

TOME 3

The State of the Internet in France

REVIEW AND PERSPECTIVES ON ARCEP'S ACTIVITIES

**ACTIVITY
REPORT**

2025 EDITION

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JULY 2025



Editorial

OPEN DIGITAL TECH TO SECURE OUR STRATEGIC AUTONOMY



By Laure de La Raudière,
Chairwoman of Arcep

The report on the state of the internet in France that we publish every year is more than just a technical snapshot: it is a tool for measuring the vitality of an essential common good. It provides an opportunity to take the pulse of an ecosystem in constant flux, to identify the dynamics at work and, if necessary, to take action in our regulatory capacity.

The 2025 edition of this report lays out three findings.

The first finding concerns the deployment of the IPv6 protocol. If the situation in France made real strides this past year, and is among the best in the world, the situation around the global remains wildly disparate and progress has been far too slow. Even though there has been a shortage of IPv4 addresses since early 2019, the global rate of adoption for IPv6 has not yet overstepped the 50% mark (compared to 70% in France). Even though the number of objects connected to the internet continues to climb, if it were to continue, this sluggish rate of progress could impede the emergence of new use cases and compromise the network's proper technical operation.

The second finding concerns the durability of digital technology. If we want to ensure that digital services, and the infrastructures that underpin them, will benefit future generations, they will need to be ecologically designed. This finding was the impetus for our publication, in concert with Arcom, of the General policy framework for the ecodesign of digital services, and for the launch, again with Arcom, of the Stakeholder

forum to facilitate its appropriation. There is a growing awareness of the energy drain that today's generative AI systems represent, and we want to make sustainability and energy efficiency a measure of competitiveness for new "made in Europe" AI services.

Lastly, this year marks the tenth anniversary of Europe's Open Internet (i.e. net neutrality) Regulation that allows every user to freely access and publish the content of their choice. This framework has enabled the flow of traffic without unjustified blocking or discrimination, benefitting both users and innovation. But the ecosystem is changing: the large digital platforms that have taken hold as the new technical gatekeepers via their marketplaces, search engines and operating systems, and the explosive development of generative AI are challenging the very way we access online content. Although digital platforms were the subject of European regulation (the Digital Markets Act) aimed at making them more open, do we need to think about extending the scope of application for net neutrality in this generative AI era?

* * *

These three findings alone reveal the extent to which the promise of a lastingly open internet is by no means a foregone conclusion. It was with this in mind that we published our Ambition 2030 strategy back in January. It is driven by one clear aim: to ensure that France has the digital infrastructures it needs for the coming decades, while guaranteeing that the internet remains an area of freedoms.

These infrastructures — be they for fixed or mobile networks, cloud computing, AI services or data sharing — must be accessible everywhere, to everyone and for a long time to come.

This is not a purely technical vision. Guaranteeing open digital technology also means protecting our strategic autonomy. It means safeguarding our country, our businesses, our citizens, from having to depend structurally on a handful of, often non-European, actors, for what are vital functions of our economic and democratic lives.

Environmental performance can become a determining factor in European innovation and competitiveness, and so in our long-term strategic autonomy. This will only be possible if startups are truly able to enter digital markets and offer their services.

Some say that regulation is an obstacle to innovation. On the contrary: *ex ante* regulation can be a catalyst for innovation. It is pro-innovator, pro-new entrant, the same way it has been in the telecoms market for 25 years. Regulation helps open up markets, disrupt gatekeepers and lift barriers, it guarantees fairness, and expands the scope of possibilities. It allows new entrants to jostle entrenched positions.

Digital technology has become the bedrock of our economy, the foundation of our trade, the vector of our rights. It is up to us, collectively, to work to ensure that it remains a driver of emancipation rather than a factor of dependency. This requires lucidity, constancy... and sometimes, indeed, regulatory courage.

Introduction

The state of the internet: working to ensure that the internet continues to develop as a “common good”

Arcep is responsible for monitoring the state of the internet in those areas that fall under its purview, including the transition to IPv6, net neutrality, quality of service, and safeguarding an open and sustainable digital ecosystem. To provide an account of its actions and shed light on certain emerging issues, the Authority began publishing an annual report on the state of the internet in France in 2017.

According to the latest [Digital Market Barometer](#),¹ **94% of people in France are Internet users**, indicating the central role it plays in our society. In a wide range of areas including education, travel, and entertainment, having a high-quality connection and access to a range of online services and content is becoming essential to participate in social, professional, and cultural life.

In many situations, the digitalisation of society is synonymous with progress, innovation and efficiency. This is why Arcep has made guaranteeing connectivity for everyone to everything a strategic priority: Internet access and quality determine its actual availability to the entire population. **The principle of an open and neutral internet** seeks to prevent restrictions on access to certain content and services, which could limit users' choice or strengthen the position of certain dominant players, at the expense of innovation.

At the same time, the ubiquity of digital tools is giving rise to a growing number of questions. A quarter of people in France say they spend more than five hours a day on their devices for personal use. This trend raises serious questions for our society around public health, protecting minors from certain content, and the impact on the environment. To address the environmental issue, in 2024 Arcep published its **General Policy Framework for the Ecodesign of Digital Services**, aiming to make services more efficient while promoting a more eco-friendly approach to the design and use of digital tools.

Most screen time is dominated by Big Tech companies and their platforms that act as gatekeepers to the online ecosystem. For several years now, Arcep has been involved in European initiatives to correct the competition imbalances created by these very large online platforms, in particular through the implementation of the **Digital Markets Act (DMA)**, which has been in effect since 2023. In line with the adoption of two new European regulations – the Data Governance Act and the Data Act – the DMA also strives to promote greater freedom of choice in cloud services and to leverage data and innovation to bolster economic development.

