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techUK response to Ofcom call for input: Promoting investment and innovation in the Internet of Things (IoT)

October 2014

10 St Bride Street
London
EC4A 4AD

T 020 7331 2000
F 020 7331 2040
www.techuk.org

techUK | Representing the future

Contact: Skye MacLeod | Programme Executive
T 020 7331 2191
E Skye.MacLeod@techuk.org

Introduction

About techUK
techUK represents the companies and technologies that are defining today the world that we will live in tomorrow. In a very real sense techUK represents the future.

At the heart of tech in the UK is an ecosystem of 270,000 companies producing digital technologies, products and services. From east to west, north and south, from enterprise class organisations to established medium-sized businesses, growing small businesses and an exciting generation of tech start-ups: the UK is a hotbed of tech talent and techUK exists to represent the sector in its entirety.

Our role as techUK is to ensure that we seize the potential for good and address the disruptive new challenges that change and innovation always present. We work to understand the opportunities that technology provides; to support the companies and innovators that can realise those opportunities.

This underpins our simple vision to ensure that tech is good for the UK, the UK is good for tech and that tech is good for people.

Preamble

The world is in the midst of a dramatic transformation from isolated systems to Internet-enabled devices that can network and communicate with each other and the cloud within Next Generation Networks (NGN). IoT is being driven by the convergence of increasingly connected devices across a multitude of different platforms (land, sea, air and space), compute and data economics, and the proliferation and acceleration of cloud and big data analytics. This shift in technology is generating unprecedented opportunities for the public and private sectors to develop new services, enhance productivity and efficiency, improve real-time decision making, solve critical societal problems, and develop new and innovative user experiences.

techUK supports timely and innovative policy initiatives to create a favourable regulatory and commercial environment enabling deployment of IoT applications and services benefiting public and private sectors and ultimately positively impacting UK GDP.

1.46 *IoT definition, applications and demand*: The range of IoT devices, applications and supporting services that is likely to emerge across different industry sectors, along with views on potential market size. We are particularly interested in stakeholders' definitions of the IoT and views on which applications are likely to dominate and the characteristics of these applications (in terms of their range, quality of service, connection speed and data throughput, radio cost, battery life etc.).
techUK notes that due to IoT and M2M covering wide ranging deployments and applications positively impacting all aspects of industry and consumers it is therefore difficult to have one single definition. The UK is well placed to set the pace in IoT innovation and development thus could be some benefits from further discussion on potential descriptions of IoT covering the following areas –

- applications of IoT including B2B and public sector
- description of IoT benefits including reduction in energy costs, delivery of public services
- importance of IoT device / network interoperability

IoT demand is also difficult to quantify but some examples from third parties are provided below as examples –

McKinsey Global Institute identifies the IoT as one of the most under-hyped technologies with great economic potential – on the scale of $2.7 to $6.2 trillion of estimated global economic impact in 2025.

IDATE Research projects that Europe will be the most valuable region in a global machine-to-machine (M2M) market worth €40 billion in 2017.

Frost & Sullivan forecasts the European M2M market to increase at a 33% compound annual growth rate (CAGR) through 2016.

GE similarly estimates huge economic benefits from connecting machines and the Internet to drive a "productivity revolution" in Europe, predicting that the IoT could add €2.2 trillion to European GDP by 2030.

It is clear that to meet this anticipated demand different frequency bands will be needed to serve the diverse range of applications and services. Indeed, IoT will be heterogeneous: indoors and outdoors, short and long range, low and high data rates, encompassing devices ranging from smart computing products to more basic machines with communication capabilities, which all have in common the ability to connect with each other and/or with the network, enabling many new verticals ranging from healthcare, smart grid, smart transportation to the connected home. As a result, the IoT requires interoperable and scalable ecosystems, which will considerably drive demand for more spectrum. A holistic spectrum regulatory approach, encompassing licensed, unlicensed and licensed shared access (LSA) regimes, will therefore be needed to meet the variety of demand and the diversity of requirements to maximize the societal and economic benefits.

