



ORGANISATION FOR ECONOMIC
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Workshop No. 106, held by the **OECD** on 16 September, 9.00 – 11.00, Room 5

Cloud computing for leaner and greener IT infrastructures in governments

Main points raised during the workshop

Cloud computing provides opportunities to rationalise IT services, applications and infrastructures. The potential cost implications have led some governments to embrace cloud computing as a means to reduce public spending during the economic crisis. Examples show that cloud computing can make the provision of public services more agile and cost-effective. In emerging economies, it has the potential to increase citizen use and uptake of public services because different channels can be used for access, including low-cost mobile devices.

Discussants noted that “leaner” can also mean “greener” IT infrastructures. However, creative approaches and financing options are needed to reduce the environmental footprint of the growing number of servers and data centres worldwide. Technical measures were discussed, e.g. increasing efficiencies of single data centres, as well more systemic approaches: cloud computing can enable better utilisation of IT resources, effective pooling of information and it can help increase the use of renewable energy to power data centres. Government policies can facilitate developments, e.g. through demonstration projects, and help develop business cases for “greener” data centres, e.g. by creating access to carbon financing mechanisms. But in order to realise the economic and environmental benefits, discussants highlighted that policies must be comparable across jurisdictions; security and privacy issues need to be addressed.

Communication and information “gaps” still exist between areas of ICT and environmental policy-making. Discussants highlighted the need to develop clearer messages about the potential of “smart” applications of IT and the Internet in mitigating climate change and adapting to its impacts.

Speakers

The workshop was moderated by **Arthur Mickoleit**, Policy Analyst, OECD. Distinguished panel speakers were:

- **Ms Cristina Bueti**, Policy Analyst, International Telecommunication Union (ITU)
- **Ms Heather Creech**, Global Connectivity Director, International Institute for Sustainable Development (IISD), Canada
- **Ms Laura Dzelzyte**, Climate Change Advisor to the Minister of Environment of Lithuania
- **Mr DR Govind**, Head of e-Infrastructures Department, Ministry of Communication and Information Technology, Government of India
- **Mr Tracy Hackshaw**, Chief Solution Architect, National Information and Communication Technology Company (iGovTT), Trinidad & Tobago
- **Mr Deepak Maheshwari**, Director, Legal Affairs, Microsoft India
- **Mr Robert Pepper**, Vice President, Global Technology Policy, Cisco Systems
- **Mr Christian Reimsbach Kounatze**, Policy Analyst, OECD

Context

Cloud computing over the Internet involves the use of remotely-hosted hardware and software. It is a strategy to rationalise ICTs infrastructures through computing and storage consolidation. This means reduced costs for organisations such as governments (and businesses), e.g. lower capital expenditures on server purchases and lower operating expenditures on maintenance and electricity. Benefits can be grasped by any government, but context-specific challenges apply.

Scaled to the global level, cloud computing has the potential to limit the growing energy consumption of servers and data centres (in the public and private sectors). Computing and storage of information on servers requires energy for operation and cooling. Global electricity consumption from these activities has doubled between 2000 and 2005, and the pace of growth continues into 2010. Given that the majority of global electricity production relies on combustion of fossil fuels, this trend directly impacts levels of greenhouse gas emissions.

The OECD is analysing the emerging impact of cloud computing and related policy implications. The 2009 OECD Technology Foresight Forum discussed economic impacts, challenges to regulation, and potential security and privacy challenges. The OECD also analyses the environmental benefits and burdens that arise from the use of ICTs. In 2010, it issued a policy recommendation on ICTs and the environment, which guides governments in formulating “Green ICT” policies.

For further information, contact the workshop organiser, Arthur Mickoleit: arthur.mickoleit@oecd.org

OECD work on *Cloud Computing*: <http://www.oecd.org/sti/ict/cloudcomputing>

OECD work on *Smarter and Greener ICTs*: www.oecd.org/sti/ict/green-ict

Internet Governance Forum: <http://www.intgovforum.org>

IGF 2010 host country Lithuania website: <http://www.igf2010.lt>

Arthur Mickoleit opened the workshop by welcoming the audience and introducing the distinguished panellists. He alluded to cloud computing as a technology with double potential – economic and environmental. Governments in OECD countries such as the United States (apps.gov), United Kingdom (G-cloud) or Japan (Kasumigaseki cloud) have embraced the concept of cloud computing to rationalise the costs related to creating and maintaining “in-house” IT applications and infrastructures. This workshop would aim to provide complementary views from non-OECD countries such as India or Trinidad & Tobago. At the same time, environmental opportunities arise from the more efficient operation of IT infrastructures. Improved efficiencies can impact electricity use and potentially lower greenhouse gas emissions from government IT activities. Arthur invited speakers to comment on this double potential of cloud computing and to indicate potential pitfalls and policy implications.

