

WHITE
PAPER

PREPARING FOR THE INTERNET OF THINGS REVOLUTION

Document No. 2 – Inventing pro-innovation regulation

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Une initiative des Ateliers entreprises de l'Arcep

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INTRODUCTION

The deployment of the Internet of Things gives rise to an array of regulatory issues that Arcep wants to anticipate, in order to facilitate the market's self-organisation. The challenges surrounding the networks that will underpin the Internet of Things (IoT) are significant: the diversification of technologies and how they tie in with one another will be the IoT's wellspring, enabling a wide range of applications and the ability to meet increasingly multifarious needs. It will also be imperative that all market players have access to the resources they need to roll out their products. We can expect to see wars between standards for naming and application program interfaces (API), as controlling them will be strategically key. Lastly, the ability to ensure the systems' security and integrity will be another decisive variable, as will protecting individuals' and businesses' data, and ensuring these users' ability to move freely from one system to another and not be locked in.

To prepare for the Internet of Things, working in partnership with France's National Frequency Agency (ANFR), the National Network and Information Security Agency (ANSII), French data protection authority CNIL, the Directorate-General for Planning, Housing and Land Management (DGALN), the Directorate-General for Enterprise (DGE) and France Stratégie, Arcep mapped out the challenges created by the Internet of Things, which are many and vast and extend beyond the scope of Arcep's purview. The Authority also included all of the stakeholders in the series of meetings and workshops it hosted.

A first document entitled, "Preparing for the Internet of Things revolution – Mapping out the challenges" therefore concentrates on the public policy challenges that Arcep and its partners intend to meet, to make the Internet of Things a galvanising force for innovation, modernisation and competitiveness for the entire economy.

In this second document, Arcep has set itself the task of identifying the actions it needs to carry out, and the subjects to watch when laying the groundwork for the Internet of Things. To this end, it has set five key objectives:

- Ensure multiple, mobile, reliable and affordable connectivity;
- Guarantee the availability of scarce resources for the IoT's deployment;
- Keep the playing field open to everyone;
- Help build trust around data and applications;
- Support market players and foster a thriving Internet of Things ecosystem.

1 ENSURE MULTIPLE, MOBILE, RELIABLE AND AFFORDABLE CONNECTIVITY

The Internet of Things is based on a plethora of technologies, designed to satisfy disparate needs (coverage, consumption, autonomy, mobility, latency, low-cost, etc.). Stakeholders agree that, because the market is still only nascent, regulatory action should be avoided at this stage as it would stifle the market and impede innovation.

A host of rollout initiatives are already underway, both with public and independent networks. The current regulatory framework covers resilience issues for public networks. Independent networks that are managed directly by users could become an area of focus.

Lastly, roaming on mobile networks, and permanent roaming in particular, has been identified as a priority issue.

1.1 STIMULATE INNOVATION FOR GREATER CONNECTIVITY

The existence of a plethora of technologies – both wireline and wireless – is vital to satisfying the multitude of application and connectivity needs created by the Internet of Things, but how they tie in with one another must also be well thought out.

GUIDELINE NO. 1

To encourage innovation processes, Arcep is contributing to the creation of a regulatory framework for conducting trials on electronic communications networks. The Digital Republic Act (*Loi pour une République Numérique*) stipulates that Arcep can define an experimental framework designed to facilitate the pre-commercial development of an innovative technology or service, provided a certain number of conditions are met (duration, revenue, maximum number of users, etc.).

To this end, in the first half of 2017, Arcep will launch a “start-ups and trials” office whose purpose will be to serve as an information conduit and a single point of contact, to support start-ups as well as businesses and local authorities in their innovation process. This office will be open to all enterprises conducting trials and experiments.

GUIDELINE NO. 2

Arcep will pay close attention to the work being done by standardisation bodies, to maintain a detailed understanding of industry guidelines, and to disseminate this information when appropriate, notably via its "start-ups and trials" office, and to anticipate any regulatory work required for new service rollouts.

To this end, as a complement to existing actions that France's National Frequency Agency (ANFR) is performing within standardisation bodies to ensure consistency between radio standards and regulations, Arcep will monitor European actions within international standardisation bodies (including 3GPP and ETSI).

