Ubiquitous Computing – Chips With Everything

Conservative Technology Forum Meeting
House of Commons
Monday, 26th March 2012

"The Internet and the Internet of Things is the Wisdom of the Earth" Wen Jibao: Chinese Premier

Chairman's Overview Summary

Philip Virgo:

"*British innovation is opening the doors to a new wave of change, from ubiquitous computers, smart meters and telecare to smart buildings and infrastructures. But it is the Chinese who have the political vision (from Wen Jiabao down) to embrace the opportunities for transforming the physical and well as the economic environment – including with smarter, cleaner cities requiring half the power.*

Awareness of the opportunities, let alone of the need for joined-up policies is minimal in the West. In consequence, leading edge UK companies are working with Chinese and American partners on the inter-operability standards that are central to smart, low carbon, world of the future while UK departments and regulators appear to be mandating fragmented and expensive planning and procurement programmes to protect the economic dinosaurs of the past. There are issues to do with privacy and personal choice and control (e.g. do you or the power company, or the regulator control your smart meter?) but the future is bright, provided we act quickly to remove barriers to market-driven, investment-led, economic recovery, instead of trying to "pick winners" as part of a Stalinist, Whitehall co-ordinated, "industrial strategy"

The meeting identified a number of areas for urgent policy attention to enable the UK to capitalise on its lead and bring forward the massive domestic energy and efficiency savings in prospect as part of a new industrial revolution in which British industry, working within global partnerships, is once again a leader, not a laggard. "

Report on Formal Presentations

Rapporteur: John Riley, Event Organiser

Presentations by
Rob Barnes, **European Director of Embedded Marketing at ARM**
Jenny Sener, recently retired from role as Director of ICT and Shared Services, OCS Group
Dr Robin Daniels, Executive Vice President, & John Stenlake, CTO, of Living PlanIT
Followed by
Questions and Informed Comments
Suggestions to Consider for Government Policy

Rob Barnes, **European Director of Embedded Marketing at ARM** highlighted the scale of the impact the exponential growth of Internet-connected chips and resulting data and the massive 30-50% savings this will enable in energy costs and consumption.

(ARM, a British Cambridge-based company is world leader in intelligent chip design with virtually every mobile phone containing its technology, is at the very forefront of this third wave of Internet usage expansion).

Huge Increase in Internet Usage Imminent

The PC with the World Wide Web first enabled us to access the Internet on a huge scale, said Rob Barnes. Next there was a massive jump in Internet usage through the smart phone. This third era we are currently entering - "The Internet of Things" - is about Internet connection via intelligent chips which will sit, for example, within electrical motors, pumps, meters, air conditioning systems, or domestic appliances. They will respond intelligently to their environments to maximise efficiencies to achieve huge operational savings.

He pointed to the sheer scale of proliferation. Today there are about 12-14bn internet connected devices. According to Ericsson that number will rise to 50bn by 2020 and Cisco reckons that will reach 1 trillion by 2025. At the same time chips are becoming smaller and more powerful and their cost is plummeting.

What is New about the Internet of Things

He stressed that The Internet of Things is separate from Machine-to-Machine interfaced devices which have been with us for some time in for example vending machines and using

cellular connections. That is a sub-set of the Internet of Things and a much smaller market comprising millions of devices, not the billions of the latter. Internet of Things devices go much wider, with multiple sensors interconnected before linking to the Internet. They relate to servers, mobile phones, measurement devices such as voltage or water flows, and they incorporate communications protocols to pass on data which can be connected to the Internet in a cloud-based environment.

Huge Increase in Data Traffic

The amount of data these smart chips will generate is massive, he added. There will be a quadrupling of the amount of data in the next few years, with each person having at least two additional connections and at least two more people additionally connected. Citing Cisco, he said that global Internet data traffic will reach 80.5Exabytes per month by 2015 – that is the equivalent of 28m DVDs an hour.

Huge Opportunities in Related Services

The smart chips are only part of the story: there will be huge opportunities for those engaged in manipulating the data they generate and cloud-based service companies will be opening up fresh markets for Internet of Things based services.

The range of applications will be huge. The best examples we can currently see are to enable smart metering and smart energy. Among the early Internet of Things applications we can expect to see will be in demand response systems for example to turn fridges on and off according to the environment, or measuring the moisture content of flower beds.

