, 2006)*

NASA (2010) has a stated mission of pioneering the future in space exploration, scientific discovery, and aeronautics research, while NOAA's (2010) mission is to keep the public informed about the changing environment around them. The need for data to accomplish their mission pushed NASA to create ESIP in 1998, and NOAA to begin to help funding in 2006.

NASA's Earth Science Enterprise (ESE) and the need for ESIP

NASA provides information from space in order to effectively learn global scale phenomena and to be aware of local, regional and global-scale changes in their larger context. (Earth Observatory, 2010) NASA's Earth Science Enterprise (ESE) was created to develop a scientific understanding of the Earth system and its response to natural and human-induced changes so the prediction of climate, weather, and natural hazards for present and future generations can be improved. According to the Earth Observatory, some of the goals of ESE are to understand earth changes, expand the realization of social and economic benefits of earth science and information, and to develop technology. Every day, terabytes of information is retrieved from NASA satellites in order to provide society with access to earth data.

Karl Thomas (1998) stated that in order to manage the vast amount of data, NASA initiated the Federation of Earth Science Information Partnerships in 1998 as a system for data management and a means for representing interests of a broader community. During that time,

the internet brought vast amounts of information and the computer technology improved through the years which enabled scientists to access data on computers. Karl Thomas also stated that the National Research Council (NRC) recommended changes in NASA's direction because they believed the centralized architecture of The Earth Observatory System Data and Information System was too inflexible and would not support the scientific community to come together. The NRC thus recommended NASA to implement a federation of partners.

Due to the changing times and advancement in the volume of data that is still continuously pouring in, even the largest of organizations, with massive amounts of technical support can be overwhelmed. The Earth Observatory (2010) believes that there is a necessity to retrieve, process, and distribute the data. They believe that ESIP was created in order to generate products for specific uses in society by being a decentralized, heterogeneous and distributed data and information system.

Role and Funding of NASA

NASA has several potential roles regarding ESIP. NASA wants to ensure that the goals of ESE are met, provide funds, help the federation, and evaluate the success of the federation (Thomas, 1998).

NASA (2010) requested "the amount of $18.686 billion to advance Earth science, complete the International Space Station, explore the solar system and conduct aeronautics research. The budget request represents an increase of $903.6 million, about 5 percent, above the amount provided NASA in the FY 2009 Omnibus Appropriations Act."

NASA (2010) split its budget into several areas, with Earth Science receiving consistent

funding of at least 1,237.4 million dollars since 2008, with a projected increase in funding to approximately 2,282.1 million dollars in 2010.

NASA's Data Rights and Policies

NASA's goal with the Earth Science Program is to protect the planet earth by using satellite data and other advanced technologies to study the earth system for improving predictions regarding earth changes. In order to successfully accomplish that, NASA (2010a) believes that their data should be publically available to anyone, especially to those who want to make a difference. If there is a greater availability of data, users can utilize the information to provide more innovative applications that benefit the community much more quickly and effectively. The data products and services are available to the user community without discrimination and without restriction as to its use and duplication. NASA allows full and open sharing of earth data. These data are made available as soon as they are received and there is no exclusive access for them. The data collected by NASA represent a significant public investment in research. NASA provides these data in public trust to encourage a complete, long-term Earth science research. Consequently, NASA developed a policy to maximize access to data and to keep user costs as low as possible

ESIP Working with NASA to Expand Members

The stated objectives of the cooperative agreement between NASA and ESIP are both numerous and complex. The objectives are broken down into several categories, to leverage ESIP Federation Communities of Practice, Collaborating with Earth Science Data System Working Groups, and Community Consultancy and Coordination (B. Rogan, personal

communication, 2010). These objectives are stated by ESIP in a semi-annual progress report to NASA, dated October 30, 2009.

The goal to "leverage ESIP Federation Communities of Practice" actually means that ESIP wants to increase and strengthen community ties with other members of the scientific community (B. Rogan, personal communication, 2010). ESIP intends on expanding membership of the Air Quality Cluster to include award winners of recent research grants. The Federation also plans on working with NASA and other partners to form a leadership team with a goal of advancing the Air Quality Collaborative Consortium.

In order to collaborate with the Earth Science Data System Working Groups (ESDSWGs), ESIP will begin a thorough review of the current system to make sure that the ESDSWGs are working with the correct committees (B. Rogan, personal communication, 2010). ESIP will then go out into the scientific community to invite any groups or organizations not currently an ESIP member to become a member, along with asking all ESDSWGs to host one of the semi-annual meetings. When a significant overlap of research occurs, ESIP will attempt to join members to explore joint initiatives that could be helpful to the scientific community.

During the meeting in 2009, NASA presented a review of the organization. ESIP continues to change and evolve, and due to this flexibility, its value as an important organization has been solidified (B. Rogan, personal communication, 2010). This is due, in large part, to ESIP's policy of community-wide data sharing and collaboration. Although ESIP does not produce any products, its existence has allowed the scientific community to advance greatly.

Measuring Success

Success may mean different things to NASA, ESIP, and its partners. According to Karl Thomas (1998), the main measures of success for NASA are whether there is an increased productivity of the science in the Earth Science Enterprise and whether there is a greater spread of innovative information products. ESIP measures its success by the ability to reduce dependence of NASA funding, attract new members, increase size and diversity of the community, and develop new products. Lastly, success of the partners is mainly monitored by the generation of new products and the advancement of science. As of today, these indicators of success are still valid.

Organizations Similar to ESIP

Nowadays, many organizations have at least one competitor who is trying to do something similar to their goal. A similar organization to ESIP that is also dealing with data preservation is the USGEO.

In 2005, USGEO was established under the White House Office of Science and Technology Policy's Committee on Environment and Natural Resources to lead federal efforts in achieving a national Integrated Earth Observation System (IEOS) (United States Group on Earth Observations, 2010). Through USGEO, the U.S. further supports cooperative, international efforts to build the Global Earth Observation System of Systems (GEOSS). GEOSS is being developed through the intergovernmental Group on Earth Observations (GEO), a partnership of 80 countries, the European Commission, and nearly 60 international organizations (Fontaine, 2006). The purpose of GEOSS is for us to imagine a world where more people will be fed and

more resources will be protected. USGEO also wants more diseases to be prevented so that more lives will be saved from environmental disasters (United States Group on Earth Observations, 2010).

USGEO includes representatives from 17 federal agencies and the Executive Office of the President. USGEO is co-chaired by representatives of the White House Office of Science and Technology Policy (OSTP), NOAA and NASA

GEOSS is being developed from the many thousands of individual land, sea, air and space-based Earth observations working around the globe. Because these systems tend to work separately, information can be incomplete, providing only snapshot assessments that can lead to critical gaps in scientific understanding. Moreover, data being collected today are just a fraction of what can be put to excellent and lifesaving use in all regions of the world (United States Group on Earth Observations, 2010).

According to Brian Rogan (personal communication, 2010), USGEO is a part of GEO that is in Europe. He believes that the USGEO is emphasizing a lot in details of data and they cannot handle very well those petabytes of data.

However, NOAA which is a sponsor for both the organizations wants them to collaborate in activities such as, Air Quality, Coastal Management, Disaster Management, Ecological Forecasting, Public Health and Water Management. People from NOAA believe that working with the USGEO will advance efforts on the Near-Term-Opportunities. ESIP should continue to promote USGEO and GEO efforts and bring in stakeholders (academia, industry, scientific community, etc.) (Vice Admiral Lautenbacher, Conrad C., Jr., U.S. Navy, 2006).

Analyzing Websites and Marketing Tools

The potential usefulness of a website, to any organization, is contingent on what that organization does (Holter E., 2004). The organization needs to provide an accurate representation of the data that it processes and to present the data in a format that is comprehensible by most people. Holter believes that most organizations invest significant money on website management in order to have a user friendly webpage and to find easier ways to upload the processed data to their web pages. Moreover, it is very important to understand how the money spent on a website can be used to make it user friendly and increase its statistics.

Marketing is a very important aspect of business since it contributes greatly to the success of the organization (Armstrong, Kotler, Saunders, & Wong, V, 2008). Donelly and Peter (2004) state that computer-based information systems can be employed, aiding in a better processing and storage of data. Furthermore, Kotler, Armstrong, Wong and Saunders (2008) believe that marketing researchers should use such systems to enhance data gathering methods (Kotler, Armstrong, Wong & Saunders, 2008). They also believe that Information technology can aid in improving marketing information system software and a company's marketing decision-making process. Web analytics is not only just a tool for measuring website traffic, but can also be used as a tool for business and market research (Petley J, 2003). Web analytics provides data such as the number of visitors, page views, and much more to track the traffic and popularity trends which helps market research. Technology will be very useful, because nowadays it is one of the main marketing aids.

Effectiveness of a Website

Although many companies and individuals have well-established purposes in developing their websites, they may still have concerns about the effectiveness of their sites. One big concern is to assure that people will visit the web page. Once people acess the site, the company wants them to look over the website's content, as opposed to going elsewhere (Whittington, 2009). Finally, the company wants to achieve the initial purpose of its website, which is to increase the popularity.

According to our discussion with Mr. Brian Rogan (Personal Communication, 2010), most writings and critiques on website evaluation focus on usability and accessibility of a web page. Annika S Hipple (2009) states that user-friendliness and clarity of purpose are the main aspects which determine the effectiveness of a website. She believes that advanced web features like JavaScript or Flash may not work in all browsers and thus hurt a website's effectiveness. Fancy features can make a site take longer to load and more difficult to browse on hand-held devices, which are becoming increasingly popular. In order for an organization to determine the effective of their website, proper marketing techniques need to be analyzed. Diane Vigil (2010) believes that all websites serve to attract visitors and in order to successfully do that, websites need to look professional, represent the organization well, be set up so information is findable, download fast, and be search engine friendly. She states that effective web design consists of marketing.

Google Analytics

Marketing management can note the importance of technology, within the scope of its marketing efforts. According to many magazines, one of the best tools that is used for marketing is Google Analytics (Lynn, 2010). Google Analytics (Google Analytics, 2010) is a free service offered by Google that generates detailed statistics about the visitors to a website. According to a recent journal article, Google Analytics has been fun and easy (Lunn, 2008). Lynn (2010) believes that the product is aimed at marketers, as opposed to webmasters and technologists from which the industry of web analytics originally grew. Google Analytics is the most widely used website statistics service.

A great number of people who use web analytic software believe that Google Analytics is not the appropriate software to use for website tracking. They believe that one of the most important elements of analytics is testing. If one changes some pages as a test, it is good to have easy access to a log of changes within the analytics tool. Google does not provide this, fragmenting one's workflow if one does frequent tests.

Although there is no cost, Google owns the data. Google knows about the visitors and can track them based on their interest in various pages. They can do whatever they want with this information. For some people, this is fine while for others it is a privacy issue.

HBX

Furthermore, there is also other competitive software that is called HBX (Omniture: An Adobe Company, 2010). HBX can set up custom targets to track certain data relating to goals that one sets for the page. It has a plugin with Excel called ReportBuilder. This plugin is great for

converting information into Excel format, which is more comprehensible. According to Megan Burns (2007), HBX Analytics provides a solid measurement platform and has one of the most usable interfaces out of all the available software. However, the product is intended for firms that do not have specialized analytics requirements and want to set up web analytics mostly for fun. HBX is also not a free software.

Piwik

Piwik is a free alternative to Google Analytics that has gained recognition in Europe but is also beginning to gain recognition in America. Piwik addresses some of the complaints about Google Analytics but is by no means a cure-all. Piwik was originally designed by interns of several major software companies. In Piwik, reports are generated in real time by default (Piwik, 2010). For high traffic websites, one can choose the frequency for reports to be processed. One can also add new features and remove the ones that are not needed. It is easy to build own web analytics plug-ins. Piwik is fully customizable consisting of over 40 widgets currently on the site. Third party developers are also encouraged to develop new widgets as newer versions of the software are always being released. Because Piwik is installed on the server, data is stored in a database and statistics can easily be accessed using open APIs (publishing the data in many formats: html, Appendix D) (Piwik, 2010).

Mint

Mint is a self hosted and extensible web analytic program that costs about $30 for every site that one wants the software to be installed onto. According to Aaron Russell (2008), Mint is an unusual analytics program because web statistics can be viewed from one's own server. He

states that Mint's interface is well designed and provides basic analytics functionality such as visits, referrers, page views, and searches. Mint has other features which can extend just beyond the basic features from both Mint itself and third party developers. Individual users can be tracked using Mint which means that it is possible to analyze individual users and observe how they found the site, what they searched for, and what pages they spent time on. Russell states that Mint is great at what it does and has a cleaner user interface than most website tracking software.

WebTrends

WebTrends is another software that tracks information on websites, just as any other competitive software. The interface of WebTrends is customizable, which allows the web administrator to display information as he or she wishes (Kemelor, 2007). WebTrends has the capability to store an enormous amount of website information and organize it so it's easier to understand who is visiting and leaving the website. Phil Kemelor believes that the drawback to this software is that programming and understanding of HTTP is required in order to use it. However, WebTrends does offer good technical support, making it easier to handle troubleshooting and upgrading.

AWStats

AWStats is an open source web statistics that converts log files into data that is organized and graphically represented. It combines the data it collects in time-based intervals which are then represented through graphs (Owen, 2007). Some of the data that AWStats

includes basic web statistics such as the number of new visitors, page hits, bandwidth used, geographic location, and more. AWStats is another software that is installed on one's own server. The most important data that is supplied by AWStats is the collection of in-bound links and IP addresses. Tracking does not have to be added to every page one wants information for, unlike Google Analytics. There are significant amount of data that the software collects and presents in an attractive way. However, AWStats does have some drawbacks. According to Hendrik Weimer (2006), the earlier versions of AWStats had many problems and users were afraid to go back and use the software. Versions of the software had security issues as well. Nonetheless, the software has evolved over time into a program that may be helpful in serving needs.

Internet Privacy

The internet is a tool that allows its users to communicate, exchange information and data, and connect with people all across the world (*Online Privacy*, 2010). It stretches across almost all aspects of life, and has become a suitable replacement for many things, like maps and faxing. One would hope that the same rules and regulations applied to "real life" would apply to the internet, however, in most cases, this is simply not true. Instead of imagining the internet as a "superhighway" with neat exits, police and speed limits, try to picture it as a chaotic mess in which there are thousands of exits, some people traveling hundreds of miles per hour faster than others, thousands of billboards, and a small group of whistle-blowers with almost no real power.