1.2 ANTICIPATE NETWORK COVERAGE REQUIREMENTS FOR THE INTERNET OF THINGS

For certain applications, the Internet of Things requires widespread national coverage from mobile operators, which have historically owned and operated a large number of transmission towers, and by other players wanting to deploy other types of network. Under these circumstances, it is vital that existing passive infrastructures (civil engineering, towers, road infrastructures, urban installations, pre-outfitted new housing, etc.) be reused for the deployment of all types of network. This reuse is bolstered by the transposition – through Order No. 2016-526 of 28 April 2016 – of Directive 2014/61/EU of the European Parliament and the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks.

GUIDELINE NO. 3

To limit rollout costs for new IoT networks, Arcep will encourage the reuse of existing passive infrastructures insofar as possible.

In addition, increased connectivity ambitions for public spaces raise the question of the potential installation of optical fibre access points for connected equipment and for connecting network elements.

GUIDELINE NO. 4

In summer 2016, Arcep published draft recommendations on access to ultrafast optical fibre networks with improved quality of service, and the use of spare fibres. In this draft document, Arcep considers that it would be advisable for infrastructure operators to develop solutions for bringing service to equipment located outside existing buildings and to network elements¹. The conclusions of this public consultation could be taken into account, notably when making possible changes to the existing symmetrical framework.

¹ http://www.arcep.fr/uploads/tx_gspublication/consult-projet-reco-acces-reseaux-fibreoptique-qualityamelioree-juin2016.pdf

1.3 HELP PROVIDE IOT STAKEHOLDERS WITH CLEAR INFORMATION ON THE LONGEVITY OF STANDARDS, TECHNOLOGIES AND ROLLOUTS

The longevity of deployments is one of the most prevalent criteria in enterprises' and local authorities' choice and adoption of technologies. A number of solutions are based on relatively old standards, such as GSM, and stakeholders today are wondering about the future of existing networks that employ this standard.

GUIDELINE NO. 5

Frequency licences for the 900 MHz and 1800 MHz bands, which are used by legacy GSM systems, are set to expire in 2021 and 2024. In preparing for the award of new licences, which will take place between 2018 and 2020, Arcep will work to reconcile the principle of technological neutrality and IoT players' need for clarity on the future longevity of GSM networks.

In the meantime, Arcep invites all interested players to contact the Authority and share their input on the issues associated with maintaining GSM networks.

1.4 SUPPORT THE DEVELOPMENT OF RESILIENT CONNECTIVITY SERVICES FOR CERTAIN USES

It could be worthwhile to study the development of high availability mobile services for strategic uses.

GUIDELINE NO. 6

Arcep will continue the dialogue begun with operators during the public consultation on mobile network sharing guidelines, and particularly on the creation of a high availability mobile service underpinned by national roaming solutions between operators.

1.5 ENSURE CONSISTENCY BETWEEN INTERNET OF THINGS SOLUTIONS AND EUROPEAN INTERNATIONAL ROAMING REGULATION

Some of the areas of application for connected objects involve uses that are intrinsically transnational. It is therefore important to clarify how international roaming regulation is interpreted with respect to IoT applications that are reliant on permanent roaming on mobile electronic communications networks.

Moreover, ITU has made available numbering resources dedicated to international use (MCC 901 and MSISDN +88x). They are particularly well suited to certain IoT uses. But some players disagree over the application of European international roaming rules to these international codes, regardless of their usage. Clarification from Europe on this point would be useful.

GUIDELINE NO. 7

Through its participation in BEREC, Arcep will call for clarification from Europe on the applicability of EU international roaming regulations. These clarifications will pertain, on the one hand, to connected objects in a situation of permanent roaming and, on the other, to the recipients of numbering resources specific to international networks.

2 GUARANTEE THE AVAILABILITY OF SCARCE RESOURCES FOR THE IoT'S DEPLOYMENT

Current access to frequency resources largely satisfies IoT players' needs, keeping in mind that, in addition to bands that require individual licences, networks can also be deployed using frequencies that are subject to a general authorisation, otherwise known as unlicensed bands. It nevertheless appears vital to take an interest as of now in the availability of frequencies and the terms and conditions governing their use with regard to new applications, to support the IoT's deployment in the medium term.

Regarding addressing, it could be worthwhile to identify and to quantify the types of connected object that will generate the greatest demand for IP addresses, to prevent the risk of a dearth of IPv4 resources.

2.1 ENSURE THE AVAILABILITY OF FREQUENCIES FOR ALL PLAYERS IN THE MEDIUM-TERM

Arcep wants to create a level playing field that is open to everyone, and not take action directly on technologies but rather on the resources made available for their development. To this end, it is important to ensure the availability of spectrum for the Internet of Things, and particularly the capacity of unlicensed bands – which are subject to general authorisation and shared by users of the same application or by different types of application – to cover a set of expected uses.