Huge Energy Efficiencies

A key area, he said, is in motor control. Motors account for well over 40% of all electricity consumption and they are inherently inefficient. They range from 40-70% efficiency which is why many industrial unit over-specify their motors. Through the Internet of Things there are 30-60% energy savings to be made.

There are comparable savings to be had by real time measurement in other areas – pumps, flows, heating, lighting, vibration. For example, we can expect 30% savings from water usage with ARM participating in trials in India and Turkey, he said.

UK at Forefront of White Space Innovation

Along with the huge increases in smart chips and data, British technology is enabling low cost bandwidth for Internet of Things devices via "White Space" with TV bandwidth released with the digital switchover.

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Jenny Sener, recently retired from role as Director of ICT and Shared Services, OCS Group

(OCS Group is the UK's largest private property services company (turnover >£500m pa) employing 30,000 people, and Jenny provides the viewpoint of a technology based business director.)

We are entering the 3rd Internet Age with Sensors Everywhere

Tim Berners-Lee recently commented that 'it is time to re-imagine the Web' and he's spot on, said Jenny. The first and second ages of the Internet have already had a profound transformational social, economic and political impact. If it were a country, the Internet economy would be the 5th largest in the world, ahead of Germany. In the G8 countries 21% GDP growth was derived from the Internet.

We are now on the cusp of the third Age of the Internet, where we will see intelligent sensors and controls in everything. This has exponential potential for us all as those chips will be embedded in physical things ranging widely from, for example, vehicles and pacemakers to buildings and crop fields.

Internet Economy is 8.3% of UK GDP – and Growing at 10% pa

The numbers point to a powerful push forward. In the UK the Internet economy accounts for 8.3% of GDP, closing on the 9% from the finance sector. With that 8.3% growing at 10% a year the Internet economy is of huge national significance.

On top of that, the billions of Internet of Things devices will transform our world enabling smart and sustainable technologies, which will drive more innovation and economic growth.

The UK currently has a high labour and high fuel cost economy and to compete we need the scale of smart and sustainable resource management the Internet of Things opens up.

Internet of Things – a Game Changing Technology

The Internet of Things is a game changing technology for real estate, for example. Embedding smart sensors in offices, schools, hospitals or homes enables us to slash 30%+ off energy costs. In healthcare applications, embedded smart chips will automate and regulate processes and improve the patient environment – especially important in the UK with its ageing population. There are also significant gains to be had in major efficiencies in transport and agriculture.

UK is well placed to lead this next generation Internet usage

The UK is well placed in the Internet economy. As a percentage of GDP, the UK has the largest Internet economy in the world at 8.3% (the EU average is 3.8%), and our Internet related exports are almost three times what we import. We also have world leading players, and let's not forget our trail-blazing history in computing from Babbage and Turing to Tim Berners-Lee's World Wide Web.

High Engagement and Political Leadership from Chinese Premier

'One thing that leaps out for me', she said, 'is the high level of engagement for the Internet of Things in China. Do a Google search of "Internet of Things" and "Wen Jiabao" and you will find references gushing at you– just contrast that by putting in "Barack Obama" or "David Cameron"', she said. 'This is of great concern to me, as I know the potential of this technology', she added.

Chinese premier Wen Jiabao has said: "The Internet and the Internet of Things is the Wisdom of the Earth". China is already grasping the Internet of Things opportunity. Its 12th Five Year Plan includes the development of the smart power grid, transport, logistics and agriculture. Shenzen province is already building two industrial parks based on the Internet of Things technology.

Need to Ensure Britain Keeps its leading Place in the new Internet of Things Economy

France is assiduous in promoting "national champion" industries – the UK should promote "national innovators" in Britain plc. We need to rebalance the economy to favour innovators, to incentivise banks to invest in innovators, to improve tax incentives and provide university scholarships for science and technology. Above all, we must applaud achievement.

Britain is already a leader in the world internet economy and business and political leaders need to leverage this position to ensure that Britain remains at the forefront of innovation and opportunity.

Finally, Jenny commented: 'I am passionate that Britain continues to lead the charge with these growth technologies.'

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Dr Robin Daniels, Executive Vice President, & John Stenlake, CTO, of Living PlanIT

(Living PlanIT is engaged on fundamental work across London and with Greenwich and Newham Councils in particular, focused on providing a robust IT basis for sustainable regeneration. This is in addition to projects in China, Latin America and Portugal. All of these projects are driving the deployment of a common integrating and orchestrating software platform for smart-urban environments – the Urban Operating System.

