

Organizational Structure and Culture at FreeBSD

Nothing to Learn from Business Schools ;)

Business Schools teach you during expensive MBA studies how managers should shape the structure and influence the culture of organizations so that they become more innovative.

What you will learn...

- What the organizational environment is like when you work for the FreeBSD project
- What kind of organizational structure and culture is best suited to sustain innovation

What you should know...

- No prerequisites required

Concepts such as natural systems, self-organization, creative swiping, boundary spanning, empowerment... are known to be helpful in making employees more creative. To save you the trouble of paying for costly business courses and based on my view as a committer, this article addresses the question to know whether or not FreeBSD is the right place to develop innovative ideas.

This article will start by briefly describing what the FreeBSD organization looks like using theoretical work from business academics. This in order to give an overview of how the project is organized for those who do not own a @FreeBSD.org address. Then the question of innovation sustainability will be approached and the most adequate organizational structures and cultures to support creativity will be presented.

As a bonus and to keep the readers who are not interested in business concepts entertained, some extracts from online conversations between FreeBSD developers were included (nicknames were obfuscated and do not correspond to real FreeBSD developers' login). That way it is still possible to get an insight into FreeBSD's culture without bothering about the gory details.

*<tacoz> icanhasarm: sorry I only pay attention half of the time
<tacoz> but keep on talking, it's interesting :)*

FreeBSD's from an Academic Perspective

Let's imagine you as a freshly minted Business School graduate, in suit and tie (I know... but let's give it a try) and your boss is asking for a report on the Open Source movement and more specifically the FreeBSD organization. Let's start by describing how the organization is structured.

A Post-industrial Organization

First we can say that FreeBSD presents many characteristics of a *post-industrial organization* (such as described by Bell in 1974 and Huber in 1984), that is a *flexible structure*, a *flattening in hierarchy*, a *blurring of boundaries* between insiders and outsiders and the use of *advanced communication and computing technologies*.

Evolving in a flexible structure means that work units can be created or removed easily and organizational members are able to join several of them at the same time. At FreeBSD there exist many work units such as those dedicated to the ports collection, to file systems, networking, etc., most of them being listed on the wiki home page (<https://wiki.FreeBSD.org>). Developers are free to create new units or participate in any of those, depending only on their own motivation, technical skills and availability.

Regarding the flattening in hierarchy, all FreeBSD committers are at the same hierarchical level except for some people who are given the responsibility to ensure that a

certain portion of the system works as expected. This results in the presence of small teams such as the *Release Engineering Team* which is responsible among other things for setting official FreeBSD release schedules, or the *Port Management Team* which ensures that the ports collection is functional, stable and up-to-date. The complete list of project teams with their areas of responsibilities is available at: <http://www.freebsd.org/administration.html>.

Furthermore, a handful of members are elected to be part of a core team. However this core team is not like a board of despotic directors but mainly has administrative responsibilities such as granting access to new developers. Core also intervenes when there are strong disagreements between developers which is very rare from what I have experienced since I joined the project in 2010.

As for the blurring of boundaries between insiders and outsiders this concept will be described in details later on when considering the boundary spanning concept. And finally, the use of advanced communication and computing technologies is not surprising as it is part of FreeBSD's core business and developers rely on several communication channels (emails, irc, wiki, etc.) to stay connected.

```
<canadabald> there is something wrong in the universe
<canadabald> no email in my inbox since midnight
<icanhasarm> well, your mail server is probably dead
<canadabald> checks
<canadabald> mail server is fine
<canadabald> maybe i can just take the day off
<icanhasarm> maybe you already did
<canadabald> i am not in my underwear watching sci-fi, so i
don't think i took the day off
```

A Natural System

Then FreeBSD could also be considered as a *natural system* as defined by Scott (1981): a collectivity 'whose participants share a common interest in the survival of the system and who engage in collective activities, informally structured, to secure this end'. Such a natural system is characterized by its *informal structure* and a *variety of interests* which leads to a *plurality of goals* within the organization. Indeed, some developers at FreeBSD prefer maintaining the ports tree, others writing documentation or hacking on the base system itself.

```
<canadabald> icanhasarm: you want pictures of me, in my un-
derwear, hacking freebsd while watching sci-fi?
<icanhasarm> do you happen to hack freebsd ?
<canadabald> icanhasarm: you know i don't really, i just hack
Makefiles for ports
<icanhasarm> oh of course, that
```

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This led to the division into three different kinds of 'commit bits' (ports, doc, src), depending on the area of FreeBSD you are given the rights to apply some changes to. However there is no strict rule here and you could also commit in the ports tree even if you are a documentation committer, as long as your patch was reviewed by developers in the area for which you miss the commit bit.