The Internet's outlines are changing rapidly. The rise of **artificial intelligence**, and particularly generative AI, is a prime example. In 2024, 77% of people between the ages of 18 and 24 reported using these technologies.² These new practices raise technical, economic, and legal issues. Generative AI has the power to profoundly alter how users access online information, services, and content. In its Ambition 2030 strategy, Arcep stresses the importance of building open digital technology and artificial intelligence systems.

¹ Arcep, Arcom, CGE, ANCT, [Digital Market Barometer 2025](#).

² Ibid.

Against this backdrop, Arcep is dedicated to contributing fully to the construction of an **open, sustainable, and safe** internet, working to guarantee that it continues to develop as a **common good**. The goal is to ensure that this “network of networks” remains a positive and welcoming space for users, generating opportunities, respecting fundamental rights, and acting as a catalyst for freedoms.

This **report on the State of the Internet in France** is **Volume 3** of Arcep’s annual report. It provides a summary of the actions taken by the Authority in 2024 on three key fronts:

- **Supervising how the internet operates**, including monitoring the data interconnection market, supporting the transition to IPv6, and guaranteeing net neutrality;
- **Actions to support open digital ecosystems**, which included creating a framework of trust to stimulate the development of the data economy, working to promote the development of generative AI systems that protect freedom of choice and innovation, and participating in the economic regulation of the very large digital platforms also known as “gatekeepers”;
- **Contributing to reducing the environmental footprint of digital technologies**, by producing studies and robust data on the impact of these technologies and promoting ecodesign to all stakeholders in the ecosystem.

The report also includes contributions from experts and bodies which are shaping the public debate and understanding of these topics. In this edition, the **RIPE NCC*** (European IP Networks – Network Coordination Centre)³ provides a reminder of the vital role that interconnection plays in the smooth operation of the internet. The **European Consumer Organisation (BEUC)** reviews the ten-year history of the EU’s Open Internet regulation. Economist **Jacques Crémer** shares his views on the economic and competition issues surrounding cloud computing, while **PEReN**, the French government’s centre of expertise for digital platform regulation⁴ outlines the work it is doing on the interoperability of various suppliers. The French competition regulator, the **Autorité de la concurrence**, and **Mozilla** share their perspective on the challenges created by generative AI. Finally, following a contribution from the French government’s **General Secretariat for Ecological Planning** on the role that data infrastructures play in the Green transition, **France Télévisions** and the **Green Algorithms** project demonstrate their commitment to ecologically designed and sustainable digital tech.

Arcep’s work on national coverage is detailed in **Volume 2** of its annual report, entitled “Regulation in support of connected territories”. The state of the internet also encompasses other major issues and challenges including sovereignty, cybersecurity, digital inclusion, and privacy. Because these subjects do not fall directly within Arcep’s purview, they are not addressed in detail in our annual report.

³ <https://www.ripe.net/>

⁴ <https://www.peren.gouv.fr/en/>

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Snapshot of the state of the internet in France

KEY FACTS

KEY FIGURES

Key facts

ARTIFICIAL INTELLIGENCE

15 JANUARY 2024

Arcep Chair, Laure de La Raudière, appears before the Steering Committee of the “*Etats Généraux de l'Information*” national summit on protecting freedom of the press. The Authority explains that generative AIs could become new gateways to the internet and to information online, with potential repercussions for the openness of the internet.

DIGITAL AFFAIRS

15 FEBRUARY 2024

As part of the obligation contained in the DMA for instant messaging apps to be interoperable, BEREC submits its opinion on Meta's draft reference offer for the company's WhatsApp messaging application to the European Commission.

ARTIFICIAL INTELLIGENCE

MARCH 2024

Arcep submits its response to the European Commission's public consultation on generative AI. The Authority places particular emphasis on the opportunities and the economic and competition issues surrounding generative AI, as well as its still poorly assessed environmental footprint, along with the potential threats to an open internet.

ECODESIGN

17 MAY 2024

Arcep and Arcom, in concert with ADEME, publish the General Policy Framework for the Ecodesign of Digital Services. Produced in collaboration with DINUM, Inria, and CNIL, the purpose of this document is to establish a frame of reference for reducing the environmental footprint of digital services (websites, platforms, video streaming, chatbots, etc.). To this end, it compiles 78 criteria and factsheets to help digital industry professionals establish their own proactive ecodesign processes.

DATA

22 MAY 2024

Arcep is entrusted with additional responsibilities to regulate cloud services and data intermediaries. Upon adoption of the law enshrining these new competences, Arcep opens a dedicated window, inviting data intermediary service providers to notify their business to the Authority, and apply for certification.

ECODESIGN

26 JULY 2024

In preparation for the new European regulation on the ecodesign of computers, along with the new European Commission work programme on this subject, Arcep publishes a set of proposals drawn from its work to promote digital ecodesign within the European Union. One of these proposals suggests to establish an obligation to maintain computer operating systems for ten years and extending European ecodesign targets to digital services.

ARTIFICIAL INTELLIGENCE

4 JULY 2024

Arcep hosts a panel discussion on “Generative AI: a new gateway to the internet” with Célia Zolynski, law professor, Jean Cattani, Secretary General of the French Digital Council (CNUM), and Frédéric Alexandre, Director of Research at the CNUM. This coincides with the publication of the 2024 Arcep report on the state of the internet in France which, for the first time, includes a chapter on artificial intelligence.

ENVIRONMENT

7 OCTOBER 2024

Arcom and Arcep, in collaboration with ADEME, publish a study on the environmental impact of audiovisual media consumption, in accordance with the French Climate and Resilience Law. In 2022, audiovisual use accounted for 2.9% of electricity consumption in France, or 13 TWh, and 0.9% of the country's carbon footprint.

