MAKE PRODUCTS SMART

24th September 2014

Response to Ofcom Internet of Things Consultation

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1 - Background:

EVRYTHNG is a Web of Things software company, making products smart by connecting them to the Web. Global product manufacturer brands use EVRYTHNG technology to connect their products to the Web, connect with their customers through their products, connect their products with applications & other products, and generate real-time product analytics to operate smarter.

EVRYTHNG's technology provides online identity on the Web for physical objects to enable them to connect with applications and other digital resources, independent of the transport layer and physical & network methods of network connectivity for the objects. EVRYTHNG works with fully connected objects and occasionally connected objects using tagging technologies.

The online identities for objects - Active Digital Identities™ - are programmable software objects managing the information from and about a physical object and interacting with applications via RESTful application programming interfaces and persistent URLs. The EVRYTHNG Engine™ is a platform capable of managing billions of these Active Digital Identities, and provides tools and resources to work with them - including the Reactor™ rules engine for programming active business logic into individual or collections of objects, analytics tools, identity management tools and fine-grained access control.

EVRYTHNG's position as a cloud-based platform with a deep technical expertise in the Web of Things strongly emphasizes the applications that work with physical objects - be they 'devices' in the sense of objects with active computational capability, or passive objects that are simply mapped to their digital identity via tagging technologies. EVRYTHNG therefore focuses only on the application layer (OSI Layer 7) and uses primarily HTTP as application-level protocol.

2 - EVRYTHNG Perspective:

EVRYTHNG's point of view is that the Web has emerged as the global application integration platform, with Web protocols providing the lingua franca for interaction between applications and data resources, between applications and other applications, and for the exchange of data between enterprises. The breadth and depth of Web technology skills and tools for application development, the increasing efficiency and de facto standardisation of these protocols, and the abstraction they provide for applications from infrastructure and transport layer architectures are compelling motivators for their playing a central role at the application layer of the internet of things, and as a consequence significantly influencing the architecture of other layers of the internet of things stack.

In EVRYTHNG's view, it is very unlikely that a single transport layer networking protocol will emerge as the dominant 'solution' for the IoT. This is because of conflicting and evolving requirements for the environments in which objects and devices are used, and the type of the applications that need to be built to work with them. By its very definition the IoT is heterogeneous in the nature of the 'things' it is connecting, with a great deal of the value and excitement in IoT's potential based on the opportunities for interworking between this diverse and heterogeneous set of devices and objects, both with each other and with the other elements of the digital landscape. The enablement of Metcalfe's Law to become applicable to the IoT is important to the realisation of its value potential.

It seems improbable to us that all physical object or device use cases will be satisfied with one network access and connectivity solution. Indeed the consideration of power availability, physical context of use, cost in physical bill-of-materials, security, persistence of connectivity need and network access availability, and on device application functionality requirements will motivate substantially different responses to the solution methodology for the transport and network access layer. Technologies and protocols including RFID, NFC, WiFi, Zigbee, Bluetooth, LTE and many others may and will be applicable.

Although most of these protocols are not directly compatible with each other, a form of protocol translation should take place to enable data from and about different objects to be exchanged, and for those objects to interact with applications. When it comes to the application-level protocol, EVRYTHNG strongly believes HTTP provides a compelling solution for any use case that requires the integration and collaboration of data and services of multiple objects made by various manufacturers with multiple applications and on-network resources provided by other parties.

In EVRYTHNG's view, there is too great an emphasis on the role of wide area networking technologies and transport layer issues in telecommunications and ICT

regulatory responses to the emerging IoT. While these technologies and contexts are very definitely applicable, EVRYTHNG does not believe the primary barriers to successful adoption and proliferation of IoT applications exist in these environments, but rather in the local and personal area networking environments at the transport layer, the protocols and semantics of data exchange at the application layer, and the regulation and standardisation of security requirements and privacy.

The volume of physical objects and devices that are able to be connected to the IoT is directly proportional to the costs of implementing that connectivity - in the hardware technology and 'power budget' on the object itself, in the accessibility of network access for that object with robust authentication and integrity of access and transport, in the costs of application development and data integration for that object to become a role player at the application layer, and in the direct cost and potential liability cost in information exchange from and about that object.

