Vodafone's response to BEREC's Draft Report on Enabling the Internet of Things[1]

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[1] Vodafone welcomes comments or questions on the views expressed in this document. They should be directed to Markus Reinisch at Markus.Reinisch@vodafone.com

Introduction

Vodafone welcomes BEREC's draft report on enabling Machine-to-Machine ('M2M') services and the Internet of Things ('IoT'). It is a measured and considered response in a new and fast-moving area. The BEREC review team should be commended for their detailed review and the transparent manner in which they have consulted with stakeholders on this subject.

Vodafone's previous response to the BEREC review team[2] contains a number of key themes which Vodafone believes should inform regulatory policy in this area. We do not seek to repeat the content of our previous submission to BEREC in this document. Rather, we expand on it by reference to a number of developments that have taken place since our meeting with the BEREC review team in July 2014, in response to the specific questions set out by BEREC in its consultation. We hope this will be helpful to BEREC as it considers its policymaking in this important area.

In particular, the need to treat equivalent services in an equivalent manner remains a key consideration which is not fully addressed in the draft report. BEREC does appear to recognise this point in the introduction, where it is stated that "*many M2M applications exist or may be developed which are based on another kind of connectivity (including fixed and another kind of wireless connectivity) than mobile connectivity*". However, as BEREC itself also acknowledges, the draft report then focuses – almost exclusively – on M2M services provided via mobile connectivity. This 'elephant in the room' was evident during the BEREC stakeholder forum that took place in Brussels in October 2015, where Cisco and Microsoft made presentations on behalf of industry during the M2M/IoT panel discussion. Recent market projections from Machina Research[3] highlight the broader market trend very clearly:

	2014	**2024**
Total global M2M Connections	5 billion	27 billion
Of which total global cellular M2M connections	256 million	2.2 billion

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[2]See 'Vodafone's comments to the BEREC Machine to Machine Expert Working Group on an appropriate regulatory framework for Machine to Machine communications and the Internet of Things, July 2014', at
http://www.vodafone.com/content/dam/group/policy/downloads/Vodafone_response_to_BEREC_review_of_Machine_to_Machine.pdf

[3] Machin Research, M2M Global Forecast and analysis, 2014-24

Therefore BEREC should be wary about focusing on regulation which will, in practice, only apply to one small subset of the market. Given these different technologies may be actively competing, any intervention must be evidence-based and subject to thorough competition analysis, so that regulators are not, essentially, 'picking winners'.

This issue is brought into sharp relief for mobile operators who are designing the connected M2M and IoT devices of the future, and making decisions about whether to adopt an IP-based approach or utilise mobile numbering resources. For example, Vodafone is currently developing its Low Power Wide Area Network (LPWA) product which we hope will facilitate a new generation of connected devices, including white goods sold throughout the EU. The decision around the numbering and addressing for this product design (i.e. whether IP-based or via the use of mobile numbering resources) should not be unduly influenced by any regulatory uncertainty associated with the latter. Rather, a desire to develop a model which most efficiently meets the needs of customers should ultimately drive product development.

We will now respond to each of the questions that have been raised by BEREC in its draft report.

1. **How do you evaluate the three options mentioned in section 2.2.1.4 (extra-territorial use of national E.164 and E.212 numbers, use of global ITU numbering resources, use of a European numbering scheme) for the provision of M2M services? Which of these solutions is preferable to address the need for global marketing of connected devices? Should these solutions be used complementarily?**

Vodafone provides M2M services to its customers via its M2M platform, which has network elements located in the EU. Only two numbering resources have been configured to work on this platform for EU customers; supranational numbering resources allocated to Vodafone Group by the ITU and a national E.212 number range that has been allocated to a Vodafone Operating Company licensed in the EU.

This approach provides clear benefits for both Vodafone and its customers. As evidence of this, we have attached as Annex 1 to this response a recently published report by KPMG ('Securing the benefits of industry digitisation' – which we refer to in this document as the 'KPMG report'), which illustrates how enterprise customers

across multiple industry sectors benefit from the use of supranational and extra-territorial numbering resources.[4] For example:

- Our customers may not know in which countries the M2M-enabled application will be sold. The KPMG report highlights one such case study in relation to Atlas Copco (a global provider of industrial productivity solutions). Some of this industrial equipment (which can have a lifespan of 30 years) will be sold via dealers, or installed as an intermediary product in a manufacturing process. It will not be possible for our customer to know where the machine will end up when the SIM is installed in the production process.[5]