1.47 *Spectrum requirements:* The need for additional spectrum to meet the expected demand for wireless connections between IoT devices. In particular, we would welcome views on which specific frequency bands are desirable, the need for internationally harmonised bands, whether additional spectrum should be made available on a licensed or licence exempt basis, and whether shared or dedicated spectrum bands will be needed

Connectivity is imperative to realise the full power of the IoT. With 85%+ of existing devices worldwide based on unconnected legacy systems it is critical to address connectivity and interoperability of legacy devices as an interim step to realise the benefits IoT can deliver.

As a result of IoT's ubiquity, requirement for interoperability, and scalable ecosystems (identified in greater depth in the response to 1.46), IoT will considerably drive demand for more spectrum. A holistic spectrum regulatory approach, encompassing licensed, unlicensed and licensed shared access (LSA) regimes, will therefore be needed to meet the variety of demand and the diversity of requirements to maximize the societal and economic benefits.

Ubiquitous and affordable connections over licensed and licensed-exempt spectrum are critical to enable consumers and the public and private sectors throughout the IoT ecosystem. This is equally a prerequisite to enable scalability and economies of scale. Effective and efficient management of this increasingly scarce resource must be a priority for policymakers. Depending on applications, different IoT networks are likely to utilise a variety of spectrum bands and spectrum access mechanisms. Without the adequate and appropriate availability of spectrum, the full potential of IoT will not be realised.

techUK notes that in the short-term the UK, due to technology neutral regulations, there is likely to be sufficient possibilities to secure access to spectrum for initial IoT deployments e.g. within bands suitable for Short Range Devices (SRD), license-exempt Wi-Fi / Radio LANs spectrum designated for Industrial Scientific and Medical (ISM). In certain cases however where a guaranteed quality of service is required, access to exclusive, dedicated spectrum suitable for IoT (as well as other services / applications) will be required to enable these applications and services, e.g. reliance on GSM/3G/4G/IMT networks.

3G/4G is a key driver for the growth and scalability of the IoT. LTE-Advanced could be the next major milestone in the evolution of 4G, incorporating several enhancements, all of which will be beneficial for the roll-out of M2M applications and products- such as controlled QoS, high reliability (redundant network design) and strong penetration; a robust security (built-in security features used in government and financial sectors); extremely low power consumption; and finally scalability - as the total cost of ownership is lower due to a large established ecosystem, thereby leveraging existing mobile infrastructure and global standards to enable seamless interoperability.

In this context, and as the 700MHz band becomes available across Europe, LTE-Advanced eMTC (evolved machine type communication), part of Release 13 of LTE, could represent a cost effective solution for connecting the IOT; indeed, harmonizing 2X3 MHz in that band, namely 733 – 736MHz and 788-791MHz, would allow M2M applications to thrive. This would then benefit from the considerable economies of scale driven by commercial mobile broadband LTE services to be deployed in the adjacent spectrum (703-733 MHz and 758-788 MHz). This option is currently under study in CEPT and the ECC should take a decision on such harmonization by end 2015. We invite Ofcom to continue supporting this harmonization at CEPT and EU levels. A 2x3 MHz in the 700 MHz band suitable for M2M would offer a 24/7, national and European wide ubiquitous coverage; controlled QoS; high reliability (redundant network design) and strong penetration; a robust security (built-in security features used in government and financial sectors); extremely low power consumption; and finally scalability, as the lower total cost of ownership due to a large established ecosystem, leveraging existing mobile infrastructure and global standards enables seamless interoperability.

Additionally, as highlighted recently by the HLG report presented by Pascal Lamy, the 700MHz band provides the best opportunities for harmonized wireless applications across Europe.

In the longer timeframe, additional spectrum or new spectrum approaches, such as Licensed Shared Access (LSA), will be required given the diversity of the IoT applications and devices. LSA, applied in higher frequency bands, such as 2.3 GHz or 3.6 GHz, could unlock spectrum that cannot be cleared nationwide (24/), but is not used at given times and/or at given locations, allowing operators to obtain licensed rights to use the spectrum when and where it is unused and to deliver a predictable quality of service. LSA, as developed by the Radio Spectrum Policy Group (RSPG),[1] could help address some specific cases, particularly when it comes to quality of service and cost aspects.

techUK recommends Ofcom advise on current spectrum availability / suitability for IoT with a view to create a whitepaper highlighting frequency bands and propagation characteristics in layman's terms to encourage investment and IoT deployments (trials and/or commercial). In addition we recommend Ofcom to leverage innovative radio spectrum approaches, such as LTE-Advanced eMTC in the 700MHz band for M2M applications together with LSA, in order to ensure network security, resilience, ubiquitous connectivity, Quality of Service and low power consumption, all needed by M2M applications and products and unlicensed for best effort, short range applications.