DIGITAL AFFAIRS

3 OCTOBER 2024

BEREC publishes its report on the role of large content and application providers (CAP) and their relationship with electronic communications network operators and service providers (ECN/ECS). It provides an overview of the leading content providers' strategies and the different forms and power dynamics of their relationships with ECN/ECS operators, drawing on multiple case studies.

IPV6

2025

According to operators' forecasts, the transition to IPv6 should be virtually complete for consumer plans by the end of 2027. The transition could take a few more years for professional and corporate customers' plans. In terms of IPv6 use, France has risen from third to second place among the 100 countries with the most internet users, with a consumer and business rate of adoption estimated at 68.6% in February 2025.

CLOUD

14 OCTOBER 2024

Arcep launches a public consultation as part of the new powers entrusted to it by the SREN act to regulate data intermediation and cloud service providers. The Authority invites all stakeholders affected by the use of cloud services, along with cloud service providers, to share their views on the directions it plans to take.

INTERCONNECTION

10 DECEMBER 2024

After two years of work, BEREC publishes its report on the IP interconnection market. The document presents the findings of an unprecedented Europe-wide campaign to collect data on IP interconnection between 2017 and 2022. The report highlights the competitive nature of the IP interconnection market, in line with BEREC's previous observations on this subject.

STRATEGY

21 JANUARY 2025

At the annual New Year's Greetings ceremony, Arcep Chair, Laure de la Raudière, shares the Authority's new strategy, *Ambition 2030*. New technologies, new user expectations and new competences: with its nine strategic objectives and three modes of action, Arcep is aligning its strategies to meet contemporary challenges. The target for 2030 is to ensure that the country is *"equipped with digital infrastructures for the coming decades, and that the internet remains an area of freedoms"*.

ENVIRONMENT

12 MARCH 2025

The World Bank and the International Telecommunication Union (ITU) publish a joint study entitled, *"Measuring the environmental impact of the ICT Sector – Arcep case study,"* devoted entirely to Arcep's environmental data collection process. With its annual "Achieving digital sustainability" survey, Arcep is *"the first and only sector regulator to regularly publish [...] indicators from data it collects directly from digital players to assess and monitor their environmental impact"*. The fourth edition of this survey, which now includes mobile network equipment suppliers, is published four weeks later, on 17 April 2025.

DIGITAL AFFAIRS

3 MARCH 2025

BEREC issues its third opinion on the reference offers for the interoperability of Facebook Messenger and WhatsApp. BEREC recognises the improvements that Meta made following its first two opinions but also points to a number of weaknesses that the company needs to correct, including the restrictions on Messenger's interoperability.

NET NEUTRALITY

7 MAY 2025

A BEREC workshop on network slicing and net neutrality provided European regulators with an opportunity to discuss the regulatory issues surrounding these technologies and, more broadly, the current framework governing specialised services. The goal was to answer the questions raised by market players (telcos, service providers, and hardware manufacturers) within the context of 5G Stand Alone (SA) deployment and the increased opportunities for differentiated services on mobile networks.

ECODESIGN

19 MAY 2025

One year after the publication of the RGEN, the Digital Design Stakeholder Forum meets for the first time for multi-stakeholder discussions on the policy framework and ecodesign issues.

Key figures

DIGITAL PRACTICES

(source: Digital Market Barometer, 2025 edition)



94% of people in France used the internet in 2024, and **84%** did so on a **daily basis**.



Use of instant messaging and VoIP continues to increase:

85% of people aged 12 and over report using mobile apps to exchange messages (up 5 points YoY) and

78% use these apps to make calls (up 5 points YoY).



In 2024, **1 in 3** people had already used an AI tool (up 13 points YoY), a percentage that increases to **77%** for young people between the ages of 18 and 24.



72% of the population spend more than two hours a day on their devices for personal use.



32% of mobile subscribers have a monthly data allowance of more than 100 Gb.



Average monthly mobile data traffic per SIM card stood at **16.6 Gb** in Q4 2024 (up 1.7 Gb YoY).



51% of internet users have a cloud storage space.

CONNECTIVITY AND SUBSCRIPTIONS

(2024 figures; sources: Electronic Communications Market Observatory; Observatory on Broadband and Ultrafast Broadband Subscriptions and Deployments; 5G Deployment Observatory):



More and more people have fibre internet access at home: at the end of 2024,

there were **32.6 million internet subscriptions** in France, of which three-quarters were to a fibre plan (up 8 points YoY).



At the end of 2024, **40.6 million premises** in France were eligible to subscribe to fibre to the home (FttH), up by **2.6 million YoY**.



5G rollouts continue: in the span of three years, between **8,794** and **18,607** 5G cell sites had been launched commercially in Metropolitan France, depending on the operator, as of 31 December 2023.



Of the **84 million SIM cards** in service, **24 million** are activated on 5G networks, accounting for 29% of all mobile SIM cards in Q4 2024.

INTERCONNECTIONS

(figures for 2024; source: Barometer of data interconnection):



At the end of 2024, inbound traffic to the main ISPs in France was estimated at **50.8 Tb/s**, reflecting a **9.2% increase** compared to 2023.



At the same time, outbound interconnection traffic for France's four largest ISPs stood at approximately **5.1 Tb/s**, a 17.5% increase YoY. Between the end of 2019 and the end of 2024 this traffic almost tripled.



Around **47% of traffic** to the country's four largest ISPs came from five companies: Netflix, Akamai, Facebook, Google, and Amazon.



Standing at 9.9:1 in 2024, the asymmetry ratio between inbound and outbound traffic continues to shrink : in 2024, for



At the end of 2024, on-net CDNs were estimated to account for **19% of ISPs' traffic to end users**, or around **12.1 Tb/s**.

every **1 Gbit/s** of outgoing traffic, there were **9.9 Gbit/s** of incoming traffic.

