

Abstracts

06 The fantasy of the Internet of Things

Pierre MUSSO

The Internet of Things (IoT) is both a new grand narrative about a technological revolution that has been announced for some time now, and a set of technologies combining objects, networks and data. The imaginary world associated with the IoT is ambivalent: on the one hand, it holds out the promise of hyperconnection between objects and humans thanks to the massive production of data and, on the other hand, the threat of continuous control through the capture of personal data. This imaginary extends and amplifies that of the Internet, and draws its roots in the cybernetic paradigm.

13 The history of connected devices

Jean-Pierre CORNIOU

The world of IoT – Internet of Things – is breaking the historical frontiers of computing in bringing the power of software, networks and data centers in the heart of everyday life. Could we work, travel, connect, share emotions without our smartphones? Could we drive without the support of GPS? We are entering in a hybrid society where physical realities are enhanced by their digital image to enrich human experience. This is the endless story of connectivity between objects and data.

18 Trackability

Matthieu HUG

End-to-end tracking is apparently the next objective in supply chain management. Pressure from regulations and consumer demands for “transparency” have turned this topic into a question of resilience, conformity and differentiation. Owing to globalization, supply chains have been splintered, thus diluting responsibility and making controls ever more piecemeal and insufficient. While connected devices and, more broadly, digital technology provide solutions for tracking goods from point of expedition to point of delivery, they also raise new questions by adding to the product’s life cycle (and thus to its trackability) specific issues of accountability in relation to software updates.

23 The use of communicating devices in electricity firms

Vincent AUDEBERT

The world of electricity is used to connected devices, the closest example being the installation of smart meters in buildings. Meanwhile, the trend in production toward wind turbines and photovoltaic technology has introduced intermittence in the generation of electricity and boosted the interest in solutions based on connected devices. Apart from high-volume projects however, several factors have hampered their deployment. A few examples of these factors are the lack of standards and of maturity for this technology in relation to the needs stemming from the long-term conservation of these systems. Nonetheless, the electricity sector has room for such devices to help improve operations, maintenance or equipment. Furthermore, connected devices should be interoperable with related fields (*e.g.*, the smart home). Two connected devices are presented to demonstrate the interest of connectivity with existing objects.

28 **Connected devices in the system of justice**

François BOUCHAUD & Thomas VANTROYS

The proliferation of connected devices in everyday life opens new opportunities for society. Embedded throughout our lives, these devices are “witnesses” and eventually sources of information; they place digital “traces” on the same level as physical evidence and provide information as never before for understanding phenomena during digital investigations. In parallel however, this vector of information fosters criminal activities. Its low level of security is a mighty lever for cyberattacks, as digital devices provide new attack surfaces and become gateways for acts committed with criminal intent. Deviated from its primary use, such a device can generate threats against people, firms and states. The pair “opportunity/menace” calls for all stakeholders in security to adopt innovative approaches for coping with an ecosystem oriented toward the interconnection of diverse “spaces”.

33 **Internet protocols for the interoperability of the Internet of Things**

Marianne LAURENT, Alexander PELOV & Laurent TOUTAIN

The massive rollout of the Internet of Things (IoT) relies on technology and models that break with the classical Internet. New forms of connectivity have emerged for this deployment of billions of small devices that can communicate at a low cost while remaining autonomous for several years. For these devices to have long-range effectiveness while consuming very little energy, the emerging IoT networks have had to make compromises that have revived issues with regard to interoperability and security that had been settled for the Internet. The problems stemming from IoT’s lack of native support for Internet protocols are discussed; and the perspectives, presented that recent work on standardization has opened for the rollout of a simple, interoperable, efficient, scalable IoT.

39 **5G for connected devices: The stakes**

Cécile DUBARRY & Anne-Lise THOUROUDE

While various forms of technology (LoRa, Sigfox 4G...) can already be used to install connected devices, 5G has often been promoted as a mobile technology that will stimulate a massive growth of the number of such devices. Contrary to the development of earlier techniques, 5G was designed from the start as a formative technology for the Internet of Things (IoT). It is now being rolled out, and should eventually benefit from the innovations introduced on networks. To enjoy the full benefits of these new possibilities, operators will have to develop new services that better target the needs of various users and, in particular, economic agents; and users will have to explore the possibilities opened by 5G...

