# Ofcom Call for Information on Promoting Investment and Innovation in the Internet of Things

## Response from Ericsson Ltd

## October 2014

Ericsson welcomes this opportunity to offer input to Ofcom on the Internet of Things. In Ericsson we have an overarching vision called the Network Society in which communications technologies are used to empower individuals and society to improve productivity, efficiency and get more benefit using less resource. The Internet of Things is one part of the communications needed in such a vision. The key difference between what we have today where most communication is between people and people or people and things is the possibility of machines, or things, communicating without involving people. Ericsson's involvement in this work has extended to commitment on the ETSI machine to machine communications work and that of the global OneM2M project. We recognise that this vision needs Global scale and as a Global company we are happy to participate actively.

Ofcom asks that responses refer back where appropriate to the figure given in the call document. We therefore include it here as Figure 1.

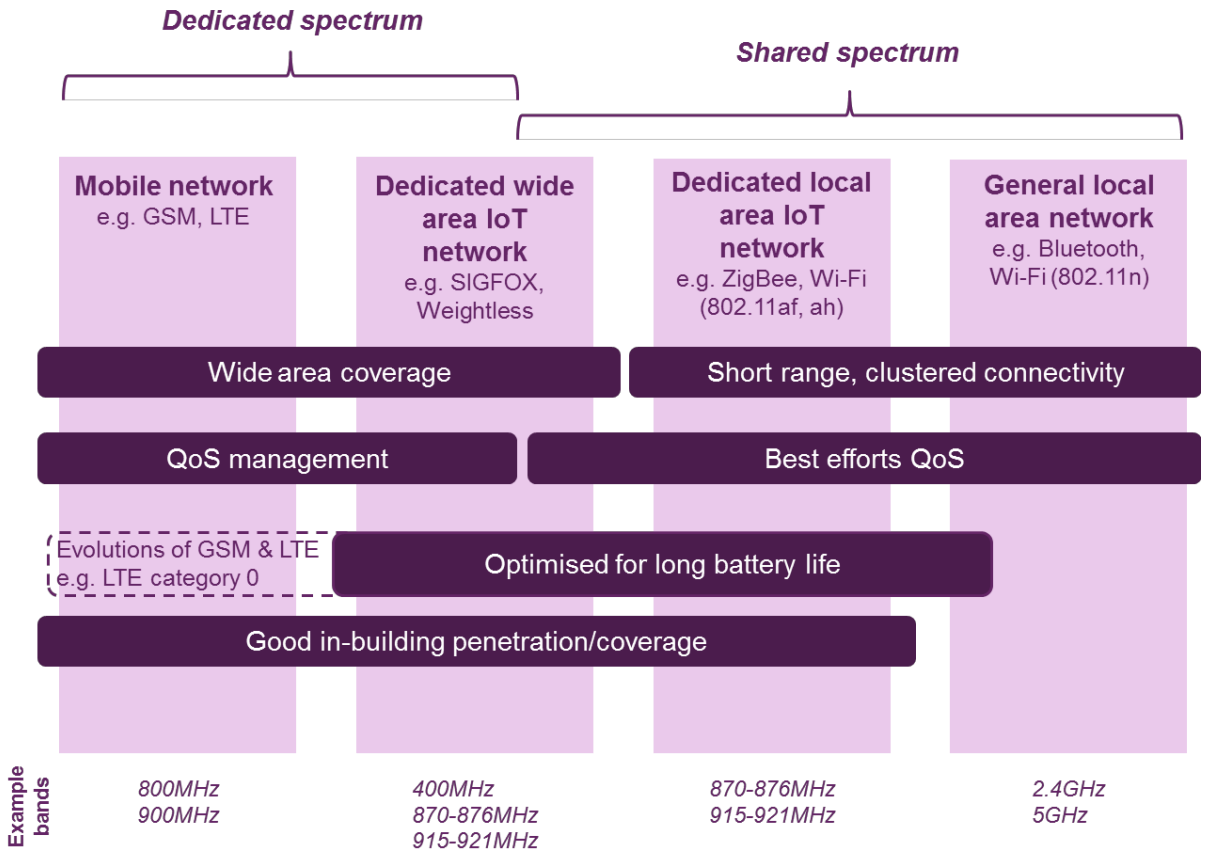


Figure 1: Proposed framework for considering spectrum requirements for the IoT

## Summary Comments

- IoT devices need to be low power, small in size (highly integrated) and low in cost
  - To achieve these criteria they need to be produced in volume to global standards
- Data typing needs to be dependable and futureproof
- Proportionate regulation is needed to ensure security and privacy of data
- IPv6 will become essential eventually but network address translation capabilities mean that no urgent action is required at this time
- Future spectrum releases should consider allocation of otherwise unusable fragments
- We see no burning need to take special action on consumer data literacy regarding the IoT
- User data and rights to use haven't needed any special interventions between consumers and service providers so far
  - It is unclear if this situation will remain
- Ofcom and the ICO need to work closely on data aspects of the IoT

## IoT definition, applications and demand

Our view of IOT as a component of the Network Society means that unlike some we do not see any particular sectors as being key driving forces in the evolution of the IoT.