Over the past few years internet privacy has been a growing concern to internet users.

Many people in the world of technology are worried about being tracked by companies and organizations so that they can gain access to information and send advertisements based on the users browsing history (Internet Privacy, 2010). In 2000, The Federal Trade Commission completed a survey and in its annual report to congress, it stated that 92 percent of internet consumers are concerned about internet privacy. Some of the fears that internet users have includes the privacy of email, collection of private information, and having internet browsing tracked.

Privacy Laws and Anonymity on the Internet

In the recent years, many bills regarding internet privacy have been passed to the congress but the lawmakers are hesitant to proceed because they fear that laws regarding privacy may hurt the online business (*Internet Privacy*, 2010). The Electronic Communication Privacy Act of 1968 (ECPA) is an act that creates limited privacy to internet users. The act was originally passed to prevent wiretapping but over the years, it has been amended due to growing privacy issues in an age of new communication technology. The ECPA protects electronic communications such as the transfer of email and data but has been criticized due to limited privacy protection and the many exceptions in the act. The Supreme Court has taken almost no action in restricting what can be done on the Internet, except for some cases like child pornography and gambling (*Online Privacy*, 2010). Due to the overall lack of regulation, it has become easier for people to steal personal information. There are many ways illegal ways for personal information to be stolen such as phishing and spam. People can gain access to personal information through legal ways as well such as gathering IP addresses to see who is

visiting a certain website. Both can be damaging and troublesome to an individual.

According to Jacob Palme (2002), many internet users may not want their true identity to be shown by providing false names or identities. He also believes that privacy for the anonymous user is not very high since the IP address and the host name can be tracked. The IP address is a number that is usually used to identify devices connected to the internet and is unique to each device. According to Leo Notenboom (2005), some internet users are concerned that the IP address can be used to track them down physically. He believes that the IP address of a user is usually wanted by companies and the general public because they are being contacted by that address. A users IP address is the only identifying information that people can gain access to and can only be traced to the internet service provider who provides the IP address. The location of an IP address can also be found. Leo Notenboom also believes that a good internet service provider will not give the identity of whom they allocated the IP address to.

Browsing

It is almost impossible to completely prevent personal information from escaping one's control. A web browser most likely provides a short list of recent internet activity to website operators. However, it is possible to limit how much information is stored and released by changing the internet settings (*Know Privacy*, 2009). Websites like whitehouse.gov even tell their users that they will be tracking other websites that are visited around the time that users are on their website. Most websites do this to some extent, even if they do not know they are doing it. The problem is that with this information, combined with an IP address and location, a great amount of information can be found about anyone by the webmaster

Personal Websites

There are many ways that a website can track personal information, but most of the time it is for benign purposes. Websites want to know who is visiting their site and where that person is from, so they can adapt to best fit their users. However, tracking bugs and tracking software are not governed by a website's policy, but rather by an outside party (*Know Privacy*, 2009). Tracking software has become so abundant that Google Analytics can track and keep records on 92 out of 100 websites in use today. Google has little control over what the users of their software do with this information, but it is encouraged that they share all the data gathered. Now this is not illegal, but some of the information that is gathered could possibly be used in ways to harm benevolent web surfers. Even though Google has blocked the ability to gather IP information out of the box from one's Google Analytics reports, one can resort to PHP to "introduce" them back (See Appendix G for details). This is based on the fact that by using Google Analytics one shouldn't be able to identify specific users and their behaviors.

Chapter Three: Methodology

The goal of our project was to propose an efficient method of evaluating and capturing metrics of ESIP so that they could show their sponsors the extent of the work they accomplish. We wanted to determine the effectiveness of ESIP's website in portraying these accomplishments. In order to achieve this goal, we conducted interviews with webmasters, analyzed the website, contacted partners, and used web analyzing software. By interviewing webmasters, we gained a better understanding about the structure of the website and the different web pages, which we further analyzed. Furthermore, we contacted partners to gather data regarding the number of hits on their data set as compared through ESIP's redirection. Finally, through the analysis of the software systems that ESIP currently uses and could use for their websites, we determined the usefulness of their website and compared it to the partner data in order to make recommendations for gathering better results, which can then be shown to sponsors.

Determining the Status of ESIP's Website

Our project was involved with analyzing ESIP's website so we could witness its current effectiveness. We also recommended improvements by analyzing the website in order to show the impact of their organization in a better way. To help us further analyze the structure and functionality of ESIP's website, we interviewed the webmaster of ESIP's website.

Interview with the webmaster

Our team conducted interviews with the webmaster of ESIP's website who happened to be our liaison. However, before the interview took place, our team developed an interview protocol, outlining the topics and questions that were covered. The webmaster is the person who is responsible for maintaining and updating the ESIP website. These interviews had to take place in order for us to have a better idea on the sections of the website and what each section of the website was used for. Our motive was to gain a better understanding of the structure and the current functionality of ESIP's website. We were given a tour of the website based on our questions to further analyze the structure and functionality of the website.

Obtaining Data from Partners

Part of our project involved interviewing a selected number of partners, asking for data from their respective websites that would help evaluate the effectiveness of the ESIP website. We asked for the total number of visits that the partner website received over a certain period and would compare that number against the total number of people that were redirected from the ESIP website to the partner website. This data would show whether or not the ESIP website was functioning effectively, or was a waste of NASA and NOAA funding.

To begin, the statistics from the ESIP website had to be evaluated. This was due to the fact that the ESIP's website had many broken links and there would be no point in contacting partners and asking for data that would have nothing to compare to from the ESIP website. The links that were identified both had statistics from the ESIP website and the partners, who would track them using tracking software.

After the partners and links were identified, a draft of an email was created that would be used as a template asking the partners for the information. This email was sent out, along with a letter of introduction (See Appendix E) from the advisors explaining to the partners the goal of the project and the reason that the information was being requested.

Software Systems

Google Analytics is a software that helps keep track of the statistics of a website, such as number of visits, average time spent by each person that visited the website, etc. This chapter will describe in detail on how we used Google Analytics and other web analytic software to keep track of ESIP's web page. We also compared Google analytics to different web analyzing software to see which software gave better results. This was done so we could give recommendations to ESIP on which software would better show their impact. Software was also used to compare ESIPS's data with partners' data.

Determining the Right Software

In order to determine the right software for ESIP, we analyzed each competitive web analytic software to Google Analytics and noted down some of the important features that may be helpful in determining impact. Some of the aspects we analyzed was the price of the software and the user friendliness of the software. We also wanted to which software could track IP addresses since that was a major part of our liaison's request. Furthermore, we figured that considering the number of visits from a region was very important in the effectiveness of ESIP. We wanted to observe the depth of a particular region and the level of detail in providing

accurate number of hits from a specific city inside a region. Statistics regarding the behavior of websites users was also a very important aspect to look at when determining the right software for ESIP.

Analyzing Google Analytics

As stated in Chapter Two, Google Analytics is an online free software that provides the statistics of an organization's website use. For better understanding on how we used this software, we provide the following figure.

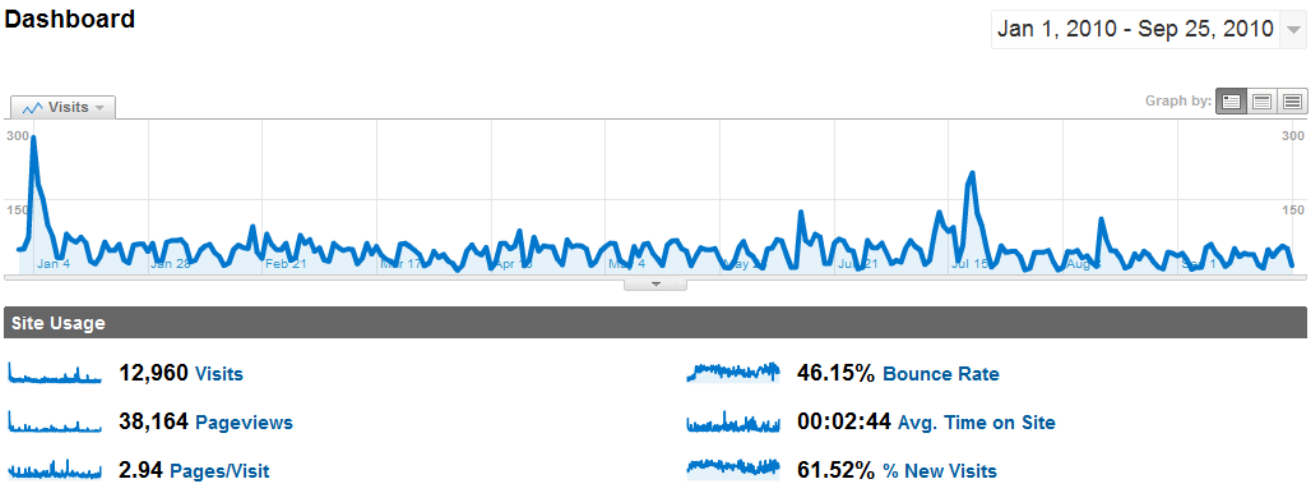


Figure 2: Site Usage for ESIP Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/dashboard?dashboard=1&id=20352897&bmid=7042216&esig=0&pdr=20100812-20100911&cmp=average (www.esipfed.org)

As it can be seen in Figure 2, these are the number of visits to the website from January 1, 2010 from September 25, 2010. We monitored the number of users that accessed ESIP's website. We saw the number of visits, the average time on site, the bounce rate and also the pages per visit. The bounce rate indicates the percentage of people who come on the website and leave without clicking on anything else. A high bounce rate generally indicates that site entrance pages aren't relevant to the visitors of the webpage. Also, the time spent by visitors

on different sections of the web page was a very useful metric to tell us which sections needed improvement.

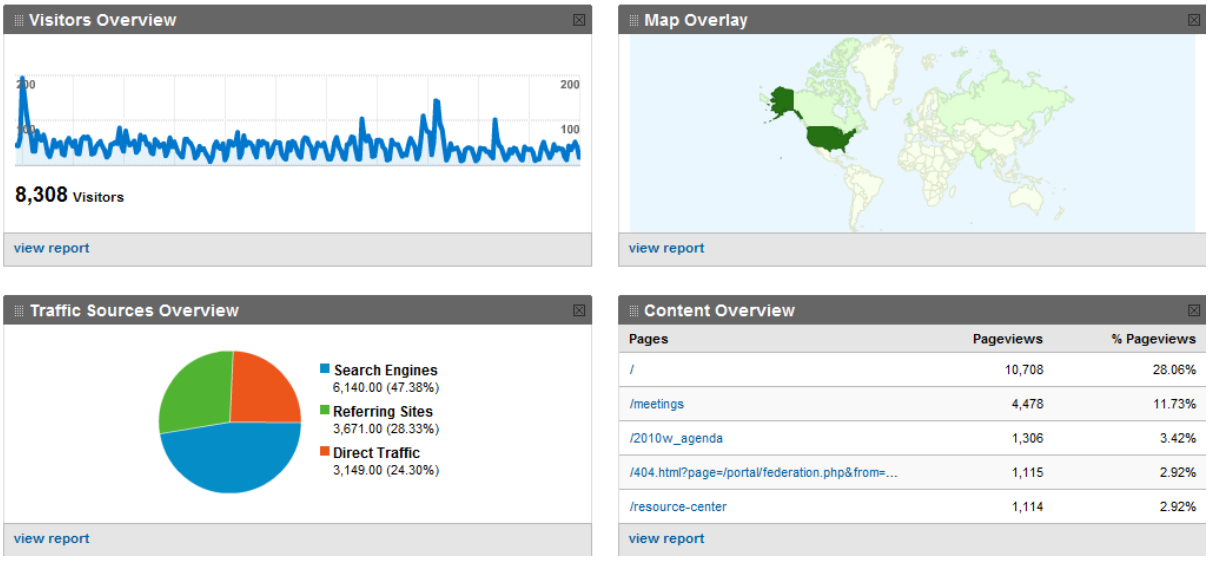


Figure 3: Google Analytics Dashboard Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/dashboard?dashboard=1&id=20352897&bmid=7042216&esig=0&pdr=20100812-20100911&cmp=average (www.esipfed.org)

As shown in Figure 3, Google Analytics has sections called *Visitors Overview, Map Overlay*, *Traffic Sources Overview*, and *Content Overview*. Google Analytics was used to provide us with many useful characteristics, such as the locations, the number of direct hits and referral sites, the sections of the website that are most popular, and search results. The visitor's overview section was analyzed to see the trends of the visits and the number of new users accessing the website. We focused our findings mainly on the map overlay feature to see where the visits came from. We further analyzed the hits in the top five states and searched for organizations, research facilities, or schools that were located in the cities with the most hits, who may be interested in earth data provided by ESIP. We also analyzed the ways users gained

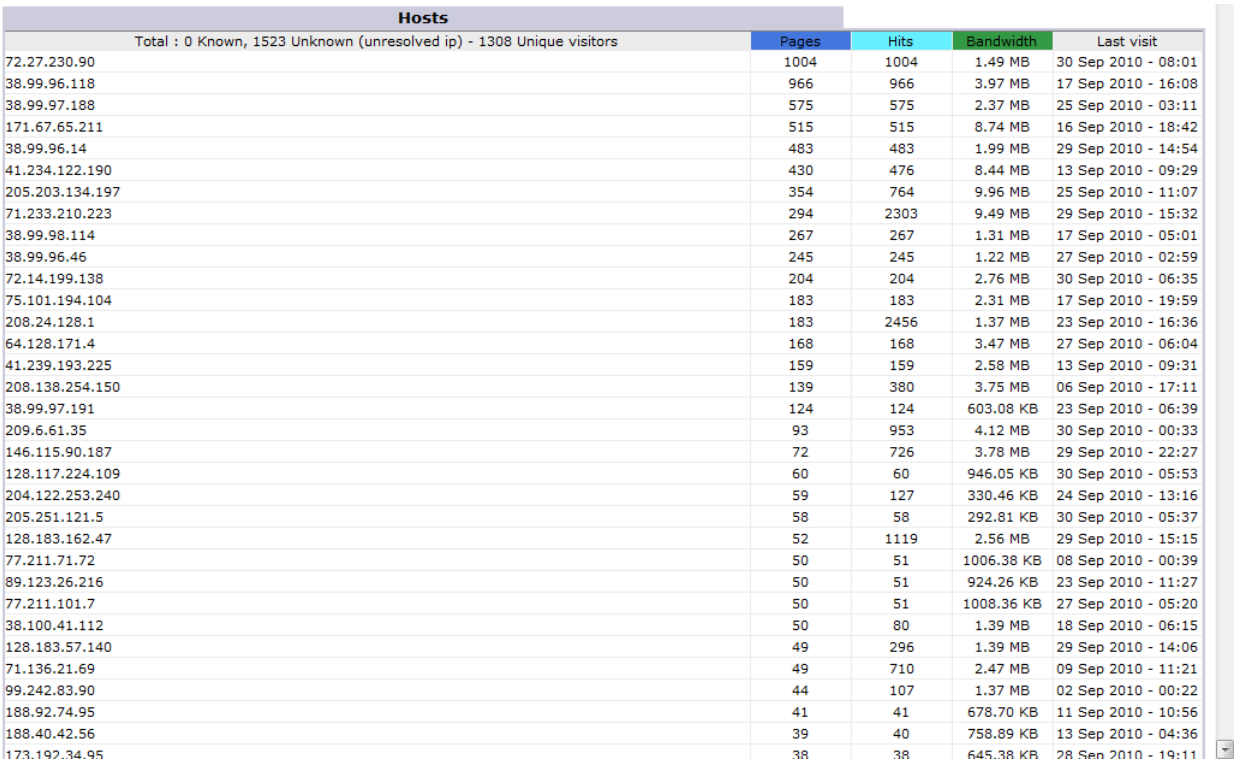
access to the website and whether or not they were referred by other sites. We wanted to have a great percentage on the direct visit, which means that people know the exact name of the website so they can visit it directly. We monitored the keywords of the searches that led users to ESIP's webpage and also analyzed the sites that the user previously visited before landing at ESIP's website. These statistics helped us develop recommendations to ESIP on how they can show their performance to their sponsors more effectively.

