The Internet of Things: *The Next Wave of Opportunity*

The Next Internet Wave

Over the past two decades, the privatization and commercialization of the Internet has led to the fastest and most pervasive improvement in human communications. The moves from narrowband to broadband, and from fixed to mobile have further enhanced the value and ubiquity of the Internet. We are now in the next wave of the Internet's evolution—the "Internet of Things" or IoT.[1]

The IoT encompasses diverse and evolving networking technologies connecting the physical systems of the world such as power meters, vehicles, containers, pipelines, wind-farm turbines, vending machines, personal accessories—essentially, any device or system that would benefit from a combination of connectivity, automation and data analytics. The IoT also includes a comprehensive ecosystem of innovative players—connectivity providers (mobile and fixed network operators), hardware manufacturers (equipment manufacturers and device manufacturers), software/application service providers (telematics, data analytics, billing solutions, etc.), and system integrators—that are developing new life-enhancing services and capabilities for the benefit of consumers and to facilitate the real-time, adaptive enterprise. Although at a nascent stage of development, the IoT has already demonstrated the potential to massively improve efficiency, productivity and social welfare in such diverse fields as education, clinical research, transportation, energy, security, public safety, agriculture, and many others.

Transformational Impact

The IoT is on a trajectory of exponential and unparalleled growth—growth that could be truly transformative. According to Cisco, the number of mobile-connected M2M modules will grow 6.5-fold between 2014 and 2019, with 11.5 billion mobile connected devices. Projections by other companies estimate between 25 billion to 50 billion connected devices by 2020. ABI Research predicts that data generated by IoT connections will exceed 1.6 zettabytes in 2020, a growth rate of 800 percent. Given this growth, Cisco estimates that the IoT will create up to US$19 trillion in economic benefit and value through 2022. Indeed, the IoT promises to deliver significant economic and social benefits. In addition to private sector innovation, governments at all levels are using the IoT to advance a wide range of policy priorities (e.g., energy efficiency, traffic management and road safety, pollution mitigation, social cohesion, efficient deployment of government resources). With pressure to reduce costs, the introduction of more efficient ways of delivering high quality and sustainable public services is increasingly important. For example, a 1 percent savings from efficient IoT solutions[2] could save billions in operational costs.

New Business Models

Technology, innovation, investment and competition drive growth. With today's technological advances happening in an incredibly dynamic environment, flexible, light-touch policies are critical. Today, value from the IoT is already being realized—without prescriptive regulations—through novel business models. These adaptive business models differ greatly from the traditional business models that have supported the mobile phone and tablet industries in the past.

Traditional handset business models do not readily accommodate IoT device manufacturers, and would force them to:

- Have country-specific SIMs provisioned for each IoT device to be distributed in each country, thereby requiring manufactures to establish unique platforms with dozens or even hundreds of carriers;

- Manage the entire customer logistics chain with extreme precision on a per-country basis (i.e., forecast demand, distribution, activation, support, repair), negatively impacting efficiency; and

- Have the capability to interface with and navigate a unique platform for each mobile network operator (MNO) with which it contracts in every country, costing several hundred thousand dollars per platform.

[1] The IoT includes Machine-to-Machine (M2M) communications, which can use fixed or wireless connectivity.
[2] Efficiencies can be realized with fuel cost savings in aviation or fleet management, healthcare productivity improvements, reductions in capital expense in oil and gas exploration, etc.

To achieve the necessary economies of scale, IoT device manufacturers often partner with a single MNO to maximize the MNO's commercial agreements for wireless connectivity in all, or nearly all, of the countries where the manufacturer seeks to sell its products. Having one agreement with one MNO eases expansion and provides predictability for the manufacturer. This single platform approach (also referred to as a "Global SIM"), predicated on the extra-territorial use of numbering resources, substantially reduces barriers to market entry for IoT device manufacturers, particularly for smaller entrants that would not otherwise have sufficient resources to compete on a global scale. In short, the new business models enable economic viability by allowing IoT device manufacturers to "build it once and sell it everywhere."