IPV6

(figures at end of 2024; source: IPv6 barometer):



At the end of 2024, **87% of fixed access customers and 70% of mobile customers** in the consumer market were IPv6-enabled, and nearly all are expected to be so by 2027.



Only **23% of domain names** accept emails in IPv6, but this percentage has increased substantially since 2022, rising from 8% to 23%.



Including businesses, **69% of all internet users in France** are IPv6-enabled.



France ranks **2nd** (behind India) in the rate of IPv6 use in the 100 countries with the most internet users.



35% of websites are available in IPv6.

ENVIRONMENT

(2023 figures; source: Arcep annual Achieving Digital Sustainability survey):



Data centre operators' **greenhouse gas emissions, energy consumption, and water use continue to increase sharply, up 11%, 8%, and 19%** YoY, respectively.



The main electronic communications operators' greenhouse gas emissions **increased by 4.2%** YoY.



Mobile networks' energy consumption is rising (up 6% YoY in 2023), due to the increase in mobile data traffic and cell site deployments. Meanwhile, fixed networks' power consumption is declining as a result of the growing ubiquity of fibre.



Internet routers and STBs together consumed 3.5 TWh, representing five times more than fixed networks' energy use.



95% of routers' power consumption does not depend on internet traffic or how heavily they are employed by users.



The production of mobile access network equipment (Base Band Unit, Radio Remote Unit, passive and active antennas) sold in France required

2.4 tonnes of precious metals. This marks a decrease for the second year in a row, due chiefly to a significant drop in equipment sales, and not to a change in the products' composition.



The steady decrease in the number of new digital devices put on the market **could help to reduce device manufacturers' environmental footprint**, although this reduction could be offset by increasing screen sizes. On average, a large-screen television **consumes 6 times more** electricity when in use than a smaller model.

PART 1

Supervising the smooth operation of the internet and net neutrality

CHAPTER 1

**Supervising data interconnection and
relations between internet service
providers and content providers**

CHAPTER 2

**Continuing to accelerate
the transition to IPv6**

CHAPTER 3

Guaranteeing net neutrality

CHAPTER 1

Supervising data interconnection and relations between internet service providers and content providers



THE BOTTOM LINE

- Inbound traffic to the main ISPs in France was estimated at **50.8 Tb/s at the end of 2024**, which marks a 9.2% increase YoY.
- Around **47% of inbound traffic for the top four internet service providers comes from five companies**: Netflix, Akamai, Facebook, Google, and Amazon (including traffic from Twitch).
- BEREC collected data from across the EU on the **IP interconnection** market and published an overview of the European market between 2017 and 2022. It concluded that market competition is satisfactory overall but recommended that monitoring continues and increased attention be given to safeguarding an open internet.

1. DATA INTERCONNECTION, AT THE HEART OF ARCEP'S EFFORTS TO SAFEGUARD AN OPEN INTERNET

The internet is a “network of networks”, in other words networks that are interconnected in a way that enables information to take a multitude of possible paths. “Interconnection” refers to the **technical and economic relationship established between different parties to connect to one another over the internet and exchange traffic**. It takes the form of a physical link between networks, creating a global mesh, and enabling end users to communicate with one another.

Data interconnection is thus at the heart of how the internet, this network of networks, functions, since it is through these links that the internet's many players exchange traffic, thereby creating a global network to which end users connect via their internet Service Provider (ISP). ISPs, meanwhile, interconnect with content and application providers (CAP) and other players along the internet ecosystem, to relay content and ensure good quality service to their subscribers. The more direct the links, the better the quality of service.

The internet can only run smoothly if these interconnections are sound. Negotiation difficulties between two interconnected parties may, for instance, result in a lower quality of service or a loss of interconnection which, in turn, will make it partially or fully impossible for users to access, use, or distribute the services and applications of their choice. Interconnection could also be used for the purpose of anti-competitive discrimination against the source, the recipient, the destination, or the content of the traffic being relayed.

When an interconnection issue arises, **Arcep can exercise the powers assigned to it by the legislator**, either through an *ex ante* regulatory decision or a dispute-settlement decision at the request of one of the parties.

To ensure continuous monitoring of the market, and particularly the relationships between content providers, technical intermediaries, and operators, **Arcep has been collecting data on interconnection and data transport on a biennial basis since 2012**. The aggregated findings of these data collection campaigns are published in the Barometer of Data Interconnection.¹ Key figures for the 2025 edition of this Barometer, pertaining to 2024, are included in this chapter.

The Authority is also involved in the work of BEREC which, in 2024, published a report on IP interconnection in Europe (See Chap.1.3.).

¹ The Barometer of Data Interconnection is updated annually on [the Arcep website](#).



THE MAIN PLAYERS INVOLVED IN INTERCONNECTION AND THE INTERNET

A range of major stakeholders interconnect within the internet ecosystem. These include:

- **Content and application providers (CAPs):** the owners of the content who rely on multiple intermediaries to relay their content to end users;
- **Web hosting companies:** the owners of the servers that host the content managed by third parties (CAPs or individuals);
- **Transit providers:** international network managers that act as intermediaries between CAPs and ISPs to relay traffic;
- **Internet Exchange Point (IXP) managers:** third parties operating an exchange point that enables the different players to interconnect directly through that IXP, rather than going through one or several transit providers;
- **Content Delivery Network (CDN) operators:** these technical intermediaries specialise in delivering large volumes of traffic to multiple ISPs, in different geographical areas, using cache servers located close to end users, to optimise routing while improving performances and reducing costs;
- **Internet Service Providers (ISPs):** network operators who are responsible for relaying traffic to end users.