Analyzing Piwik

Piwik is a free online software that tracks information from a website. This information ranges from total number of hits to the IP addresses of specific users. We tried installing Piwik on ESIP's server in order to analyze the benefits of Piwik and to see if the software, when used correctly, can rival the power and ability of Google Analytics. The advantage of analyzing Piwik was due to its customizable interface. This means that all of the features of Piwik are dependent on the user. Piwik gives the user access to over forty widgets that can be added or removed from the dashboard, and each of the widgets can be changed to display the information differently.

Analyzing AWStats

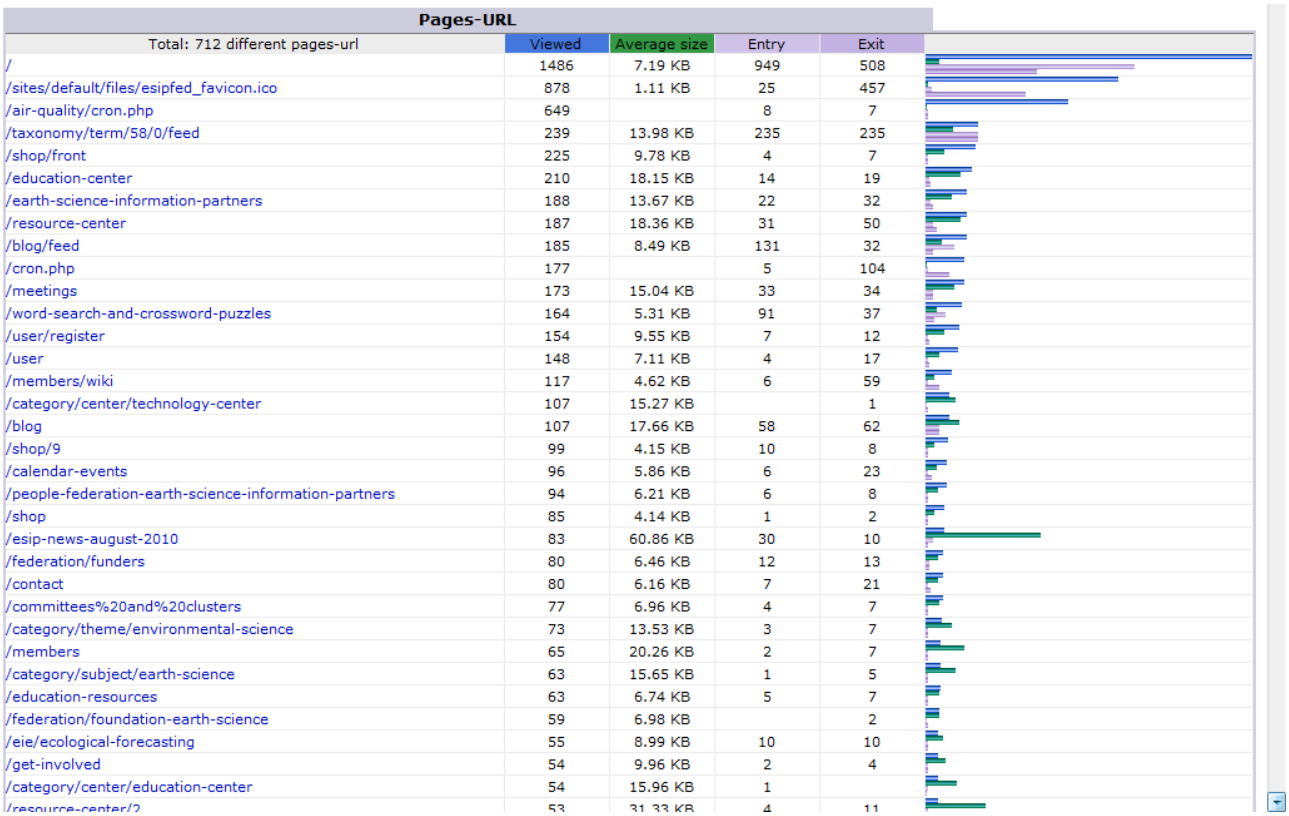
As stated in Chapter Two, AWStats is an open source web analytics reporting tool, suitable for analyzing data from Internet services such as web, streaming media, mail and FTP servers. We will now go into some more details on how we used this software during this project.



Hosts				
Total : 0 Known, 1523 Unknown (unresolved ip) - 1308 Unique visitors	Pages	Hits	Bandwidth	Last visit
72.27.230.90	1004	1004	1.49 MB	30 Sep 2010 - 08:01
38.99.96.118	966	966	3.97 MB	17 Sep 2010 - 16:08
38.99.97.188	575	575	2.37 MB	25 Sep 2010 - 03:11
171.67.65.211	515	515	8.74 MB	16 Sep 2010 - 18:42
38.99.96.14	483	483	1.99 MB	29 Sep 2010 - 14:54
41.234.122.190	430	476	8.44 MB	13 Sep 2010 - 09:29
205.203.134.197	354	764	9.96 MB	25 Sep 2010 - 11:07
71.233.210.223	294	2303	9.49 MB	29 Sep 2010 - 15:32
38.99.98.114	267	267	1.31 MB	17 Sep 2010 - 05:01
38.99.96.46	245	245	1.22 MB	27 Sep 2010 - 02:59
72.14.199.138	204	204	2.76 MB	30 Sep 2010 - 06:35
75.101.194.104	183	183	2.31 MB	17 Sep 2010 - 19:59
208.24.128.1	183	2456	1.37 MB	23 Sep 2010 - 16:36
64.128.171.4	168	168	3.47 MB	27 Sep 2010 - 06:04
41.239.193.225	159	159	2.58 MB	13 Sep 2010 - 09:31
208.138.254.150	139	380	3.75 MB	06 Sep 2010 - 17:11
38.99.97.191	124	124	603.08 KB	23 Sep 2010 - 06:39
209.6.61.35	93	953	4.12 MB	30 Sep 2010 - 00:33
146.115.90.187	72	726	3.78 MB	29 Sep 2010 - 22:27
128.117.224.109	60	60	946.05 KB	30 Sep 2010 - 05:53
204.122.253.240	59	127	330.46 KB	24 Sep 2010 - 13:16
205.251.121.5	58	58	292.81 KB	30 Sep 2010 - 05:37
128.183.162.47	52	1119	2.56 MB	29 Sep 2010 - 15:15
77.211.71.72	50	51	1006.38 KB	08 Sep 2010 - 00:39
89.123.26.216	50	51	924.26 KB	23 Sep 2010 - 11:27
77.211.101.7	50	51	1008.36 KB	27 Sep 2010 - 05:20
38.100.41.112	50	80	1.39 MB	18 Sep 2010 - 06:15
128.183.57.140	49	296	1.39 MB	29 Sep 2010 - 14:06
71.136.21.69	49	710	2.47 MB	09 Sep 2010 - 11:21
99.242.83.90	44	107	1.37 MB	02 Sep 2010 - 00:22
188.92.74.95	41	41	678.70 KB	11 Sep 2010 - 10:56
188.40.42.56	39	40	758.89 KB	13 Sep 2010 - 04:36
173.192.34.95	38	38	645.38 KB	28 Sep 2010 - 19:11

Figure 4: IP addresses of www.esipfed.org Source: AWStats. (2010). Retrieved September, 30, 2010, from http://esipfed.org:2082/awstats.pl?config=esipfed.org&ssl=&lang=en (www.esipfed.org).

The graph represented in Figure 4 shows one of the most interesting features of AWStats that we took advantage of during this project. AWStats is a software that could keep track of IP addresses by default without using any programming knowledge. According to this graph we obtained the IP addresses and their date of the last visit on ESIP's webpage and used http://aruljohn.com/track.pl, which is an online free IP tracker to find out the location of the visits. From those IP addresses we gave our liaison a full detail list from where they were located, how long they had been on ESIP's website and what specific sections they had visited.



Pages-URL

Total: 712 different pages-url	Viewed	Average size	Entry	Exit
/	1486	7.19 KB	949	508
/sites/default/files/esipfed_favicon.ico	878	1.11 KB	25	457
/air-quality/cron.php	649		8	7
/taxonomy/term/58/0/feed	239	13.98 KB	235	235
/shop/front	225	9.78 KB	4	7
/education-center	210	18.15 KB	14	19
/earth-science-information-partners	188	13.67 KB	22	32
/resource-center	187	18.36 KB	31	50
/blog/feed	185	8.49 KB	131	32
/cron.php	177		5	104
/meetings	173	15.04 KB	33	34
/word-search-and-crossword-puzzles	164	5.31 KB	91	37
/user/register	154	9.55 KB	7	12
/user	148	7.11 KB	4	17
/members/wiki	117	4.62 KB	6	59
/category/center/technology-center	107	15.27 KB		1
/blog	107	17.66 KB	58	62
/shop/9	99	4.15 KB	10	8
/calendar-events	96	5.86 KB	6	23
/people-federation-earth-science-information-partners	94	6.21 KB	6	8
/shop	85	4.14 KB	1	2
/esip-news-august-2010	83	60.86 KB	30	10
/federation/funders	80	6.46 KB	12	13
/contact	80	6.16 KB	7	21
/committees%20and%20clusters	77	6.96 KB	4	7
/category/theme/environmental-science	73	13.53 KB	3	7
/members	65	20.26 KB	2	7
/category/subject/earth-science	63	15.65 KB	1	5
/education-resources	63	6.74 KB	5	7
/federation/foundation-earth-science	59	6.98 KB		2
/eie/ecological-forecasting	55	8.99 KB	10	10
/get-involved	54	9.96 KB	2	4
/category/center/education-center	54	15.96 KB	1	
/resource-center/2	53	31.33 KB	4	11

Figure 5: Most visited Tabs of www.esipfed.org Source: AWStats. (2010). Retrieved September, 30, 2010, from http://esipfed.org:2082/awstats.pl?config=esipfed.org&ssl=&lang=en (www.esipfed.org).

Figure 5 shows the most visited tabs of ESIP's webpage. We used this feature of AWStats in order to find out the specific kinds of data the partners were interested in and also to find which of them needed update or which of them were broken. As mentioned in chapter Two, AWStats tracks all the web pages that have been visited by default and coding does not have to be added to every page, unlike Google Analytics.

Methodology for comparing ESIP to USGEO

USGEO is an organization similar to ESIP, and the differences between the two organizations needed to be evaluated. Doing so could help ESIP gain more funding, or provide them an area in which they need improvement or focus. In order to accomplish our goal, we

reviewed both the ESIP and USGEO websites, along with both the NASA and NOAA websites. These websites allowed us to compare funding, the number of other organizations involved with ESIP and USGEO, size of the organization, and any other factor that could adequately contrast the two groups.

Chapter Four: Findings and Discussion

Our project was mainly focused on ESIP's website and the current structure, functionality, and effectiveness of the website. We wanted to find out if ESIP justified their funding, primarily from NASA and NOAA, so that we could give recommendations based on our findings. After viewing the website, contacting partners, and analyzing web analytic software, we were able to gather information about ESIP and their current effectiveness as an organization. In this chapter we discuss the difficulties we encountered through the process as well as the results from our interviews and the understanding of software.

ESIP's Website

In order to determine the effectiveness of ESIP, the first step was to analyze the website and understand the way the website is operated.

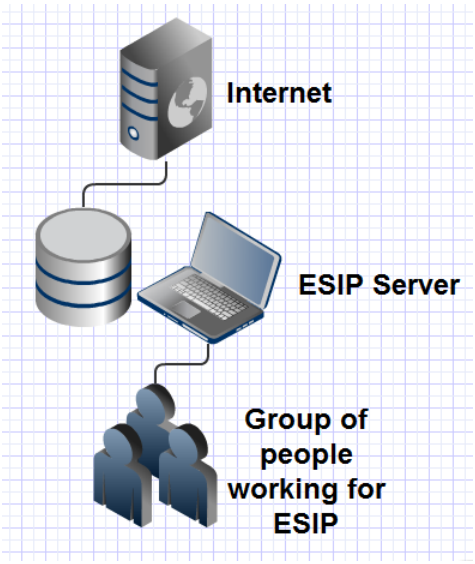


Figure 6: Structure of ESIP's Website

When analyzing ESIP's website, we found that ESIP's website runs on a main server which is connected to the internet as demonstrated by Figure 6. People working for ESIP such as our liaison are connected through this server. ESIP uses a software called cPanel which is a web hosting control panel that provides tools designed to simplify the process of hosting a web site through a graphical interface. cPanel allows ESIP to make their website accessible to the internet and it also provides space on the server for website data. As of right now, we found that ESIP has been using approximately 90% of their provided website space.

cPanel provides functionality for the administrator to control the various aspects of website and server administration through a standard web browser. Any changes made in the control panel to the website will be made on the World Wide Web.

