Towards the Web of Things

Whitepaper 1.0

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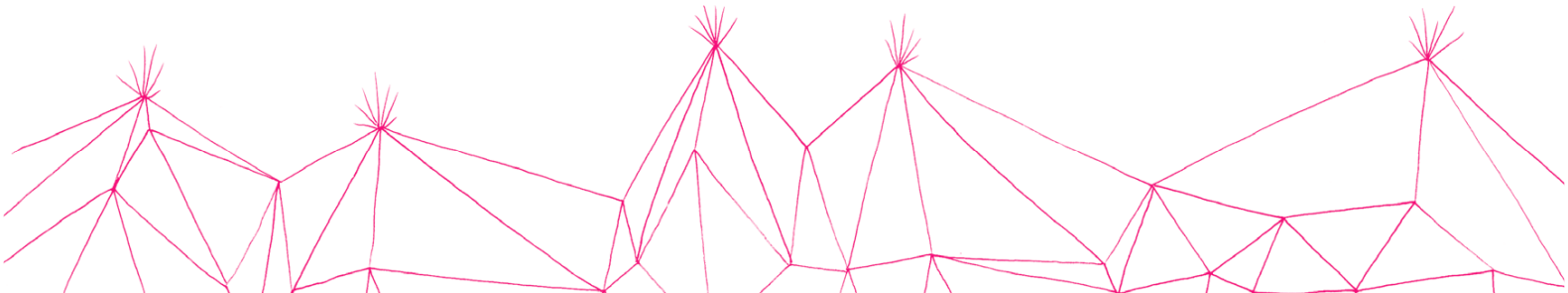
Thanks to the stunning progress in the field of embedded devices, physical objects such as home appliances, industrial machines and wireless sensor and actuator networks can now embed powerful computers that can connect to the Internet from anywhere. The Chumby, Gumstix, Sun SPOTs, Ploggs, Nabaztag, Pokens, etc. are only a few examples of these versatile tiny computers. In the meanwhile, broadband and cheap Internet connectivity is very likely to become a commodity accessible from anywhere. According to the IP for Smart Objects (IPSO) Alliance, an increasing number of embedded devices will be supporting the IP protocol [8], so that many physical objects will soon possess direct connectivity to the Internet. This convergence of physical computing devices (Wireless Sensor Networks, mobile phones, embedded computers, etc.) and the Internet provides new design opportunities for interactive applications and tangible artifacts, as digital communication networks will soon not only contain static documents, but also real-time information about places and objects from the real world. We talk about extending the Web beyond your computer, and bring it into the real world!!!



Unfortunately, development of applications that run on top of such physical objects is still a cumbersome process that requires extensive expert knowledge and time. Indeed, little attention has been paid to the development of simple and functional open systems that focus on sharing and reuse of physical things. Currently, development of such system require technical experts to re-implement similar functionalities over and over again, and a large amount of work is still devoted to low-level programming and to the creation of application-specific user interfaces. This is clearly a waste of resources that could be devoted to the development and prototyping of interactive applications. The creation of a global and flexible eco-system of connected real-world devices calls for a common ground that allows physical objects to interact and exchange information seamlessly.

Among the existing solutions for building distributed applications, Web Services standards (known as WS-*) have been proposed and an increasing number of companies are using Web Services for connecting physical objects with other applications. However, the level of coupling between parts attained by Web services are sufficient to interconnect devices in rather static use-cases [2, 3], but are not flexible enough to build rapidly prototypes of lightweight ad-hoc applications such as mashups [1].

In the last decade, a newer generation of Web applications has become highly popular - commonly referred to as Web 2.0. With Web 2.0 applications the focus is on the user and user-generated content on the one hand, and on the other hand on a set of technologies (e.g., AJAX, RSS) that support the development of highly interactive interfaces that offer a rich user experience, similar to common desktop applications. As shown by the unparalleled scalability of the Internet, simple technologies (e.g. HTTP) can give birth to very efficient and flexible systems, where a large variety of hardware and software platforms coexist and interact smoothly. As seen with the success of several Web 2.0 applications (Wikipedia, open source communities, blogs, and more recently Web mashups), massive projects have been developed cheaply by fostering collaboration and sharing of information. Open access to data through services onf the Web has enabled information to be reused across independent system, therefore has lowered the access barrier that allows people to develop their own applications.

For all these reasons, we foster the development of novel composition platforms for networked objects by leveraging as much as possible the existing Web and by extending the current Web to include the real-world. Creation of a new generation of Web-enabled devices will result in the Web of Things [1, 7, 5, 6], and in our vision the future Web will be a collection of devices that can be (re-)combined at runtime

to solve any task. Our research is focused on the development of composite applications on top of the open and simple standards that made the Web so successful (REST, XML, HTTP, or Atom) to interconnect physical devices. Reuse of existing Web standards will allow any device to finally "speak" the same language as other resources on Web, therefore making it much easier to integrate physical devices with any other Web content. This will enable the Web to reach out into the real-world and the real-world to directly benefit from services on the Web. Thus, real-world objects will become first class citizens of the World Wide Web, which will make them linkable, discoverable, searchable, and therefore usable just like any other data available on the Web.

The Web is out there and rocks, so why do companies keep reinventing square wheels? Don't do the same mistake and join us on www.webofthings.com.

About the authors

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Resources and Bibliography

The Web of Things Blog: http://www.webofthings.com

The Energie Visible Project: http://www.webofthings.com/energie

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