DR Govind provided an overview of the Indian government’s plans to use cloud computing for the delivery of e-government services to citizens. India plans to provide over 90% of public services using cloud computing services instead of applications running on “in-house” IT infrastructures. To provide an order of magnitude of this plan, DR Govind alluded to India’s continued impressive economic and social development. The growth of the population and the economy poses unprecedented challenges in improving healthcare, education, skills development, national security and the environment. Innovative IT and broadband applications, e.g. in the area of cloud computing, are important to tackle these challenges. Moreover, he highlighted how government cloud initiatives positively impact domestic IT firms, including small and medium-sized firms around cloud services.

Robert Pepper defined cloud computing, highlighting that public, private and hybrid clouds refer to the same technology, albeit with different governance rules. For governments, the main advantages of cloud computing are the facilitation of procurement and purchase processes – hardware purchase, maintenance and amortisation costs are largely replaced by service costs – and the possibilities to scale on demand. Users of cloud-enabled government services can access these services with a variety of devices and via many channels. Access devices can be low-cost, which has important implications for the reach of e-government services in developing countries. Finally, Robert underlined that cloud computing services are becoming increasingly efficient with reduced electricity consumption per user.

Arthur Mickoleit used Robert’s final remarks to point to the importance of assessing absolute increases in electricity use and greenhouse gas emissions from Internet activities such as cloud computing. Arthur informed the audience on the OECD framework for ICTs and environmental challenges. Cloud computing touches upon the environment on all levels of the framework: direct impacts from electricity use, enabling effects through the use of “smart” ICT applications such as tele-work, and systemic impacts such as shifting dispersed data centers to consolidated data centres via cloud computing.

Heather Creech presented the results of a study on using carbon credits to “green” data centres. This research, undertaken with CANARIE, aims to leverage national fibre-optic networks to relocate data centres of universities and/or share their computing resources using a “community cloud” configuration. Three options that were studied: i) building new data centres in proximity of renewable energy sources but far away from urban zones; ii) building new data centres closer to urban centres, but in provinces that have a higher share of renewable energy in electricity generation; iii) modifying existing assets to make better use of excess heat generation for district heating. None of these options were found to be economically viable solely based on carbon credits. A fourth option put forward by the study is that of a “green community cloud” shared by individual universities, which would help optimise utilisation of IT assets and provide shared repositories for information from publicly-funded research. Heather highlighted that policies to

support such community clouds must be validated and implemented across jurisdictions, i.e. across national or other administrative borders.

Laura Dzelzyte provided the view of an international climate change negotiator on the role of ICTs and the prospects of carbon financing for “greener” data centres. She assured the audience that there is both interest and need for empirical evidence about the role of ICTs for international climate change negotiations. Laura conceded that appropriate financing solutions are key to the success of projects such as the Canadian one on “green” data centres. But she also noted that carbon trading is unlikely to be a solution in the short run because of the complexity of the issue and the lengthiness of international negotiations in this area. She suggested financing options for environmentally beneficial ICT projects might exist with the international financing institutions, e.g. World Bank or EBRD.

Robert Pepper agreed that financing from carbon credits might not be viable in the short term. But with reference to Helen’s remarks he highlighted the great potential for tackling underutilisation of data centres through shared cloud resources. Cloud computing enables services provision by every level of government – national, federal, local – without having a data centre at each level and the environmental impacts that go with.

Cristina Bueti outlined the activities of the ITU in the context of international climate change negotiations. It works with other international organisations, e.g. OECD and WIPO, to inform policy-makers about the potential contributions ICT applications in the context of climate change monitoring, mitigation and adaptation. The ITU develops messages about the double potential of the ICTs: providing ways to drastically reduce environmental impacts in different industry sectors while also lowering the sector’s own environmental footprint.

Deepak Maheshwari accentuated the importance of cloud computing for business growth in emerging economies, notably India. He provided the example of an export-oriented textile industry cluster that used relatively little IT to manage and share resources. Microsoft, in collaboration with the local industry association, developed a “community cloud” that helped spur IT uptake and use among the textile sector firms. The data centre was hosted at the association in order to guarantee security and confidentiality of competitors’ data. Access to cloud services was provided via mobile phones in order to cater for the specific needs of the users. Deepak said this model of lean IT infrastructures can also be applied to provide governments easy and affordable access to ICT services and applications.

Tracy Hackshaw discussed how a Small-Island developing state views the opportunities of cloud computing. The impacts of climate change are most tangible in countries such as Trinidad & Tobago. He said that cloud computing might be beneficial from an environmental point of view, but it is certainly necessary in small states from a resources point of view. Skills needs and maintenance costs for individual data centres are high. So instead of having one data centre per small-state government, cloud computing could allow for pooling resources across states in the Caribbean region. He pointed to connectivity issues that would need to be resolved.

Christian Reimsbach Kounatze gave an overview of “Green ICT” policy priorities of OECD countries. Most governments have R&D and more general innovation programmes in this area. And they are using internal cloud computing projects to demonstrate the technology opportunities. However, he highlighted that most governments formulate policies regarding the energy use of ICTs, neglecting somewhat environmental impacts categories such as land and water use that are important in the context of data centres. He also indicated that there is potential for further cross-sector policies of using ICTs, e.g. in transport or energy. He concluded by saying that e-Government programmes increasingly focus also on the interactions with broadband and cloud computing developments.