

Technology collaboration by means of an open source government

Steven M. Berardi

United States Air Force, 483 N. Aviation Blvd, El Segundo, CA, USA 90245

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ABSTRACT

The idea of open source software originally began in the early 1980s, but it never gained widespread support until recently, largely due to the explosive growth of the Internet. Only the Internet has made this kind of concept possible, bringing together millions of software developers from around the world to pool their knowledge. The tremendous success of open source software has prompted many corporations to adopt the culture of open source and thus share information they previously held secret. The government, and specifically the Department of Defense (DoD), could also benefit from adopting an open source culture. In acquiring satellite systems, the DoD often builds walls between program offices, but installing doors between programs can promote collaboration and information sharing. This paper addresses the challenges and consequences of adopting an open source culture to facilitate technology collaboration for DoD space acquisitions. **DISCLAIMER: The views presented here are the views of the author, and do not represent the views of the United States Government, United States Air Force, or the Missile Defense Agency.**

Keywords: Technology collaboration, open source government, mass collaboration, information management, network centric warfare, knowledge management

1. INTRODUCTION

The idea of open source software originally began in the early 1980s, but it never gained widespread support until recently, largely due to the explosive growth of the Internet. Today, open source software is everywhere: Apache runs almost 50% of web servers^[1], Firefox accounts for almost 20% of web browsers^[2], and the Linux kernel runs on over 13% of all web servers^[3]. Free and open source software continues to make a big impact on the market, and shows no signs of slowing down.

Open source software is founded upon the idea of sharing information freely and allowing the user freedom to modify the software to his or her needs. Software developers voluntarily dedicate their time to fix bugs and add new or missing features to open source software. Only the Internet has made this kind of concept possible, bringing together millions of software developers from around the world to pool their knowledge, and collaborate on a massive level.

The great success of open source software has inspired many corporations to not only release the source code for their own software, but also to adopt the open source culture and share information they previously held secret. For example, Goldcorp, a gold mining company, released all their proprietary information on one of their diminishing mines in an effort to learn new ways of mining gold.

Society is also moving towards an open source system of mass collaboration, using Web 2.0 tools on the Internet to create self-published content. People voluntarily release personal information about themselves on social networking sites like Facebook, MySpace, and YouTube. They even share photos with the world on Flickr, and many people write their most personal thoughts on public blogs, accessible to the world. Wikipedia, the completely open and voluntary online encyclopedia, currently hosts over 2.4 million articles in the English language^[4] alone. People around the world are volunteering their personal knowledge and skills and sharing them with the world.

The government, and specifically the Department of Defense, could also benefit from adopting an open source culture. It would facilitate mass collaboration between departments and agencies and help contribute to the present demands of the warfighter: network centrality. Tools already exist that can help the government benefit from the open source concept, but more importantly for success, a cultural change needs to occur. The government needs to shy away

from its age-old mentality of keeping everything behind closed doors, and instead adopt a new philosophy of sharing information freely.

1.1 Definition of open source

Since the open source software community adheres to the principle of decentralization, there exists no universally accepted definition of open source software. However, Eric Raymond’s seminal work, *The Cathedral and the Bazaar*, offers a great metaphor explaining the difference between open source and closed source development strategies, and he uses this metaphor to demonstrate how the open source approach results in technically superior software.^[5]

Raymond explains how the traditional closed source development model is like a cathedral, where software is “carefully crafted by individual wizards or small bands of mages working in splendid isolation.” If you look at the photograph below (Figure 1), of the National Cathedral, you’ll immediately realize how such a structure could never be developed without a central authority or central designer. If one person designed the front of the building while another designed the back, you would end up with a very asymmetrical cathedral. Beyond the design, cathedrals even operate in a centralized manner: people attend religious ceremonies, and sit in organized rows, listening to one central speaker. In a cathedral, there is not much room for freedom or deviation from the original central plan. Everything is pre-planned and all operations adhere to this plan for the life of the cathedral.^[5]



Fig 1: National Cathedral, in Washington D.C.
(Photo by NCinDC: <http://www.flickr.com/photos/ncindc/>)



Fig 2: Bazaar in India
(Photo by McKay Savage:
<http://www.flickr.com/photos/mckaysavage/>)

