

# OpenStack - a Novel Open Source Project Phenomenon?

*Ville Friman, Wang Jiahuan, Tuomo Ruottinen*

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## Abstract

Cloud computing has been touted to bring down the high IT costs of companies through improved usage and administration efficiency of computation infrastructure. Market leaders like Amazon and Google have established positions with their proprietary solutions, and are encroaching on other companies established markets with the new service. An alternative to the proprietary cloud platforms, OpenStack was launched as an open source project by RackSpace in 2010 with a mission statement to provide a standardised cloud computing platform. The project's intellectual rights have been transferred to the OpenStack foundation and it has built a conspicuously large company participation around it, including notable companies late to enter the cloud computing scene. Although representing a new phenomenon of a "community of companies", the project seems to reconcile with much of the observations of literature on open source software development.

# 1. Introduction

In the context of the slow but inevitable onset of the disruptive cloud computing (Catinean & Căndea, 2013) paradigm, OpenStack seems like a novel phenomenon of joint development by a “community of companies” for a freely usable technology aimed to optimize companies computational infrastructure. While it started as what Hecker (1999) specifies as a “loss lead” strategy by RackSpace or by West & Gallagher (2006) as a “spinout”, it has attracted a large corporate backing both in numbers and size of some companies. The project founders, RackSpaces role as specified by (Hauge & Sørensen & Røsdal, 2007) could be stated as that of an OSS Provider, as it has provided most of the contributions and governance of the community in the beginning leg, it’s transfer of the intellectual property rights to the OpenStack foundation, has changed the community into a democratic group of Inner Source Software (ISS) Participants. Another description would be the transformation from “cathedral” to the “bazaar” (Raymond,1999) (Capiluppi & Michlmayr , 2007). This congregation of company involvement is also in accordance with the observation of open source software development displaying conformance with the “power law” (Madey & Freeh & Tynan, 2002). Mass buildup signals of competence and success and attracts more mass forming a self feeding loop. With the projects intellectual property under the protection of open source legal and normative mechanism (O’Mahony, 2003), the viable business models revolve around companies complementary assets combined with possible benefits from network externalities(Lerner & Tirole,2002). Companies seem to be signaling for competence through competitive-like rate of contributions, a marketing strategy which links with possibly selling of the competence as a service. This apparent race is building the technology at a rapid pace.

In the following chapters we will continue trying to link literature to different aspects of the OpenStack project in an attempt to try to exhaustively delineate it with proposed models and observations. We will assume here that any part left without association to previous literature by this method of elimination can be counted as something novel. We grant that this is a very relative exercise whereby we leave the perceived coverage to the judgement of the reader and possible subsequent papers. Section two will set the project to its larger picture, the area of cloud computing. Section three will browse the business side of things and its applicability to OpenStack. Section four will contain some observations of the projects organisational and architectural composition. Section five will touch on the issue evading our literature hunt, the “community of companies”. Section six will conclude this foray.

## 2.Cloud Computing - How OpenStack arose

Cloud computing as stated in Mell & Grance (2011) is a model, where ubiquitous, convenient and on-demand network access is granted to a pool of configurable computing resources. The computing resources can be networks, servers, storage, applications and services, that are provisioned with minimal management and service provider interaction. Mell & Grance (2011) also defines three basic service models of cloud computing are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). OpenStack is a project aiming to provide the necessary components to construct an Infrastructure as a Service (IaaS) solution.

In the cloud deployment model the service provision and consumption is decoupled. With this decoupling the service may be geographically separated and organisationally external, or internal relative to the consumer. Consumption is always through a network interface, abstracting the fact that the service may originate from a “public cloud” in an external organisation, or from an organisation internal “private cloud”. It is also possible to combine these in so called “federated” or “hybrid clouds”.(Mell & Grance, 2011) (Fox, Griffith, Joseph, Katz, Konwinski, Lee ... & Stoica, 2009). The hybrid clouds are not yet very viable due to different cloud infrastructure provider platforms not providing interoperability.