- There can be significant energy savings and quicker delivery of equipment from our customers to the ultimate end-users. The KPMG report highlights one such case study in relation to RWE, a manufacturer of charging stations for electric cars.[6]

- Economies of scale. The KPMG report highlights that Mswipe, a provider of mobile payment services, receives significant benefits when it is rolling out solutions in different countries, particularly given the need for cross border acquirers to have a unified platform.[7]

Configuring additional national numbering resources on our M2M platform requires costly, complex national HLR integration. Vodafone has networks in 12 EU Member States, and are licensed as providers of electronic communications services in a number of others. We have however only integrated two numbering resources onto our M2M platform in relation to provision of M2M services to our EU customers. The case study on page 30 of the KPMG report, which sets out the complexities associated with integration of national numbering resources due to the requirements of Brazilian numbering regulation, provides further evidence of these complexities.

Vodafone's preferred numbering strategy for M2M is to rely exclusively on its supranational E.212 and E.164 numbering resources as allocated to it by the ITU.

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[4] This report (Securing the Benefits of Industry Digitisation, November 2015)' can also be found at http://www.vodafone.com/content/dam/vodafone-images/public-policy/policy-papers-and-news/Vodafone-Industry-Digitalisation-Report-051115.pdf
[5] See the case study on page 31 of the KPMG report
[6] See the case study on page 15 of the KPMG report
[7] See the case study on page 31 of the KPMG report

However, there remain a number of challenges associated with relying exclusively on these ITU allocated supranational resources. For example, many operators have not yet entered into roaming agreements for LTE connectivity associated with the ITU range (increasingly relevant for connected car applications).

In light of this, Vodafone considers that there is still a role for the use of a national EU E.212 number range for extra-territorial M2M/IoT applications. In these cases, however, we map the E.164 supranational numbers that the ITU has allocated to Vodafone onto this national EU E.212 resource, to ensure no depletion of national E.164 national numbering resource. Therefore, it can be seen that Vodafone uses these solutions complementarily (i.e. we use both the supranational E.212/E.164 allocations and also an EU E.212 allocation).

We highlight these examples to outline our preferred numbering strategy for M2M, and why we have not yet been able to rely exclusively on our supranational ITU numbering resources. We believe that National Regulatory Authorities across the EU should therefore adopt a suitably flexible approach to the use of supranational numbering resources and also extra-territorial E.212 allocations based on use of a national EU E.212 range.

New pan-EU authorisation system for M2M and M2M-related services

We also note BEREC's question as to whether there is a need for a European numbering scheme for the provision of M2M services, which mirrors the question in the European Commission's Framework Review consultation as to whether a European attribution system for M2M communications would have an adequate geographic scope.

We do not see a requirement for a new pan-EU number range for M2M, given the existing approach works well for both us and our customers. We would however support a system of pan-EU authorisation for M2M, which could work in the following way:

- Applicants to the central EU authorisation entity (which could be BEREC) must demonstrate that the body that has allocated the numbering (i.e. whether the ITU or an EU National Regulatory Authority) has agreed for such numbers to be used for M2M and M2M-related applications across the EU;

- The authorisation criteria would ask the applicant to specify whether the applicant is seeking to roll-out different categories of service, specifically:

  1. Communications between machines only (e.g. between a vending machine and a server);

  2. Communications between machine with strictly limited human interaction (not peer-to-peer voice, e.g. eCall), and

  3. Communications between machines which also includes configuration of an open-internet consumer service (e.g. a car with an M2M SIM which is used for both vehicle diagnostics and to create a wi-fi service for passengers in the car).

- For reasons of practicality, we do not propose that the pan-EU authorisation provides for any peer-to-peer voice functionality, given the increased range of national regulatory obligations (e.g. number portability) that may apply to such services.

In Vodafone's case, for example, the ITU has explicitly authorised all of the three abovementioned use-cases for its supranational numbering allocation, based on its selection criteria as set out in 8.1 of Recommendation ITU-T E.164.1[8] . One such example is criterion 8.1.8, which requires the applicant to demonstrate that other reasonable technical and operational numbering alternatives e.g. use of national numbers, are not appropriate.

BEREC can then consider the request for pan-EU authorisation accordingly. Clearly, it remains the responsibility of the authorised party to comply with any specific requirements as found under national EU regulatory frameworks (e.g. any security requirements that may be associated with any consumer facing 'open internet' capability as per example (3) above). Given the nature of M2M applications, however, such a requirement should be the exception, rather than the rule.