The Internet of Things requires massive integration and collaboration

We are moving to a world where we have sensors everywhere, said Robin Daniels. You can put many thousand sensors in a building but the trick is to do useful things with the data you collect to make it work for the inhabitants.

The Internet of Things requires integration of technology on a scale larger than any one company can manage. Therefore Living PlanIT, itself a software company and only part of the solution, works in partnership with large companies such as Cisco, Microsoft, Deutsche Telekom and Hitachi none of which are big enough to cover the Internet of Things waterfront by themselves.

Urbanisation is a spur to Internet of Things Uptake

Real estate, he said, is the only sector that has declined in productivity. That is why, for example, China, with its huge urbanisation programmes, is so heavily engaged with the Internet of Things to build in capability for the future – for example to cope with water supply which even today is insufficient for their needs. The UK has a huge export opportunity in this area, he said

Applying Efficiencies through the Internet of Things in Greenwich and Newham

Living PlanIT is working with UK real estate development company Quintain to identify how Internet of Things technologies can best be deployed in developing the Greenwich Peninsula in London, and how to better engage the private sector here. It is also doing similar work at Newham, like Greenwich, another public sector body looking to stimulate local GDP by exploring the Internet of Things.

To attract the private sector to engage with these public sector projects Robin talks in terms of efficiency rather than sustainability. Developers need to understand the commercial argument for embedding Internet of Things technology, he said. They want to know why they should pay extra for technology. A smart building stuffed full of technology that is not used effectively and efficiently is as useful as an airplane standing on the tarmac that doesn't take off, he said.

Living PlanIT spearheads Internet of Things Data Integration and Alignment

John Stenlake continued by highlighting Living PlanIT's data and controls platform which provides a consistent way of connecting together all the sensors and devices for a building. His aim is to do for the building environment what Windows did for the PC.

The Greenwich and Newham work draws on and complements Internet of Things related work that Living PlanIT is also doing for a new city in China and a pilot project in Portugal.

Living PlanIT places strong emphasis on a long term approach to data integration and alignment, interrogating historical data from smart devices for predicting, for example, the peaks and troughs of demand which are important for energy management. The company is looking to do this continuously to enable buildings to become more efficient as they age.

Plan now for the long term

Policymakers need to look to long term sustainability of the systems they put in – too little is currently done to demonstrate efficiencies over time. KPIs should be collected from the whole environment with serious intent to drive efficiencies through.

Public data should be freely accessible through protocols, he said, but with regard for security which is necessary for privacy. The Internet of Things is bringing more opportunity to join data together and we need to get the balance between transparency and security. Mandates such as the right to be forgotten can cause difficulties in finding and tracking data to be purged.

Care and consideration is needed when it comes to certain building regulations – for example, the EU regulations for smart meters mandate a particular type of meter to be used by 2013. However that specification has been overtaken by developments. In this case policy should be about mandating smart metering – not smart meters.

Above all, adoption of the Internet of Things needs to provide clear benefit to the consumer.

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Questions and Informed Comments

● On China, we welcome Chinese companies to input into policies, for example in cleaning up environments such as derelict industrial areas and turning them into areas for high tech growth. The Chinese introduced a high tech complex on top of old steelworks in Beijing before its Olympics - that resonates with what we are doing at Greenwich, previously very polluted. They offer a mix of future and past.

● The Chinese drive on using IPv6 (the protocol which supports meteoric rise of the Internet of Things) raises a lot of issues. For example, should our core partnership drive be with the Chinese rather than the US or Europe?

● The Chinese are so interested to learn. They are not ripping everything off now. We have established ourselves as a Chinese company. There is a desire to learn there and they pay to get access to leading technology. The Chinese learn very quickly – they throw manpower at it. They have bought hundreds of millions of smart meters. There is a great set of knowledge there on IPv6. We need to work with partners to interoperate – interoperability drives unit prices down.

● Even the largest firms can no longer provide the whole pie. We all have to go forward with open standards and interoperate in pan-national partnerships. It is time to grab these big opportunities. They will be huge. I couldn't have foreseen the transformations the Internet has brought so far, and it's the same with this 3rd era of the Internet we are entering.