What we see as being important is the availability of savings at all levels and in all applications by using more efficient data management. So the challenge is to provide devices that are appropriate to the application at the right price. This is of course the essence of all innovation.

For the sectors where innovation of this type is not already recognised there is an underlying need to add communication where none currently exists and thereby provide a step change in capability. These applications tend to involve movable or countable objects needing RFID or simple sensors or actuators in domestic settings. Many applications can be designed to create inferences from sensors and implement management of the actuators. Individual's behaviour can be determined by correlating date from presence sensors and so on.

For many sensors the means of connecting them together for example in burglar alarms and central heating systems destroys the secondary use of the data from the sensors. Existing wired systems often use simple parallel connection of loops for single purposes systems. Advances can be achieved by combining systems so that heating systems do not heat unused rooms and save money for Social Housing tenants.

Now we can see volumes of devices by considering these individual applications but the generic need is for low cost low power devices that act as senders for sensors and receivers for actuators. The ability to re-use low cost devices is the heart of innovation and general purpose devices will be what enable this market. However what stimulates the production of the devices is more difficult to predict. However we can predict that to achieve the prices levels that drive innovation it will not be a UK only application, *it will have to be global*.

We should concentrate on the global aspects since the production is likely to be in foreign factories to meet global needs. That is why be believe the global involvement in oneM2M is important and the presence of Chinese standards bodies as being essential.

## Spectrum requirements

In general we do not favour application specific spectrum allocations.

We see two different applications delineated by capability of the device. Some devices will be so simple that they do not possess a software stack that is capable of accessing an internet licensing server directly. Such low capability devices can only act as slave to a master that does seek licence sharing or else they use unlicensed spectrum. Our view is that such unlicensed spectrum should be limited and there is not a case for providing more spectrum than we have already. We prefer the idea that devices which need new spectrum should use the gateway device to obtain licensed spectrum access. This is because only the very lowest cost devices really need the low cost behaviour of cut down network stacks and the lack of registration. We also believe that in time spectrum should always be capable of being re-purposed and we fear that unlicensed spectrum will become unrecoverable which will not happen with licensed shared spectrum.

## Network-related issues

We draw a clear distinction between those things which will connect directly with other things using IP and those that are resource constrained and communicated via an intermediary gateway device. This distinction is clear within the OneM2M architecture which we commend to Ofcom. We note that this distinction is already made in Figure 1.

### Approaches to delivering IoT services

For devices that can support a full IP stack there is a choice of wide are access radio technologies. We believe that general purpose spectrum is preferable to dedicated spectrum. We see the network chosen as being a function of the application needs. For devices with constrained locations the choice is probably going to be determined by the environment within which the device is constrained. Wi-Fi will often be a good choice for such networks if the radio environment is controlled to an extent that permits the application to operate correctly. For devices that are more portable or even more remote then cellular radio will offer a suitable method. We are keen to see LTE extended to allow greater reach from existing base station grids to allow IoT connection to the greatest geographical extent by reuse of existing facilities with additional spectrum rather than seeing additional specialist networks and spectrum used.

Since we see so many diverse applications we do not see that it is fruitful to suggest one method as being more suitable than others other than from the perspective of shared resource and economies of scale and scope which arise from re-use of MNO facilities. These economies can drive down the costs of devices for communication and enable innovation by encouraging large volume low cost devices to the market. *In this regard fragmentation without an underlying technical need is not a driving force for successful innovation.* The innovation that is being sought is in our view, innovation in services and processes in the wider economy. Competition between communication technologies does not appear to be synonymous with the encouragement of innovation in the economy as a whole.

### Degree of openness

We expect both open and closed interfaces to be used extensively. If IoT is to be enduring then open interfaces will need to prevail because the life-time of proprietary equipment is often too low to make an enduring difference in terms of efficiency whilst maintaining a supply of spare parts. Whilst some may point to the car parts industry, the reality is that such diversity is achieved by having high prices. If we are to achieve innovation at low cost then that will not be the model which dominates. Low cost devices made on a global scale would be a driver of such a low cost market.

A further facet of openness applied to data interfaces as well as physical and radio interfaces. Data needs to be clearly defined and re-usable. One of the enduring problems with updating software is uncertainty about what to do with data from older systems, clarity as to data semantics is essential. There are some who advocate systems which learn what interfaces mean in real time during integration. These types of systems are a derivative of Real-Time Typing Interfaces and can only work if the original typing is lexicon is rich enough to handle all interfaces without resorting to comments. This is not the case in reality and proper publication is needed as a means of ensuring interworking.

