ED STIC - Proposition de Sujets de Thèse

pour la campagne d'Allocation de thèses 2011

Titre du sujet : A Programming Environment for the Diffuse Web

Mention de thèse : Informatique

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Description du sujet :

 The web is the obvious diffuse platform where applications of
tomorrow will be deployed. Though already wide, the web will
eventually become even wider when it will connect all the appliances
that surround us. The web has already produced amazing new
applications such as Google Maps, but a radically new way of thinking
is required to smoothly interconnect a wide variety of devices.
Currently developing a web application cannot be accomplished without
using a plethora of dialects and tools that have all been designed by
different authors with different goals in mind. A web programmer is
facing a true tower of Babel. Stacking up such heterogeneous
technologies should be abandoned. New coherent systems should embrace
the development of web applications as a whole. Creating such systems
is one of the goals of the INDES INRIA team. More precisely, one

of our research directions consists in using the web as a virtual machine for diffuse applications.

Our approach relies on a small number of principles. A web application will no longer be viewed as a federation of dynamic pages, but as a single and coherent program projected on multiple servers or (possibly roaming) clients. A typical application will syndicate multiple data sources and be driven by multiple event streams. Managing home appliances, organizing multimedia streams will be typical targets for this new vision of the web. Building applications will require appropriate programming languages, whose semantics and compilation process will be studied. Designing and debugging these applications will also require suitable programming environments to be developed. Creating and implementing such an environment will be a central element of the proposed PhD subject.

HOP is an execution platform that has been designed and implemented at INRIA in the INDES team. It is dedicated to interactive and multimedia applications on the web [serrano:sfp06 sgl:dls06 serrano:mm07 serrano:mmcn09]. It may be viewed as a first attempt in designing and implementing a language for diffuse applications. It has been first released at the end of 2006. Since then, one new major version has been released per year. HOP has been the winner of the ACM Multimedia open source contest 2007. The HOP web site has been browsed more than a hundred thousand times. Currently, HOP consists of: a programming language designed for addressing the distributed aspects of web programming, two compilers for producing server-side and client-side [ls:tfp08] executable codes, a rich set of libraries for dealing with music files, sounds, images, etc., a full-fledged lightweight web server for executing the server-side components of the applications. This server has a small memory footprint and it is highly portable. It has been successfully installed on personal computers, PDAs, mobile phones, NASes, etc.

On diffuse terminals such as smartphones, not only speed matters. There is another central criteria that is neglected by desktop environments, namely the power consumption. On a mobile device, it might be more important to reduce the energy consumed by a program execution than minimizing its execution time. Extending the battery lifetime of mobile devices has been mostly attacked from the hardware and operating system point of views, but also in the compiler and software development areas. The prominent achievement in the hardware front concerns the design of components that consume less power, and batteries that can store and deliver more power for longer

times. Operating systems, meanwhile, have been able to suspend and resume mobile computers for several years, but with the incorporation of GPS receivers and Bluetooth and WiFi transceivers into smartphones and PDAs, they also allow the suspension of these and other components independently. The subject of this PhD will consist in exploring and discovering new ways for extending battery life of diffuse applications. New solutions may be introduced at various level: hardware, operating systems, compilers or middleware. Even when they are not specific to a web environment, they can have a great impact nonetheless. During the duration of this PhD we will evaluate, incorporate and cooperate with such efforts.

URL : http://www-sop.inria.fr/indes/

English version: