Internet of things plays with hand of ACEs

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(PhysOrg.com) -- European researchers have created a new software abstraction called Autonomic Communication Elements (ACEs) which will enable ecosystems for service networks, and make the future 'internet of things' a reality, now.

The internet is evolving in front of our eyes: Web 2.0 is beginning to reach it is potential as a 'platform', a computing and service delivery system in its own right.

At the same time, we are already seeing the emergence of Telco 2.0: telecommunications providers are seeking to create the same sort of open environment for user-generated content and services potential that the web is now renowned for.

Services like mash-ups, combining applications such as Google maps and real estate listings to provide powerful new services from currently available tools and data. For example, Telco 2.0 will allow users to combine mapped property information with voicemail, SMS and other telecommunications enablers.

And this is just a prelude to other, perhaps more sophisticated, technologies like Web 3.0, the so-called 'semantic web'. Add to this the 'future internet' and the proposed 'internet of things' linking people, devices, telecoms and data networks into one, vast network of networks.

It is an ambitious vision, but it all invites increasing complexity; complexity that could kill innovation before it gains traction.

ACES up our sleeve

It is one reason why European researchers at the Cascadas project are proposing a new approach to manage the complexities of future service networks: creating an ecosystem whose atomic building block is the Autonomic Communication Element (ACE).

“[The project] was set-up with the goal of investigating autonomics as an emerging technology for creating innovative and flexible ‘service networks’ ecosystems for ICT -telecommunications and the future internet,” explains Antonio Manzalini, coordinator of Cascadas.

“Specifically, autonomic technology is taking inspiration from the biological characteristics of the human Autonomic Nervous Systems. In other words, an autonomic system is capable of making decisions on its own. Using high-level policies, it constantly checks and optimises its status and it automatically adapts to changing conditions, with limited human intervention.”

ACEs are lightweight software components, pervasively distributed, that are self-configuring, self-organising and self-healing. They can combine various elements together to create a service for any type of device on any type of network.

For example, ACEs on a mobile phone could self-organise with ACEs on the network, such as a location ACE and some other data ACEs, like Google maps and restaurant listings. These components link with the preferred wireless network to aggregate and deliver the service to the final user - say, sushi restaurant listings, with maps, that are close to the user’s location.

These are just some of the ACEs associated with a specific service, but in the Cascadas model there are ACEs for every conceivable device,

network, data, service and application. And all these together form an 'ecosystem'.

The simplicity of complexity

The beauty of this model is its simplicity; a simplicity that, like DNA, can be adapted to create endless variety and diversity.

This is not just theory. Cascadas has developed a framework and a toolkit in Open Source to make the ACE ecosystem a reality. And they have ported this toolkit to a variety of application environments, including Laptops and Nokia's smart phone, the N800 and Google's new operating system, Android.

The team has also developed a demonstrator, displayed at ICT 2008 last year, called the Behavioural Pervasive Advertisement. It allows advertising plasma screens to adapt content to nearby attendees, tailoring it to the viewer's interests.

More work needed

It is just an early demonstration that the system works and how it could be used, but the potential of Cascadas and the ACE ecosystem is enormous.

The project's work has generated considerable interest from both business and academic communities, and the Cascadas team has developed numerous collaborations with interested parties.

While Cascadas' work is a fascinating new response to the challenges of emerging communication paradigms, more work still needs to be done.

"Future research and development activities are required to bring into maturity the Service Networks Ecosystem vision," says Manzalini. "For example, engineering rules are required in order to meet top-down design and bottom-up self-organisation."

But with a little more work, the future internet could well be playing with all the ACEs up its sleeve.

The CASCADAS project received funding from the FET Pro-active initiative of the Sixth Framework Programme for research.

More information: www.cascadas-project.org/

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