Ericsson strongly supports open standards in this area and we have contributed to both the ETSI M2M and oneM2M work.

## Security and resilience

We agree that there are a range of different requirements for applications that are all in the category of IoT. We do not see this as in any way unusual but the consequences could be that different architectures are needed. Where high speed error free transfers are required it is possible that the associated dated processing needs to be close to the antennas in order to reduce end to end delay. An often quoted example of this is vehicle to vehicle warning messages. The mechanisms for error control and encryption as well as multiple base stations that are needed will be fairly

standard tools at least in what we expect of evolution to improve application coverage. But locating servers near the edge is different. The special needs that cause architecture difference can also cause competition issues and hence are of regulatory interest.

## Data privacy

Data privacy is a major concern because of the ability to correlate and mine low level data about individuals. Particularly with third party managed gateways to home based information it is quite easy to conceive of ways in which unwanted consequences could occur.

We suggest that whilst this responsibility is currently shared with the Information Commissioner the general public will expect it to be Ofcom that takes the lead because it is seen to involve communications equipment and very probably communications companies.

The general expectation that information about individuals should not be exploited in ways for which they did not consent is really very difficult to hold on to in an environment where innovation is allowed to happen quickly. Consequently there is a need to consider privacy of derived data which may even be generated in an ad-hoc way needs to be considered. The existing mechanisms around the Data Protection Register are clearly inadequate in this environment and regulation about outcomes and remedies are needed. However there is a clear need to be flexible since a proportionate approach will not be apparent until the shape of the market and the potential weaknesses come to the fore.

This is a difficult area where what we suggest is a clear statement of intent to protect consumers with updates on the evolution of the threats and the response made over time.

## Numbering and addressing

We expect that for security reasons most of the information exchanges will be in sessions which use other than Ofcom numbering resources for identification. In particular there are very few applications which demand polling from a central point, however there are some and White space devices are one. The key question is probably are there sufficient of this king of without notice any to any connection demands to mean that IPv6 is essential everywhere to support them. We currently do not believe that is the case over the timescale we have considered.

For gateway devices they can be expected to share IP addresses with existing fixed or wireless devices. The other big question affecting Ofcom is whether the number of mobile numbers will become exhausted. We suggest that preparation for that event should be made but we will be able to see it coming in time. The number of direct cellular connections is not expected to be all of the predicted 50 billion devices we expect and the success of other mechanisms will need to be watched rather than anticipated.

## Devices

We see work on increasing the link budget for 1.4MHz LTE devices as described in 3GPP (TR36.888 Study on provision of low-cost Machine-Type Communications (MTC) User Equipments) based on LTE to be rather important in making IoT widespread and not just in city centres. Many consequential changes are being made to 3GPP LTE specifications during this year in release 12 to make those new objectives possible. The ability to incorporate the extra reach and battery life into basic coverage using existing infrastructure that starts from 98% population coverage seems an exciting prospect. Naturally the usual rollout timescales need to be applied for practical availability. In addition there the question of device volumes using the new version of LTE and that is subject to

volume take-up for the silicon for a viable user base. Again the need to track the market is important since so many things are possible the economics will drive which ones are successful. Our view is that the very wide availability of an LTE based MTC solution and enhanced coverage made it a very serious contender for devices that could be anywhere that people are.

## Digital literacy

We do not see Digital Literacy as being a significant issue in the sale of IoT devices in large volumes. Only high end devices are clearly going to benefit from an understanding of the technologies by users. We suspect that the largest volumes of devices will be sold on convenience and ease of use. We do expect that there will be a need to explain potential privacy issues but our consumer lab experience to date suggests that most consumers will take this in their stride.

## Data analysis and exploitation

Ericsson does not believe it is yet possible to predict whether such services will be a market success but there are no technical barriers. Rather we expect any barriers to relate to rights to use data and privacy issues. In particular we are unsure as to the rights to use data which may be assumed to have been given for one purpose being also used for other purposes in the absence of full disclosure. An example of such a service would be advertising targeting which might be a significant monetisation target.

## International developments

As mentioned elsewhere we recommend that Ofcom keep an eye on the oneM2M standards group which is available to them as members of ETSI.

## Ofcom's role

We see the need to Ofcom to develop a strong relationship with the Information Commission on Data Privacy and suggest that Ofcom be the public face of the subject to increase consumer confidence.

We believe that Ofcom needs to monitor Telephone number usage as well as the technical schemes that will allow devices not to need E.164 numbers in the future which have been discussed in 3GPP. In addition we recommend that the mechanisms to allow some general purpose spectrum to be used by MNOs for IoT and other services with the lower power user equipment class be considered as part of the 700MHz UHF plans as shown in the left hand vertical of Figure1.