Microsoft, Amazon and Google have started early on developing their proprietary cloud platforms and currently dominate the market share of cloud computing. OpenStack can be seen as “loss lead” strategy by RackSpace to challenge them, through aiming to achieve adoption at the expense of appropriability, playing on what is mentioned in West (2003) as the “essential tension” in pushing for a de-facto standard. Kerner (2014, January 3rd) states that this strategy is “paying off” although not financially yet. Looking at it like this, OpenStack may also be gathering corporate momentum partly as the last low cost train to cloud computing markets. This seems evident with IBM announcements for entering the foundation, as it is partly being threatened by Amazon for its industry IT clientel. The latest standing barriers of adoption are seen as mistrust in clouds and the lack portability, driving vendor lock-in(Bessani, Kapitza, Petcu, Romano, Gogouvitis, Kyriazis & Cascella, 2012). The mistrust includes apprehensions of companies to hand over their mission critical data to outsider hands, and data proliferation may also be administered with country specific legislation adding to the requirement of providers to demonstrate their capability for trust in them. But the portability is partly business strategy drive. Current cloud giants with their proprietary non interoperable platforms achieve a high lock-in on their customer, which is profitable to them. Of course one can wonder, would the cloud computing market expand with better interoperability benefitting all.

As things are, OpenStack using vendors are not making a mark on the markets, raising questions can it ever reach it's de-facto mission goal. Given the example of Firefox and IE,

neither has driven the other out, but have settled into a market oligopoly. Somewhat same may be expected at best to happen with OpenStacks penetration of the market.

### **3. Open Source Business Models - financial motivation for company involvement in OpenStack**

The literature has been looking extensively on the business motivations of the open source adopting companies. Against the mindset set by the two decade reign of the strategy of licensing the use of protected intellectual property, the open source movement seemed outright contradictory. Since then companies have adopted different strategies as can be observed from several papers, and the observed apparent contradiction has changed to acceptance of open source as a viable business strategy. The companies around OpenStack are numerable and a complete hunt down of their business reasons for affiliating with the project is not in scope of our effort, but we give next listings of possible business models identified in the literature to explain possible company motivation for participation in some form to the project network.

Hecker (1999) outlines the eight classical open source business models: service support seller, loss-leader, widget frosting, accessorising, service enabler, sell it free it, brand licensing, software franchising. OpenStack started as a quite clear loss-leader strategy, while the current companies pumping contributions to the project might be seen to position most evidently for service support selling, accessorising and service enabling. The OpenStack is a definite brand, although its use is not licensed under a fee. It's power comes from it's adoption, which again "costs" only coming under the fold of the community and its blessing by adhering to its principles.

Rappa (2004) gives business models with the customer relationship as the primary dimension: brokerage model, information intermediary model, merchant model, manufacturer direct model, affiliate model, community model, subscription model, and utility and hybrid models. We can identify several possible business venues for revenues for OpenStack network participating companies in these contexts. For example, Catinean & Căndea (2013) mentions a new operator the Cloud Broker, and companies holding the OpenStack conferences can derive profit. Aptira is the golden member of OpenStack, they offer private and hybrid cloud solutions and technology support and sell their product that based on OpenStack named Aptira OpenStack, which directly to customers by license (Aptira Inc. (n.d)), so business model of Aptira is manufacturer direct. CCAT (Cloud Computing Association in Taiwan) is also the golden member of OpenStack, they are an association in Taiwan to speed up the development of cloud computing, there are many information and software companies of Taiwan attend Cloud Computing Association in Taiwan, so their business model is community model (Cloud Computing Association in Taiwan).

Daffara (2007) specifies models as business clusters: twin licensing, split OSS/commercial products, badgeware, product specialist, platform providers, selection/consulting companies. The top five companies are exhibiting almost all of these strategies. Several big OpenStack contributors have their proprietary licensed packages of OpenStack. Badgeware meaning association with a brand is more or less easily achieved by simply registering to the project site as some form of affiliate, gaining instant association with and the transition of perceived properties of OpenStack affiliate. The consulting model seems to be a strong contender with OpenStack as it is not cost free to adopt it(not free as in beer), requiring competence in selecting and assembling the many components under the project. This is a very apparent business possibility especially for companies that have profiled as main code contributors and so signalled for competence to deliver this service.

Lastly Bessen (2005) argues that open source and proprietary packaged software are not exclusive at the market even when they are of comparable quality in feature set. Instead open source can be used to cater to certain set of customer whose problem has a high complexity and are not satisfied with proprietary costs. Proprietary packaging and open source software may each cater to different customer situations, neither being superior in addressing any specific market situation as a whole but complementing.