As business models evolve, enterprises must have the flexibility to adapt to innovative service models and delivery platforms. Only a light-touch regulatory approach to the IoT supports this need for rapid adaptation.

Policy Priorities

Light-Touch Regulation

Government and industry must work together to create flexible, future-focused policies to ensure the IoT delivers its potential for economic and social development in all countries. We need global policy frameworks to foster and advance the IoT and to promote the enormous investment necessary to sustain it. For our connected world to fully develop, the connectivity between people, places, devices and things must work seamlessly. For example, to monitor a cargo shipment as it travels around the globe requires economies of scale for devices and regulatory frameworks that are interoperable across borders. For countries with regulatory policies that encourage new IoT technologies and business models—such as the extra-territorial use of numbers and consumer-focused security and privacy measures—the IoT promises to deliver unprecedented results well into the future.

Technology Neutrality

IoT services can be delivered using a range of technologies (e.g., mobile, WiFi, fixed, satellite) and policies need to be applied in a technology neutral manner. Indeed, market players should be allowed to choose the technology that is most appropriate to support the full range of capabilities of the IoT. For instance, different IoT devices may require operators to use licensed and/or unlicensed spectrum to deploy services covering short and long distances, indoor and outdoor locations, and static and mobile applications. When regulations are considered, they should be proportionate and technology- and service-neutral.

Numbering Resources

The new business models for the IoT necessitate innovative numbering solutions to accommodate the requirements of IoT customers and product manufacturers alike. While a number of possibilities exist, the most immediate and effective solution for global IoT services is to explicitly allow the extra-territorial use of numbering resources. That is to say, national regulators should allow use of their numbering resources outside their national territories, as well as allowing the use of foreign numbering codes within their national territories. In fact, this operational model has been successfully put into use for many years.[3] This promotes fair competition and competitive telecommunications markets.

Security and Privacy

With the IoT bringing innovation to every sector, a massive volume of information is being generated, transmitted, collated and stored. And the amount of available information will only continue to grow as users adopt more Internet-connected devices. This volume of data, together with its variety and speed, intensifies security and privacy awareness. That is why industry is proactively addressing consumer-oriented security and privacy issues. Industry understands how critical it is for customers to trust the security and privacy of these services. Indeed, in our global economy, where everything is, or will be, connected to the Internet, data is our most valuable currency and should be protected.

Industry stakeholders have a track record of committing to meaningful, voluntary efforts to improve security and privacy—and will continue to do so. Indeed, there are a number of industry-led, collaborative efforts underway, such as those to develop technical security specifications and privacy seal programs, to address security and privacy issues particular to the IoT. Forward-looking security and privacy standards efforts should (1) build on work already in progress relative to IoT security and privacy standards, (2) be an industry-led rather than a top-down regulatory standards-

[3] The international M2M roaming framework—endorsed through MNOs' adoption of the GSM Association's (GSMA's) M2M Roaming Principles—addresses and makes transparent international roaming used explicitly for M2M services.

based model, (3) be flexible enough to accommodate innovation, (4) be ecosystem-wide as opposed to being narrowly focused on specific sectors such as mobile carriers, and (5) allow data controllers[4] to determine the best approach for protecting consumer privacy. A good start for any action on the matter would be to create an inventory of already established or in-progress best practices.

Accelerated Transformation

By any measure, the IoT is positioned for exponential growth and profound societal benefit. Whether it is smart cities, health monitoring or connected cars, IoT applications—limited only by the imagination—continue to accelerate. As our world becomes increasingly interconnected, a light-touch regulatory approach that espouses collaboration between government and industry will drive the next wave of the Internet revolution.

[4] Data controllers may be the MNO, the device manufacturer, a third-party system integrator, a value-added reseller of ICT services, an unlicensed Wi-Fi network operator, and the like.