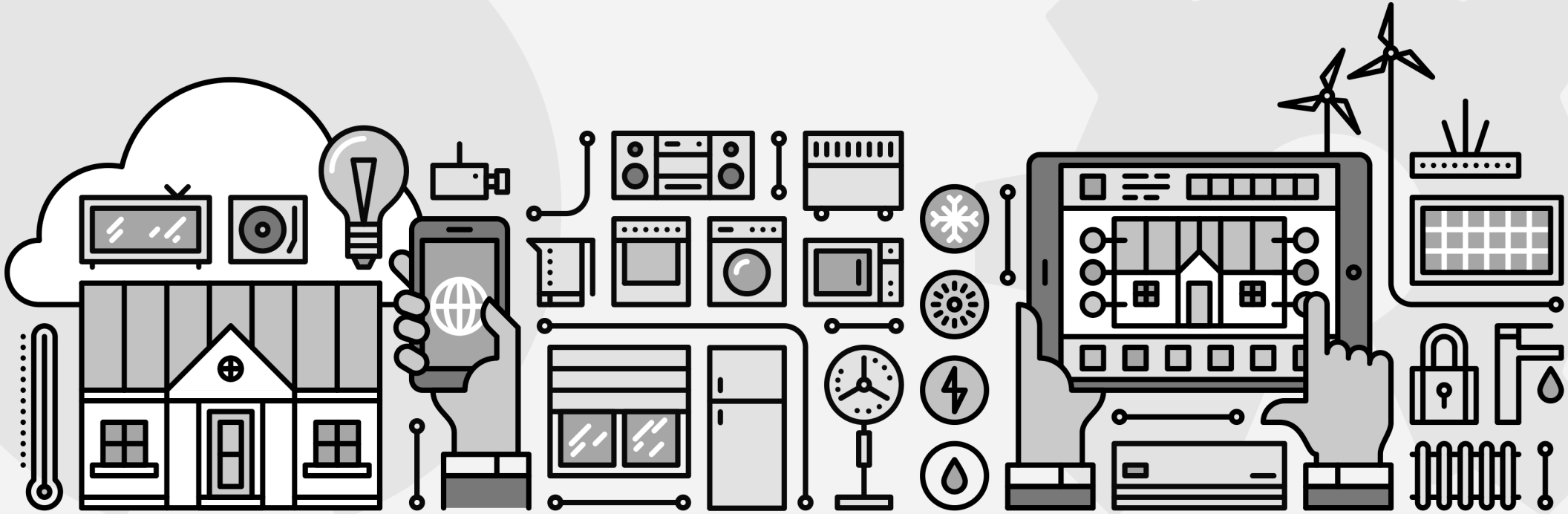
VISIONMOBILE PRESENTS

THE ESSENTIAL GUIDE TO OPEN SOURCE IN IoT

Open Source goes mainstream - tools and strategies that IoT developers employ for open source, open hardware and open data.



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ABSTRACT

With the dawn of the Internet of Things, software is making its way into every product, into every industry. And along with software come developers, who bring their beliefs, attitudes, expertise, and habits along with them. One of those is open source technology - a staple in the software industry since the 1980s, but a new and often scary concept for many traditional industries, whose businesses are built on protecting their assets and intellectual property. In this white paper, we'll show that open source is already a reality in IoT, and give some insights in how companies can leverage it to their benefit.

INTRODUCTION

This paper will illustrate how open source technologies permeate every part of the IoT development stack, and outline how open source can be used a means of market control as well as a booster of innovation and a way to tap into the IoT developer talent pool.

The data have been collected from 3,700 IoT developers in 150 countries across the globe, surveyed in Q4 2015 and shines a light on how big a deal open source really is in IoT, why developers love it, and how companies can create a successful commercial strategy around the use of open source by aligning themselves with the values of that core stakeholder group that are developers.

OPEN SOURCE IS PERVASIVE IN IOT

First of all, let's dispel the myth that open source is a niche phenomenon, the domain of hobbyists and idealists. Quite the contrary, the use of open source is pretty much ubiquitous among IoT developers.

91% of IoT developers uses open source software, open hardware, or open data in at least one part of their development stack. Fewer than 1 in 10 IoT developers will never take up the open-source option, and rely exclusively on proprietary technology. The use of open source is truly mainstream: this high number of usage is maintained regardless of the motivation of developers to enter IoT (for money, for fun, or for learning); independent of their experience, the size of company they work for, or how much money they make; and whether they target consumers or enterprises.