GUIDELINE NO. 8

As part of its "start-ups and trials" office, in the first half of 2017 Arcep will install one of the first building blocks of a portal dedicated to unlicensed frequency bands, with the goal of:

- providing information on the current regulatory framework, the bands that are subject to a system of general authorisation and the work being done, in collaboration with ANFR, on identifying and harmonising new unlicensed frequency bands;
- collecting information, on a voluntary basis, from IoT ecosystem players on their use of unlicensed bands, to improve Arcep's knowledge of their applications, and to inform discussions on possible saturations and the need for additional resources.

As a follow-up to the White Paper, Arcep will elicit feedback from the Internet of Things ecosystem to specify the best format for this portal, insofar as its means allow.

In addition, as the authority responsible for allocating resources, and in tandem with ANFR which is in charge of preparing and defending France's positions in European and international frequency bodies, Arcep will favour initiatives that are geared to achieving the greatest possible level of harmonisation, to enable players to engage in European and international deployments for their activities. To this end, Arcep will rely on work that has

already begun with ANFR, notably the public consultation held in 2016² aimed at studying, among other things, new opportunities for using the 870 - 876 MHz and 915 - 921 MHz bands, opening up European and international-scale prospects.

GUIDELINE NO. 9

Arcep and ANFR are examining the possibility of opening up these frequencies, with particular emphasis on the 915 - 921 MHz band, given its global harmonisation potential.

2.2 ENSURE THAT RULES GOVERNING SPECTRUM USE MATCH INTERNET OF THINGS USAGE

Arcep will play an active role in reviewing the terms and conditions of use for unlicensed bands, to increase power ratings and duty cycles. Work to this end is already underway, in collaboration with ANFR, on the above-mentioned 870 - 876 MHz and 915 - 921 MHz bands.

The aim is to minimise risks of interference on unlicensed bands, notably by ensuring the equipment being used complies with technical terms and conditions, and by tracing any illicit use being made of unlicensed frequency bands.

GUIDELINE NO. 10

As the allocating authority and the regulator, Arcep will help define the ANFR spectrum measurement programme, with a view to monitoring spectrum use and ensuring its proper use, notably in unlicensed bands.

Moreover, to anticipate potential saturations, Arcep will create a space on its portal dedicated to unlicensed bands that allows players to report any quality of service issues on unlicensed frequency bands.

2.3 ANTICIPATE A DEARTH OF IP ADDRESSES AS THE NUMBER OF CONNECTED OBJECTS CONTINUES TO GROW EXPONENTIALLY

Among other things, the dearth of IPv4 addresses that the internet is having to deal with worldwide could hinder the development of a portion of connected objects. The Minister of State for Digital Affairs, Axelle Lemaire, requested a status report from Arcep on the rollout status of IPv6 in France.

² http://www.arcep.fr/uploads/tx_gspublication/consult-arcep-anfr-iot-frequences-030616.pdf

GUIDELINE NO. 11

In accordance with the task it was assigned, on 30 September 2016³ Arcep published⁴ a status report on the deployment of the IPv6 protocol in France. In its report, Arcep identified the obstacles to the implementation of IPv6 and their consequences on the sector. It then proposed a set of actions designed to encourage and accompany users and enterprises in their migration to the new protocol.

Lastly, Arcep announced the creation of a scorecard for monitoring this transition.

³ The document had been submitted to the Minister on 30 June 2016.

⁴ Cf.

[http://www.arcep.fr/index.php?id=8571&no_cache=0&tx_gsactualite_pi1\[uid\]=1905&tx_gsactualite_pi1\[annee\]=&tx_gsactualite_pi1\[theme\]=&tx_gsactualite_pi1\[motscle\]=&tx_gsactualite_pi1\[backID\]=26&cHash=e46b8063c1ba85ae60e274e06c54f22e](http://www.arcep.fr/index.php?id=8571&no_cache=0&tx_gsactualite_pi1[uid]=1905&tx_gsactualite_pi1[annee]=&tx_gsactualite_pi1[theme]=&tx_gsactualite_pi1[motscle]=&tx_gsactualite_pi1[backID]=26&cHash=e46b8063c1ba85ae60e274e06c54f22e)

3 KEEP THE PLAYING FIELD OPEN TO EVERYONE

On the Internet of Things, where a multitude of technologies operate side by side, it may be appropriate to wonder about the right degree of openness to aim for. Encouraging a very open market would help stimulate competition between systems, but would also raise industrial and economic considerations for the IoT's deployment. The marketplace must not organise itself in a way that is detrimental to innovation, imposing technical constraints that have a fundamental impact on the objects' design.

