'Triple Space' offers web for web services

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(PhysOrg.com) -- What the World Wide Web is to humans, the Triple Space could become for machines, say European researchers who have helped lay the foundations for this innovative integration of web services, semantic web and tuple space technologies.

As a new form of network-based, machine-machine communication, the roll out of Triple Space technology heralds a new era for the internet in which computers are able to publish and read information just as humans create and browse webpages.

By using semantic web technology to make information understandable by computers and expressing that knowledge as basic atomic units called tuples, the Triple Space enables web services to make use of true web communication instead of the email-like point-to-point exchange of messages common today. As such, it promises to provide faster, more efficient and more secure web services and distributed applications to a wide variety of sectors, from telecommunications and e-commerce to air traffic control and healthcare.

Putting the 'web' in web services

"Despite their name, web services today aren't very 'webby'," says Elena Simperl, a senior researcher at the Semantic Technology Institute (STI) of the University of Innsbruck, Austria.

"The way they communicate is more like email in which messages are sent and received between machines rather than true asynchronous web

communication in which information is published and becomes persistently available to be read at any time," she explains.

STI coordinated the EU-funded TripCom project, a pioneering initiative that has successfully proven the Triple Space concept and implemented the technology to make the World Wide Web for machines a reality.

"When we started our research in 2004 and 2005 it wasn't a very popular idea. But we have seen that the world has evolved in our direction as more and more software services have been put on the web and cloud computing has become the talk of the moment with companies, such as Google and Amazon, releasing cloud computing products and services," adds Simperl.

Though similar in concept to cloud computing, in which computational resources are distributed and provided as a service over the internet, the Triple Space deals with data - offering a simple, scalable way for machines to share information asynchronously.

To create the Triple Space, the TripCom researchers worked on making web services and the data they use understandable by computers, using semantic web technologies to communicate machine-readable knowledge rather than raw data. The team opted for the Resource Description Framework or RDF format, which represents data and the semantics of data in triples of the form "subject-property-object" in order to build statements of knowledge.

Information is then published in tuple spaces, shared virtual data-spaces designed for concurrent access by multiple processes and applications in which data units are generally expressed as tuples, a mathematical unit referring to an ordered list of finite length.

Just as multiple human web surfers can view webpages hosted on the

same or different servers at any time, information stored in the Triple Space is “persistently published” - meaning it is always available for any application with access to read it or, if permitted, change it. In contrast, most current web services require the sender and receiver of data to have a same-time synchronous connection to each other, to agree on a data format, to know each other and share a common representation.

“Triple Space is the same paradigm as the web where information is published, stored and read persistently but instead of being used by humans it is used by machines,” Simperl notes. And, just as humans can access the same webpage with different web browsers and different operating systems, computers are able to publish and read information in the Triple Space without format, process or technical constraints.

Secure space

Within the Triple Space, information can be robustly secured by restricting access to different tuple spaces, preventing the need, as is common practice with current web service systems, to manage each communication path individually.

“It is a bit like the directory structure in your PC, albeit with files and folders that overlap. Within that directory each virtual container of data can be given different levels of security depending on the user requirements,” says Simperl.

Data security is critical for many of the applications for which the TripCom researchers envisage the Triple Space being used. For example, one case study carried out by the team outlines how the Triple Space could form the backbone of a European e-health information system, allowing medical professionals to obtain medical records stored in distributed hospital databases quickly, efficiently and securely.

Other potential uses of the Triple Space include facilitating Enterprise Application Integration or EAI systems for distributed businesses, supporting virtual marketplaces for e-commerce, and enabling mobile computing services - an application currently being investigated by Nokia on the back of the TripCom project results. Project partner Telefónica, meanwhile, is incorporating elements of the technology into its Altamira real-time charging system for customers. Other companies have also expressed interest in other commercial uses for the technology, Simperl says.

The project partners currently have a version of the TripCom kernel available for evaluation through Amazon Web Services and are collaborating in a follow-up project, SOA4All, that aims to use Triple Space technology to communicate billions of distributed web services.

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More information: www.tripcom.org/

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