On the other hand, Raymond explains how open source software development resembles a bazaar of “differing agendas and approaches.” In the photo above of an Indian bazaar (Figure 2), you will see how bazaars look disorganized at first, where individuals set up their shops and sell their various products to a very diverse set of consumers. Prices are not set by a central authority, but instead are determined by each buyer and seller. No central planner controls what products are up for sale, and people move in a self-organized fashion, rather than the centrally organized fashion of a cathedral. Bazaars are complex systems, and the photographer who took the photo above even remarked how difficult it is to capture all the complexities and massive diversity of the bazaar in one frame. Bazaars are self-organizing complex adaptive systems that continue to evolve as new producers and new consumers arrive and interact in the system. Supply and demand dictate the prices, and no central authority controls traffic or operation of the system: people are free to buy and sell what they wish.^[5]

Raymond admits that at first, the bazaar style seemed preposterous to him. He could not understand how such a stable operating system (Linux) could emerge from such a chaotic, decentralized method of development. He decided to put this model to the test, with the development of an open source tool he called fetchmail. The next section details some of the key principles he learned from this test.^[5]

1.2 Principles of the open source culture

In order to fully grasp the principles of free and open source software, Eric Raymond tried to model his development of fetchmail as closely as possible to the way Linus Torvalds managed the development of the Linux kernel. In doing so, he quickly recognized many key principles of successful open source projects.^[5] The most important principles are summarized below:

Treat users as co-developers, and they will reward you by fixing bugs and/or improving your code. Releasing software as open source allows any user to look at the source code, and attempt to fix problems himself. The user is also free to implement missing features in the software. If the users are treated as co-developers, they will respond by fixing problems they encounter, and even implement new features the original designer never dreamed possible. Less than 3 percent of the present Linux kernel is written by Linus Torvalds himself, and he is often quoted as saying, “I’m basically a very lazy person who likes to get credit for things other people actually do.” There’s also a hybrid approach to accomplishing the same result, which the developers of MATLAB effectively employ. They developed MATLAB in a cathedral-style, but created a bazaar-like user community that develops independent toolboxes. Some of these toolboxes dramatically extend the use of the software.^[5]

Release source code early, release it often, and listen to the thoughts and ideas of your customers. Releasing updates to the project, and doing it often, gives your users the perception that you want and need their involvement in the project. It shows you have little to hide, and that you do not carefully craft each update before throwing it out to the public. This keeps the users constantly stimulated and rewarded, it makes them feel like real contributors (and they are!).^[5]

If the pool of software testers and developers is large enough, then there will always be at least one person who can solve the problem quickly. Less formally, Eric Raymond states, “Given enough eyeballs, all bugs are shallow.” He considers this the ultimate principle that separates cathedral building from the bazaar style of development. It’s the principle that facilitates mass collaboration. Linus understood that the person who first found a problem was rarely the person who ended up understanding and fixing the problem.^[5]

Raymond explains how in the cathedral style of development, bugs are considered “tricky, insidious, deep phenomena” and “it takes months of scrutiny by a dedicated few to develop confidence that you’ve winkled them all out.” On the other hand, the bazaar style of development assumes all bugs are “shallow” because they are always exposed to a massive pool of anxious developers.^[5]

Ironically, this phenomenon, known as the Delphi Effect, was originally discovered in the early 1950s by a US Air Force research project.^[6] It’s the idea that the averaged opinion of a mass of individuals often leads to a more reliable answer than a response from a single individual.^[6] This effect is especially strong in the case of Linux, because all developers are self-selected: each one voluntarily chooses to download the software, learn how to use it, and attempt to fix any bugs they find. Raymond points out that any person who passes all those filters, is highly capable of producing an effective solution.^[5]

Wikipedia, the free and completely editable encyclopedia works on this same concept of pooling together the knowledge of dedicated individuals from around the world. Surprisingly, a recent study concluded that the Wikipedia is generally more accurate than the Encyclopedia Britannica.^[7]

Designing good data structures and formats is much more important than writing beautiful code. The building blocks of any software are always the most important design consideration because it’s always harder to redesign data structures than it is to rewrite algorithms and functions. Building sound data structures in an open source project allows the users to easily and effectively exploit the software in new ways, or completely rewrite implementations. All software can be reduced to the problem of data manipulation. How you manipulate the data or process it is always up in the air: new ideas and algorithms will always come forward, but the data itself seldom changes, and this is why the data structures always require careful design considerations.^[5]