● I agree with those points on China – interoperability is critical. There is a lot of competition going on within China to establish the model for the Chinese city. The Chinese are increasingly looking outside their national boundaries and their drivers are like the ones we have: smart transport, clean energy and utilities. There is still concern over IP. The Chinese want to move quickly with in a multi-faceted way. IP bleed risks splitting partnerships but we are working with Japanese and Singaporean partners to help ensure that doesn't happen.

● China is shifting from an era where it copied to get engagement to one of shaping interoperability and outcomes. For interoperability we need to work at setting standards – standards are lamentable in many areas. We need the right sets of standards for stacks. The only way to drive standards is to go out and do things and then slam them together. Thrashing our standards from first technical principles rarely works. You need to take pragmatic real projects and turn them into the next generation of standards.

● The Chinese government is offering tax incentives to develop in this area

● It is critical to have key performance indicators (KPIs), and integrated reporting.

● Very clever companies are looking at how they can interoperate in this area (Internet of Things). Look at the thinking here – for example Bill Ford's work on gridlocks in the transport industry where the car is just a tiny part of the infrastructure. We are beginning to develop a level of integration for the Internet of Things that the motor industry hasn't.

● Major companies such as General Electric, Deutsche Telekom, Microsoft, and Cisco are doing deals with Living PlanIT for example because each has a part of the solution and are beginning to realise how interoperability increases the value of that part. Microsoft, for example, realises that despite the size of its own platform, it needs to look at being part of a wider platform than they can build themselves.

● The amount of urban development is huge. There is a pressure in China for urbanisation. I think that can only be justified if it leads to quality of life – with services built in to improve quality of life. The Mayor of Newham realises that intelligent infrastructure will deliver better services.

● We in OSCRE are building a data dictionary of every bit to do with real estate, and are looking to co-ordinate activities in all areas of real estate, including the Internet of Things, cities, and sustainability across all three political parties. Government is trying to collect information on energy and sustainability but it's unsure what it should be doing with it. We do know that it needs to involve commercial sectors.

● Start looking at the outcomes you want to drive. Complexities unpick at every level here (chips, boards, power, communications, semantics, commercial).

● To work effectively the Internet of Things has to work at both the technical and the commercial level. One intelligent weather management system for example will have a lot of data feeds to work not only horizontally but for vertical specialist areas. There is a lot to do.

● If you can't get bandwidth and data on the same licence it falls apart. Some standard IPR models don't represent the networked world. It would be difficult to unpick information sent out to thousands of people running different IPR policies.

● With such pitfalls we need to be cautious for example about calling for tax incentives. It is easy to have a policy of picking winners, but as we saw in the case of smart meters we need to ask who is it functioning for? Were the smart meters to enable users to pick the best tariffs, or for suppliers to ensure that users pick their option and not necessarily the best option for the users. Not that it is necessarily bad to do that if, for example, a company has invested in the infrastructure

● We have to beware any desire of the regulator to protect citizens from having a choice

● We need to take caution from the lessons above. I note the smart meter policy has been bumped again and put back. That means that for two million smart meters there is no clarity about many areas. At the recent Nominet conference we were alerted to the opportunities the Internet of Things provides for clandestine investigations.

● Privacy has not been mentioned so far. We have heard about the benefits of the Internet of Things but it is the opposite for those for us concerned with privacy – consumer protection is not being built in.

● Consumers are prepared to give up privacy for benefit when it comes to loyalty cards. We need to ensure the value matches what you give.

● The economic driver is so powerful with 10% growth potential a year.

● Could we see freedom curtailed?

● These devices have the potential to do that.

● Innovation leads to control. There is a new type of camera which requires just a chip and no lens controlled via the Internet. Will a new era of give-away cameras bring dystopia - surveillance and control? How do we manage privacy in this new environment?

● It is a case of freedom versus control. To whom do you give the freedom to control? If the customer is empowered and in control there is more freedom. They can prioritise. For example, there would be a higher priority to keep an electric car charged at all times if one had a heavily pregnant wife, but not such a high priority for the water heater.

● How do we ensure more competition, more education and more choice? Many consumer protection agencies wrestle with that.

● Data privacy and data security are very different

● Problems arising with any technology depend on its purpose and how it is presented. If, for example, when introducing smart cards you target miscreants then non-miscreants don't see the benefit. You can control more of your information through a smart use. For example, there were many objections from constituents to the installation of CCTV. However following a major murder in the constituency many of those who had objected wrote to demand why some of the relevant CCTV cameras weren't working at the time.