6 out of 10 IoT developers (58%) don't just use open source technology, they also contribute to open source projects. Some are core contributors, others lend a hand occasionally, e.g. to fix some bug or other. Fact is that these developers are actively engaged in pushing the quality and pervasiveness of open source technology forward, making the community a formidable innovation engine. The amount of contribution increases with the amount of use, creating a virtuous innovation cycle. More contribution means that open source technology becomes more attractive to use, which again feeds the urge to contribute.

It shouldn't surprise then that a plethora of open source tools and components are available in every niche of Internet of Things technology. Some are created by small startups or community groups; many are backed by major corporations investing serious resources. We present here just a few examples to illustrate just how widespread open source technology is in IoT.

Part of the IoT development stack	Examples of open source technology
Embedded operating systems 64% of IoT developers uses open source for this	Raspbian, Ubuntu Core (a.k.a. Snappy), Google Brillo, Contiki, FreeRTOS, RIOT OS, TinyOS, ARM mbed
Frameworks, software components, and libraries 71% of IoT developers uses open source for this	**Open source business rule engines**: Node-RED (made by a team at IBM), Siddhi, bip.io, The Thingbox Project **Communication stacks**: IoTSyS, VerneMQ, RHIOT, or the Eclipse IoT Project **Miscellaneous**: KinomaJS, Zetta, Yaler, prpl Foundation
Device-side IoT platforms 61% of IoT developers uses open source for this	OpenHab and Eclipse SmartHome (share a common technology base), Nimbits, IoT Toolkit, Chimera IoT platform
Cloud-based IoT platforms 64% of IoT developers uses open source for this	DeviceHive, DeviceHub, OpenRemote, ThingSpeak, SiteWhere, Kaa
Open hardware 77% of IoT developers uses open source for this	Arduino and derivatives, Texas Instruments' BeagleBoard, networking equipment and gateways like The Things Network, Flutter, sensor platforms like eHealth in biometrics, AirBeam in environmental monitoring, processors like PULPino
Open data 68% of IoT developers uses open source for this	The governments of the G8 countries (Canada, France, Germany, Italy, Japan, Russia, UK, and USA) have published over 540,000 datasets on their combined national data portals so far.

OPEN SOURCE IS THE NEW STANDARDIZATION

Does this mean that companies should consider open sourcing their products, as part of a commercial strategy? While there are certainly some pitfalls to avoid (we discuss how in detail in our premium report Open Source in the Internet of Things), using and contributing to open source technology offers plenty of advantages. In many cases open source fulfills a similar role as standardization: a way to gain efficiencies and stimulate innovation by commoditizing non-core, non-differentiating parts of the technology stack.

There are the efficiency gains in using a common solution, in the same way as using open standards would provide. In fact, open source implementations of public standards could help solve the problem of interoperability, a major issue in the nascent Internet of Things. You could even consider the reduced training costs of new personnel, already familiar with the open source technology you use. Google did just that when open sourcing its MapReduce technology, for example.

Relative to using proprietary technology from middleware providers there is the advantage of controlling the underlying technological infrastructure of your solution, at each layer necessary to deliver the desired user experience, without the threat of the tool being discontinued. It is, therefore, no surprise that we see technology empires being built on open source plumbing; Google, Facebook, and Amazon, to name just a few. Companies like these are big contributors to open source technology, and will systematically open source some of their own non-core technology as well. Two recent example come from Facebook. The first is Wedge, a switch for data centers consisting entirely of open source software and open hardware components. And on the consumer side there is Surround 360, a 17-camera array and accompanying web-based software to capture images in 360 degrees and render them automatically, which the company hopes will dramatically increase the amount of content on its platform.

Specifically in the Internet of Things space, open source solutions can help the industry to achieve those tens of billions of devices that pundits predict by the end of the decade, as well as the infrastructure to connect them all together. This level of scale might be unaffordable otherwise. In many areas, the Internet of Things is still a technology in search of a need to address. Open source technology enables permissionless, low-risk innovation that could accelerate the search for new killer use cases. For big enterprises and startups alike, open source can represent the ability to explore new technology without big, up-front financial commitments, and with less concerns over future royalties or intellectual property lawsuits.

Open source technology could be used as a purposeful strategy to shrink a market and hurt competitors, as IBM did by open sourcing the Eclipse IDE as an attack on Microsoft's Visual Studio, or as Google did by funding Mozilla and its Firefox browser. Competition from free open source alternatives has put pressure on the revenues and profitability of closed-source vendors. For example, the use of open source operating systems in embedded projects rose from 43% in 2010 to 50% in 2014, according to UBM tech. Commercial variants dropped from 41% at their peak in 2011 to 33% in 2014. No doubt this shift in mindshare has an even bigger equivalent in profitability. Differentiating features are not enough to keep the revenues at previous levels, and as open source solutions get better, there is a constant (and expensive) race to stay ahead.