Together, these principles form the foundation of the open source culture. They revolve around the idea of allowing users to co-develop the software and participate in its design. Getting users involved and motivated requires frequent releases of new versions of the software, and their ideas need to be considered by the lead coordinator. In following these principles, Linus Torvalds managed to create one of the world’s most reliable and versatile operating systems, all without paying for any development time, whatsoever. Many corporations have recognized the brilliant

success of the Linux operating system and have tried to implement the open source culture in their own enterprises. Some of these stories are told in the next section.^[5]

2. COMMERCIAL APPLICATIONS

Recognizing the success of the bazaar-style of development, many corporations have begun to adopt the open source culture and release proprietary data they previously held secret, in order to reap the benefits of mass collaboration. Many Internet services, like Second Life, YouTube, and Facebook, are completely based upon the concept of mass collaboration, where they allow their users to create nearly 100% of the content. However, it's not just Internet services taking notice of the open source concept. Goldcorp is involved with one of mankind's oldest endeavors, mining for gold, and they have one of the most financially successful open source stories to date.

2.1 Goldcorp

In 1999, the Canadian gold-mining company Goldcorp was on the verge of bankruptcy. Demand for gold was declining, and one of the company's oldest mines, in Red Lake, had apparently reached the end of its production. Chief Executive Officer, Rob McEwen, looked everywhere for a good solution to save his company, and he found one while attending a conference at the Massachusetts Institute of Technology (MIT). At the conference, he heard the successful story of how Linux was developed over the Internet by a massive group of dedicated software developers. He had an epiphany, and thought that maybe if he released the source code of his company (all information on the Red Lake mine), then maybe someone out there on the Internet could tell him where to mine for gold.^[8]

McEwen then launched the "Goldcorp Challenge," offering a total prize of \$575,000 to anyone who could tell him where to find gold at the Red Lake mine. He put all the information on the 55,000 acre mine up on the Internet (all 400 megabytes of it), and waited for ideas to come in. Just a few weeks later, the company had submissions from around the world, coming in from graduate students, management consultants, mathematicians, military officers, and geologists. "We had applied math, advanced physics, intelligent systems, computer graphics, and organic solutions to inorganic problems. There were capabilities I had never seen before in the industry," McEwen said. "When I saw the computer graphics, I almost fell out of my chair."^[8]

The Goldcorp Challenge violated the first rule of the mining industry: never share proprietary data. McEwen explains, "We were attacking a fundamental assumption; you simply don't give away proprietary data. It's so fundamental, that no one had ever questioned it." The gamble paid off, however. The contestants identified over fifty new targets for the Red Lake mine, and over eighty percent of these ended up containing substantial amounts of gold. McEwen estimates that the contest saved his company two to three years of exploration time.^[8]

Not only did the competition help Goldcorp find more gold, but the contestants also showed the company new ways to look at the problem: they taught Goldcorp new state-of-the-art technologies and exploration techniques, collection procedures, and better ways of modeling geological data. This innovative revolution transformed the company from a \$100 million dwarf into a \$9 billion giant and leader of the industry.^[8]

McEwen broke many of the fundamental rules of business management. Instead of trying to recruit and retain the best minds of the industry, and keep them behind the closed doors of his corporation, he opened his company's secrets to the world, and invited everyone to participate in the company's search for gold deposits. He embraced the most important principle of the open source culture: given enough eyeballs, any problem is trivial.

2.2 Netflix Prize

In October of 2006, Netflix also decided to try and reap the benefits of an open source culture. They started a competition, called the Netflix Prize, and offered \$1 million to anyone who could improve their existing movie recommendation system, Cinematch, by at least ten percent. Cinematch suggests new movies to Netflix customers, based on how the customer rated other movies.^[9]

In order to help contestants come up with solutions, Netflix released data on 100 million of its customer movie reviews, and waited for submissions. Within two weeks, they received over 150 submissions. After a year, there were about 18,000 registered teams from over 150 countries. Submissions included ideas from machine learning, neural networks, collaborative filtering, and data mining. As of January 2009, the leading team has an improvement increase of about 9.5%, just half a percent shy of winning the \$1 million.^{[9][10]}

