European Commission

Science for Environment Policy

New cloud computing network could cut GHG emissions from ICT

The growing use of Information and Communication Technology (ICT) services is producing an increasing amount of greenhouse gas (GHG) emissions. New research has proposed a network model spanning Europe, USA and Canada that uses 'cloud computing' to supply renewable energy to IT data centres.

Current approaches to reducing GHGs from ICT focus on reducing energy consumption at the 'micro-level', i.e. making systems more efficient through design and technology. However, some suggest that this approach will eventually produce an overall increase in energy consumption, due to rebound effects, whereby greater efficiency leads to greater use of devices.

An alternative 'macro-level' approach is to build IT data centres (the facilities for storing and managing electronic information) near green sources of power. However, many computing centres are not near these sources, so an alternative, as proposed by this study, is a distributed network that links data centres via cloud computing.

Instead of using local services, cloud computing uses a network of remote services that are hosted on the internet to store, manage and process the data. In this instance, its use would enable data centres to be powered by geographically-distant renewable energy sources

The Canada-based GreenStar Network (GSN)[1] initiative is the first worldwide attempt to provide ICT services based on renewable sources, such as wind, solar and hydroelectricity. The network consists of data centres that are built near renewable energy sources in Canada, the USA, Iceland, the Netherlands, Ireland, Spain and China. It is collaborating with the EU Mantychore project[2] to create low-carbon ICT networks that are managed through cloud technology.

This new study outlines GreenStar and Mantychore's network proposal, and presents some preliminary results based on a case study in Canada. The data centres consist of several devices, including the renewable energy technology (such as solar panels or wind turbines), a battery bank to store the energy and power distribution units (PDUs) to distribute the electricity.

Software is used to 'virtualise' each of the devices in the data centre, so they can be placed in a cloud that is controlled by a cloud manager. These 'virtual machines' are linked into the network and are always active and available to control. This means that 24/7 decisions can be made to meet the workload requirements of the devices and maximise the use of renewable energy by 'moving' virtual machines from one data centre to another, so they can 'follow' available renewable energy.

The study illustrated this with a simulation of a solar PV system installed at a data centre in Ottawa. With no cloud network or virtualised systems, when the charge is small or the solar PV system is off, the data centre is powered by the battery bank and then the national grid. This means that, from mid-December to January, the centre is permanently powered by the national grid.

However, in the new cloud computing system, the virtual machines can be relocated to data centres with available renewable energy supplies when the solar power dwindles. In the case of Ottawa, this would result in an 80% increase in the time when the data centre is entirely powered by solar energy.

21 March 2013
Issue 322

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Source: Nguyen, K.K., Cheriet, M., Reijs, V., Mackarel, A. & Pastrrama, A. (2012) Environmental-aware virtual data centre network. *Computer Networks.* 56:2538-2550. Doi: 10.1016/j.comnet.2012.03.008

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1 See: www.greenstarnetwork.com

2. Mantychore (Provide infrastructure resources and IP networks as a service) is supported by the European Commission under the Seventh Framework Programme. See www.mantychore.eu