2. THE STATE OF INTERCONNECTION IN FRANCE IN 2024

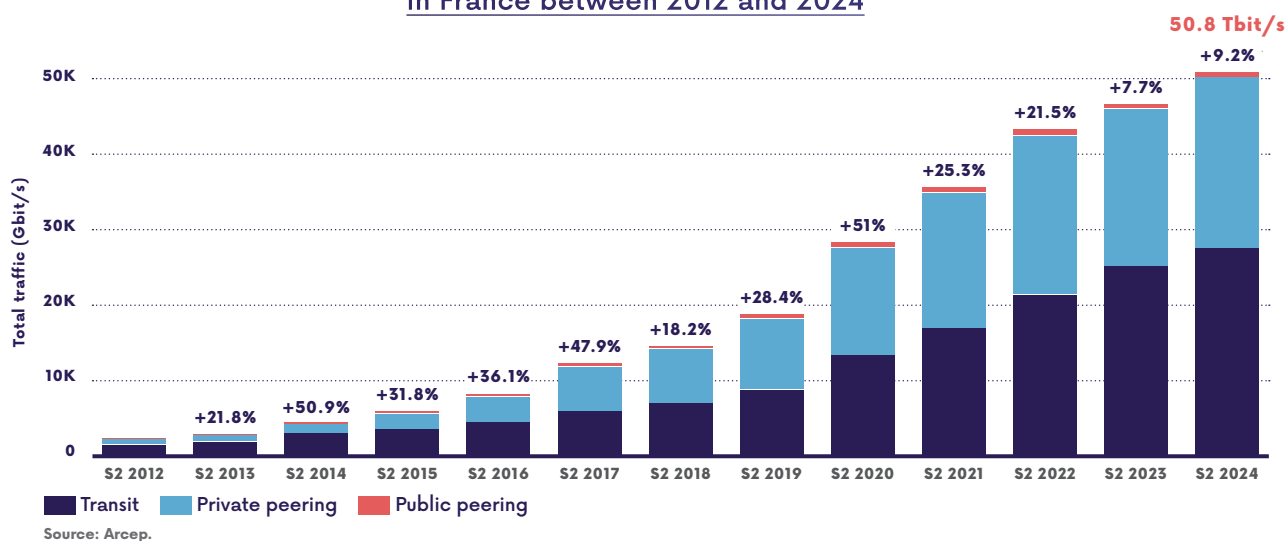
Arcep therefore has technical and financial data on interconnection from the first half of 2012 to the second half of 2024. For confidentiality reasons, the published findings² only cover the **aggregated results from the four main electronic communications operators in France**.

2.1. Inbound traffic

Inbound interconnection traffic to the networks of the four largest ISPs in France rose from 46.5 Tbit/s at the end of 2023 to **50.8 Tbit/s at the end of 2024, which marks a 9.2% increase YoY**.

This progression is comparable to the 7.7% increase in 2023, and well below the rates of increase in previous years. By means of comparison, the annual rise in inbound traffic in 2022 was estimated at 2.5%.

Progression of inbound traffic to the main ISPs in France between 2012 and 2024



² Results obtained from ISPs' responses to information gathering on the technical and financial conditions of data interconnection and routing, the scope of which is detailed in [Arcep Decision 2017-1492-RDPI](#).

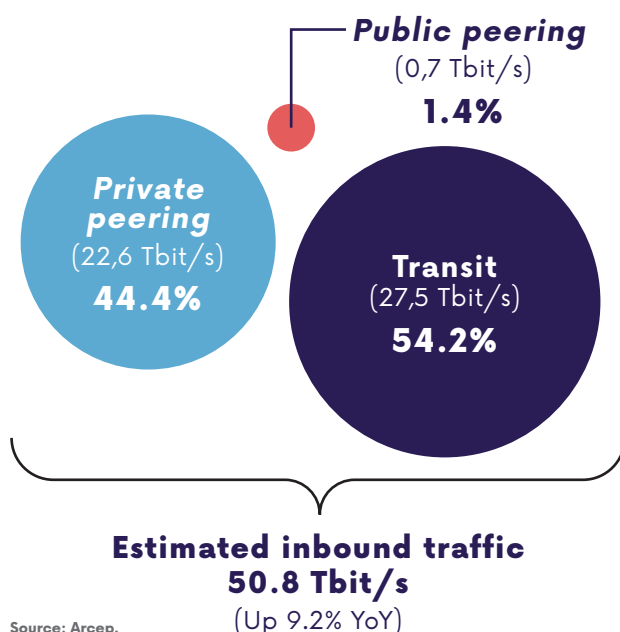
This increase in bandwidth consumption is consistent with the progression in mobile data traffic that Arcep documented in its Observatory of the Electronic Communications Markets in France, which revealed a slight decline in mobile data traffic since 2023³ that can be attributed to:

- first, a change in demand: for instance, the 2024 Digital Market Barometer published in March 2025⁴ underscored a levelling off of the penetration rate for video on demand (VoD) services – at 56%, identical to the previous year – after several years of steady increase;
- second, some content providers' efforts in terms of compression and traffic optimisation, including the use of on-net CDNs.

In the second half of 2024, inbound traffic to ISPs' networks was split chiefly between transit (around 54.2%) and private peering (around 44.4%), with a fraction being handled by public peering, i.e. at Internet Exchange Points or IXPs (1.4%). Transit thus accounts for the majority of this traffic once again in 2024, with very little change in the overall balance compared to 2023, when it stood at 54.1% for transit, 44.7% for private peering, and 1.2% for public peering.

The high proportion of transit can be explained in large part by the transit traffic between Open Transit International (OTI), a Tier 1 operator owned by Orange, and Orange's internet backbone and backhaul network (*Réseau de Backbone et de Collecte internet d'Orange*, RBCI), for relaying traffic to the ISP's end customers. This rate of transit is much lower for other ISPs that do not have their own transit business and so rely far more heavily on peering.