It is also interesting to note that from a strategic standpoint, natural systems tend to *evolve and adapt* depending on changes in both the internal and external environment rather than build upon strict plans and strategies.

A Missionary Structure

And last, Mintzberg would define FreeBSD as a *missionary organization* (Mintzberg, 1979) that is having *little planning and control*, being *fully decentralized*, and using the standardization of *norms as the coordinating mechanism*. At FreeBSD those norms come either from clearly written rules such as style(9) manpage that explains how to format code, or from long lived traditions such as how to format ports commit messages. Such norms allow to constrain developers' behavior within certain pre-defined limits which is a way to control without the need for any hierarchy. The decentralization is also an aspect of FreeBSD's structure with about 400 developers (list available at <http://www.freebsd.org/doc/en/articles/contributors/staff-committers.html>) spread around the world.

Summary: FreeBSD traits

From an academic standpoint we have seen that FreeBSD exhibited the characteristics of a post-industrial and a missionary organization as well as a natural system, that is:

- flexible and informal structure
- little planning and control, no strict strategy, but focus on adaptation instead
- flat hierarchy
- full decentralization
- norms as a mean of coordination and control
- permeable boundaries between insiders and outsiders
- variety of interests and plurality of pursued goals
- use of advanced communication and computing technologies

Now that FreeBSD's characteristics were highlighted, let's compare them with the best practices recommended by Business Schools to bring creativity and sustain innovation in organizations.

Sustaining Innovation: Which Organizational Structure to set up?

A self-organization

In an attempt to become more responsive and creative, organizations often invest in improvement and incremental change programs which usually have exotic names such as kaizen, six-sigma, etc. But more radical approaches exist and the one of interest here is the *self-organization* which, unlike the above-mentioned strategies which focus on procedures and processes, focuses on people as the source for sustainable organizational innovation.

Self-organization is a form of organization within which staff are empowered with absolute trust to organize their day-to-day work in a professional manner. Such a structure advocates creativity through participative self-organization. You believe it does not exist in real life? Well Semler (1994) did it in his Brazilian company 'Semco' where he abolished most rules, norms and procedures. Financial information is available to all, employees are able to appoint and appraise their managers, to set their own working hours, titles, salaries, expenses and (within limits) share of the profits!

"Semco's standard policy is no policy. Many companies have entire departments that generate mountains of paperwork trying to control their employees. Take travel. At Semco, we want our people to spend whatever they think they should, as if they were taking a trip on their own, with their own money. If we're afraid to let people decide in which section of the plane to sit or how many stars their hotel should have, we shouldn't be sending them abroad to do business in our name, should we?"

– Semler, 1993

Semler's philosophy is to maximize worker participation, decision making and public information, and to minimize management control procedures that can inhibit creativity. And at a time when companies try to instill a few values to be respected by all its employees, Semco's success (and we saw the same applies to FreeBSD) is based on the promotion of autonomy and diversity.

<canadabald> man, waiting for chromium to build is like waiting for a frenchman to win a war

<icanhasarm> not fair, you know it will fail in the end

<canadabald> touche!

<canadabald> if only the french had a way of conveying the sentiment of touche...

Boundary Spanning

Boundary spanning (Aldrich and Herker, 1977) takes place when an employee brings information to the orga-

nization from the outside, by networking across traditional organizational borders. It was demonstrated that statistically, the more boundary spanners an organization has the higher its degree of innovativeness (Newell and Clark, 1990). This result would imply that innovation requires an ability to identify and adopt the most efficient technologies and know-how from sources outside the organization. This is an ability owned by boundary spanners who are active in various networks and are able to keep pace with the latest developments in different areas.