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[8] SERIES E: OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS. Operation, numbering, routing and mobile services –International operation – Numbering plan of the international telephone service. Criteria and procedures for the reservation, assignment, and reclamation of E.164 country codes and associated Identification Codes (ICs). ITU-T Recommendation E.164.1

2. How do you regard the market situation in the M2M sector with regard to permanent roaming and national roaming?

In Vodafone's opinion, the debate about whether or not M2M should be subject to Roaming Regulation (past, present or future) is something of a 'red herring'. As BEREC's draft report states, the rationale for roaming regulation underlying person-to-person communication relates to consumer protection arguments which do not apply to M2M communications (section 3.2.5 of the draft report), and in any case, it is likely that M2M roaming charges are below the regulated price caps (section 3.2.3 of the draft report).

We do, however, recognise that certain electronic communications services which might 'piggy back' on M2M (e.g. a wi-fi service, configured using an M2M SIM, and which involve a public network and usage based charging[9]) should in principle be subject to roaming regulation. We agree with the position taken by BEREC in section 3.2.2 of the draft report that a case-by-case approach should be taken in relation to such services.

The draft report specifically asks about the market situation associated with both 'permanent roaming' and 'national roaming'. We will now address each of these in turn.

Permanent roaming

The use of a 'permanent roaming' delivery model carries many benefits for customers of M2M and M2M-related services. Further details of these benefits are set out in the KPMG report and have already been referred to in response to question 1 above.

It is difficult to understand why an operator would have an objectively justifiable reason to either refuse to enter into a roaming agreement for M2M services or terminate a roaming agreement for M2M services. Vodafone has roaming agreements in place for M2M across the EU (with at least one operator in every Member State). In addition, activities are already underway to ensure industry has a set of guidelines and approaches in this area.[10]

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[9] For further detail of our proposed approach in this area please see section 3 of Vodafone's response of 31 July 2014 to the BEREC M2M review team.
[10] For example, the work being carried out in the GSMA's Wholesale Agreements and Solutions Working Group - see http://www.gsma.com/aboutus/leadership/committees-and-groups/working-groups/wholesale-agreements-and-solutions-group

It is clearly the case that having such agreements in place promotes sustainable competition, efficient investment and innovation in the interests of end-users relevant to the provision of M2M services across the EU. We agree with BEREC's apparent concerns in 3.2.5 of its draft report regarding refusal of permanent roaming or imposition of 'economically unattractive conditions' for permanent roaming. With this in mind, we consider that there should be an expectation that roaming operators should not refuse to carry traffic related to the pan-EU M2M authorisation set out above in response to question 1.

National roaming

The draft report also states at 3.2.5, page 21, that "*on certain national markets there seem to be competition distortions stemming from the fact that the roaming operator could benefit from the coverage of all the visited networks, while visited networks in the absence of national roaming are often prevented from doing so themselves*".

There are a number of reasons why the use of supranational or extra-territorial numbering resources for 'static' M2M applications in a particular Member State would not create a national 'competition distortion'. For example:

- Even if the M2M application is 'static' in a particular member state, the service may still have been provided in the context of a pan-EU customer requirement for M2M. One such example would be a customer who wants to use M2M for retail point of sale applications in its retail outlets in Member States across the EU. This would be a service provided in response to a pan-EU European demand, not a national one, therefore any possible 'distortion' would not be felt at national level;

- It should not be assumed that use of supranational or extra-territorial numbering resources for M2M automatically creates a 'winner' and therefore a 'competition distortion'. Operators using supranational or extra-territorial numbering for M2M do not win every national M2M deal they enter into[11], and

- Providers of SIM-based M2M applications are in any case competing against other technologies (e.g. IP, unlicensed spectrum). Without a proper competition analysis (across multiple competing technologies), it should not

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[11] As evidence of this, please see outcome of UK smart meter bidding process at
https://www.gov.uk/government/speeches/award-of-smart-meters-dcc-licence

be assumed that use of supranational or extra-territorial numbering for a SIM-based M2M applications creates a competition distortion.

3. **Which solution – OTA provisioning of SIM or MNC assignment to M2M users – do you think is preferable to facilitate switching between connectivity providers in the M2M sector? Which advantages, which disadvantages are attached to the two solutions?**

Vodafone has publicly committed to OTA provisioning, and we consider that OTA provisioning provides a viable alternative to MNC assignment to M2M users. We have not seen evidence of a sustained demand for MNC assignment to M2M users, nor is any presented in BEREC's draft report.