1.48 *Network-related issues:* We are interested in views on a number of IoT network and infrastructure related issues, including: 1.48.1 *Approaches to delivering IoT services:* Broadly, services could either be delivered using conventional mobile networks, in general licence exempt bands or via bespoke networks that are optimised for the IoT. Other approaches may exist between this range of options. We are interested in opinions on the approaches to delivering IoT services that will likely emerge, citing advantages, disadvantages and views on which applications might be better suited to a particular approach.

techUK believes that **t**o have a successful IoT ecosystem (public and private) a robust network enabling and embracing interoperability is crucial. There are significant benefits from enabling interoperability between networks in order to seize the maximum potential of transformational IoT opportunities. As noted earlier, a combination of spectrum management approached will be required in order to meet the data traffic increase and to enable new platforms and business models.

As mentioned with ~85% of existing devices worldwide based on unconnected legacy systems it is critical that industry focuses on the development and deployment of solutions needed to address the connectivity and interoperability of legacy devices as an interim step. Intelligent gateway solutions are likely to play an important role since they can connect legacy systems and provide common interfaces and seamless communication between devices and the cloud.

Connecting legacy systems will accelerate the impact of the IoT by allowing data from existing infrastructure to be captured and utilised to immediately deliver value plus will enable legacy devices to seamlessly interact with each other and existing infrastructure as well as new devices and infrastructure added the IoT ecosystem at a later date.

[1] Radio Spectrum Policy Group: Opinion on Licensed Shared Access, RSPG 13-538, November 12th, 2013.

The UK needs a pro-infrastructure approach from central and local government to ensure timely delivery of the necessary networks which includes facilitating access to public sector land, buildings and street furniture. In harder to reach areas this may also mean offering such sites at low rent to incentivise investment where the existing cost-benefit case does not make business sense.

These measures will help ensure the UK has a platform from which to lead the development of IoT technology and not be held back unnecessarily.
An end-to-end managed service approach is essential as a framework to sense that IoT services can be provided cost effectively. The wide range of networks together with proliferation of devices means policy based approaches are essential in realising applications and hence market potential.

1.48.2 *Degree of openness:* IoT services could be deployed over entirely open networks, i.e. any manufacturer's device conforming to a particular technical standard can be connected; or over a closed network, in which the operator controls which devices can access the network. We are interested in views on which of these (or similar) approaches might develop, whether particular services are suited to an approach and what the implications might be for the development of the IoT. We are also interested in views on the role of open versus proprietary standards.
techUK believes that voluntary open global standards are likely best placed to accelerate adoption and generating competition enabling cost-effective introduction of IoT services and applications. "open standards" in this context means standards developed by organizations that are open for participation of interested parties and follow the World Trade Organization Technical barriers to trade principles of international standards bodies.

A certain level of standardisation and interoperability is necessary to achieve a successful IoT ecosystem. Open standards which facilitate interoperability across the IoT ecosystem will stimulate industry innovation and provide a clearer technology evolution path.

Several standards organizations, including international standards bodies, have created standards in several areas that are relevant to IoT. In this context, industry is in the best position to develop the technological standards and solutions to address global IoT ecosystem opportunities and challenges. Ofcom should further encourage such industry based innovation.

1.49 *Security and resilience*: Across the range of IoT services there are likely to be a variety of security and resilience requirements. At one extreme there may be applications that can be supported on a best efforts basis, whereas other applications may need to be highly available and resistant to malicious attack. We are interested in views on the steps required to enable the IoT to support high levels of security and resilience
techUK believes that privacy and security are critical building blocks for the IoT ecosystem with capabilities designed into IoT systems from the outset thus any policy framework must have a clear and implementable privacy and security strategy.

For trusted data exchange in an IoT ecosystem, data generated by devices and existing infrastructure must be able to be shared securely between the cloud, the

network, and intelligent devices for analysis – enabling users to aggregate, filter, and share data from the edge to the cloud with robust protection.