At FreeBSD we could say that almost all developers are boundary spanners as most of them work in other contexts as part of their official job. This gives the opportunity to discuss and exchange ideas with other passionate engineers and facilitate inward flows of valuable information.

```
<icanhasarm> I have a trick, I have a windows desktop
<icanhasarm> it's so cool because you can use communicator
<icanhasarm> and do you know what communicator have?
ANIMATED SMILEYS
<bsdng> wow like caramail chat !
<icanhasarm> a bit, except they are professionnal smileys
<icanhasarm> because communicator is a serious tool
<icanhasarm> look how professionnal it looks
```

Virtual Teams

Virtual teams are composed of members based at different locations and connected electronically to each other. Young (1998) states that such teams are a powerful way of working and the new production unit of knowledge and innovation. In theory it allows organizations to work continuously on projects over 24 hours thanks to the span of members over multiple time zones.

```
<icanhasarm> I wrote almost 50 LoC today, that's certainly
enough
```

```
<tacoz> I wish I had that much productivity
```

But the reality seems a bit less glamour and Storey and Salaman (2005) found few actual examples of successful implementation of such teams. However, FreeBSD is a living proof that virtual teams can bring great success to an organization. With developers spread all around the world the project never stops and communications are ongoing 24/7 on irc channels.

Maybe the biggest constraint for commercial organization when they try to set up virtual teams is that, as noticed by Young (1998): 'the notion of control goes out of the window, along with management in its strict sense'. And control is not something managers are willing to abandon, unlike within the FreeBSD project where the hierarchy is flat.

Summary: Organizational Maturity

As for people, it seems that organizations exhibit different levels of maturity. Argyris (1957) argued that traditional organizations (having hierarchical layers with chain of commands and lack of delegated authority, task specification, etc) keep people immature. On the contrary, more radical self-organizing forms of collectivities such as FreeBSD are expected to provide more lively, and creative places to work.

```
<icanhasarm> moin tacoz
```

```
<tacoz> hey icanhasarm, wanna help me procrastinate?
```

```
<icanhasarm> I don't know I'm kinda tired
```

Based on Argyris' criteria we could assert that FreeBSD is a very mature organization as depicted in Figure 1.

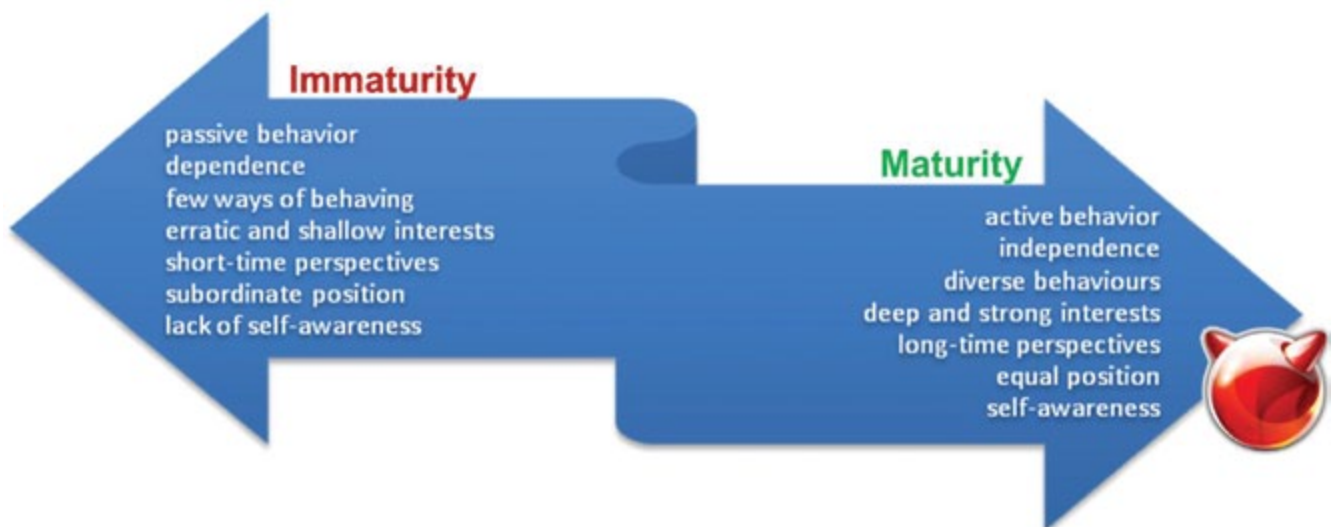


Figure 1. Organizational maturity continuum

As an exercise left for the reader it would be interesting to evaluate where they believe their own organization lies within this maturity continuum.