Vodafone sees a number of advantages to OTA provisioning as opposed to MNC assignment to M2M users. OTA provisioning ultimately enables customers to retain control and leverage over their communications spend. It allows change of operator during the product lifecycle with greatly reduced costs compared with manual SIM swaps.

The draft report highlights at 3.3.2 that "*no process has been agreed between MNOs which would enable an MNO to re-programme a SIM of a customer of another MNO (in case of a customer's wish to switch to another MNO) and which in addition provides for non-discriminatory access as well as a solution for security issues.*" BEREC should note that there have been a number of recent developments in this area. The GSMA has recently published enhancements to the standards that enable customers to re-program a SIM from one mobile operator to another.[12] The GSMA has also published guidelines which specify the business processes that will be executed when changing operators.[13] This is aimed at providing customers with more confidence that the business processes will be executed when required, in a formal, secure, predefined manner, transparent to all parties.

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[12] Remote Provisioning Architecture for Embedded UICC Technical Specification Version 3.0 : June 2015, available at http://www.gsma.com/connectedliving/embedded-sim/
[13] Business Process for Remote SIM Provisioning in M2M at http://www.gsma.com/connectedliving/embedded-sim/

Furthermore, Vodafone is helping to drive the development of an Independent Entity[14] that will monitor and manage the process of switching operators, provide audit and dispute assurance, guarantee service levels and reduce the cost of switching through shared network components and standardised interfaces. This will build trust with customers that want assurance that they can switch operators at the end of contract. It will also help address security issues as it simplifies the ability to perform end-to-end security audits. A similar approach has been adopted by the utilities industry for switching energy suppliers.

This Independent Entity will enable industry to effectively 'self-regulate' in a manner that is open and transparent, ensuring that the market can scale effectively, especially given the complexity of switching large sets of eUICC devices across geographies between many potential operators. This industry approach will have the following objectives:

- Timely and reliable provisioning of profile changes with a guaranteed performance (to agreed service levels);

- A contractual regime that is scalable and does not require "many to many" contracts;

- A messaging mechanism that records transactions for issue management and dispute resolution; and

- A code of practice that is maintained according to evolving industry needs.

This Independent Entity would help address security issues, build trust with customers that want assurance that they can switch operators at end of contract, and reduce costs through standardisation of interfaces and shared network elements, providing a single point for audit and dispute. Therefore the suggestion in section 3.3.2 of the draft report that NRAs might consider adopting an OTA switching obligation, in order to encourage the sector to find an agreement on a global open standard for switching operators through OTA provisioning, is not warranted and indeed could disrupt industry's own initiatives in this area.

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[14] A dedicated project is planned within the GSMA Connected Living Programme to drive activities to set up this Independent Entity. It is anticipated that this will be part of the GSMA's Connected Living group.

4. Do you think there is a need to adapt Art. 13a of the Framework Directive to address security concerns in the M2M context? If so, which adaptations do you consider to be useful?

We do not think this is required. There are already initiatives underway (for example the Cybersecurity Directive) that propose to apply a requirement, similar to that found within Art.13a of the Framework Directive, to other providers of digital services. There is no actual evidence presented in the draft report as to why specific new regulation for M2M may be required. Consistent with principles of better regulation, such evidence should be presented before further regulation is introduced.[15]

Irrespective, we believe two points are relevant here. The first is that, as the draft report already states, the obligations set out within Art. 13a of the Framework Directive already apply also to M2M services provided that they are considered ECS, or to the ECS which is underlying any M2M service. The second is that there are already many industry-led initiatives underway which are endeavouring to address security concerns in this area, for example:

- **Standards** - e.g One M2M initiative, IETF security in constrained environments, OMA lightweight M2M;

- **Standardisation methodologies** – For example Mandate 530, which addresses privacy management in the design and development and in the production and service provision processes of security technologies and European standardisation deliverable(s) giving practical guidelines for the practical implementation of the requested European standards,[16] and

- **Industry guidelines** – For example, the GSMA's security guidelines for IoT.[17]

Further evidence of this activity is referred to in section 4 of the report by the 'Alliance for Internet of Things Innovation', attached at Annex 2, and referenced further in response to question 5.