In the medium term, however, the lack of openness must not lock users into closed systems. At a time when the market is still only nascent, its ability to self-organise in terms of openness should be encouraged, while continuing to be assessed on a regular basis, paying particular attention to the creation of walled gardens and whether users are being locked in.

3.1 ENSURE FAIRNESS BETWEEN PLAYERS IN THE TOP LAYERS

In certain cases, the issue of open and fair competition in the top layers derives from more general considerations regarding platforms. Which is why the scale of any action to be taken must be Europe-wide at the very least.

Arcep thus plans, on the one hand, to participate fully in the exploration of these topics that is already underway in Europe and, on the other, to include the "Internet of Things" dimension systematically in the agenda of any work programme devoted to platforms.

GUIDELINE NO. 12

Arcep will lend its support in particular to actions taken at the European level, such as the one taken as part of the Digital Single Market strategy whereby the European Commission identified the cloud, Big Data and the Internet of Things as priority areas for ICT standardisation, and which will rely on large-scale rollout projects for testing and validating standards.

Discussions regarding platforms that are being led by Arcep – which subscribes to the recommendations that the French Digital Council set out in its 2014 report on platform neutrality, aimed at "creating the conditions for an open and sustainable digital environment"⁵ – will extend to the Internet of Things.

⁵ Conseil National du Numérique (CNUM) report: *Neutralité des plateformes – réunir les conditions d'un environnement numérique ouvert et soutenable*, May 2014.

3.2 ENCOURAGE COMPETITION BETWEEN CONNECTIVITY PROVIDERS

The Internet of Things sector is just now taking shape. Several technologies exist but no single standard has taken hold thus far. For Arcep, it is vital not to impede innovation, and to leave it up to users to choose between available options.

Arcep contributes actively to the work performed by BEREC which, in February 2016, published a report entitled, "*Enabling the Internet of Things*"⁶. This report refers to the debates taking place over reprogramming SIM cards over the air, which would enable users to switch connectivity providers without having to replace their SIM card. Because it eliminates switching costs for users, this type of solution would help bolster the IoT's adoption, notably with a view to 5G.

GUIDELINE NO. 13

Through its participation in the work being done by BEREC, Arcep will be attentive to the issues surrounding over-the-air SIM card updates. The Authority will be particularly mindful of interoperability, of the deployed solutions being open to every operator, of the level of security required and, if applicable, of the "good faith" of the associated devices.

In addition, to allow users to make an informed choice, it may be advisable to define common metrics for benchmarking the different available connectivity solutions, notably with respect to coverage, security, power consumption and interoperability.

GUIDELINE NO. 14

At the forthcoming BEREC workshop devoted to the Internet of Things, Arcep will propose that objective and verifiable indicators be established that enable comparison between the sector's connectivity products, and create a transparency that will be beneficial to users.

⁶ http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/5755-berec-report-on-enabling-the-internet-of-things

4 HELP BUILD TRUST AROUND DATA AND APPLICATIONS

The deployment of connected objects and the creation of the Internet of Things can only occur if users – i.e. customers, user enterprises and local authorities – trust these new technologies. IoT players will need to gain this trust by guaranteeing a high enough degree of security for their objects, and by managing personal data in a transparent fashion.

4.1 CLARIFY IOT PLAYERS' RESPONSIBILITIES

In essence, the Internet of Things makes it possible to endow objects with a connectivity which they did not necessarily have up until now. Designating an electronic communications service provider within the Internet of Things ecosystem is thus often up for debate, particularly if the end customer has contractual ties only with the supplier of its connected device.

The challenge here lies in enforcing the obligations attached to the status of electronic communications service provider (in terms of security, confidentiality, end user identification, continuity of service, resilience, legal interception, portability, etc.) solely within the context of the Internet of Things, and taking into account the variety of connected devices.

GUIDELINE NO. 15

The current review of the European electronic communications regulatory framework provides an opportunity to clarify the scheme to be applied to connectivity providers in the Internet of Things ecosystem. Arcep will be required to participate in the debate in a dual capacity. First, it will participate actively in drafting BEREC opinions and reports on the framework's review, in addition to serving as the BEREC chair in 2017. Second, it will provide its expertise to the Government to help prepare French authorities' position.