Distribution of inbound interconnection traffic in 2024



³ See the figures from Arcep's [Observatory of Electronic Communications Markets in France](#) for Q1 2024.

⁴ Arcep, Arcom, CGE, ANCT, 2025 Digital Market Barometer.

⁵ Florian Dèbes October 2024. "Electronic communications: how the 2024 Paris Olympics and Taylor Swift shaped the future of mobile networks", Les Echos (in French).

⁶ By way of example, the article in Frontier Economics, "The impact of artificial intelligence on the telecoms sector", published in 2023, mentions the Omdia assumption estimating that AI could represent two-thirds of ISPs' traffic by 2030.

⁷ Telegeography, 2025. [State of the network](#).

2.2. Asymmetry between outbound and inbound traffic

At the end of 2024, outbound traffic from the networks of France's four largest ISPs climbed to around 5.1 Tb/s, which marks a 17.5% increase from the end of 2023. This traffic virtually tripled between the end of 2019 and the end of 2024.

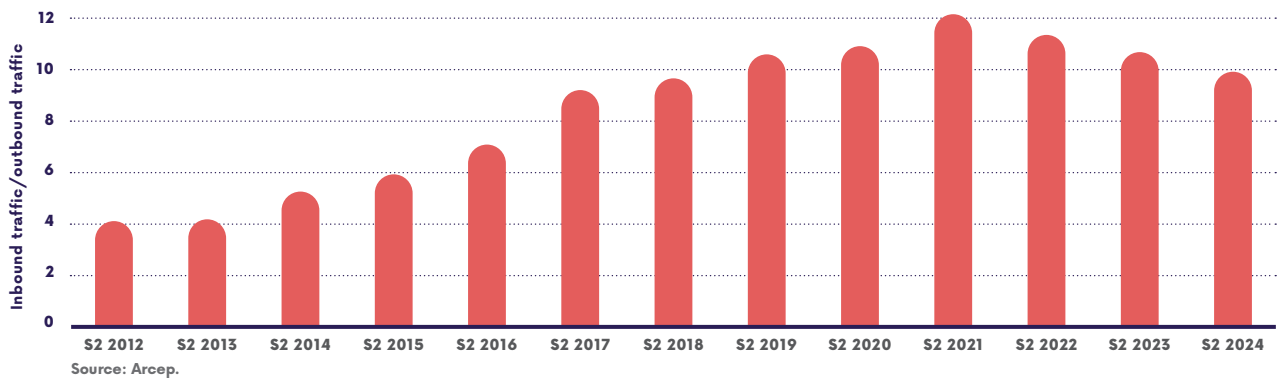
The volume of outbound traffic therefore continues to be smaller than inbound traffic, due to an asymmetry in how the internet is used, with end users receiving more data than they send.

The asymmetry ratio between inbound and outbound traffic on the main ISPs' networks has, nevertheless, been narrowing steadily since 2022. In 2024, for 1 Gb/s of outbound traffic there were 9.9 Gb/s of inbound traffic, compared to a ratio of 1 to 10.6 Gb/s in 2023 (see the chart titled 'Change in the asymmetry ratio between 2012 and 2024').

Several assumptions can be made to explain this increase in outbound traffic that is altering the asymmetry ratio. **The main assumption is the rise in video uploads to social media sites.** End users are uploading more videos online, which is increasing ISP networks' outbound traffic. Unsurprisingly, the 2024 Olympic Games in Paris saw a dramatic uptick in mobile network traffic⁵. Streaming videos over smartphones appears to have become commonplace, which may well be affecting outbound traffic.

Although some players expect to see an increase in the percentage of traffic dedicated to artificial intelligence (AI)⁶, it is not yet possible to draw any definite conclusions about how generative AI will affect traffic. There is, indeed, little reliable data available on the use of these applications and their impact on traffic. In its latest report, Telegeography⁷ explains that the impact of generative AI on international traffic capacity is "not entirely clear". The report nevertheless puts forward the hypothesis of a possible increase in ISPs' traffic over time, resulting from the use of services such as GPU-as-a-service, which enable remote model training.

Change in the asymmetry ratio between 2012 and 2024



2.3. On-net CDNs' share of traffic towards end users

Seamlessly transmitting content, and video content in particular, is becoming vital for CAPs who are striving to move closer and closer to end users. This has led to the advent of a new interconnection method: on-net (or proprietary) CDNs. **CDNs are systems that make it possible to optimise the transmission of content to end users, thanks to a network of cache servers that store content temporarily, located close to users where demand exists.** This approach helps to reduce latency (content is loaded more rapidly) and to distribute the traffic load (requests are distributed between the different cache servers) when demand is high. To this end, CAPs create partnerships with ISPs to have their content hosted on cache servers on each ISP's network. These on-net CDNs can belong to the ISP that hosts them or to third parties.

By way of example, the service providers that account for a large percentage of ISPs' inbound traffic, such as Netflix, Google, Amazon, and Meta, can install their own servers on certain ISPs' networks. Arcep has been collecting data on on-net CDN since 2016.