● Politicians should be careful about being specific about how technology is used because it can be out of date before the legislation is passed.

● The Internet of Things ***will*** happen. How do we take advantage so that citizens see the benefit for themselves? Which areas do they want to restrain and which to permit?

● The problem with the Internet of Things is that it is ubiquitous and exponential. However, standards bodies work unbelievably slowly, so we are likely to see default standards set by market leaders.

● There needs to be agreement on a high level framework with description of metadata to link together as quickly as possible to ensure a control. It is difficult to do this through traditional standard routes.

● I am concerned about the counterfeit chip for criminal use (it *will* happen) and how to curtail it.

● The person who controls the trust computing module in your chip will be the person who you bought the device from. They will control the upgrades. You may own the code and the key but there will always be a higher level code in it.

● Security takes a long time to implement at the right level and at the right cost. After 12 years ARM is only now seeing its silicon secure. It will be some time before we see cost effective really secure belt and braces at the level of: the Device ID; Secure boot – number keys; Access to keys; Access to third party keys, etc.

● Trusted computing then relies on the supply chain for responsibility. The weakness is human handling of licensing, liability law and tort etc.

● Where is the bandwidth coming from?

● From new technology for the energy side – for every $1 on a smart phone there's $7 on the back end service side. The people providing value are those who provide data.

●There is a lot of technology, but with White Space that technology will take up less power because it is localised. Much of it will be on/off but not operating continuously. Sensor data compresses more than video data therefore not as taxing on bandwidth resource.

● What about extreme RF conditions blocking transmissions?

● Data interference from handsets is very little but they need to be able to operate independently until they can phone home.

● I wonder if the Internet of Things, driven by a scarcity of networking, will lead to efficiency in the data gathering process. I envisage fractal fragmentation into house networks and area networks.

● Is there protection around white space? I want sensor data to be a constant stream to stop people using traffic analysis to know whether I'm in the house or not.

● Even today the technology is there to measure which TV channel you're watching from the data streams – the brighter the screen the more energy is being used which makes it possible to reconstruct the TV channel.

● How cheap are jammers so people can't measure this?

● Biggest problem is availability and reliability of bandwidth

● should there be review of the spectrum space?

What are the political issues?

● The Internet is anarchic with no supra government agency. The Internet of Things is happening - will we have the bandwidth needed?

● We are not good at rolling out broad band in UK – this is a key area for policy makers moving forward to develop policies that ensure in UK we have access and properly managed ways to exploit the Internet of Things.

● Need to incorporate Internet of Things capability in real estate when doing a new build

● Anticipating bandwidth requests.

● We've been planning for White Space for years with the looming digital switch off – other bits of spectrum being evaluated – need to engage Ofcom

● Don't talk about politicians getting in the way or about the technology blocking the internet of Things because of bandwidth (limitations). Let it go and search for constructive ways to remove their concerns including over-abuse.

● Modernising infrastructure investment. We need to look at how to get private sector investment and allow investors to make a profit.

● Intelligence may bring additional intrinsic efficiencies over time. For example, a smart meter may initially require a lot of measurements a day through many inputs. With intelligence, that could go down to just a few measurements per year.

● Tracking parcels etc round Europe is not a technical problem. It may require, say, 1 bit a minute. The problem is how to licence it across Europe - how to get bandwidth when you need it internally and when you don't know when you will need it.

Ideas for the Way Forward from Attendees Following the Meeting

● Ensure political leadership, vision & communication from the top

● Government to commission a IoT technology strategy panel to develop and drive IoT strategy, includes commissioning sub-panels to work on interoperability, technical infrastructure & network bandwidth, security, legal framework, as well as fostering demonstrator projects

● Encourage technology focused investment - government to provide targeted incentives to banks and angel investors to develop a Silicon Valley style investing culture in Britain with some IoT demonstrator projects. This includes making tax incentives simpler and more accessible

● Legal/Security working party (control points, privacy, data security)

● Government to work with academia and business on scholarships, grants and prizes for IoT research and development to raise public profile of this key technology development.

● Document in broad-brush terms the validity of early growth forecasts about current usage in order to reinforce the validity of the current forecasts.