Netflix generates over 60% of its business from the Cinematch rating system, so an improvement of just 10% could dramatically improve their business. Traditional movie-rental stores, like Blockbuster, generate 80% of their revenue from new releases, but Netflix gets 70% of its sales through lesser known and obscure films, so a good recommendation system is key to their success. They recognized the benefits of an open source culture and mass collaboration, and as a result, have effectively employed thousands of the world's best computer scientists.^[10]

2.3 Second Life

Linden Lab decided to create an entire product founded upon the idea of open source and mass collaboration. In 2003, they launched Second Life, a massive multiplayer online game (MMOG), where over 300,000 users interact in a virtual world and actually develop the world themselves. Users are free to design their own characters, their clothes, houses, cars, and even start their own virtual businesses. Robert Hof, of *BusinessWeek*, calls Second Life "[T]he unholy offspring of the movie *The Matrix*, the social networking site MySpace.com, and the online marketplace eBay."^[11]



Fig 3: Screenshot from Second Life. All content seen here was created by the users of Second Life. (Image by CC Chapman: http://www.flickr.com/photos/cc_chapman/)

The virtual world of Second Life even has its own economy, and players can buy virtual Linden dollars with real money (and vice versa). Some players have started their own virtual real estate agencies that design homes and then sell them. One such virtual entrepreneur currently has holdings worth more than \$250k in real dollars!^[11]

Instead of designing the virtual world from a central authority, the creators of Second Life gave this responsibility and power to the users. The virtual world of Second Life has very few rules, and as a result, its users have created everything from storefronts to nightclubs to cars and houses, all at no expense to Linden Lab. In fact, they profit from their users' creations! They created the central data structures and operating scripts of the world (which account for less than 1% of the entire world), and left the rest of the creation up to its users. They treated their users as co-developers, and their users responded by becoming their most valuable asset.^[11]

The success of Second Life illustrates the importance of a key principle of the open source culture: designing good data structures is much more important than writing beautiful code. Linden Lab focused on creating the basics of the virtual world, and let its users exploit those basic rules and create things Linden never dreamed possible.

2.4 Society is moving towards an open source culture

Goldcorp, Netflix, and Second Life offer great examples of effectively employing the open source culture to facilitate mass collaboration, but they are by no means an exhaustive list of open source supporters. Society in general is moving towards an open source culture, where people voluntarily blog about their personal lives, report their constant whereabouts on Twitter, create public profiles on MySpace and Facebook, share their photography skills on Flickr, and collaborate on thousands of open source software projects. The corporate world has already learned the powers of open source and its ability to facilitate mass collaboration, and now is the time for government to learn some of these same concepts.

3. GOVERNMENT APPLICATIONS

A few departments and agencies of the government have already recognized the benefits of an open source culture and mass collaboration, but a central change in culture still needs to occur before the government benefits completely from the model. Traditionally, each department and agency has kept its information behind closed doors, and sharing information and data has been a sluggish process. An open source culture would open up these doors, resulting in mass collaboration.

3.1 Intelink: mass collaboration within the Intelligence Community

Recognizing the problem of effectively sharing information, the Central Intelligence Agency (CIA) began a competition called the Galileo Awards, calling upon all its employees to submit essays describing innovative ways to share information amongst the Intelligence Community. The first winning submission was an essay by Dr. Calvin Andrus, then Chief Technology Officer of the Center for Mission Innovation at the CIA. His essay, titled “The Wiki and the Blog: Towards a Complex Adaptive Intelligence Community,” advocated the implementation of wikis and blogs for the intelligence community.^{[12][13]}

A wiki is web page or collection of web pages that anyone can edit. Any user can create a page, link that page to another page, delete pages, modify existing pages, and even redirect pages. They are often used as knowledge management systems or as a means to collaborate on a specific topic. The most well-known implementation of the wiki is Wikipedia, an online encyclopedia that anyone can edit and contribute to. As mentioned earlier, it was launched in 2001, and as of January 2009 has over 2.4 million articles in the English language^[4], covering a wide range of topics: everything from chemistry to obscure rock bands. In order to protect from vandalism, each wiki contains a detailed history of all edits, allowing users to revert to a previous version of an article at any time.

The other tool Andrus proposed in his essay, the blog, is sort of like an online journal or newspaper.^[13] The word “blog” originally comes from the term “web log.” Some blogs on the Internet are maintained by one individual, who writes about his or her interests, and allows readers to comment on articles. For example, some photographers write blogs about learning photography, and their users participate in the discussion by writing comments or asking questions about articles the photographer posts on his blog. Other blogs on the Internet have multiple contributors, and cover multiple disciplines. They all work the same way, however: they are like public journals that readers can comment on.