45 **Use unlicensed LPWANs for cost-effective & secure massive industrial IoT**

Derek WALLACE

This article introduces Low Power Wide Area Network (LPWAN) technologies for the Internet of Things. LPWANs can be divided into the licensed and unlicensed spectrum. Under the unlicensed spectrum we find the LoRaWAN® standard; a cost-effective, low battery, long-range technology specifically designed to serve massive industrial low-critical IoT. Thanks to its easy network roll-out with flexible, secure connectivity models, LoRaWAN allows for a rapid global use case development to benefit cities, enterprises,

rural areas and large industries on either public, private or hybrid models. The global LoRaWAN standard is promoted by a group of IoT companies called the LoRa Alliance®. The LoRa Alliance is a non-profit organization representing over 400 member companies developing and operating LoRaWAN equipment from silicon to solutions.

48 The space revolution or communication between devices everywhere around the world

Alexandre TISSERANT

Billions of connected devices have been announced for our planet, but only 15% of Earth's surface is covered by land networks, a situation to be overcome thanks to the satellite networks devoted to the Internet of Things (IoT). Despite this dense "skyscape", this solution is a must for several use cases. Beyond issues related to techniques, these networks are affected by global issues, whether economic or even ethical and environmental.

54 Skywise, for predictive maintenance and beyond

François LE BOULCH, Frederic SUTTER & David MARTY

Over the next twenty years, aviation services will generate nearly as much revenue as the products themselves. With this in mind, Airbus already decided a few years ago to develop its services portfolio powered by digital. Its Skywise platform analyses data from the entire aviation ecosystem to optimise aircraft design, manufacture and operations both in flight and on the ground. While it is already living up to all its promise – with a vast amount of positive feedback –, digital transformation is clearly on the fast track to redefining the aviation industry.

60 Where are our data going? The example of smart speakers

Martin BIERI

If voice assistants are presented with the objective of simplifying people's lives, the way they work remains obscure for users. Specifically, there remains the question of how the data is handled – which most of the time travels between the connected device (speaker, watch, fridge, etc.) and remote servers. This "journey" of our data raises some questions, especially when it comes to our voice, which is not unambiguous: at the same time, it can be an intimate data, a biometric one, vector of meaning but also of emotion, can inform on health status, etc. This article provides a brief overview of how a voice assistant works, the stakeholders in its value chain, and the issues surrounding personal data.

66 The environmentalist myth of the smart city

Philippe BIHOUIX

According to "correct" discourses, digital technology should reduce a city's environmental footprint, make it more efficient and optimal (and, at the same time, more transparent, "inclusive" and democratic) — make the city "smart" thanks to connected devices and software based on artificial intelligence. This idyllic vision of an ultra-optimized, technological management of smart cities has run into several problems explored herein: the consumption of resources, environmental issues, the inertia of the rollout of smart cities, the rebound effect, and questions having to do with resilience.

71 **Personal communicating devices: Ethical issues**

Christine BALAGUÉ

Communicating devices are increasingly a part of our personal lives and spaces, as they collect ever more data to be fed into abstruse algorithms. To better understand the consequent ethical issues, a typology of connected devices is proposed that emphasizes the importance of paying as much attention to users as to technical features. The risks related to 5G and the massive gathering of data, to the quality of these data and the security of the systems being used, are brought under discussion along with the ethical issues related to the algorithmic processing of data. The conclusion focuses on the need to develop a real “use value” and design connected devices that are “responsible” in terms of their environmental and societal impact.

76 **Privacy and the cyberphysical tracking of persons**

Mathieu CUNCHE

The users of devices equipped with wireless technology (*e.g.*, Wi-Fi and Bluetooth) are exposed to having their movements tracked by third parties. For several years now, sensors, installed in various places, have been collecting the signals emitted by such devices for the purpose of following their owners. This is an obvious threat to privacy. These invisible systems of cyberphysical tracking record data without the user’s consent. To cope with this new threat, guardrails must be erected, both regulatory and technical. The general principles of these tracking systems are presented along with the solutions imagined for protecting the individual’s privacy.

81 **Communicating devices and issues of sovereignty**

Didier DANET & Alix DESFORGES

Communicating devices raise many issues related to the exercise of sovereignty by nation-states: national security, control over data, etc. Similar issues have arisen from all other processes of digitization in our societies. However, the quantitative change of scale and the embedding of connected devices in all areas of everyday life lend much more weight to these issues and to the current momentum toward making nation-states dependent on private parties. This article takes as example Amazon’s connected doorbells.