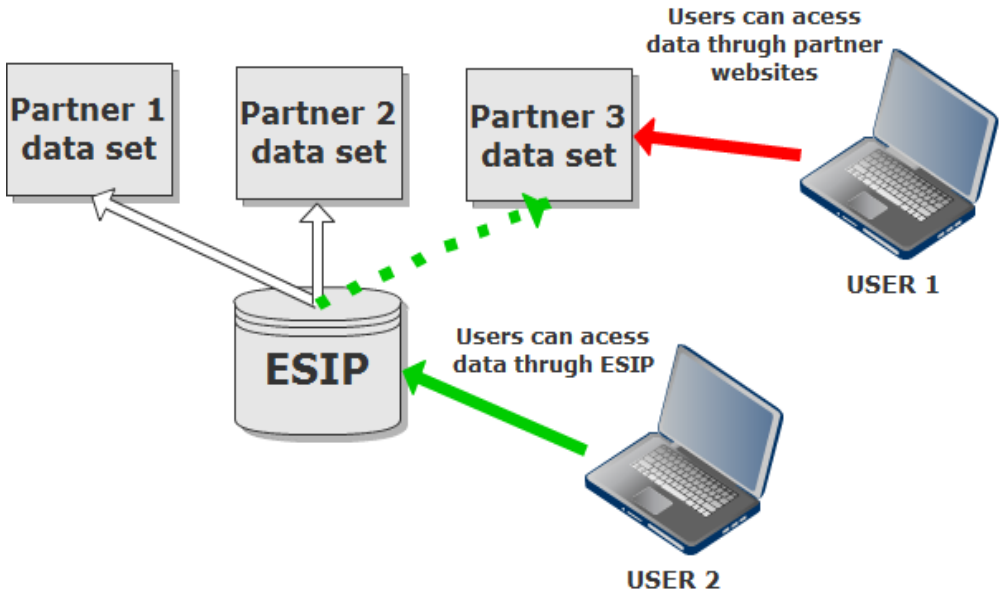


Figure 7: ESIP as a conduit

Figure 7 demonstrates the way that ESIP's website works regarding access to the various datasets. We found that ESIP has a wide collection of various datasets from 115 partners which

can be found on partner websites as well. Internet users who are looking to access specific datasets can either go to the partner websites or find data through ESIP's website. The partners provide data sets in a specific earth discipline but ESIP serves as a conduit for the general community in providing data sets to a more general public rather than in a specific discipline area.

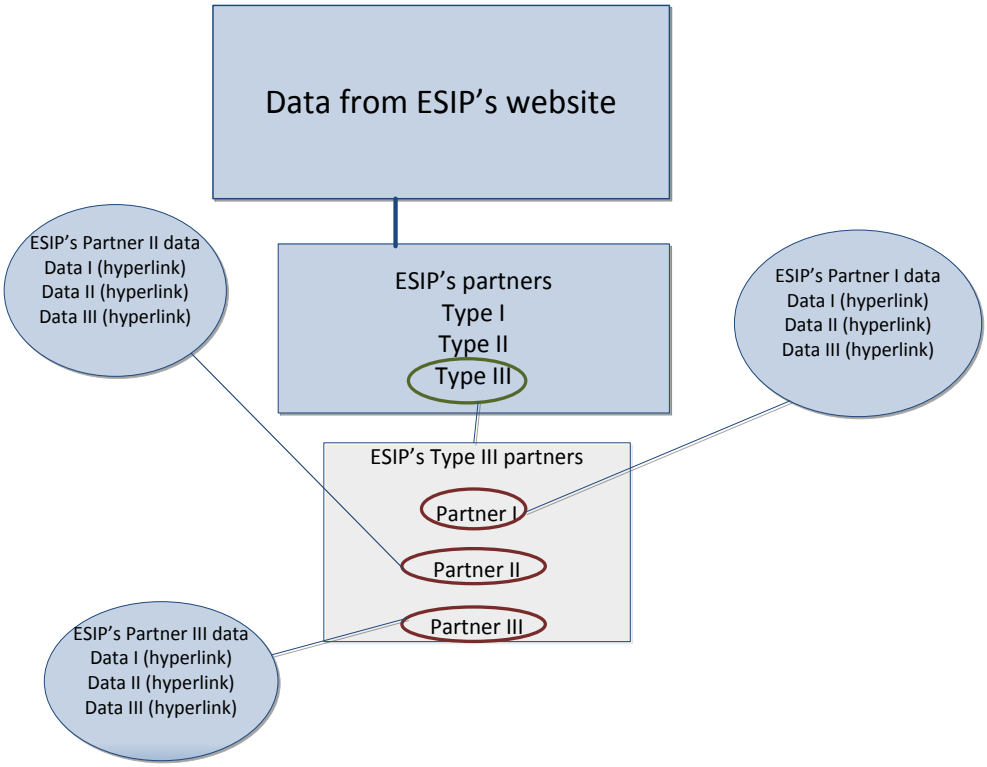


Figure 8: Data from ESIP's website

In Figure 8, we explain how the data resources tab from ESIP's webpage operates. After a user clicks on this tab, the type of ESIP's partners will show up as shown (Type I, Type II and Type III). Since these hyperlinks are too general, users can click on the specific type of partners that they are interested in and every partner of this type will show up in a hyperlink text. Based on the name of the partner that the user wants data for, the user can click on the hyperlink text

and further click on the specific data sets that exist for the partner. From there, the hyperlink text will browse them to the partner's webpage where the data are located and can be downloaded from.

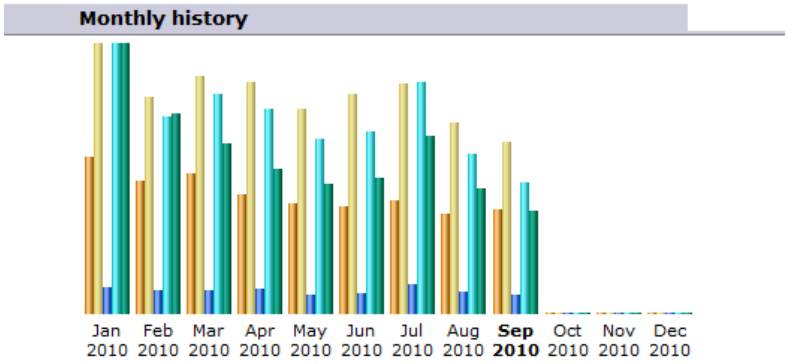
What we found from ESIP's webpage was that Google Analytics tracks only the number of hits on the specific type of partner that a user wants data for. The tracking does not go any further to track the number of times a specific partner and their datasets are clicked on. We also found that many of the links that lead to a partner's website were broken and or outdated due to changes of the partner website. Partners do not provide information to ESIP indicating that their website is undergoing updates, which leaves the links on ESIP's webpage incompatible.

Determination of the Right Software

We found that Google Analytics does not track downloads very easily, and getting any sort of report that it does not already give is impossible because one only gets what one sees. Most of the graphs in Piwik are similar to those in Google Analytics but the control panel is completely customizable unlike Google Analytics. Many useful plugins, which are extra features, can also be installed in Piwik. Piwik is actually more accurate than most other web analytic software because it picks up more visitors and keywords from search engines. Piwik is a very similar software to Google Analytics, but is not as well known as Google Analytics. There are many benefits of Piwik, the main being that all the data that is collected by Piwik is owned by the installer, whereas Google can control the data that is gathered by Google Analytics. Piwik can also track downloads and updates in real-time, which is very useful for both small and large websites. Unfortunately, we found that Piwik can be difficult to install, and some computer

programming background is recommended for use of the program.

Compared with other software such as AWStats, Google Analytics can be a useful software to record the statistics regarding website usage and location of visits because it uses effective visual aids so the user can have a very clear image of a website unlike AWStats. The following figure shows the representation of statistics that are gathered in the AWStats homepage:

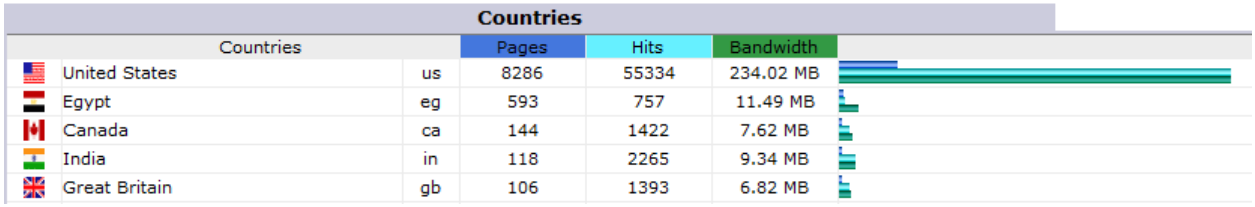


Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2010	1908	3277	14868	156405	900.02 MB
Feb 2010	1617	2622	13885	114229	669.65 MB
Mar 2010	1709	2879	13890	127045	568.45 MB
Apr 2010	1447	2813	14402	118677	483.71 MB
May 2010	1333	2480	11235	100891	433.57 MB
Jun 2010	1307	2663	11359	105783	451.66 MB
Jul 2010	1380	2797	16853	134115	593.61 MB
Aug 2010	1209	2318	12233	92155	418.32 MB
Sep 2010	1267	2090	10715	76387	344.22 MB
Oct 2010	0	0	0	0	0
Nov 2010	0	0	0	0	0
Dec 2010	0	0	0	0	0
Total	13177	23939	119440	1025687	4.75 GB

Figure 9: Web statistics from AWStats homepage Source: AWStats. (2010). Retrieved September, 30, 2010, from http://esipfed.org:2082/awstats.pl?config=esipfed.org&ssl=&lang=en (www.esipfed.org)

Figure 9 gave us information about the total number of visits of ESIP's webpage, how many people went on ESIP's website, their connection bandwidth, etc. It provided us with an effective bar graph of all those stats for every month of the year 2010. However, we did not

focus too much on this feature of AWStats because we already knew about those from Google Analytics, which in fact, had a better graphic representation of the website statistics. AWStats not only had the same information about all the months of the year, but also the dates of the specific month and even the days and the hours of the week of that month.



Countries

Countries		Pages	Hits	Bandwidth
United States	us	8286	55334	234.02 MB
Egypt	eg	593	757	11.49 MB
Canada	ca	144	1422	7.62 MB
India	in	118	2265	9.34 MB
Great Britain	gb	106	1393	6.82 MB

Figure 10: Top five Countries from AWStats Source: AWStats. (2010). Retrieved September, 30, 2010, from http://esipfed.org:2082/awstats.pl?config=esipfed.org&ssl=&lang=en (www.esipfed.org)

AWStats shows us a full list of the countries where people that have visited ESIP's website come from. For example, Figure 10 only represents the top five countries. This feature is also well developed by Google Analytics and has a much better representation since it not only gives the user details of the countries, but also gives the user a map overlay where the user can zoom into specific regions and view the number of visits in a much more detail approach. A table of comparison representing a variety of software and their features is shown in Figure 11.

	Google Analytics	*Piwik*	*VisiStat*	*Omniture's SiteCatalyst*	*AWStats*	*WebTrends*	*Mint*
Can show analytically the regions in the map	YES	NO	YES	NO	NO	NO	NO
Can track the IP address by default	NO	YES	YES	NO	YES	YES	NO
Free software	YES	YES	NO (15-20$ per month)	NO (pricing is varied and include options for hosted service)	YES	NO (pricing is varied and include options for hosted service)	NO ($30 per website)
Fully Customizable	NO	YES	YES	YES	YES	YES	YES
Easy to be installed (does not require any programming skills)	YES	NO	NO	YES	NO	NO	YES

Figure 11: Table of software and their features

Due to the small funding that ESIP recieves, it was necessary to take in account the pricing of software. We found that Google Analytics, AWStats, and Piwik are free and provide the same features as software that cost. In Chapter Five, we discuss our recommendations regarding these software.

Results from Google Analytics

Google Analytics can generate up to 85 different reports that helps analyze all possible data about website traffic. In this section we discuss, present, and analyze ESIP's website traffic information obtained from Google Analytics. We focus mainly on geographical information

provided by Google Analytics but also observe the overall behavior of users and the content of websites that are most viewed from January 1, 2010 to September 25, 2010.

Site Usage

Figure 12: Site Usage Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/dashboard?dashboard=1&id=20352897&bmid=7042216&esig=0&pdr=20100812-20100911&cmp=average (www.esipfed.org)

Figure 12 shows ESIP's site usage so far this year. The site has accumulated 12960 visits with 38164 page views. An average user visits about 3 pages per visit and spends close to 3 minutes on the website. This is a very low number, which means that ESIP's website is not very effective in providing the information that an average users want access to, causing the user to exit the website relatively quickly. The bounce rate indicates the percentage of people who access the ESIP website and leave without browsing other sections of the webpage. ESIP has a bounce rate of about 46 percent, which indicates that 46 percent of the people accessing the website were not interested in ESIP or did not think that they would find the information they needed. Figure 13 below shows that almost half of the visitors on ESIP's webpage exited on the first page. Very few people found ESIP's website appealing and helpful since most people exited without thoroughly browsing the website.

Most visits tracked: 1 pageviews

Pageviews in the visit	Visits with this many pageviews	Percentage of all visits
<1 pageviews	18.00	0.14%
1 pageviews	6,385.00	49.27%
2 pageviews	2,577.00	19.88%
3 pageviews	1,305.00	10.07%
4 pageviews	700.00	5.40%
5 pageviews	516.00	3.98%
6 pageviews	342.00	2.64%
7 pageviews	249.00	1.92%
8 pageviews	167.00	1.29%
9 pageviews	113.00	0.87%
10 pageviews	96.00	0.74%

Figure 13: Depth of visit by users Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/depth_of_visit?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average#lts=1286989357894

Going back to Figure 12, we see that about 62 percent of the visits were new visits, which means that these visitors are finding about ESIP through searches or from other users, organizations, research labs, or schools that have accessed their website before.