Optimal privacy and security methods must be developed as required for different IoT solutions. Use cases should be used to proactively identify privacy and security risks and to develop robust strategies to mitigate those risks. However, techUK would warn against an approach based on developing specific privacy and security requirements for the IOT. It is important to keep in mind that the current data protection framework applicable in Europe and in the UK is of horizontal nature. For M2M to thrive, it is important that such an approach is being preserved.

1.50 *Data privacy*: We are interested in the nature of privacy and data protection issues that may arise through the development of the IoT, including views on approaches to appropriately manage personal or commercially-sensitive data.
The importance of resolving issues relating to ownership, control, management and usage of data for successful development of IoT need to be carefully considered. Data must be accurate to be beneficial so the policy framework must promote the importance of accuracy and integrity of data in all market sectors; especially in the industrial domain where the safeguarding of critical infrastructure can be vital to economic and social stability.

The policy framework must evoke consumer and industry trust through hardened privacy and security solutions in order to motivate adoption and participation in the IoT marketplace.

Consumer notice and consent will continue to be important, however other privacy principles must also be emphasised to ensure consumer privacy is adequately protected e.g. focusing on accountability for the appropriate collection, use, and protection of the consumer's data.

1.51 *Numbering and addressing*: We are interested in views on the likely nature of demand for device addresses and to what extent this demand might be for electronic addresses and/or telephone numbers. We are also interested in the extent to which demand for device addresses, in the form of telephone numbers, IP addresses or other identifiers, could be a barrier to the deployment of IoT services.
To cater for the number of number of anticipated IoT devices it will be important that IPv6 is adopted to help enable IoT scalable and sustainable development. Indeed, the value chain needs definition to ensure new entrants (in line with NGN principles).

A recent report by Akamai "State of the Internet (for Q1 2014)" shows European nations leading the way for IPv6 adoption. Belgium is the overall leader, with an impressive 14 percent of internet traffic using IPv6 but the UK does not feature on the list. techUK believes that UK Government and industry need to champion IPv6 adoption in networks, devices and websites, and promote more IPv6 enabled content to ensure IPv6 is a key consideration in IoT infrastructure and discussions.

1.52 *Devices:* We would welcome stakeholders' views on technical and commercial developments that could affect the cost and capability of IoT devices, in particular in relation enabling the manufacture of low cost devices with low energy consumption and long battery life. We are also interested in views on the role that existing or emerging device operating systems will play.

techUK suggests enabling a policy framework contemplating tools to accelerate IoT adoption and enable cost-effective introduction of new technologies, including open standards efforts, targeted government funding, and impactful public-private

collaborations. Ultimately creating a sustainable, stable, and compelling regulatory and commercial ecosystem in a harmonised manner can foster development of devices which SWaP (size, weight and price) issues are considered the key driver.

1.53 *Digital literacy*: We welcome views on the role of digital literacy in underpinning the growth in take-up of IoT devices. What steps, if any, will be required to enable citizens and consumers to understand the potential benefits and risks of the data created by their devices being shared? What steps is industry taking to address this challenge?

A recent World Bank study indicates the ICT sector is rapidly growing with an addressable market of $800 billion globally and estimates that over the next 10 years there will be two million unfilled ICT-related jobs globally. In the UK, this translates to 300,000 new recruits needed by 2020.

Meeting this skills need will be difficult and techUK supports efforts to increase progress already being made e.g. September 2014 the UK will become the first G20 economy to implement mandatory computing lessons for 5-16 years olds on a national level and a major component part of the course will involve learning how to code. Post 16, higher educational initiatives are being complemented by public and private sector collaboration.

techUK believes that more needs to be done to build on these existing initiatives in order to address the impending skills gap. Policy makers need to work with government and industry to raise awareness of IoT through relevant campaigns e.g. European eSkills week.

1.54 *Data analysis and exploitation:* The capture, analysis and exploitation of "big data" from multiple devices and applications to provide new, innovative services. We are interested in views on whether there will likely be demand for such services, on the nature of the services and whether there are any barriers to their development.

"Big data" is an unprecedented opportunity for growth, job creation and innovation. The potential use of IoT in 'big data' could be a key aspect derived from IoT – 'big data' could even be termed the 'currency' of IoT. Understanding the potential whilst identifying challenges is essential to delineate policies that encourage take-up and protect the interests of all involved.