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[15] European Commission, Better Regulation Guidelines, May 19, 2015, http://ec.europa.eu/smart-regulation/guidelines/toc_guide_en.htm, Better Regulation Toolbox, May 19, 2015 http://ec.europa.eu/smart-regulation/guidelines/toc_tool_en.htm
[16] See http://ec.europa.eu/growth/tools-databases/mandates/index.cfm?fuseaction=search.detail&id=548
[17] See http://www.gsma.com/connectedliving/future-iot-networks/iot-security-guidelines/

5. Do you think there is a need to adapt the Privacy Directive and ePrivacy Directive to address privacy concerns in the M2M context? If so, which adaptions? Do you think that the reform of the Privacy Directive as foreseen in the Council's General Approach of 15 June 2015 on the future General Data Protection Regulation goes in the right direction?

Vodafone does not consider that either the Privacy Directive or the ePrivacy Directive need to be amended specifically with M2M in mind. Generally speaking, Vodafone considers that the same protection must apply to the same services, however they are technologically provided. This includes a regime which provides an appropriate protection for confidentiality of communications, as this is an integral element of the right to privacy, which should govern all services enabling communications to the public.

There is also a strong role for industry to be pro-active here and we can see that this is happening already. In the context of its Digital Single Market activity, DG Connect recently set up the 'Alliance for Internet of Things Innovation', which involves a Policy Working Group. The AIOTI policy working group has recently finalised its report which makes 10 specific policy recommendations designed to address specific privacy barriers that could restrict the take-up of M2M/IoT.[18] These include recommendations in relation to use of Privacy by Design for IoT, as well as adoption of Privacy Engineering methodologies and an AIOTI Privacy Knowledge Base. Such an approach, in what is a nascent and fast moving area, is more appropriate than trying to redesign existing regulation specifically with M2M in mind.

6. What is the impact of open and proprietary standards on the development of the M2M sector? What are the advantages and disadvantages of open and proprietary standards, taking in account that M2M services may be provided on private or public networks?

Standardisation and interoperability will be essential in unlocking the full socio-economic benefits associated with M2M and IoT data. Vodafone will continue to work with international standardisation bodies, partners, and public authorities to define industry standards and best practice for data interoperability. In particular, a standard and open means to discover IoT devices, to learn and interpret their data, and to

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[18] See 'AIOTI – Alliance for Internet of Things Innovation: Policy Report, 15 October 2015' at http://ec.europa.eu/newsroom/dae/document.cfm?action=display&doc_id=11815

interact with them (e.g. retrieve data or initiate commands), is necessary to achieve interoperability at the data level and so open the global market.

As with any communication network, interoperability between elements of an IoT network is particularly important for a successful deployment of the technology, with standards playing an important role. Standards work on a basic principle – a company that invests in and contributes significant technology to their development is entitled to appropriate compensation in the form of an IPR licence fee.

Standardisation and the associated IPR frameworks established within traditional ICT industries have been major contributors to rapid deployment and technical evolution. However, the existing IPR licensing models may not be as practical for IoT when considering the relatively low value of IoT devices and the much higher deployment rates of such devices. International collaboration between regulatory bodies, institutions and industry is essential to ensure that an efficient framework for interoperability and IPR is established that reflects the need for low value devices at large scale deployment, whilst balancing the need for adequate compensation to those players investing in innovation and contributing key technology. It is also necessary to analyse the international aspect of standardisation and the global nature of IoT to avoid duplication of technology, territorial variances in technology and territorially discriminating operation and deployment costs.

It is equally important to recognise that companies need to compete on the IoT marketplace through technical and commercial differentiation, in particular when it comes to managing large numbers of connections. This differentiation is often achieved through proprietary solutions which, although "closed" to other companies, communicate with other proprietary solutions thanks to the interoperability mentioned above. Thus, care must be taken that nothing is done to deter companies from differentiating their offers on the marketplace through investment in innovation and development of proprietary solutions. Proprietary solutions can present an advantage here in that they may enable earlier solutions to the market than a standardised solution, and very low cost proprietary access technologies can initially reduce the 'Bill of Materials' cost for a device.

That said, we do see that the development of an open radio access standard for IoT devices will provide great long term advantages. In particular, this will help because global investment by service providers will enable higher quality of service to be offered, and so enable for example commercial grade IoT services. It will also lead to a

reduction in fragmentation will help device vendors focus on achieving low cost mass market devices. These are, of course, important considerations which should not be underestimated.