Sustaining Innovation: is Organizational Culture Involved?

Empowerment

The principal aim of empowerment is to increase the organization's flexibility and speed of response, but it could also lead to a more cooperative, committed and proactive workforce which helps in sustaining innovation. There exists an empowerment continuum ranging from very limited autonomy, such as at McDonald where employees are only free to use non-standard greetings to welcome customers, to extensive empowerment such as Semco where we have seen that employees could set their own wages and travel budgets!

Marchington et al. (1992) represent this empowerment continuum using a stairway as shown in Figure 2.

Clearly, developers at FreeBSD are at the same empowerment level as Semco: they have a say in all decisions and they control when, on what and with whom they want to work. In other words we find truly self-managing work teams at FreeBSD with almost no limits to their autonomy, which is very rare in practice. Bowen et al. (1992) refer to this as high-involvement work systems and suggest that those can be very effective.

<icanhasarm> hug me I'm famous
<tacoz> I'll hug you if your build succeeds icanhasarm
<icanhasarm> I'll be drunk before it succeeds, I'm afraid
<tacoz> not a bad alternative :)
<icanhasarm> I'd advise you to hug me BEFORE I get drunk, as

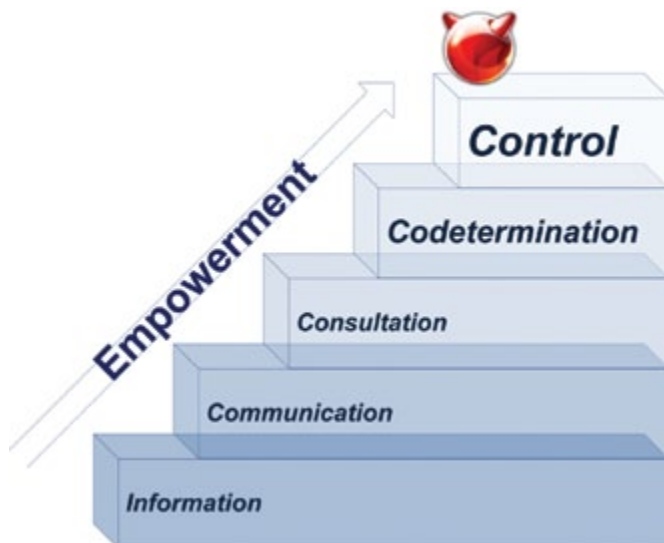


Figure 2. Stairway to empowerment

drunken icanhasarm has an unpredictable behavior
_femur_runs

I experienced in some of my previous companies forms of "confined" empowerment with the creation of small and dedicated R&D teams which were given more control upon their work organization (freedom to choose either the research subject or define the planning and set deadlines). This often led to a rise in motivation and creativity amongst team members, but it was nothing compared to what I live within FreeBSD which pushes this concept of empowerment much further.