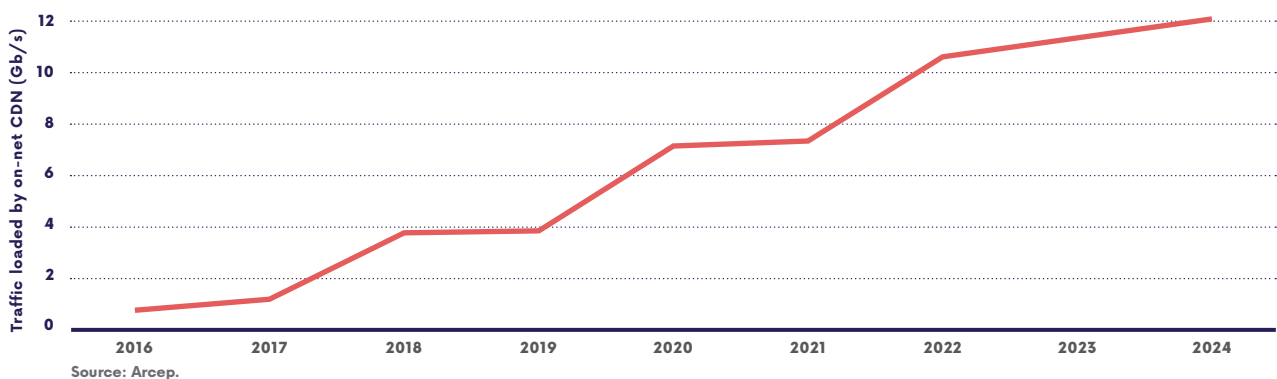
Between the end of 2023 and the end of 2024, traffic from on-net CDNs to the customers of France's largest ISPs increased slightly, rising from close to 11.4 Tb/s to around 12.1 Tb/s.

Since their first appearance, on-net CDNs have become firmly established. Because they are an efficient way to distribute content, they minimise inbound interconnection traffic and the volume of traffic being relayed over the internet. The ratio between interconnection traffic to the on-net CDN cache and outbound traffic from the on-net CDN to end users varies between 1:10 and 1:19 depending on the ISP, with an average ratio of 1:14. In other words, **the data made available via on-net CDNs are viewed an average of 14 times** (see the chart 'Interconnection point traffic, and the role of on-net CDNs'). This ratio, which stood at between 1:7 and 1:15 in 2023, has increased, proving that demand is highest for content that is hosted on on-net CDNs.

Using on-net CDNs helps to reduce interconnection point traffic, hence provisioning of the links. At identical end-user consumption levels, inbound interconnection traffic would increase by 24% in the absence of an on-net CDN.

In 2024, the percentage of traffic coming from on-net CDNs represented around 19% of traffic to ISPs' customers. This is relatively unchanged compared to 2023, although it does vary between 12% and 29% depending on the ISP.

Progression of on-net CDN traffic



Interconnection point traffic, and the role of on-net CDNs



2.4. Breakdown of traffic by origin

Based on data collected from ISPs⁸, Arcep can estimate the proportion of traffic coming from certain CAPs and content delivery companies (notably third-party CDNs), when they are identifiable, as a percentage of total interconnection traffic.

It should be noted that **the interconnection data analysed here pertain to direct relationships between internet companies' network infrastructures**, identified by their Autonomous Systems (or AS) number. This means that content hosted or transported by a third-party, which does not therefore involve a direct interconnection with an ISP reported to the Authority, is not identified in the graphic below.⁹

Despite being very popular with users, some service providers are not represented as their traffic is relayed by intermediaries (CDNs, transit providers, etc.) up to the ISP's interconnection point. For example, broadcasters – such as TF1, M6, France TV, and VoD platforms like Disney Plus¹⁰ – relay all or a portion of their traffic via CDNs or other technical intermediaries, which explains why such a small percentage of traffic is attributed to them in the graph below. Content providers represented in the graph may also relay a portion of their traffic via technical intermediaries and thus be associated with a percentage of traffic that is proportionately smaller than the actual amount of their content consumed on user devices.



WHAT IS THE LINK BETWEEN USERS' DIGITAL PRACTICES AND INTERCONNECTION TRAFFIC IN FRANCE?

Traffic measured by ISPs at the interconnection point is influenced by users' digital habits in France but is not an exact representation.

The interconnection point is where traffic is exchanged with all ISPs' partners. It can, therefore, be seen as representing the border between ISPs' networks. It is a border in a technical but not a territorial sense: although the traffic being exchanged could come from France, Europe, or anywhere else in the world, its origin cannot be accurately determined.

Here, Arcep is presenting the aggregated results of the speeds measured at the interconnection point. These measurements are not taken on end-user devices.

The traffic, which is measured upon its arrival into the ISP's network, does not enter solely to meet the needs of end users. A minority of the data exchanged may be relayed over an ISP's network to reach another destination, such as another ISP's network.

In addition to the information from the Barometer of Data Interconnection, Arcep collects and publishes other data that can help provide a more detailed understanding of how the internet is used, and particularly mobile data traffic, as part of the [Observatory of Electronic Communications Markets](#) in France. The annual [Digital Market Barometer](#), which is produced in partnership with Arcom, CGE, and ANCT, delivers a more qualitative snapshot of digital practices in France.