Traffic Sources

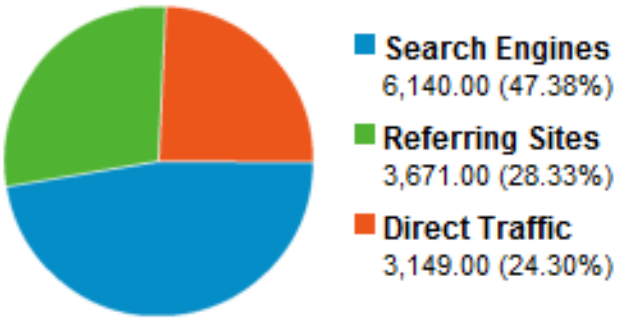


Figure 14: Traffic Sources Percentages Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/sources?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average#lts=1286989424464

Figure 14 shows a visual representation of the amount of visits that were from search engines, referring sites, or direct traffic. About 47 percent of the website visits were from users who were searching for ESIP or some specific page of ESIP's website as well as users who were looking to find some earth data. Around 28 percent of the users visiting the website were referred from other sites. These referring websites would consist of a link that visitors would click on in order to lead them to ESIP's website. Approximately 24 percent of visitors went to ESIP's website directly. We suspect that these visitors were returning visitors and that they previously had heard of ESIP before. The top ten traffic sources are shown in the figure below.

	Source/Medium None	Visits ↓	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
1.	google / organic	5,660	2.68	00:02:10	65.87%	46.02%
2.	(direct) / (none)	3,149	3.58	00:03:57	42.14%	43.47%
3.	gos2qp.geodata.gov / referral	958	1.93	00:00:44	94.26%	62.63%
4.	wiki.esipfed.org / referral	286	3.76	00:05:57	11.54%	33.57%
5.	landsat.org / referral	247	2.14	00:01:41	90.69%	51.82%
6.	bing / organic	178	3.04	00:02:00	78.09%	36.52%
7.	yahoo / organic	159	2.60	00:01:27	88.05%	46.54%
8.	mail.google.com / referral	111	5.26	00:08:17	0.90%	4.50%
9.	trfic.msu.edu / referral	105	2.70	00:02:07	93.33%	47.62%
10.	us.mc1107.mail.yahoo.com / referral	87	4.11	00:04:52	0.00%	17.24%

Figure 15: Traffic Sources Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/all_sources?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average#lts=1286989471960

Figure 15 shows the ways that users accessed the website starting with Google since almost half of visits came from searches. As shown in Figure 15, we can also view the pages per visit, average time on site, percent of new visits, and the bounce rate for each traffic source. Google was the search engine that users most often used in order to access the ESIP website. A more detailed figure regarding the specific keywords searched in Google is shown below.

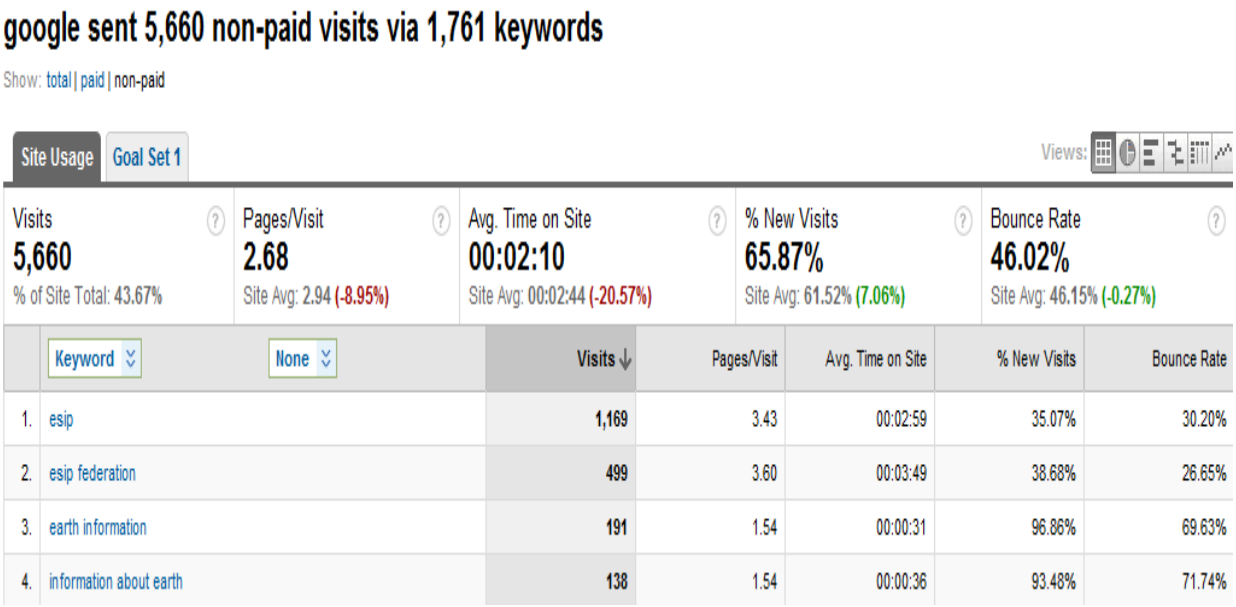


Figure 16: Keyword Searches Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/search_engine_detail?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&d1=google&tab=0&lasttab=0&view=0&tchcol=0#lts=1286989524322

As shown in Figure 16, many users who searched for data in Google did not find what they were looking for due to the high bounce rate of about 46 percent. Searches such as *esip* and *esip federation* have a low bounce rate, shown in the last column on the right hand side, compared with searches regarding specific data that do not contain keywords about ESIP. A low bounce rate is optimal for an effective website because that means visitors were interested in the website and stayed to browse more pages instead of exiting on the entrance page. These searches are expected to have a low bounce rate since ESIP's webpage are what online users are expecting. The average time spent on the website for users who used the keyword *esip* in their search was also high along with the amount of pages that were browsed. Searches that consisted of finding earth data had high bounce rates as shown above. This indicates that when visitors were lead to the ESIP's website, they were not interested in the webpage or did not

think they would find relevant earth data. For example, searches consisting of earth information and information about earth had bounce rates of about 70 percent and 71 percent respectively. Seven out of every ten visitors exited the website after landing on ESIP's page. An average user wanting to find earth data stayed on ESIP's website for a very short time and only browsed about 2 pages. As discussed earlier, this is because the average user did not find the appropriate information or data from the website. We believe that ESIP's page is not effective in portraying the work they do and the data they supply.

	Page Title None	Pageviews ↓
1.	Federation Of Earth Science Information Partners | Federation o...	10,865
2.	Meetings | Federation of Earth Information Partners	4,585
3.	Page not found | Federation of Earth Information Partners	2,234
4.	2010 Winter Meeting Documents | Federation of Earth Informati...	1,294
5.	Data Products from Type I ESIPs | Federation of Earth Informati...	1,114

Figure 17: Top hit pages Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/content_titles?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average#lts=1286989567560

Figure 17 indicates the top five pages which accumulated the most views. The homepage had the most page views, which is expected for the homepage. The meetings webpage was viewed 4,585 times, which indicated that many people were interested in various meetings held by ESIP throughout this year. The third most page with the most page views was ESIP's error page. This metric severely impacts the effectiveness and functionality of the ESIP website. In the following chapter, we discuss our recommendations for ESIP to better show their performance to sponsors.

	Page None	Exits
1.	/	3,848
2.	/meetings	1,756
3.	/404.html?page=/portal/federation.php&from=http://gos2qp.geodata.gov/QuickPlace/esip/Main...	716

Figure 18: Top exit pages Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/content_titles?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average#lts=1286989567560

Figure 18 above shows the top three exit pages on ESIP's webpage. The homepage is the most exited page because search engines often lead online users to the homepage, so it is expected that it will also be the page that is most exited. If the homepage was not very interesting or did not effectively show what ESIP does or provides, people would exit the website. Once again we see that the third most exits were from the error page. This error page has to be fixed so that NASA and NOAA know that the federation actually does its job.

In the next section of this chapter, we discuss the locations where various visits came from. Despite ESIP's lack of effectiveness in their website, we discuss possible states and cities that have shown interest in ESIP's data due to the number of visits.

Map-Overlay

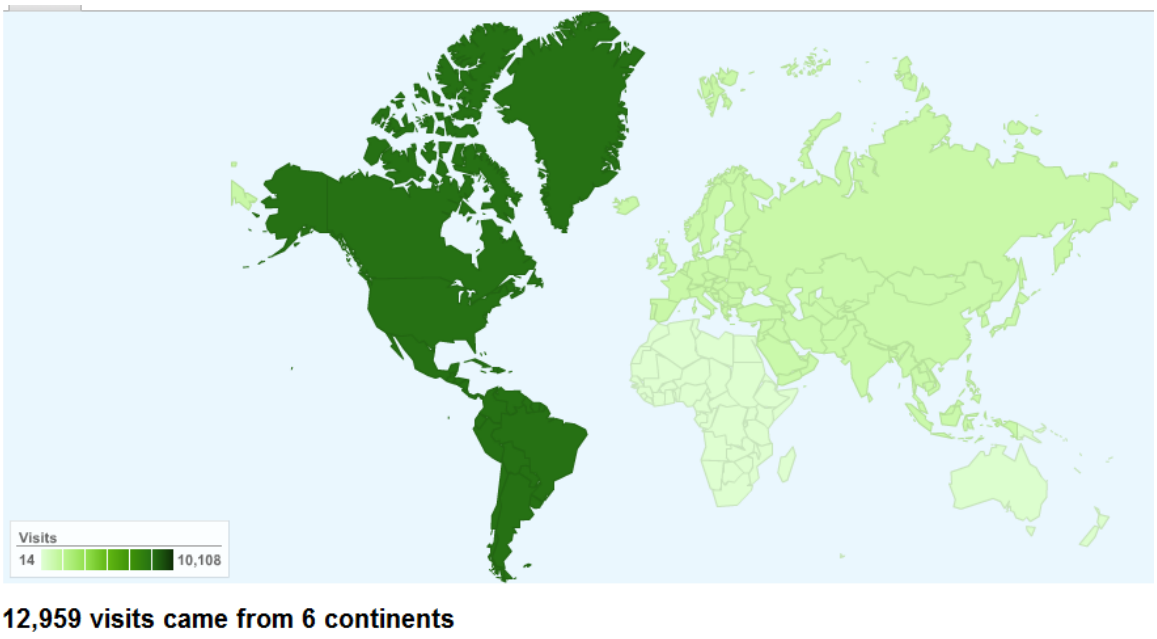


Figure 19: Geo-overlay feature Source: Google Analytics. (2010). Retrieved September, 16, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&segkey=region&d1=US&mdet=country#lts=1286989615065

In Figure 19, we were able to see visits that the website obtained from each continent around the world. The continents with a high number of visits are represented by a darker shade of green. In total, ESIP's website had 12959 visits from January 1st, 2010 to September 25th, 2010. We were also able to view the number of visits acquired from each country as shown in Figure 20 below.

	Detail Level: Country/Territory	Visits
1.	United States	9,474
2.	India	435
3.	United Kingdom	331
4.	Canada	229
5.	Russia	152
6.	Australia	150
7.	China	139
8.	Germany	134
9.	Philippines	132
10.	Mexico	99

Figure 20: Top ten countries with visits Source: Google Analytics. (2010). Retrieved September, 30, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&segkey=region&d1=US&mdet=country#lts=1286989615065

Since ESIP is funded by U.S Government Agencies, it is expected that United States would have the most visits with 73 percent of the total website visits this year. In order to get a more detailed view of the hits, we zoomed in the map to get the total number of visits by each region. We focused our map to represent the number of hits by each state because United States territory was the most dominant.

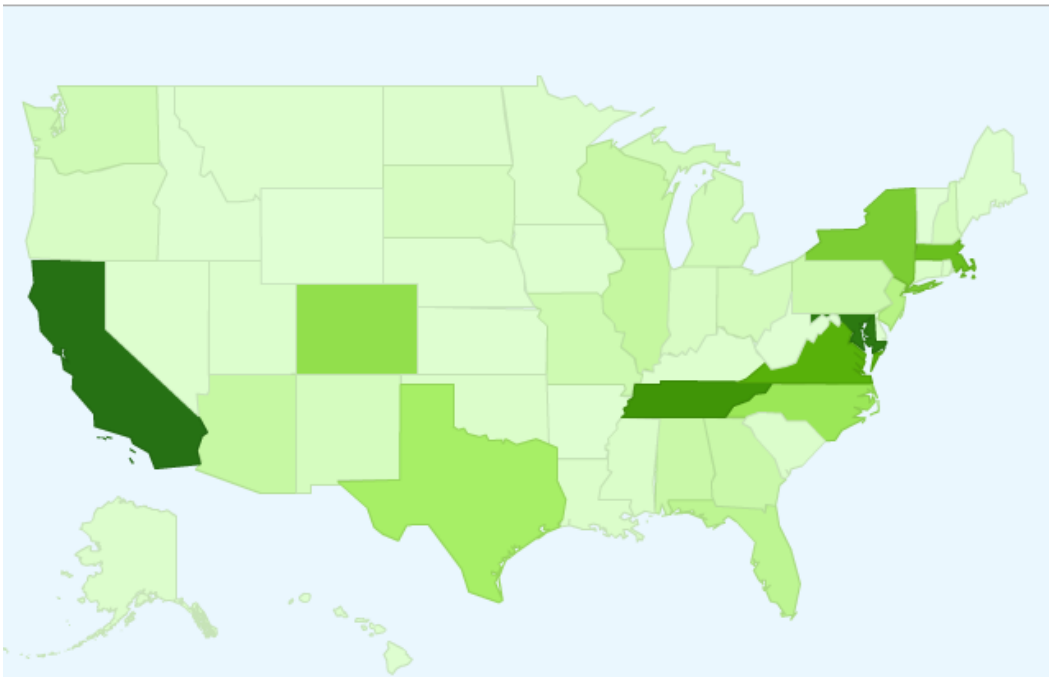


Figure 21: Visits in the United States Source: Google Analytics. (2010). Retrieved September, 30, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&segkey=region&d1=US&mdet=country#lts=1286989615065

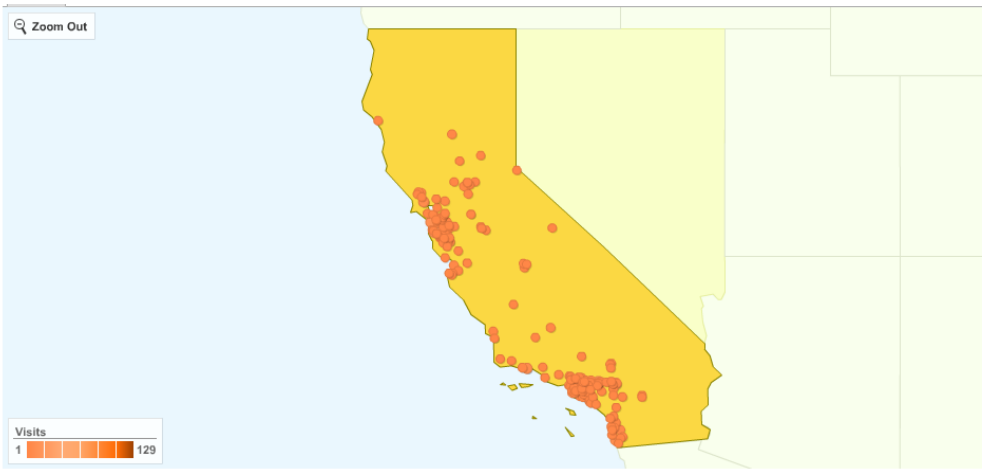
Figure 21 shows the distribution of visits across the United States. From this map, the top three states with the most visits can be distinguished easily as California, Maryland, and Tennessee because these states have the darkest shades of green. The top five states are shown in the figure below with their corresponding number of site visits from January 1, 2010 to September 25, 2010.