4.2 SHARE BEST PRACTICES PROMOTED BY CNIL, GIVING USERS THE ABILITY TO HAVE REAL CONTROL OVER THE DATA THAT CONCERN THEM

Issues surrounding data privacy and how data are utilised are central to the Internet of Things' adoption. To guarantee the confidentiality of every users' data, service providers should be encouraged to use aggregate data, and end users should be informed of any such use and given the ability to control it. It seems vital that this be made a central topic of debate during the object's design stage, in other words to adopt a "privacy by design" approach as recommended by the European regulation.

Arcep notes the "compliance pack" and certification initiatives introduced by CNIL whose aim is to define and disseminate best practices, sector by sector, in concert with the different sectors' stakeholders.

It seems equally necessary to support the implementation of the right to “data portability”, which allows users to recover the data they supplied to a service provider, in a structured, commonly used and machine-readable format. This right is provided for under Article 20 of the General Data Protection Regulation of 27 April 2016⁷, which will come into effect on 25 May 2018. Moreover, Article 48 of the Digital Republic Act stipulates that, in all circumstances, consumers have the right to recover all of their data – particularly those enabling them to switch service providers or to access other services – from providers of public online communication services, as of that same date.

GUIDELINE NO. 16

Arcep will pay close attention to CNIL initiatives pertaining to the Internet of Things, and could take part in this work if necessary. In particular, the Digital Republic Act stipulates that Arcep and CNIL can seek advice from one another on any matter that falls under their respective purviews.

4.3 SUPPORT INITIATIVES AIMED AT PROTECTING ENTERPRISES’ DATA OWNERSHIP

In addition to how personal data are treated, which falls under the purview of CNIL, the issue of data ownership for enterprises is a further challenge. For user enterprises and local authorities, the ability to maintain control over their data will no doubt be a prerequisite to their adoption of the Internet of Things. It is therefore be advisable to pay close attention to these issues as they unfold.

4.4 SUPPORT ANSSI ACTIONS AIMED AT ENSURING THE SECURITY OF NEW INTERNET OF THINGS NETWORKS

To strengthen users’ trust, in addition to the security mechanisms that are built into objects at the design stage, connectivity networks, including the most recent ones, need to take security aspects into account. A security-by-design approach must be encouraged for networks, to ensure security issues are taken into consideration from the very outset. It will thus also be advisable to implement schemes for raising awareness of and providing instruction on best practices for security as they apply to the Internet of Things.

⁷ Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)

GUIDELINE NO. 17

Arcep wants to continue its dialogue on this topic with ANSSI, operators and equipment suppliers, building on earlier meetings.

5 SUPPORT MARKET PLAYERS AND FOSTER A THRIVING INTERNET OF THINGS ECOSYSTEM

5.1 PURSUE THE DIALOGUE WITH IOT STAKEHOLDERS

Following through on the positive response to the meetings and workshops, Arcep will continue its dialogue with the ecosystem's stakeholders. This dialogue must not remain confined to public authorities, but must also take place amongst the players themselves.

GUIDELINE NO. 18

Arcep will schedule new opportunities to meet with IoT stakeholders in 2017 by hosting, among other things, technical workshops that will enable Arcep and the broadest possible ecosystem to share information and feedback.

5.2 SUPPORT INITIATIVES AIMED AT STRENGTHENING FRANCE AND EUROPE'S POSITION ON THE WORLD STAGE

French and European players are members of a number of global industrial alliances and standardisation bodies that are working on standardisation strategies for future concrete applications for the Internet of Things.

As part of the work being done at the European level, Arcep will work to ensure that regulations help European actors to flourish.

THE GUIDELINES

Guideline No. 1 To encourage innovation processes, Arcep is contributing to the creation of a regulatory framework for conducting trials on electronic communications networks. The Digital Republic Act (*Loi pour une République Numérique*) stipulates that Arcep can define an experimental framework designed to facilitate the, notably pre-commercial, development of an innovative technology or service, provided a certain number of conditions are met (duration, revenue, maximum number of users, etc.).

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Guideline No. 3 To limit rollout costs for new IoT networks, Arcep will encourage the reuse of existing passive infrastructures insofar as possible.

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Guideline No. 15 The current review of the European electronic communications regulatory framework provides an opportunity to clarify the scheme to be applied to connectivity providers in the Internet of Things ecosystem. Arcep will be required to participate in the debate in a dual capacity. First, it will participate actively in drafting BEREC opinions and reports on the framework's review, in addition to serving as the BEREC chair in 2017. Second, it will provide its expertise to the Government to help prepare French authorities' position.

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