In his essay, Andrus argued that the Internet got its real power from individuals sharing information freely and publishing their own content, on platforms such as the wiki and blog. He used Wikipedia as a perfect example. Andrus observed how this idea of openness allowed the Wikipedia to cover new information quickly. He remembers how within minutes of the 2005 London terrorist bombings, Wikipedia already contained up to date information on the incident, and as the day progressed, more contributors (including witnesses of the attack) continued to submit new information and correct erroneous reports. Andrus explained how, “You could just sit there and hit refresh, refresh, refresh, and get a sort of ticker-tape experience.” This idea of self-governance and absence of a central controlling authority fascinated Andrus, and in his essay, he suggested how the Intelligence Community could benefit from this same infrastructure: using tools like the wiki and blog to help facilitate information sharing.^{[12][13]}

His essay gained widespread support, and inspired the creation of Intellipedia, a Wikipedia for the Intelligence Community. Created in 2006, Intellipedia now has 37,000 users and contains 200,000 pages. It works just like the public Wikipedia, and even runs on the same software (MediaWiki). Analysts throughout the various intelligence agencies can create articles on any topic they wish (i.e. Iraq, Afghanistan, weapon systems, etc).^{[12][14]}

As an example of how Intellipedia is being used by the Intelligence Community, in 2006, a group of intelligence collectors and analysts from around the world used the system to collaborate on a report detailing how Iraqi insurgents were using chlorine in improvised explosive devices (IEDs). Tom Fingar, Deputy Director of National Intelligence for Analysis, explains how “they developed it in a couple of days interacting in Intellipedia. No bureaucracy, ‘no mother may I,’ no convening meetings.”^[15]

Andrus also advocated the use of blogs, as a compliment to the wiki, explaining, “the wiki will be authoritative in nature, while the blog will be highly agile. The blog is personal and opinionated. The wiki is agreed-upon and corporate.” This clarity of difference helped convince the Intelligence Community to adopt a variety of collaboration tools, including personal blogs, a news recommendation system, and even a MySpace for intelligence analysts (aptly named A-Space). Together, all these tools are accessible through a portal called Intelink, which is available on a variety of government networks: the unclassified Internet, the secret SIPRNet, and the top secret JWICS network.^[13]

In a testimony before congress on September 10, 2007, the Director of National Intelligence, Michael McConnell, explained how these tools “enable experts from different disciplines to pool their knowledge, form virtual teams, and quickly make complete intelligence assessments.”^[16] The wiki and blog allow analysts to communicate on a level they have never had access to before, and these tools allow them to evade the traditional way of writing reports, where before an ignorant supervisor might ignore a potentially significant finding, now analysts can communicate more democratically on an equal level.

Intelink has been a great success, but for the success to continue and to truly reap the benefits of mass collaboration, the entire defense department needs connectivity to this system and a change in culture still needs to occur. Agencies are still somewhat reluctant to share information on Intellipedia, and many of the blogs experience little to no activity.

3.2 Blogging at US Strategic Command

Another success story of effectively employing the open source culture within government is the story of General James Cartwright’s blog. During his time as commander of US Strategic Command (USSTRATCOM), the command saw a monumental shift in responsibility: it went from simply managing the nuclear weapons of the United States to managing all space operations, cyber operations, missile defense, intelligence surveillance and reconnaissance, and command and control. This immediately created a problem for the General as he tried to communicate across many previously separate entities and to get them to work together and synchronize their efforts. He employed a blog to help fix this problem.^[17]

General Cartwright explains that “the reason blogging was so useful was because it could handle all of the time zones, it could handle global activity, it could change your strategy on a dime... it could in fact inform decision makers in real time with real information to make decisions much quicker than a phone conference.” On top of this, the blog facilitated rapid communication by bypassing the traditional chain of command and calling out directly to the subject matter experts.^[17]

The key to getting the blog working, General Cartwright says, was to incentivize participation and respond quickly to the participants. Going back to the principles of open source presented by Eric Raymond, this is a key point: people will not participate unless they really feel like someone is listening to their ideas.^[17]