● Try to identify the areas of productive growth i.e. that which will produce profit. By this I mean that I do not regard a massive growth of games and online films to do much more than clog up bandwidth – for which not very convincing answers were given on Monday. I know the providers of such games, films etc will benefit, but what I would want to see is the gain in business and industrial activity.

● Encourage Government to have a major inter departmental, private and public sector involved initiative that considers the social implications of growth such as is being forecast, particularly in the areas of position and location of jobs, surveillance, access to personal information etc.

● Ensure processes are integrated. Full benefits only attained when processes are well integrated e.g. not much use having an online ordering system that takes an order in say 2 minutes, including payment, if the logistics of the delivery involve a 7 day wait for the product. Can now enjoy next day delivery with for example, UPS but have to wait days if sent by Royal Mail. Similarly maximum benefits attained with property management if all processes are integrated i.e. the Asset Management System, the Facilities Management System and the People Management Systems.

● Security – the greatest threat is now with people within – external defences have got so good.

● Whilst the technology is seductive, the social fallout from provision is the most important factor. Innovation giving more choice and easier functionality may be welcomed but when it is used to drive efficiency and cost reduction, then choice is often reduced and this produces backlash.

● A debate about the need for an integrated and intelligent (i.e. platform orchestrated) renewable energy policy, such as Waste-to-Resources, which goes beyond windpower and its dubious economics, would be both relevant and timely.

● Focus on outcomes - key areas such a carbon reduction, transport efficiency, assisted living become - key outcome focused commitments by public services where IoT/smarter planet solutions have a role to compete in delivering. Align with more for less policies and where budgets are under pressure. So, for example, extend the quality and extent of home

care provision to reduce burden on Health and local authorities and improve QoL with key benefits realisation metrics for example,

● Ensure the entire innovation support pipeline engages (So research councils, TSB etc)

● Kill off sector based, technology based or business model based interventions (so the patent box, the games industry, the various tax and capital allowance programmes and tech based environmental support programmes that are not subject to clear neutral rule-based use).

● The RF spectrum is a sparse resource, and it's looking pretty crowded, these days. Spectrum being freed-up as whitespace by activities such as decommissioning analogue TV should not necessarily be sold off to the highest bidder in the way that the 3G spectrum was, but instead further careful consideration needs to be made, regarding how much of it needs to be reserved for "Internet of Things" communications.

● Something could be done around encouraging whitespace-philosophy mesh-style comms by reserving a frequency range for "very local" RF comms (involving a minimum of requiring highly constrained power output on transmitters in this range). The regulation of the radio spectrum is a Parliamentary matter, so that's where this activity needs to happen. Inviting discussion with http://www.neul.com/ would be a sound initial action.

● Issues around smart meters require both standards and codes of practice. To make such things as generally applicable as possible, the industry regulators (OfWat, OfGas, etc) must be sat down with the utility providers until they can agree on these things. I would hope that recommending these organisations get together could be done simply by approaching the regulatory bodies involved, and making the suggestion. A preliminary set of agenda items could be:

a) ownership of smart meters
b) ease of transference of contracts between providers, in situations where the customer has a smart meter, or does not have a smart meter and requires one
c) whether a consumer can refuse to have a smart meter (or on taking ownership of a building which has a smart meter installed, whether they can demand its removal), and what happens when they do
d) privacy: how to ensure that traffic (including signals-level data such as the rate of traffic) from a smart meter will not unduly expose information about a building's occupancy, utilisation (or lack thereof)
e) privacy: establishing a code of practice about only using "non-leaky" subcontractors to process attributable customer data

● Ensure an appropriate balance is made between where data is gathered, where it is processed and where the results of that processing are acted upon, in order to conserve the use of (assumed) sparse resource such as network bandwidth; "data localism", if you will. This would seem to be a task for an advisory body within the smart device industry; suggest asking Living Planet whether such a body exists, and if so, what its views on the subject are.

● Communication standards must remain universally applicable; at an Internet level this appears to be the role of the IETF, and I was rather surprised and a little alarmed to hear that interests in China seem to be going their own way. IPv6 is, realistically, the only way to go, although I have my own concerns that even the address space that IPv6 makes available is, ultimately, not large enough. While there may be conflict of interests involved, pressure on Chinese industry to "play nicely" with international standards bodies can only realistically come from Western companies working with China to develop networked products.

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