	Detail Level: Region	Visits
1.	California	1,078
2.	Maryland	1,025
3.	Tennessee	852
4.	District of Columbia	849
5.	Virginia	683

Figure 22: Top ten states with visits Source: Google Analytics. (2010). Retrieved September, 30, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&segkey=region&d1=US&mdet=country#lts=1286989615065

We analyzed the visit numbers of the top five states down to the specific cities within the states and simply searched for earth related organizations, companies, or schools in the top cities and towns that may be interested in earth data supplied by ESIP solely based on the number of visits. ESIP can then contact these places because of the interest they show.

1. California (1078 visits)



This state sent 1,078 visits via 217 cities

Figure 23: Visits in California Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21137&segkey=city&mdet=REGION#lts=1286989682299

As you can see in Figure 23, most of the visits came from locations consisting of well known cities in California. The visits coming from California are very contained in specific areas of these well known cities, which indicates that ESIP may have earth data information that is relevant to many colleges and research facilities in these cities. Many of these colleges and research labs may be interested in the work ESIP does and possibly are looking to provide or receive data. The visits from each city and town are shown in the figure below:

Visits	Pages/Visit	Avg. Time on Site
1,078	3.16	00:03:04
% of Site Total: 8.32%	Site Avg: 2.94 (7.33%)	Site Avg: 00:02:44 (12.14%)

	Detail Level: City	Visits
1.	Pasadena	129
2.	San Francisco	94
3.	Los Angeles	80
4.	San Diego	35
5.	Anaheim	34
6.	La Canada Flintridge	31
7.	Santa Barbara	26
8.	Oakland	25
9.	Stanford	22
10.	Petaluma	21

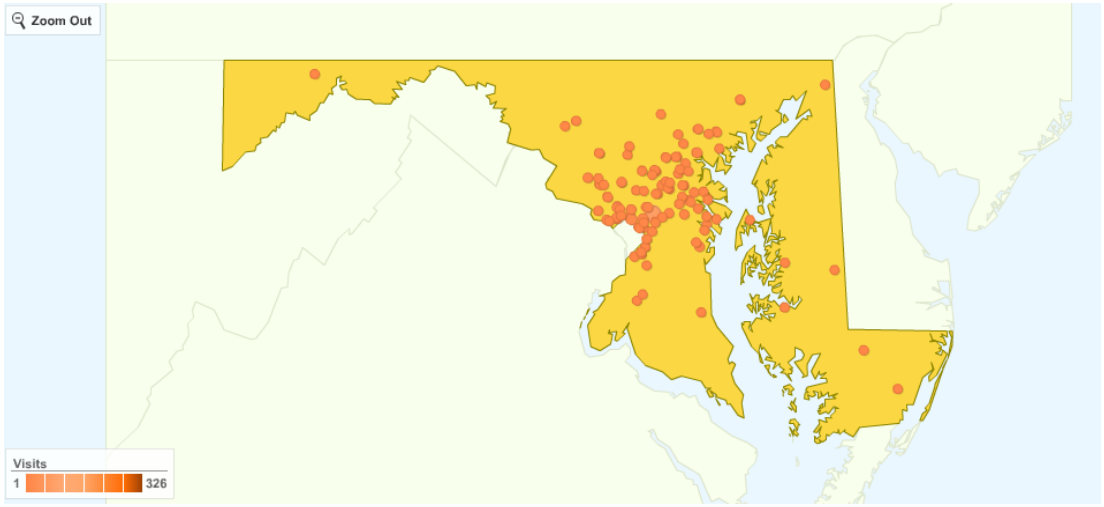
Figure 24: Top ten cities in California Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21137&segkey=city&mdet=REGION#lts=1286989682299

Figure 24 shows the cities and towns where people accessed ESIP's website the most and much to our surprise, we found that Pasadena consisted of the most visits. We wanted to find the reason behind these hits and come up with a possible explanation. After using this set of

data provided by Google Analytics, we searched for organizations, research facilities, or schools in Pasadena that may be interested in earth data. We found that the California Institute of Technology is actually located in Pasadena, California. The California Institute of Technology has an academic division called the Geological and Planetary Sciences division that may be interested in earth data supplied by ESIP.

Also in Figure 24 we can view the total number of hits, pages per visit, and the average time that users are on the website. The number of pages that are visited in California is 3.06 which is 7.33 percent above the site average of 2.94 pages per visit. The average time on the website is also higher than the site average which is quite low itself. These statistics show us that the various organizations, companies, or schools are more interested in ESIP's data than an average user who is searching for data.

2. *Maryland (1025 visits)*



This state sent 1,025 visits via 116 cities

Figure 25: Visits in Maryland Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21153&segkey=city&mdet=REGION#lts=1286989718216

The distribution of hits in the state of Maryland is spread out in one area within the state. Maryland has had 1025 hits in 116 cities so far this year totaling to the second most hits in the United States. The top two cities that had the most hits within the state far exceeded the amount of hits that came from the cities with the next number of most hits. The top ten cities with the most hits are shown in the figure below:

Visits	Pages/Visit	Avg. Time on Site
1,025	**3.66**	**00:04:02**
% of Site Total: 7.91%	Site Avg: 2.94 (24.44%)	Site Avg: 00:02:44 (47.31%)

	Detail Level: City	Visits ↓
1.	Greenbelt	326
2.	Silver Spring	113
3.	Greenbelt	88
4.	College Park	44
5.	Takoma Park	44
6.	Baltimore	35
7.	Takoma Park	20
8.	Bethesda	16
9.	Gaithersburg	14
10.	College Park	13

Figure 26: Top ten cities in Maryland Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21153&segkey=city&mdet=REGION#lts=1286989718216

As you can see in figure 26, the cities of Greenbelt and Silver Spring are clearly the leaders in visit totals, far exceeding the visits from other towns and cities. We searched for various earth related places to find out why these cities recorded more visits than other cities. Greenbelt had the majority of visits on ESIP's website in the state of Maryland. We believe this is due to the fact that Greenbelt, MD consists of NASA's Goddard Space Flight Center's main

campus that manages many earth observation, astronomy, and space physics missions. Silver Spring consists of a corporation called Earth Resources Technology Corporation which strives to be a trusted partner of federal and state governments to provide high value science, IT and engineering services and solutions. Part of what they specialize in is data integration and processing in earth services. These services include the modeling and visualization of satellite data as well as managing software for NASA and NOAA. We believe that the corporation in Silver Spring is very interested in using the data supplied by ESIP.

Maryland far exceeded the site averages in pages per visit consisting of 3.66 and the average time on site of 4:02 minutes which indicates that many users in Maryland are interested in ESIP's mission.

3. *Tennessee (852 visits)*

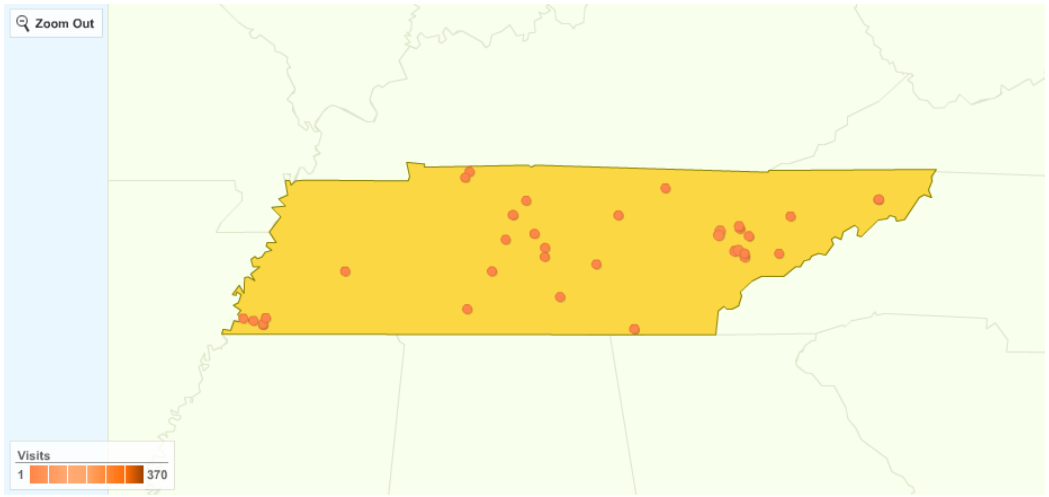


Figure 27: Visits in Tennessee Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21175&segkey=city&mdet=REGION#lts=1286989765148

Figure 27 shows the distribution of cities across Tennessee that have accessed ESIP's website this year. The cities where ESIP's website was accessed are spread out but there were two main cities where the website was accessed many times more than other cities. These cities are shown in the figure below:

Visits	Pages/Visit	Avg. Time on Site
852	**2.78**	**00:02:27**
% of Site Total: 6.57%	Site Avg: 2.94 (-5.74%)	Site Avg: 00:02:44 (-10.42%)

	Detail Level: City	Visits ↓
1.	Knoxville	370
2.	Oak Ridge	253
3.	Louisville	57
4.	Powell	38
5.	Nashville	25
6.	Oak Ridge	18
7.	Louisville	16
8.	Maryville	12
9.	Johnson City	8
10.	Tullahoma	6

Figure 28: Top ten cities in Tennessee Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21175&segkey=city&mdet=REGION#lts=1286989765148

Knoxville and Oak Ridge had far more visits than other cities in Tennessee. We did some research to find out why these hits were skyrocketed from hits from other places. We found that an ESIP Federation meeting took in the Knoxville and Oak Ridge area from July 20th to July 23rd, possibly causing various attendees to access ESIP's website. The visits currently represented in Figure 28 are during the time period from January 1st, 2010 to September 25th, 2010, but in order to test our prediction, we tracked the number of hits in Tennessee from July 20th to July 23rd.

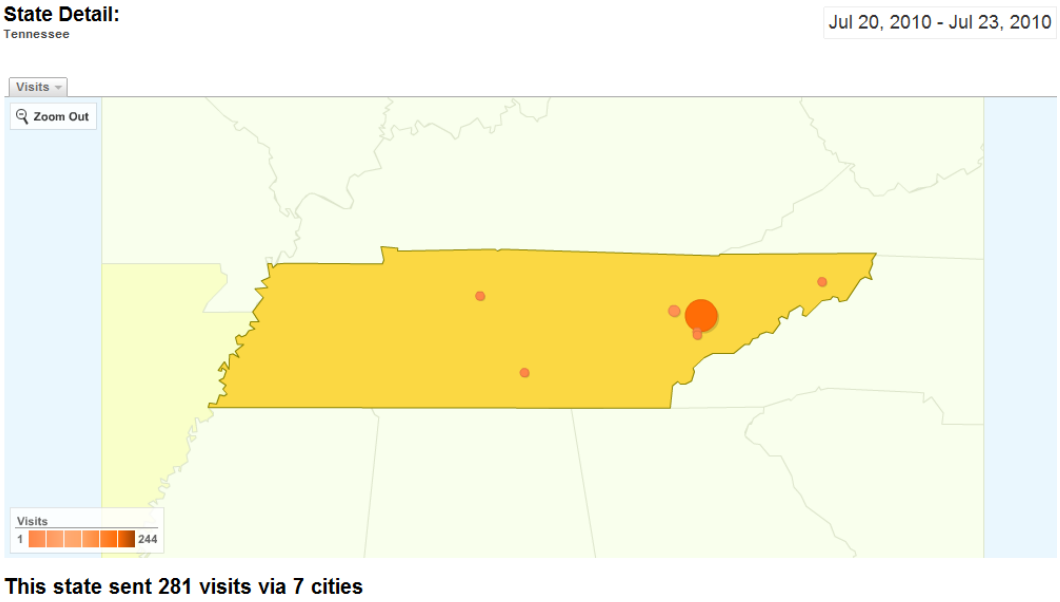


Figure 29: Tennessee July 20-23 Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21175&segkey=city&mdet=REGION#lts=1286989765148

As shown in Figure 29, we have set our date from July 20th to July 23rd in order to distinguish if the exceeding number of visits were due to the ESIP Federation meeting which took place. Shown below is the number of visits between these three days.

Visits	Pages/Visit	Avg. Time on Site
281	3.04	00:02:18
% of Site Total: 59.53%	Site Avg: 2.86 (6.29%)	Site Avg: 00:02:28 (-6.68%)

	Detail Level: City	Visits ↓
1.	Knoxville	244
2.	Oak Ridge	28
3.	Nashville	3
4.	Johnson City	2
5.	Alcoa	2
6.	Tullahoma	1
7.	Maryville	1

Figure 30: Cities in Tennessee July 20-23 Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21175&segkey=city&mdet=REGION#lts=1286989765148

There were 272 visits in Knoxville and Oak Ridge just within these three days. We believe that Tennessee was one of the top states to access ESIP's website because of this meeting. These statistics shows us that ESIP has an impact from the meetings that they host.