Many sectors can benefit from "big data". Some of them have their own policy and regulatory environments (e.g. healthcare, finance, retail), and those will constrain the way "big data" can be applied and used. This is no different from what already happens today to any other kind of data. There are, however, policies that affect big data as a whole, and will impact how it translates in real gains for the European economy. Examples of such policies are those related to R&D, trust, the role of public sector and skills.

techUK suggests the following points need to be considered –

- Use research funding to incentivise breakthrough innovation in Big Data by a) supporting research in societal challenges that can be addressed by big data

solutions, b) focusing research on hardware and software that enables "big data" processing e.g. HPC, data centres, and analytics.

- Leading role of the Public Sector in the Data Economy through a) unleashing Public Sector Information for re-use, b) adopting "big data" solutions for evidence-based policy-making.

- Ensure citizens trust in Big Data solutions protecting privacy rights by a) clarifying distinction between personal data and non-personal data, b) building a strong but balanced data protection framework to enable citizen trust, c) raising network security to enable citizen trust, d) via research in anonymisation technologies and e) developing a comprehensive and special regimes for scientific processing of data.

- Ensure the supply of data scientists and data analysts by a) engaging with academia and the ICT sector to develop data scientist curricula, and b) developing a network of Centres of Excellence for "big data".

1.55 *International developments*: In the longer term, IoT equipment is likely to be developed for a regional or global market; this will be necessary to drive down device costs and achieve economies of scale. We welcome views on relevant international activities, such as the development of common technical standards, trials and commercial deployments.

techUK recommends that Ofcom undertake some analysis of the standards and interoperability landscape since several standards organisations, including international standards bodies, have created standards in several areas that are relevant to IoT. Ofcom should continue to work with fellow regulators across Europe and continue to engage with the group of European Telecoms Regulators, BEREC, in order to achieve a common approach across the EU, to enable economies of scale and innovative business models.

1.56 *Ofcom's role*: We recognise that the IoT is a fast-moving area in which industry is well-placed to create a range of innovative technologies and services. To enable us to best support these efforts, we welcome stakeholders' views on our role across the range of policy issues raised in this document, including spectrum management, network resilience and security.

techUK supports the role of Ofcom enabling a favourable regulatory environment under technology neutrality and service neutrality principles and we believe these principles need to continue with regard to IoT/M2M.

techUK requests Ofcom to consider whether a mixed approach to radio spectrum is needed for the IOT to thrive. IOT requirements in terms of data security, resilience of networks, continuity of service, penetration and power consumption will vary significantly per application and devices. It will require different radio links and spectrum approaches, corresponding to different operational requirements (uninterrupted vs. intermittent; real time vs. delayed; command/control vs. collection; cloud vs. network edge), bandwidth usage (high vs. low data rates; high vs. low density), Quality of Service (strong requirements for security, resilience, robustness vs. best effort), coverage (wide area vs. short range; deep indoor vs. outdoor) and finally enabling ultralow power consumption and very high battery life (10 years plus for certain devices). techUK would therefore suggest that Ofcom to further study the

feasiblility of using the 700MHz band for certain specific M2M applications, leveraging the innovations of LTE Advanced for Machine Type Communication, along with unlicensed spectrum mechanisms, e.g. WIFI in cases in which QoS is not required and with innovative approaches to spectrum, such as LSA. A combination of these

approaches could result in enabling a robust IOT eco-system in the UK, but also take advantage of scalability across Europe.

techUK recommends that Ofcom undertake some analysis of the standards and interoperability landscape since several standards organisations, including international standards bodies, have created standards in several areas that are relevant to IoT. It is unclear whether Ofcom need to engage within standards organisations until this analysis in completed.

techUK requests Ofcom advise on current spectrum availability / suitability for IoT with a view to create a whitepaper highlighting frequency bands and propagation characteristics in layman's terms to encourage investment and IoT deployments (trials and/or commercial).

1.57 We are seeking views from stakeholders on all the areas set out above and any other issues you think we should consider.

techUK would like to highlight that IoT cannot be backward engineered (as seen by existing work in the energy sector), therefore it is important that IoT is a new initiative building on the Next Generation Networks (NGN) approach.