Endless Arguments in Systems Design, or, has the GENI lost its bottle?

Presentation by Jon Crowcroft

Followed by Question & Answer Session

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This conference will be conducted in English

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Speaker: Jon Crowcroft,

Jon Crowcroft is the Marconi Profesor of Communication systems in the Computer Lab, at the University of Cambridge, almost exactly almost exactly 100 years after Marconi's "groundbreaking" first transatlantic wireless call and is also a fellow of Wolfson College. Until the end of September 2001, he was a professor in the Department of Computer Science, University College London. He graduated in Physics from Trinity College, Cambridge University in 1979. In 1981 he achieved an MSc in Computing, and in 1993 a PhD, both from UCL. He is a fellow of the ACM, a fellow of the British Computer Society, a fellow of the IE[ET] and the Royal Academy of Engineering and a fellow the IEEE.

Currently Professor Crowcroft is undertaking a sabbatical at IMDEA Networks, Madrid, where his main research interests are Communications and Multimedia Systems, particularly those related to the Internet.

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IMDEA Networks: The Madrid Institute for Advanced Studies in Networking Technologies (IMDEA Networks) is a non-profit organization, established as a Foundation, whose main objectives are to provide advanced research capacities in networking technologies and to offer a world-class post graduated education, thereby becoming a world-leader in its field.

Its mission is to create value by leading research in protocol, algorithm and systems developments, to enable the Future Wireless Internet. This is made possible by conducting research and developing innovative and useful scientific and technical advances, whilst actively promoting their successful transfer to market.

IMDEA Networks depends on its team of world-class researchers and state-of-.the-art technology and equipment at the Scientific Park of the University Carlos III of Madrid (Leganés Tecnológico), carrying out its work in close collaboration with industry.

There are two themes in GENI which the Americans are ill equipped to pursue:

1. Vitalizing the Next Gen. Internet,
2. Next Gen Internet Wireless

1. Veni, Vidi but not Vici and certainly not Vini.

In work at Washington St Louis and Stanford on network virtualization a lot of the research is predicated on lots of fancy hardware for forwarding (viz NetFPGA) (a recent SIGCOMM reject by UCL/Lancaster people on this got multiple GigEs at line rate fairly nicely - a good solid piece of work on mid-range affordable virtualized routers) - but that is virtualized _forwarding_ - the real control plane is the routing protocols- if you want to virtualize that, its because you want multiple co-existing routing computations (possibly for isolated VPNs, or possible for services for different users or for robustness to attack etc etc etc) so then what you want is META routing.

2. How not to do Wireless.

Researchers at Nokia and in the Israeli milspec radio labs know how to do antennae, coding and modulation - they are many years ahead of anything any US lab is going to dream up - so the GENI wireless projects in that area are wasting their time - even the MIT clever packet and physical level net coding stuff is pretty much all done now....

What is needed is a systems approach to large scale wireless - problems in mesh, multi-hop, multi-radio, cooperative coding, but more importantly, in disconnection tolerant, and hybrid cellular/mesh are more important. But more important still is what to do with smart resource management when spectrum lication is more dynamic and when primary and secondary spectrum users co-exist. What to do about battery life and incorporating that, as well as buffer/storage (smart phones with multi-gigabytes of flash) in infrastructureless networks - what are the capacities? What kind of applications? What sort of mechanisms to delay bound delivery or cache evict or clock synch or provide infrastructure free anonymity, privacy, payment, locality service without compromising privacy, etc etc. More fundamentally, the net in a multi-radio etc etc is not a graph. not remotely - one simple example we've been looking at is inter-domain MANETs - you don't have "borders"....you don't have "edges" - if you have cooperative coding, you don't even have "vertices"....

Finally, in the 3rd part of this talk, I will try to link together what I believe to be the more interesting program of US (and European) research in Data Driven and Declarative networking, which forms, for me, the greater contribution to the future of the net in terms of decentralized control.