4. *District of Columbia (849 visits)*

Visits	Pages/Visit	Avg. Time on Site
849	**3.40**	**00:02:56**
% of Site Total: 6.55%	Site Avg: 2.94 (15.60%)	Site Avg: 00:02:44 (7.42%)

	Detail Level: City	Visits ↓
1.	Washington	482
2.	Washington	367

Figure 31: Top Cities in Washington, DC Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21175&segkey=city&mdet=REGION#lts=1286989765148

In Figure 31, we can see that Washington DC had 849 visits totaling as the fourth most state to have website visits. We believe that Washington DC had so many visits because NASA headquarters is located there, which is the sponsoring agency for ESIP. The headquarters provides overall guidance and direction to the agency. In order to implement NASA's mission, there are four organizations which are Aeronautics, Exploration Systems, Science, and Space Operations. We believe that these organizations may have had many of the visits in order to make sure ESIP is continually updating their website and also doing their job. ESIP's webmaster is also located in Washington, DC and therefore contributing to the many visits.

5. *Virginia (683 visits)*

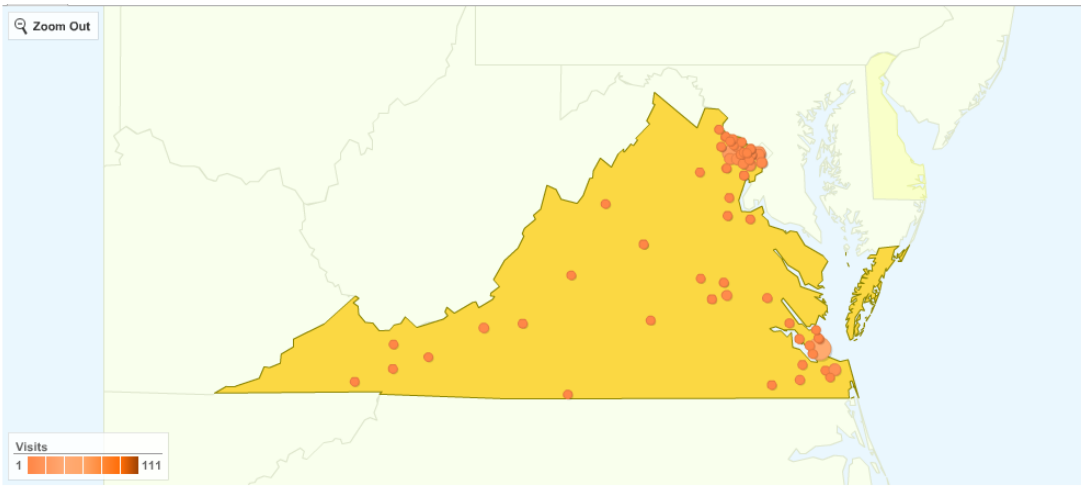


Figure 32: Visits in Virginia Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21178&segkey=city&mdet=REGION#lts=1286989836945

Virginia recorded 683 hits from 84 cities so far this year. There are two particular regions in the state where users accessed the website more than other areas. We found that most of Virginia's hits came from Northern and Southern Virginia.

Visits	Pages/Visit	Avg. Time on Site
683	2.97	00:02:48
% of Site Total: 5.27%	Site Avg: 2.94 (0.93%)	Site Avg: 00:02:44 (2.63%)

	Detail Level: City	Visits ↓
1.	Fairfax	111
2.	Hampton	64
3.	Arlington	47
4.	Chantilly	27
5.	Chesapeake	26
6.	Arlington	25
7.	Ft Myer	24
8.	Poquoson	22
9.	West Mclean	20
10.	Herndon	19

Figure 33: Top cities in Virginia Source: Google Analytics. (2010). Retrieved September, 29, 2010, from https://www.google.com/analytics/reporting/maps?id=20352897&bmid=7042216&pdr=20100912-20101012&cmp=average&rpt=GeoMapReport&d1=21178&segkey=city&mdet=REGION#lts=1286989836945

As shown in figure 33, Fairfax and Hampton were the top two cities where users accessed ESIP's website. After searching for places that may be interested in earth data, we found that the George Mason University is located in Fairfax. The University has a College of Science consists of undergraduate majors of computational and data sciences, earth science, geography, geology, and global and environmental change. They also offer masters and doctorate degrees in earth systems and geo-information sciences. We expected that many professors or students that need earth data may have searched for them through ESIP's website. Virginia also had 64 visits from Hampton. We found that NASA's Langley Research Center is located in Hampton, VA and that many scientists study the atmosphere to improve life on earth. These scientists most likely needed earth data and accessed ESIP's website for them as well.

AW Stats

As mentioned in Chapter Three, in this project we used AWStats in order to get the 15 IP addresses with the most hits on ESIP's webpage during September 2010. In the top 15 IP addresses there were also the IP addresses of Mr. Rogan from Newton and also the IP address of the webmaster of ESIP's website from Washington D.C. So, in order to get more accurate results we did not include those in our list. Many of the IP addresses only told us the location of where the visits came from. We further investigated the various locations to get information on the organization, institutions, and research labs due to privacy issues. The hits accumulated on by each address do not indicate the number of visits on the website but the number of total clicks on links and various pages. Our results are the following:

1. 171.67.65.211 (515 hits): Stanford, CA (Stanford University)
2. 41.234.122.190 (476 hits): Cairo, Egypt (European Space Agency)
3. 205.203.134.197 (354 hits) : Woodbridge, NJ USA (Branch of NOAA)
4. 75.101.194.104 (183 hits): Amazon Inc. Seattle, WA USA (ESIP provides products)
5. 64.128.171.4 (168 hits): Troy Reservoir, Troy, NY USA (Rensselaer Polytechnic Institute)
6. 41.239.193.225 (159 hits): Cairo, Egypt (European Space Agency)
7. 208.138.254.150 (139 hits): Plainsboro, NJ USA (Princeton Plasma Physics Laboratory)
8. 146.115.90.187 (72 hits): Lexington, MA USA (ESIP Partner)
9. 128.117.224.109 (60 hits): Boulder, CO USA (National Center for Atmospheric Research)
10. 204.122.253.240 (59 hits): Bartow, FL USA (Polk County Public Schools)
11. 205.251.121.5 (58 hits): Reston, VA USA (Orbital Sciences Corporation)
12. 128.183.162.47 (52 hits): Washington D.C USA (NASA and NOAA)

13. 77.211.71.72 (50 hits): Valencia, Spain (Astronomic Observatory of University of Valencia)
14. 89.123.26.216 (50 hits): Timisoara, Romania (Astronomic and Seismologic Observatory)
15. 99.242.83.90 (47 hits): Brampton, Canada (David Dunlap Observatory , University of Ontario)

To sum, most hits during this month came from Stanford University, which is an academic institution. We also found a lot of institutions and research labs that were interested in ESIP's work. Fewer hits came from Research labs around the world. These labs were interested mostly in the work that ESIP's Air Quality group does.

Comparing Partner Hits with ESIP Hits

After contacting the partners for data, we received only four responses out of the nine partners that we contacted. The four ESIP partners who responded were the National Climatic Data Center (NCDC), National Snow and Ice Data Center (NSIDC), International Satellite Cloud Climatology Project (ISCCP), and Unidata. However, most partners were not able to track the data we needed due to time constraints. As a result, we were not able to gather appropriate data. We found that Unidata uses a data delivery system in which the user can register their interest in various data by subscribing. Through a software that Unidata provides, the user community can connect to the system and obtain data. Currently, there are 400 members who are registered to obtain data in real time. The ISCPP was not able to give us the amount of times data is accessed but they were able to provide the number of publications that cited their data sets since 2006, which was at 1300. The National Snow and Ice Data Center stated that

there were no redirection hits from ESIP. Due to time constraints, the data center was not able to give the number of times their data sets accessed. This makes it impossible to compare the percentage of hits that each partner receives that come through ESIP as compared to the total number of hits.

Results from comparing USGEO and EISP

After comparing ESIP to USGEO, we found several things that could greatly affect ESIP as an organization. One of the most striking differences between the two groups was the amount of funding that each receives. ESIP gets between two hundred and five hundred thousand dollars in federal funding per year, while USGEO receives around two million dollars per year. This vast difference in funding allows USGEO to have more staff, have a more updated website, and to have more partners and still be effective. This funding disparity also allows the USGEO website to have a designated webmaster, and therefore the website has almost no broken links.

We could only find one area in which USGEO appeared to be lacking. The air quality group that works with ESIP is much more effective, having the highest meeting attendance and utilizing the ESIP website very effectively. The group that works with USGEO was much smaller than the ESIP group, and did not seem to be very involved with USGEO.

Chapter 5: Conclusion and Recommendations

Based on the information that we presented and discussed in this project, we were able to draw conclusions and recommendations about ESIP and the steps the federation can take to increase and show their effectiveness better. From the findings that we discussed, we were able to recommend procedures that will benefit ESIP to measure their performance. ESIP will be able to determine their impact more effectively and will be able to successfully show this impact to their sponsoring agencies.

ESIP's Website

We recommend that the webpage administrator add a Google Analytics tracking code to every hyperlink text that exists in the data resources tab. This will help the webmaster have a better understanding of what data sets interests most visitors. Since the tracking only goes as far as to the data resources tab, it will be greatly beneficial to add tracking down to the various partner and their data sets.

Since most of the links which led visitors searching for data through ESIP's partners were broken and or out-dated due to changes of the partner websites, we recommend that these links be linked to the correct partner pages. This will allow users to easily access data from ESIP's partners through ESIP themselves. If this is fixed, more people may access data through ESIP rather than going to the partner websites directly.

Recommending Software to Use

After looking at possible software for ESIP, we recommend that ESIP use a combination of AWStats and Google Analytics. The absolute power of AWStats, coupled with the fact that ESIP is paying for it, makes it inefficient not to use AWStats. The only area in which AWStats is lacking is a user friendly interface. Google Analytics is very graphic oriented, while AWStats is not. This means that if ESIP was presenting the website data to sponsors, Google Analytics would provide the appropriate visuals. We recommend to ESIP that they should use Google Analytics for analyzing the locations of visitors through the map overlay feature. Google Analytics should also be used to monitor the visitors' behavior as well. ESIP should use AWStats to track IP addresses that have had the most hits every month. These procedures should be conducted so ESIP can locate and contact potential schools, organizations, and research facilities that may be interested in earth data. Results should then be provided to NASA and NOAA.

The use of AWStats is dependent on the program in which it runs, cPanel. This means that, if cPanel is updated and the current version of AWStats is incompatible, a replacement program would be needed. Piwik would fill this role well. Alone, neither Piwik nor Google Analytics is as thorough as AWStats, but together, they would perform all the functions that ESIP needs. Piwik is currently not installed on the ESIP website, but all of the background programming is in place, allowing for Piwik to be installed within moments. In summary, If ESIP wants more annual funding, we recommend that they follow the procedures conducted in this report through the use of Google Analytics and AWStats. Web analytic reports can be also be downloaded as PDF and sent to the sponsors.

Providing a Better Monthly Report

Currently, ESIP presents NASA and NOAA with a data matrix that provides various statistics about the organization. We recommend that ESIP continue providing these statistics but also keep track of the number of visits that specific partners and their data sets obtain. This should be done in order to show the impact that is brought about by the organization in a better way.

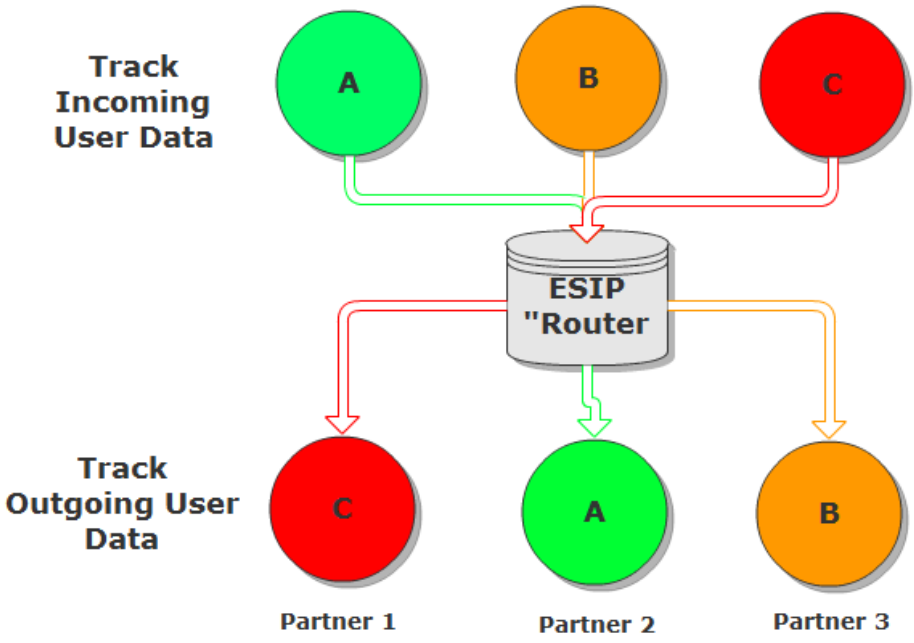


Figure 34: Proposed Model for Impact Factor

As shown in Figure 33, the ESIP website serves as a router for users for accessing data. As discussed earlier, users can access data directly from partners or through ESIP. For example, if a user wants access to data “A”, ESIP will redirect that user to the partner 2 website from where data “A” can be accessed. We propose that ESIP track the number of visits that data sets accumulate as a result from ESIP’s redirection, which is the incoming user data, and track the

number of times that the same data is accessed from partner websites. A ratio indicating the number of times data was accessed from ESIP and the partner website will clearly show ESIP's sponsors the impact that they bring.

Keeping in Contact with Partners

In order for ESIP to stay as a consortium consisting of about 115 partners, effective communication between their partners is vital. We recommend monthly communication between the partners and ESIP, which will not only help the functionality of ESIP, but also create good relationships for staying informed about projects and events. These communications should focus on any updates their website might need and any concerns that partners may have regarding ESIP. This will help identify the partners who are still interested in being a part of the consortium from those who no longer exist or do not wish to continue their partnership with ESIP. ESIP will then be able to eliminate those partners and make room for new and more diverse ones. Through these communications, we also recommend that ESIP and their partners create a system in which ESIP can also be cited in more data sets that partners provide. This will allow ESIP to stay strong as a consortium and be an optimal source of obtaining a wide variety of earth data.

