EU prizewinning researchers decongest the internet

February 2 2012

The Internet has become part of our everyday lives, in ways we would never have imagined 30 years ago, but how often do we pause and think about the how and why of getting online? A team of EU-funded Spanish researchers are doing exactly that.

IPv4 (Internet Protocol version 4), the protocol that every device uses to connect to the Internet, has just encountered a major stumbling block: because of the Internet's continuous spiralling growth, all of its addresses have recently run out. It is hoped that IPv6, a protocol currently in the early days of implementation, will eventually replace IPv4; unfortunately, however the two protocols are not compatible.

Now researchers from the Universidad Carlos III de Madrid (UC3M) have developed a solution to the problem.

They set out to make it possible for machines of the future to connect to the Internet using IPv6 addresses, and at the same time access earlier content in IPv4 format. They have successfully defined translators that permit understanding between contents in both protocols by means of a technology called NAT64 and DNS64. This is a standard used by the major manufacturers of routers, such as Cisco or Juniper, and the major sellers of the Domain Name System (DNS), such as Berkeley Internet Name Domain (BIND) or Microsoft.

"We have designed and standardised these transition tools, which have been adopted by the industry and which are now available

commercially,' states Professor Marcelo Bagnulo from UC3M. 'It is relatively easy to invent a new protocol, but it is extremely difficult to design one that is then really introduced and used, since standardisation is an important step toward the future use of a technology."

This research has been carried out as part of the 'Trilogy' project which received the most recent award for the best project in the Future Internet Award prizes; these are awarded as part of the Seventh Framework Programme's (FP7) CEFIMS ('Coordination of the European future internet forum of Member States of the European Union') initiative. The aim of CEFIMS, which is boosted by EUR 409977 of EU funding under the 'Information and communication technologies' (ICT) Theme of FP7, is to improve the quality of the flow of information and the internal workings of the Internet.

The Internet is basically characterised by the interrelation of two systems: the first (routing) defines the route, and the second (congestion control) determines the quantity and volume of data that flow.

Professor Bagnulo explains that at the moment these two systems function independently of each other, as "the mechanism that decides where the data will flow through does not take into consideration how much other data are flowing through that same path." This means that when there is congestion, the new data do not take this into consideration and choose an alternate path.

To understand this in layman terms, the Spanish researchers offer up an everyday metaphor: without illuminated signs or notices sent by radio to warn of upcoming delays, drivers cannot change their itinerary and thereby avoid the traffic jam.

One of the main objectives of Trilogy is to ensure that these systems can function in a more coordinated manner. To do this, they propose various

technologies that control and redirect data flow from the congested routes (as can occur in the case of peer-to-peer applications) to other less congested parts of the network. They have designed, implemented and standardised the Multipath Transmission Control Protocol (TCP) in the Internet Engineering Task Force (IETF), which allows a connection of this type to flow through multiple paths. For a smartphone that is connected to the Internet through Wi-Fi for example, communication is lost when the user leaves the area with coverage, and a new connection must be made. However, using this new MPTCP, it is possible to pass this communication to the alternate interface, so that the connection can be maintained, in addition to increasing the speed of the data transfer.

As well as researchers from UC3M, Trilogy brings together 9 other partners from academia and industry: Deutsche Telekom, NEC Europe Ltd, Nokia, Roke Manor Research, Athens University of Economics and Business, University College of London, Catholic University of Louvain and Stanford University, EURESCOM (European Institute for Research and Strategic Studies in Telecommunications GmbH), and British Telecommunications (BT).

Receiving the Future Internet Award Phil Eardley from BT said: "It is an honor both to be selected as the winning entry, and to have had worked with so many brilliant people on the Trilogy project."

Provided by CORDIS