In an interview, General Cartwright also pointed out that the people most skeptical and fearful of using blogs in the workplace are the “process owners” or the senior decision makers. He says, “the process owners start to see control seeping away from them because you are allowed to move cross-boundaries and correlate information in ways that start to seep away your power, your authority, to at least say ‘no’ to something that is coming through.” Blogs allow anyone to speak their mind, on an equal level with everyone else, and this makes some traditional military leaders uncomfortable, but it also facilitates rapid communication and collaboration, as General Cartwright has learned.^[17]

3.3 Towards a massively collaborative Department of Defense (DoD)

The government has already made significant progress towards a truly open source and mass collaborative system, but much work still needs to be done. The traditionally secretive Department of Defense especially needs cultural changes, and specifically in the acquisition community. Traditionally, program offices have kept their doors closed and have been reluctant to share information with other offices, and if they do share information, the transfer takes days or months. We now live in an on-demand society where the Internet gives us seemingly instant access to a wealth of information, and there is no reason why the DoD cannot operate under the same way.

Of course, the government still needs to protect its classified information from foreign countries, and only cleared personnel should have access to classified information. Within these vetted communities, information sharing needs to become the prevalent culture. This philosophy scares many people, because the government has forever operated under the “need-to-know” mantra, but as Major General (retired) Dale W. Meyerrose, Chief Technology Officer for the Director of National Intelligence, says, “We've had this 'need to know' culture for years. Well, we need to move to a 'need to share' philosophy.” In order for this change in culture to occur, the Department of Defense (DoD) needs to take a few monumental steps:

Adopt a unified network structure. Before the DoD begins sharing all this information, there needs to be a way to deliver it, and the quickest way to do that is through a unified network. Currently, there are some defense agencies that have their own computer networks, inaccessible to the rest of the DoD. This dramatically hampers the ability to rapidly communicate and share information. For example, the DoD SIPRNet is not accessible from all nodes on the Missile Defense Agency’s secret computer network, the C-LAN. The two networks do not always communicate with each other, and this causes a communication gridlock. The DoD needs one unified network for each classification level.

Utilize tools such as the wiki and blog, and shy away from e-mail. With a unified network, all of the DoD can collaborate with tools such as the wiki and blog (available through Intelink), allowing all stakeholders to communicate on an equal level. In the acquisition world, the warfighter is constantly mentioned, but rarely heard from, other than during key decision points. Creating a unified network can give the warfighter a direct voice to acquisition program offices, and this would help the program offices better develop a system to meet the evolving demands of the warfighter.

If the entire DoD was connected to the Intellipedia, through a unified network, then the Intellipedia could become a tremendous tool for knowledge management. Acquisition program offices can each maintain a page on their respective system (whether it be a satellite, plane, missile, etc), detailing all aspects of their program. With an aging workforce in the DoD, the Intellipedia can become a repository for lessons learned from the past experience of retiring experts. It could become the central knowledge base of the DoD, containing articles on everything from satellite systems to grenades to foreign threats, and even the history of heritage systems.

Acquisition program offices could also make high use of blogs. Currently, the preferred method of communication is e-mail, and although this is an excellent way to send formal messages and notifications, it’s a poor way of collaborating and sharing information because it only supports point to point communication. Instead, a blog could be utilized, where users can post comments (instead of flooding an inbox), and the discussion can be seen by future participants, avoiding the constant forwarding of e-mails, and asking each other “did you get that e-mail?” Blogs could be maintained by each government employee to report his or her progress on projects, but also could be used to report on program office news (i.e. reports on recent tests, new document releases, analysis reports). Another benefit of the blog is that users can join the discussion at any time, and see a complete history of all comments by readers. This would eliminate the common problem of mass forwarding of e-mails to a newcomer of a project.

Wikis and blogs could also help form the content necessary for a powerful DoD search engine, as Matthew S. Burton pointed out in an essay he wrote for the CIA’s Galileo Awards. He explained how the most powerful Internet search engine, Google, uses “link analysis” to determine which sites are better than others. Google ranks one site higher than another, if more sites link to it, which follows the idea that if more people link to a certain site, then it must be considered useful. Currently, the DoD has no system in place to determine which content is most useful for certain keywords, and wikis and blogs can help fix that, just as they do on the Internet.^[12]

Make the open source culture a requirement of all new contract bids. In the acquisition world, the defense contractors fiercely compete with each other to win multi-billion-dollar contracts, and as a result, they closely guard their

designs, and call it “proprietary information.” The DoD needs to start acquiring systems with an open source culture, by making open source requirements in awarded contracts.