## **4. OpenStack**

### **4.1 Modularity**

Modularisation is an inherent property of successful OSS projects. Not does it only separate modifications and facilitate joint development of code, but it is also argued to mitigate the free rider effect inherent to privately provisioned public good (Baldwin & Clark, 2006).

OpenStacks architecture rests on the standalone module each offering a service on the platform level. The core reference offers three cores for computing, storage and networking. Additional modules offer services to these and other modules, like identity management and security. Anyone can add more modules, but addition to the reference implementation requires a submission process. Any module provider may choose to relicense their module as proprietary if they see it purposeful, opening possibility for proprietary business given a very value added module.

Capiluppi & Michlmayr (2007) note that new developers like to work on new modules, instead of the ones that have already been staked by some other contributor. Addition of modules may attract more developers. Baldwin & Clark (2006) note in similar lines that code structures with high modularity and option value increase contribution willingness. OpenStack architecture may be hitting a sweet spot in offering development space for new contributors

and so garnering high amounts of this actually “scarce resource” (Capiluppi & Morisio, 2003, March).

Johnson (2001) says that Open source development tends to focus the development into features useful (or interesting) for the developer while Dahlander & Magnusson (2008) note that companies are inclined to feed back non-strategic code to back to the community. This goes inline with the projects licensing which allows relicensing, and the sentiment that companies may channel their contributions to features they find most value to their customers, and that a differentiated proprietary package of the platform may function as a revenue bringer. But to benefit from other contributions, and not get bogged down by heavy internal translations of the internal code base with the reference, companies are motivated to feed back. Especially when the project is in such a rapid development as OpenStack seems to be.

Also Bessen (2005) argues that open source software especially a complex one, which we trivially argue OpenStack to be, is well suited to the needs of customers, with highly complex problems, while proprietary packaged software is good at satisfying a large segment of middle complex problem customers. With OpenStack project companies will be equipped to derive both products.

## **4.2 Organisation**

The onion model Crowston & Howison (2003), describes how decision making is “at the core” of the project, where individual contributors earn their way through meritocratic contributions. Fleming & Waguespack (2005) agree and add that also brokering and boundary spanning increase possibility for leadership position acquisition. The OpenStack foundation development is steered by the Technical committee, under which the module development is organised into programs. Positions are elected by contributors making this a democratic process at least on paper. It might be interesting to have a closer look though, how and if companies do exert political power.

## **5.”Community of Companies”**

What may be a new phenomenon in all this, is the fact that most contributions to OpenStack seem to have company affiliation. Traditional literatures communities are to a large extent comprised of individuals with no company affiliation, and hence for example with very different motivations, giving the community an overall difference of culture. A golden level foundation member Mirantis provides a web interface for tracking commits to OpenStack (Mirantis Inc. (n.d)). Looking at the “Code Contribution ” statistics shows with the metric “Person-day effort” that only 11% of contributions are accounted to “independent”, and the “Member Directory” reports that only 20% of members being independent. The “communities of companies” has already been picked by Gonzalez-Barahona, Izquierdo-Cortazar & Maffulli & Robles (2013).

They also state both the communities and the companies involved want information on what is happening.

Another way to arrive to this setting, is starting from the often cited motivation of open source contribution, the “self use” goal of contributors. Given that a cloud computing solution is not apparently usable by an individual. It’s value comes from more efficient harnessing of racks of commodity hardware for service for use for many people, a resource not often owned by individuals of any notable number. This train of thought leaves us with the minimum unit of self use motivated contributor an organisation.

It may be that OpenStack is an example of the next step in the evolution of corporate adoption of the open source development model, and as such is a dynamic virtual organisation where even the participants are so caught up in the complexity that they look up and wonder at what is going on around them.

## 6.Conclusion

What we have tried is give explanations from literature on open source to the different aspects of OpenStack sufficiently to depict it as phenomenon largely conforming to already accepted explanations of open source workings. The part that we try to tease out is the large company drive the project has, which may set its culture apart from what we have been seeing as “traditional” communities. Possible future research might probe into question like how does a company saturated community culture differ from a more traditional unaffiliated individual community, and do the companies respect the values similarly or is there internal politics making?

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