In facilitating the successful development of the IoT, and UK PLC's leadership role in the emerging IoT ecosystem and economy, EVRYTHNG's view is that Ofcom and other regulators need to approach it with this integrated view and consideration on how barriers at these different layers of the stack can be reduced and adoption accelerated.

EVRYTHNG therefore suggests the following areas for Ofcom engagement :

- **Low power, local area protocol enablement** - Spectrum availability and compatibility for local and personal area transport protocols such as WiFi and Bluetooth that supports the efforts of these protocol standards organisations to reduce their power demands, expand their bandwidth capacity, and optimise their performance reliability in unregulated spectrum bands; Licensed spectrum usage for local area applications with relevant protocols for high performance sensitivity applications; Support for the development and standardisation of mesh networking and protocol translation gateways for these local networking technologies to optimise inter-working, coverage reach, and internet gateway access.
- **Low power, wide area protocol enablement** - Market enablement for regulated spectrum access for specialist low bandwidth, wide area access protocols; wide area unregulated spectrum access protocols and methodologies; inter-connect models for wide area networks acting as backhaul and interconnect between local area networks.
- **End-to-end security** - Authentication standards to link the integrity of network access authentication to application layer authentication; Authentication methods for ad-hoc network access models; Best practices and standards for on-device and on-network security enforcement and accountability.

- **Semantics for data exchange** - Facilitation and support for formulation of standards and best practices for data exchange through with semantics frameworks and data formats; Vertical application semantic frameworks in critical application categories such as health care, asset management and control systems.
- **Privacy** - Supporting the standardisation of privacy and data sharing rule sets to support more effective collaboration and accountable data sharing within industry; Supporting clear definition and understanding on the part of end users about how personal data is intended to be used by data acquirers; Explicit requirements and best practices for enterprises in data management, homogeneity of requirements at a pan-European level, and global interoperability.

The primary risk to the rate of adoption and success of IoT today is that it develops as a fragmented 'intranet of things' with many deployments and use cases running in isolation due to the complexities, barriers and cost constraints of interoperability and inter-working. EVRYTHNG's view is that Ofcom's engagement should be motivated by the objective of facilitating an effective 'internet of things' where all devices and services are able to interact easily, cost effectively and securely.

3 - Analysis of Barriers and Potential Interventions:

Barrier to Adoption	**Potential action/intervention**
Multiple incompatible transport protocols	Engagement with protocol standards organisations to facilitate objectives for power usage and capacity optimisation through spectrum access and inter-working. Facilitation of protocol to use case mapping to identify barriers and support industry application adoption. Engagement to develop "converters" between a subset of protocols to maximize continuity & interoperability.
Access network neutrality and availability	Ensure that more and more standard devices come with support for IoT protocols and in a form that ensures their availability to applications. e.g. standard routers deployed by ISPs supporting wifi, bluetooth, zigbee, and powerline comms protocols and containing gateway tools that make them open to third party applications vs supporting walled garden applications provided by the relevant ISP.
Limited device-to-device interoperability semantics	Facilitate and engage with standards initiatives to generate a basic "vocabulary" and set of semantic protocols for any device or object to easily talk with

	any other device or object rapidly, understand its metadata, capabilities, and function.
Energy efficiency for embedded wireless devices	Devices still need too much power, and batteries do not allow long-lived, wireless deployments. Support and encourage energy-efficient methods and protocols (e.g. EnOcean) or energy harvesting technologies for devices.
Lack of service exposition & sharing standards	There is no common way to expose and share device data & services so that they can be easily reused by various clients, platforms, and applications. Support efforts that explore Web standards & APIs to expose heterogenous services, in a simple, common, and accessible format to maximise adoption & services.
Security and sharing policies, mechanisms and standards	There are various ways to manage and facilitate the sharing of IoT resources and data, however there is no single mechanism that maximises adoption and "shareability", while providing the highest degree of security, access control, and enforcement various privacy policies. Work with standardization bodies to promote a unique solution for secure data exchange.
Public misconceptions about IoT & privacy are the rule more than exception	End users do not understand the implications for the privacy of their data when using IoT systems, with this an inhibitor to data sharing and hence application adoption. Provide best practices frameworks and public standards of accountability for application providers to communicate to end users. Facilitate understanding of value-chain and end-to-end accountability and inter-working requirements for personal data sharing and exchange between enterprises. Support pan-European methods, and global interoperability of data sharing methods.

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