In satellite acquisitions, there is an increasing tendency to start with a “demonstration” satellite and then test the utility of this demonstrator before purchasing an entire constellation. The problem is that the contractor who builds the demonstrator will not necessarily be the contractor who builds the constellation, so there is an apparent need to protect the proprietary information of the demonstrator satellite to maintain competition for the constellation. However, this is counterproductive because it severely closes the doors of the demonstrator satellite, when the demonstrator should inherently be an open system. The demonstrator is, simply put, meant to demonstrate the capabilities of a sensor, and as a secondary objective to exploit the sensor beyond its original intended use and explore other possible uses of the sensor. In order to explore these other possible uses, information on the satellite and its “proprietary” sensor needs to be shared with many other government agencies (and contractors) who specialize in these special use cases. When the information is marked “proprietary” it impairs a significant hassle in getting permission to release the information and give it to people outside the main program office. In order to truly exploit the potential of a demonstrator satellite, its technical details need to be shared freely with all interested parties.

Competition for a contract can remain closed, but once the contract is awarded, the DoD should require all contractors to open up their designs, and remove all labels of “proprietary information.” This would allow the designs to be distributed freely, so all interested parties could investigate the designs and perhaps come up with improvements. Releasing the designs would also increase competition for the follow-on system, because all competitors would know the previous winning design and could build upon this design. As Eric Raymond pointed out in *The Cathedral and the Bazaar*, different people look at the same problem in vastly different ways, and as a result they usually come up with vastly different solutions. The apparent “need to know” of a certain party may not be easily seen at first, but maybe that party wants to exploit the system in a new way, and use it for a purpose the original designers never dreamed possible. This is one of the key principles of the open source culture: you give your information freely because maybe one of your users sees the problem completely different than you do, and will use the system for a completely different application.

The DoD has already acquired some systems in this open source fashion. For example, in 1991, the US Air Force awarded a contract to New York University to develop an open source compiler, GNAT, for the Ada programming language. The compiler was released under the GNU Public License (GPL), the same license that Linux is released under. This license grants the user freedom to not only view the source code of the compiler, but also to make modifications and redistribute new versions, as long as all redistributions are also released under the GPL. The government should require all contractors release their software under the GPL.^[18]

Together, these three courses of action can help move the government towards a successful mass collaborative system. Mass collaboration depends on freely available information, and trusting your users to create great ideas. But, for this mass collaboration and exchange of information to take place, the government needs a unified network. On this unified network, wikis and blogs should be utilized as forms of daily communication. Lastly, the DoD needs to make the open source culture a requirement on all new contract bids.

4. CONCLUSION

Open source software has been around for decades, but only recently has it gained widespread support, mainly because of the explosive growth of the Internet. Successful open source projects rely on mass collaboration, where users from around the world pool their knowledge and work together on building software. Until the Internet came along, these developers really had no way of reaching each other. The Internet gave them a channel of inexpensive international communication.

The success of open source projects, like Linux, lies in their underlying principles of sharing information freely, and allowing the user to also act as a co-developer. Releasing frequent updates and keeping the user involved in all aspects of development is key to keeping them motivated to contribute. The more information that is kept behind closed doors, the less users want to spend their own time and help contribute to the project.

Many corporations have seen the great success of open source software projects and have successfully used their principles to advance their business objectives. Companies like Goldcorp released proprietary data to the world, in

an effort to take advantage of mass collaboration, and they succeeded on a massive level. Other businesses, like Linden Lab, and YouTube have based their entire business model on the open source culture, relying on their users to create nearly 100% of their content.

The government can also benefit from adopting an open source culture. It would facilitate mass collaboration, and rapid communication. However, it requires a monumental change in culture. Instead of continuing to operate in this “need-to-know” culture, we need to adopt a “need-to-share” culture.

We now live in an on-demand society where information is available instantly, whenever and wherever we need it. The Internet has given us this instant access, and central to its success lies the open source culture: the willingness to share information freely. This culture inevitably leads to mass collaboration. In order to create a truly network centric military, the government needs to adopt the principles that made the Internet great, and those are the very same principles that made open source software great: share information freely and trust your users as co-developers.

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