Motivation and hierarchy of needs

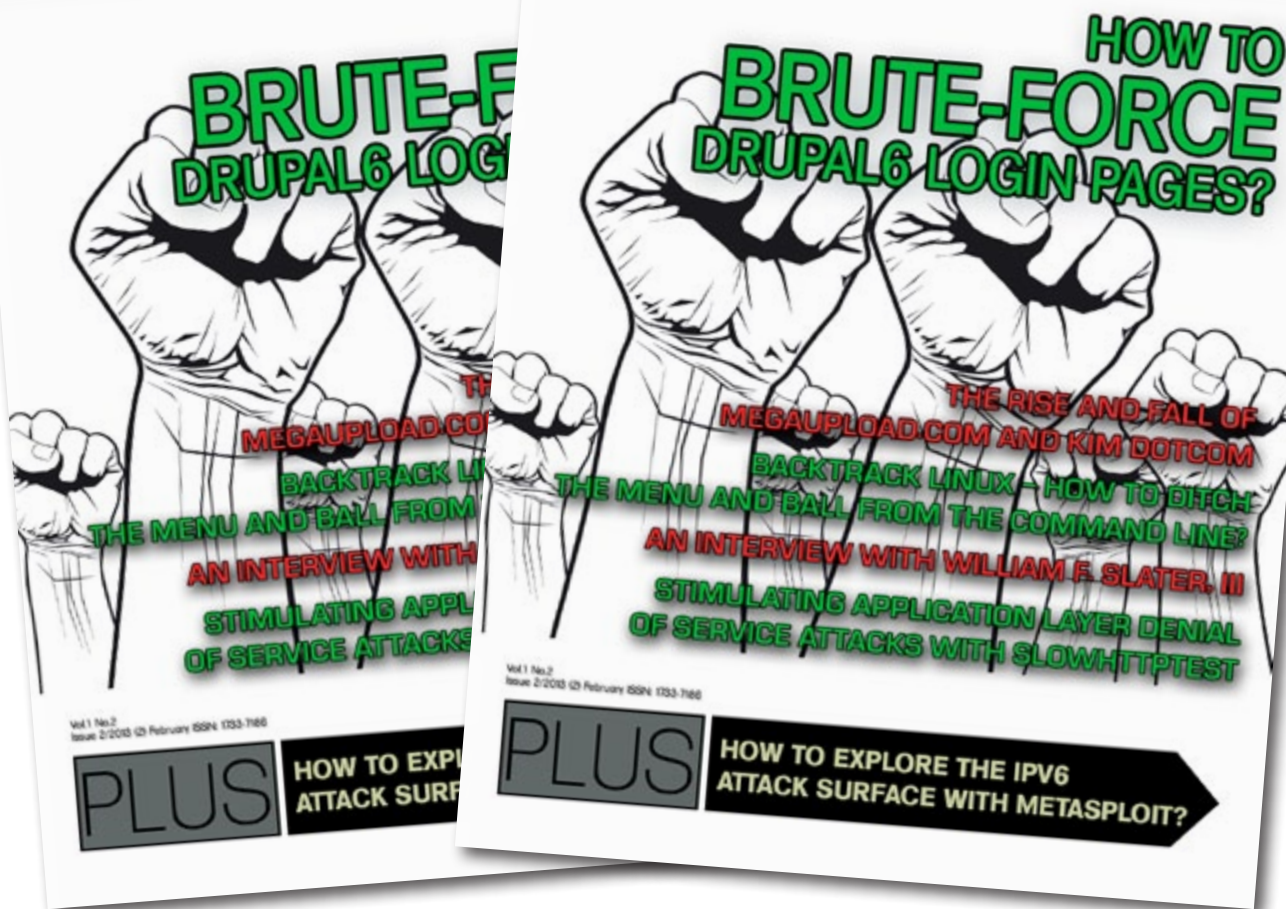
The motivation of creative workers relies on a few ingredients listed by Amabile (1998):

- challenge
- freedom
- resources (time and money)
- work-group features
- supervisory encouragement
- organizational support

Those of you who are able to say they find all this at their work place, lucky you! But I seriously doubt it. At FreeBSD we have almost all of those ingredients: challenging tasks and total freedom (the sky is the limit, you can choose whatever subject to work on), work-group features (again, you can choose whichever team you want to join or create your own work group). Regarding supervisory encouragement you always get a warm welcome from your mentors when you join the project, but after your mentoring period it's up to you to gather momentum on the subject you are working on. For the organizational support you have access to the project's infrastructure and regarding financial resources the FreeBSD Foundation could provide you with grants to attend conferences or to sponsor your work. However, budgets are quite limited compared to commercial organizations similar in size as it relies on public donations (go visit <http://www.freebsd.foundation.org/> to support the project!).

Also useful in our context is Maslow's framework related to motivation, famously known as the pyramid of needs (Maslow, 1954) and displayed in Figure 3. It would make sense to say that innovation is brought by knowledge workers who are looking for motivation from the highest levels of the pyramid, that is self-actualization. And FreeBSD is a good place to find self-actualization under the form of challenging projects within which it is natural to learn at a high level from other experienced engineers.

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- Interview with Cyber Security expert, William F. Slater

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<femur> icanhasarm: need your knowledge
 <icanhasarm> femur: you can't get aids from goats
 <femur> icanhasarm: need your knowledge, take 2

Note that lower needs could also be fulfilled at FreeBSD especially social needs with the ability to participate in team work and exchange ideas during meetings and conferences.

