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Cutting the Internet's carbon footprint

Over the last 20 years the Internet has grown from almost nothing to something of enormous economic and social value. But in the meantime, its consumption of electricity, which currently stands at 3% to 5% of the global supply, is increasing exponentially.

Interdisciplinary research being undertaken by the Universities of Leeds and Cambridge has received a major boost through a £5.9m, five- year EPSRC Programme Grant award to address this issue of enabling growth of ICT networks while at the same time reducing energy consumption.

The vision of the 'INTElligent Energy awARE NETworks' (INTERNET) project is to reduce the carbon footprint of ICT networks by at least an order of magnitude - along with a corresponding reduction in non-renewable energy consumption. This will enable comparable growth beyond the current energy barrier.

Professor Jaafar Elmirghani, the project's lead investigator, said: "The funding will offer us the stability and flexibility needed to address the major challenges associated with energy utilisation in telecommunication networks. I am delighted that we have been recognised in this way."

Energy efficient processes are increasingly key priorities for ICT companies with attention being paid to both ecological and economic drivers. Although in some cases the use of ICT can be beneficial to the environment - for example by reducing journeys and introducing more efficient business processes - countries are becoming increasingly aware of the large growth in energy consumption of telecommunications companies.

"The predicted future growth in the number of connected devices, and of the bandwidth of the Internet of an order of magnitude or two, is not practical if it leads to a corresponding growth in energy consumption. Regulations may therefore come soon, particularly if governments worldwide enforce moves towards carbon neutrality," Professor Elmirghani said.

"The INTERNET project is therefore of great importance in seeking to establish the current limits on ICT performance due to known environmental concerns and then developing new ICT techniques to provide enhanced performance. In particular, substantial advances can be achieved through the innovative use of renewable sources," he added.

The collaborative project will draw together leading research in three key areas: optical networks (led by Professor Elmirghani at the University of Leeds), optimization of internet and Web protocols and services (led by Professor Jon Crowcroft at the University of Cambridge) and optical routing and data communications (led by Professor Richard Penty and Professor Ian White at the University of Cambridge).

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Notes to editors

1. In 2007, information technology research and advisory company, Gartner, Inc., estimated that the global information and communications technology (ICT) industry accounted for approximately 2 percent of global carbon dioxide (CO₂) emissions, a figure equivalent to aviation (www.gartner.com/it/page.jsp?id=503867).

2. Professor Elmighani holds the Chair in Communication Networks and Systems in the School of Electronic and Electrical Engineering at the University of Leeds. He is also Director of the Institute of Integrated Information Systems. Also working on the project at Leeds will be lecturer in communications, Dr Li X Zhang.
3. The work at the University of Cambridge will be led by Professor Richard Penty and Professor Ian White from the Department of Engineering. They will be joined by Professor Jon Crowcroft, Professor Andy Hopper and Dr Andrew Moore from the Computer Laboratory and Prof. David MacKay, from the Department of Physics.
4. The School of Electronic and Electrical Engineering at the University of Leeds is the top electronic and electrical engineering department in the UK (2008 Research Assessment Exercise); an impressive 80% of research activity is rated as internationally excellent or world leading. With 50 academic and research staff and 400 students, the School is a major player in the field of electronic and electrical engineering.
5. The 2008 Research Assessment Exercise showed the University of Leeds to be the UK's eighth biggest research powerhouse. The University is one of the largest higher education institutions in the UK and a member of the Russell Group of research-intensive universities. The University's vision is to secure a place among the world's top 50 by 2015. www.leeds.ac.uk.
6. University of Leeds Institute of Integrated Information Systems (I3S): I3S is led by Professor Jaafar Elmighani who also heads the communication networks and systems research group. The activity focuses on storage area networks, next generation IP networks, WDM networks, ad-hoc and sensor networks, optical wireless systems (OW) and fibre-wireless systems and networks. Collaboration with industry has focused on (i) Next generation networks architectures and protocols (EPSRC TINA and HIPNet and EU IRIS) (ii) media content storage and delivery (EPSRC-DTI HIPNet and INSTANT and EU REACH) (iii) networks for e-science, grid and learning (EPSRC VESEL, EU PHOSPHOROUS).
7. The University of Cambridge is one of the world's oldest universities and leading academic centres, and a self-governed community of scholars. Cambridge comprises 31 Colleges and over 150 departments, faculties, schools and other institutions. Its reputation for outstanding academic achievement is known world-wide and reflects the intellectual achievement of its students, as well as the world-class original research carried out by the staff of the University and the Colleges.
8. Cambridge University Centre for Photonic Systems is led by Professor Ian White, assisted by Professor Richard Penty, and is part of the Electrical Division. The aim of the group is to study components and sub-systems for a range of applications, primarily in communications and sensing. The work of the group is in the three main areas of data-communications and RF systems, optical networks and ultrafast photonics. The group has very strong links with Professor Elmighani's group at Leeds, co-operating with him on 3 projects (HIPNET, TINA, INSTANT), and collaborates with a wide range of EU research institutions and industry.
9. Cambridge University Computer Lab: Led by Professor Andy Hopper, the Computer Laboratory is a department within the University of Cambridge that encompasses Computer Science, along with many aspects of Engineering, Technology and Mathematics. It consists of 38 full-time academic staff, 25 support staff, 40 post-doctoral research workers and 154 PhD students. The Networks and Operating Systems (Netos) group, headed by Professor Jon Crowcroft, has four main areas on which the group researches: A Public Computing Platform, best exemplified by the Xenoserver research; Open Mobile Systems, where there are many small projects with particular activities being focussed on shared infrastructure; Understanding Networks through Measurement; and How Policy and Economics interact with Communication, which originated in the multi-disciplinary Cambridge MIT Institute Communications Innovations Institute.
10. The Engineering and Physical Sciences Research Council (EPSRC) is the UK's main agency for funding research in engineering and the physical sciences. The EPSRC invests around £800 million a year in research and postgraduate training, to help the nation handle the next generation of technological change. The areas covered range from information technology to structural engineering, and mathematics to materials science. This research forms the basis for future economic development in the UK and improvements for everyone's health, lifestyle and culture. EPSRC also actively promotes public awareness of science and engineering. EPSRC works alongside other Research Councils with responsibility for other areas of research. The Research Councils work collectively on issues of common concern via Research Councils UK. www.epsrc.ac.uk/