ECONOMIC ADVANTAGES OF USING OPEN SOURCE TECHNOLOGY IN IOT

Quality
of solution & support

Efficiency
gains

- Cutting development time
- Cutting development cost
- Collaboration and interoperability

Affordable scaling
to tens of billions of devices

Innovation
Permissionless and low-risk

Control
over critical infrastructure

Source: IoT report series: Open source in the Internet of Things | vmob.me/OSIoT16

OPEN SOURCE ATTRACTS DEVELOPERS

There is one more critical advantage of open source that merits our attention. Implemented properly, open source can be a way to attract top developer talent to your product or solution. Developers will be the key innovation engine of the Internet of Things; getting the best ones on your platform can give you a real competitive advantage.

Developers in our survey show great enthusiasm for open source. They are sensitive to the value proposition and ideals that the open source model offers. A whopping 78% says that they will use open source technology "whenever they can" (as opposed to only when it's superior to proprietary alternatives) in at least one area of development. Using and promoting open source is a way to signal to developer that your company and technology is top-notch, in three crucial aspects.

Align yourself with developer culture and ideals More than half of IoT developers (55%) cited ideology as one of their top-three reasons for using open source, making it the top motivation. They believe in open source, and select it because it is free-as-in-speech. This paints a picture of developers as idealists, actively thinking about and advocating for better business practices. By aligning yourself with that ideal, your company and solution will be regarded favorably by this key stakeholder group.

Highlight the quality of your solution and developer support A third of IoT developers uses open source projects because constant community improvement make them the best technology in the field. A similar number appreciates the great peer-to-peer support that comes with a vibrant open source community. These results once again highlight just how important the community is for IoT developers. This was a main conclusion from our February 2016 report on Best Practices for IoT Developer Programs, too. In that report, we found that a community of developers supporting each other (developer-to-developer) is both more powerful and more desirable to developers than vendors organising direct support systems. Developers increasingly turn to their community as they get more experienced: once developers discover community support, they become converts for life.

Paint your technology as cutting-edge Developers associate open source with the bleeding edge of tools and technologies. A fifth of IoT developers picks open source tech simply because it is new and exciting. This is a great way to onboard developers early, and educate them in your products. In fact, open source is a key way for one in three IoT developers to learn new technologies and improve their skills.

THE TOP 5 REASONS WHY IOT DEVELOPERS USE OPEN SOURCE

% of IoT developers | n=3,551

Why do you use and/or contribute to open source projects?

Source: IoT report series: Open source in the Internet of Things | vmob.me/IoTOpenSource

CONCLUSION

Open source is an established reality in the Internet of Things. It is already used by the vast majority of IoT developer - 9 in 10 of them uses open source technology at least occasionally; 6 in 10 contribute to open source projects as well. In parallel, we can find high-quality open source alternative for any type of tool or technology used by developers.

This can be either an opportunity or a threat. It's a threat when you have a closed-source developer offering that faces open-source competition. A smart commercial strategy can help you dodge that danger.

But mostly, open source represents a giant opportunity for companies. Open source is a way to gain efficiencies and stimulate innovation by commoditizing non-core, non-differentiating parts of the technology stack, just like standards are. And equally powerful: open source allows you to position your company to onboard the modern kingmakers of IoT: developers

ABOUT VISIONMOBILE

VisionMobile™ is the leading analyst company in the developer economy, tracking mobile & IoT developer trends via the largest, most comprehensive developer surveys worldwide.

We reach out to more than 30,000 app developers in over 150 countries and engage them across all regions, platforms, and developer segments touching upon 7 different sectors namely , mobile, IoT cloud, and desktop to games, AR/VR and machine learning.

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ABOUT "OPEN SOURCE IN IOT"

In our April 2016 report 'Open Source in the Internet of Things'[1], we examine the state of the art in how and why IoT developers use open source, open source hardware, and open data. The data in this report comes from our 10th edition Developer Economics survey (Q4 2015). 3,700 Internet of Things developers answered questions about their use of and attitude towards open source technology.

[1] http://www.visionmobile.com/product/iot-report-series-open-source-in-the-internet-of-things/

RECOMMENDED READING & ADDITIONAL RESOURCES

Developer Economics: State of Developer Nation Q1 2016
https://www.developereconomics.com/reports/developer-economics-state-of-developer-nation-q1-2016/

Global trends in Android Use
https://www.developereconomics.com/reports/global-trends-in-android-use-2015/

IoT Megatrends
https://www.developereconomics.com/reports/iot-megatrends-2016/

Commerce of things
https://www.developereconomics.com/reports/commerce-of-things-2015/

distilling market noise into market sense