Recommendations Concerning USGEO

The US Group on Earth Observations is a group that is very similar to ESIP in its stated goals. Containing seventeen funding members, USGEO is approximately eight times the size of ESIP. In order for ESIP to compete with USGEO, the structure and goals of USGEO had to be

analyzed. We found that ESIP, at the moment, cannot compete with USGEO internationally or as broadly, but ESIP could fill a niche that USGEO would miss.

The small size of ESIP allows it to be very functional and responsive to the needs of the partners. Since USGEO is international and has hundreds of members, sometimes the smaller members can become lost and their needs left unfulfilled. ESIP has already been working with USGEO to help address these problems, and should continue to do so.

ESIP is also working on developing a universal software that would be used to read data. This means that anyone attempting to access data from a partner must download software that is specific to that partner's data, and will not work with any other data. ESIP is attempting to change this, and have all partners use the same program, to help users save time.

We recommend that ESIP focuses its attention on using the tracking software and help implement a universal reading software. They should also continue to work with USGEO in an attempt to help USGEO's functionality and incorporate more of the scientific community.

Summary

Assessing the impact that ESIP brings is vital to the organization's existence. Funding agencies such as NASA and NOAA need a reason to decide if they should continue or stop the funding for ESIP. The recommendations discussed above are ways that ESIP can determine their impact more effectively and make a case to increase funding.

APPENDIX A: Sponsor Description

The Foundation of Earth Science (2005) is a non-profit corporation. It was established by the Federation of Earth Science Information Partners (ESIP) in 2001 in order to support scientific organizations that collect, process, and analyze Earth Science information. The organization is dedicated in bringing reliable data and data products to overcome social, environmental, economic, and social challenges that the earth faces today. The foundation seeks to provide earth observation information to researchers in a way that can easily be understood so that they can make informed decisions regarding our environment. The Foundation of Earth Science consists of a nation-wide network composed of NASA and NOAA data centers, research universities and laboratories, education providers, technology developers, and non-profit organizations that make data easily accessible.

The Federation of Earth Science Information Partners (2006) is a companion organization that also strives to provide scientific data to decision makers in a way that can be beneficial for research. ESIP is a consortium of more than 110 organizations that develop applications for earth data. Even though the Federation and the Foundation are closely related, The Federation is the membership organization and the Foundation provides administrative services to the Federation. These organizations look to develop public awareness concerning the importance of earth science data. It is very important for the public to know the importance of these data so that the environmental issues facing the earth can be addressed and new ones

can be prevented. The ESIP Federation was formed in 1998 and was originally needed to assist NASA regarding data management activities, but it has grown and changed over the years

The Federation (2006) and The Foundation are funded through an agreement with NASA. In 2006, NOAA joined with NASA as the financial supporters of the ESIP federation (Federation of Earth Science Information Partners, 2006). These organizations are additionally funded through donations and professional services.

Due to the large number of organizations that need the data that is collected by ESIP, groups considered “partners” are grouped into four categories. Type I Partners are mainly distributers of satellite and ground based data sets. They also distribute products that are related to the data sets they work with. Type II Partners mainly provide data, products and services to research communities. Type III ESIP Partners are primarily commercial and non-commercial organizations that are engaged in developing tools for Earth Science. Type IV ESIP Partners are strategic funding partners. (Federation of Earth Science Information Partnerships, 2006)

APPENDIX B: ESIP Strategic Plan

ESIP Federation Strategic Plan - Background

The Federation of Earth Science Information Partners (ESIP Federation) is a broad-based community drawn from agencies and individuals who collectively provide end-to-end handling for Earth science data and information[1]. The ESIP Federation was founded in 1998 by NASA in response to a National Research Council (NRC) review of the Earth Observation System Data and Information System (EOSDIS). During its 10-year history, the ESIP Federation has evolved from its original 24 partners to more than 100 partners at present.

In the strategic plan that follows, the ESIP Federation has updated its vision since its last plan in 2004. The 2004 strategic plan positioned the ESIP Federation to become a recognized forum for community interactions between data managers, scientists, modelers, applications developers, educators and users of Earth science data and information. The 2008 strategic plan focuses on the implementation of the vision outlined in 2004.

The 2008 strategic plan recognizes that the ESIP Federation is uniquely positioned to respond to the growing need for information to solve the Earth's pressing environmental problems and the public's interest in making better use of science information. The ESIP Federation's strength continues to come from its diverse partner organizations, including all NOAA, NASA and USGS Earth observing data centers, government research laboratories, research universities, nonprofits and commercial enterprises. The growth of the community has attracted funding from three federal agencies and the promise of others is just over the horizon.

[1] Earth science data refers to observations and measurements of the physical state of the planet, encompassing the atmosphere, ocean, land, cryosphere, and solid Earth components. Earth science information refers to data enhanced by the application of value-added services. These services elucidate or integrate the data content for the benefit of end users.

The following strategic plan will guide the ESIP Federation for five years (2008-2013) and will be complemented by annual work plans put forth by committees, working groups and clusters from within the ESIP Federation. The strategic plan will be a living document, responding to community input throughout its life and reflecting the priorities set by partners who participate in ESIP Federation activities.

ESIP Federation Strategic Plan (2008-2013)

VISION

To be a leader in promoting the collection, stewardship and use of Earth science data, information and knowledge that is responsive to societal needs.

MISSION

To support the networking and data dissemination needs of our members and the global community by linking the functional sectors of observation, research, application, education and ultimate use of Earth science.

GOAL 1: Increase the use and value of Earth science data and information.

- Demonstrate use through community-vetted demos, pilots and applications.
- Develop an understanding of communities' needs through outreach to user communities. (e.g., decision makers, teachers, students)
- Reduce barriers between data providers and data users through IT, training, and standards education. (e.g., technical workshops, outreach)
- Provide mechanisms for community review of data, products, applications and other resources.
- Develop and share alternative approaches to sustaining Earth science data and information networks.
- Support a service-oriented architecture for observation, research and application provision.
- Develop and share the story of how Earth science products make an impact from discovery, through development, to ultimate use. ("impact metrics")

Stakeholders supported by Goal 1: the entire community of Earth science data and information users

GOAL 2: Act as a facilitating, coordinating and advisory community-led organization to promote the use of Earth science data and information products for our members and the communities they support.

- Foster interactions among communities of Earth science data providers, researchers, technology developers, educators and those who put their products to practical use.
- Innovate.
- Promote use of technical standards and best practices for data management, stewardship and application development.
- Evaluate and evolve the means by which the Federation serves this goal.

S*takeholders supported by Goal 2: ESIP Federation Partners*

GOAL 3: Continue to evolve the ESIP Federation (e.g., governance, structure, staffing) to strengthen the ties between Observations, Research and Applications.

- Recognize and encourage new leadership.
- Embrace technology to support community interaction.
- Establish metrics on organizational performance and progress that is made toward all goals in this strategic plan.

S*takeholders supported by Goal 3: ESIP Federation Organization*

GOAL 4: Promote techniques to articulate and measure the socioeconomic value and benefit of Earth science data, information and applications. (e.g., feedback to sponsors – value of their investment)

- Create impact metrics on the value of Earth Science data and information.
- Develop metrics to describe the linkages between Observation, Research and Applications.
- Recognize and promote best practices for providing feedback to sponsors.

Stakeholders supported by Goal 4: ESIP Federation sponsors

APPENDIX C: IQP Description

What is an Interactive Qualifying Project?

As part of Worcester Polytechnic Institute's curriculum, it is required for students to complete an Interactive Qualifying Project (IQP). An IQP is designed so that students can develop an understanding of various societal issues pertaining to science and technology and the problems that occur when science and technology meets society. Students typically research in a group of three or four to solve a real life societal problem. An IQP challenges a student to work in a diverse group of people who necessarily are not in the same major and with a sponsor to solve a genuine world problem. In the long run, an IQP also challenges a student to maintain effective working relationships with future employers and teammates. An IQP is counted as three classes and is usually taken in junior year. WPI offers project centers all over the world and U.S, so students have a variety of options to choose the project center they would like.

How Does Our Project Qualify as an IQP?

Our project qualifies as an IQP because there is certainly an underlying real world problem regarding the inefficiency of Federation of Earth Science Partnerships (ESIP) to capture performance indicators about themselves. The society does not know the extent of ESIP's accomplishments, which is a societal problem pertaining with science and technology. ESIP analyzes, collects, and processes earth data but since the organization cannot properly be

evaluated, sponsoring agencies do not have a way to determine the effectiveness of their donations. The society does not know the extent of ESIP's accomplishments because ESIP's website also does not have a user-friendly interface. The inefficiency of capturing standard metrics and the ineffective web interface are societal issues that need to be resolved through social research.

APPENDIX D: HTML Coding

HTML, which stands for Hypertext Markup Language, is the predominant markup language for web pages. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists etc as well as for links, quotes, and other items. It allows images and objects to be embedded and can be used to create interactive forms.

Web page consists of an HTML file, plus any image (picture) files used on the page. The HTML file (a normal text file) contains all the text to display, and also acts as the "glue" to hold the text and images together in the right places, and display them in the right style.

Writing an HTML file means composing the text one wants to display, and then inserting any tags one wants in the right places (Chilkuyonok, 2008). Tags begin with a **<** character and end with a **>** character, and tell a browser to do something special, like show text in *italic* or **bold**, or in a larger font, or to show an image, or to make a link to another Web page. Although HTML has many tags one can use, one does not need to know them all to use HTML-- one can get by with just a handful.

HTML coding can be very difficult sometimes when one wants to include animation in the code. In terms of our project we will do some basic HTML coding which doesn't require being a programmer and can be easily done by someone.

APPENDIX E: Letter of Introduction to Partners

September 26, 2010

To Whom It May Concern:

As part of their undergraduate educational requirements at *Worcester Polytechnic Institute* (WPI), Mr. Manish Chawla (WPI ID #597919465), Mr. Matt Sommer (WPI ID #723220016), and Mr. Anastasios Vafeiadis (WPI ID #207776646) are presently conducting a seven week survey (08/30/2010-10/15/2010) in order to assess the effectiveness of the Federation of Earth Sciences Information Partners (ESIP) in achieving its mission of disseminating the data from partner organizations to the greater scientific community. Working with Mr. Brian Rogan from ESIP, the goals of this project are to determine the current ability of ESIP to disseminate partner environmental data sets across the science research community, identify methods for assessing the effectiveness of ESIP in distributing these environmental data sets using off-the-shelf software packages, and devise strategies to enhance the data set dissemination process via the ESIP website.

The results of this survey and the analysis derive by the students will be published in a comprehensive report that will be freely available to the public and can be accessed online via the WPI Gordon Library electronic collection. These students are conducting this survey as part of their *Interactive Qualifying Project* (IQP) educational requirement, which is a cornerstone of *The WPI Plan* (a projects-based curriculum framework implemented in 1970 at WPI to foster creative and innovative thinking). Specifically, the IQP serves to connect the technical studies of the students to their work in the humanities and social sciences by enabling them to examine how science and technology interacts with societal structures and values via a project-based experience. Due to the techno-societal aspects that IQPs provide students, it has become the foundation of the WPI Global Perspective Program.

Consequently, given the extremely short timeframe for these students to conduct their survey, your cooperation is greatly appreciated. If you have questions or need further verification of any of the activities conducted by these students, please contact me at the numbers below.

Regards,

_____

Dr. Susan Vernon-Gerstenfeld
Adjunct Professor
Director of Academic Programs and Planning for IGSD
Director, WPI Boston Project Center
Director, WPI Costa Rica Project Center
Director, WPI Puerto Rico Project Center

APPENDIX F: What is an IP address?

An IP address is an identifier for a computer or device on a TCP/IP network. Networks using the TCP/IP protocol route messages based on the IP address of the destination (Indiana University: University Information Technology Services, 2010). The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be from zero to 255. For example, 169.254.0.0 could be an IP address.

Within an isolated network, one can assign IP addresses at random as long as each one is unique. However, connecting a private network to the Internet requires using registered IP addresses (called Internet addresses) to avoid duplicates.

The four numbers in an IP address are used in different ways to identify a particular network and a host on that network (Indiana University: University Information Technology Services, 2010). Four regional Internet registries:

1)ARIN(***A**merican **R**egistry for **I**nternet **N**umbers*)

2) RIPE NCC (***R**éseaux **IP E**uropéens **N**etwork **C**oordination **C**entre)*,

3) LACNIC (***L**atin **A**merican and **C**aribbea**n** **I**nternet Addresses Registry)*

4) APNIC (***A**sia **P**acific **N**etwork **I**nformation **C**entre)*

assign Internet addresses from the following three classes:

- Class A - supports 16 million hosts on each of 126 networks
- Class B - supports 65,000 hosts on each of 16,000 networks
- Class C - supports 254 hosts on each of 2 million networks

However, the number of unassigned Internet addresses is running out, so a new classless scheme called CIDR (***C****lassless* ***I****nter-****D****omain* ***R****outing)* is gradually replacing the system based on classes A, B, and C and is tied to adoption of IPv6, which is designed to allow the Internet to grow steadily, both in terms of the number of hosts connected and the total amount of data traffic transmitted.

APPENDIX G: Using PHP to gather IP Addresses in Google Analytics

PHP is a scripting language which was designed originally for web development in order to produce dynamic and interactive web pages (Planet Source Code, 2010). The PHP code can be embedded into an HTML source to generate the web page document.PHP is available as a processor for most modern web servers and as a standalone interpreter on most operating systems and computing platforms.

First the PHP code: (NOTE:One's homepage has to be a php page.).

1. <?php echo $_SERVER['REMOTE_ADDR']; ?>

This code allows us to print the IP address of a visitor according to the browser in the page being displayed"

Then the JavaScript part:

2. <body onLoad="javascript:__utmSetVar('Something to create segmentation')">

This function gives a segmentation value to the Google Analytics User Defined field in the reports.

The code you include in your page:

When php and javascript are combined, it looks like this:

3. <body onLoad="javascript:__utmSetVar('<?php echo $_SERVER['REMOTE_ADDR']; ?>')">

This is the code that needs to be included in the page. After a couple of hours one will start seeing the IP addresses of the visitors in the user-defined field of the visitor panel in one's Google Analytics account.

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