Creative swiping and the NIH syndrome

Tom Peters invented the term 'creative swiping' to describe the practice of borrowing good ideas from other companies (Peters, 1987). He said: "Put NIH (Not Invented Here) behind you – and learn to copy (with unique adaptation/enhancement) from the best!".

<icanhasarm> I wonder if they will advertise win 8
 <icanhasarm> LOOK WE PUT A DUMBED DOWN TABLET INTERFACE ON A PC OS HOW BRILLIANT
 <tacoz> isn't that what's freebsd is trying to do?
 <icanhasarm> it is
 <icanhasarm> we run great on PDP11-based tablets

Such creative swiping greatly improves an organization's rate of innovation as advocated by Procter & Gamble's Huston and Sakkab (2006): 'We needed to move the

company's attitude from resistance to innovations "not invented here" to enthusiasm for those "proudly found elsewhere." And we needed to change how we defined, and perceived, our R&D organization—from 7,500 people inside to 7,500 *plus* 1.5 million outside, with a permeable boundary between them'.

I can think of several examples of creative swiping at FreeBSD: pf (taken from OpenBSD), BSM Audit, MAC, DTrace, zfs (adapted from Sun/OpenSolaris/Illumos). ZFS for instance was imported from the OpenSolaris project and improvements were made to it such as the TRIM support implementation by pjd@.

Playfulness

Innovation guru Michael Schrage states that 'innovation is less the product of how innovators think than a by-product of how they behave' (Schrage, 2000). He believes 'serious play' is not an oxymoron and assures that 'you can't be a serious innovator unless you are willing and able to play'. What there is to understand here is that the playfulness behavior exhibited by creative people refers to an ability to be mentally flexible. While people with a rigid view of the world might feel uncomfortable approaching ambiguous problems, playful minds more easily accept ambiguity and are able to stand outside the mainstream of thoughts, leading to creative thinking. Indeed, mental



Figure 3. Pyramid of needs

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flexibility implies a mind which is able to tolerate ambiguity and switch perspectives, and helps creative people making sense of conflicting viewpoints.

Coming back to FreeBSD, the irc extracts reproduced in this article reflect the fact that playfulness is part of FreeBSD's culture. This contributes to make developers comfortable and willing to take risks, pushing their ideas without fearing to get systematically blamed by a cohort of hostile colleagues. It also make people want to spend more time within this playful environment some developers call the zoo :)

```
<canadabald > good afternoon all
<femur> hey ho canadabald
<femur> canadabald: should I fix that typo?
<icanhasarm> canadabald: would you mind answering femur,
instead of pretending your a klingon warrior ?
<femur> tnx icanhasarm appreciate it
<femur> but but i can't be in klingon
<femur> for i hate star wars
<icanhasarm> I thought klingons were twilight bad guys ?
<femur> no that's king kong
_icanhasarm_ totally lost with all those teen movies
<femur> lost is not a teen movie
<femur> btw I've committed the typo fix no matter what he says
<icanhasarm> canadabald: go on then, pretend you're a klingon warrior, even if klingons ain't nothing but bit****, we do not need you anymore
```

Conclusion

We have seen the ingredients necessary to sustain innovation in an organizational context. I tried to show using a few theoretical models that FreeBSD is a great place to work and to nurture innovative ideas. Do you recognize some of those ingredients in your own company? If not, why not getting inspired by what is done at FreeBSD and make some propositions to your managers? And if you are still an outsider, why not trying to cross our permeable boundaries and become part of the FreeBSD project? This way you could experience a work environment you could hardly find anywhere else. So, see you soon at the zoo!

```
<femur> we are a bunch of false friends who hate each other
but have no real friends and no real life, so that's what we got
<icanhasarm> I HAVE A REAL FRIEND HE4S CALLED KEKE AND
HE LIVES IN MY HEAD
```

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After a PhD in Computer Modeling applied to Physics the author has been working as a software engineer and IT project manager for the past eight years. During his spare time he pursues business studies and should complete an MBA by the end of this year, and he is also a committer for the FreeBSD project with more than 1,300 commits to the ports tree.