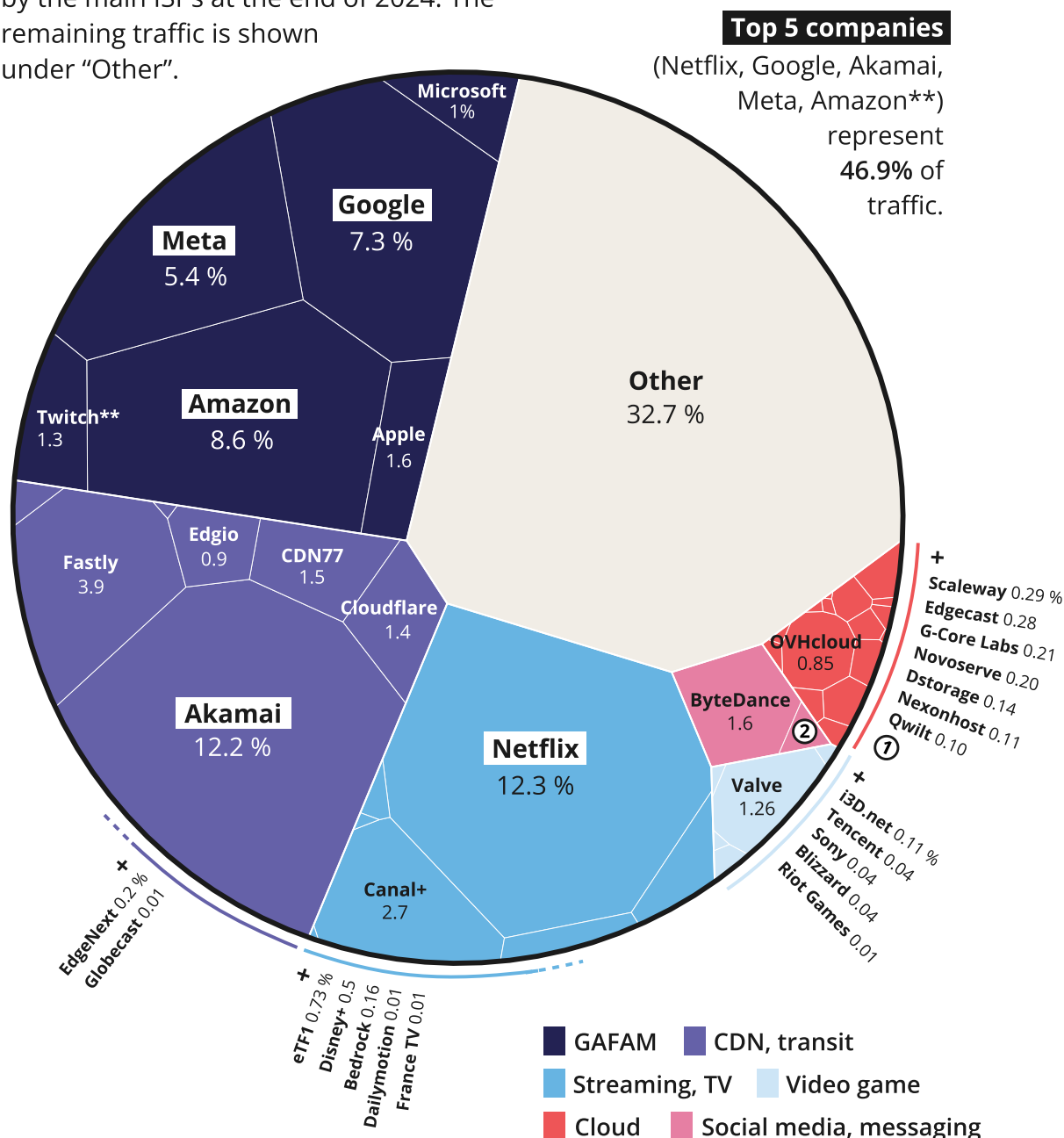
⁸ Here again, aggregated data are only from France's top four commercial ISPs.

⁹ The graph does not, for instance, distinguish between traffic tied to the Facebook, Instagram and WhatsApp apps within the Meta group, since these services are interconnected with ISPs via Meta's common network infrastructure. This is also the case with other applications and services provided by the top five Big Tech companies ("GAFAM"). The only exception is traffic from Twitch which still has a separate infrastructure and a dedicated AS number. For the sake of clarity, however, this is included under Amazon.

¹⁰ See "Disney+ compte près de 130 million d'abonnés, nettement plus qu'attendu" (in French), Le Parisien, 10 February 2022.

Estimated breakdown of traffic by origin in 2024

Percentage of inbound traffic at the interconnection point from 44 transport or content production companies, as reported by the main ISPs at the end of 2024. The remaining traffic is shown under "Other".



Source: Arcep.

* Bouygues, Free, Orange, SFR. ** including Twitch, property of Amazon.

① M247 0.06 % ; Alibaba Cloud 0.06 % ; Dropbox 0.03 % ; Zscaler 0.03 % ; Worldstream 0.03 % ; Leaseweb 0.02 % ; Zenlayer 0.01 % ; Mediactive <0.01. ② Telegram 0.2 %.

The graphic p.21 illustrates an aggregation of traffic to the top four ISPs, distributed based on the partners with which they are interconnected. The different types of interconnected players have been categorised to make the graph more legible, and only those involved in distributing or transporting content are listed.

Regarding the “TV streaming” category that includes VoD services and TV channels, Netflix remains the company that generated the largest volume, estimated at 12.3% of total traffic. This share has nevertheless been shrinking since 2022 (it stood at 15.3% in 2023). The relatively small share of the other players in this category (e.g. 2.7% for Canal Plus and 0.5% for Disney Plus) needs to be qualified: some VoD services and TV channels relay a portion of their traffic via CDNs rather than their own infrastructure, which can result in a relative underestimation of their share as depicted in the graph.

Regarding CDN providers, the percentage generated by Akamai held steady in 2024 at 12.2% (compared to 12.3% in 2023¹¹) and is comparable to Netflix's share this year. Meanwhile Fastly's share has increased dramatically, rising from 1.9% of traffic in 2023 to 3.9% in 2024.

Traffic from the Big 5 tech companies, i.e. Google, Apple, Meta, Amazon and Microsoft, which provide a very wide range of products and services,¹² reached 25%. Amazon represents 8.6% of traffic, a significant increase on 2023 (up 2 points). Including Twitch,¹³ Amazon accounts for 9.9% of traffic, followed by Google (7.3%) and Meta (5.4%). Traffic from Microsoft increased slightly, from 0.8% in 2023 to 1% in 2024, as did that from Apple, whose share rose from 1.2% to 1.6%.

Close to 19% of traffic comes from global Tier 1 transit providers whose solutions act as the link between the different internet players (content providers, ISPs).

In the social media category, traffic generated by **TikTok parent company, ByteDance, accounted for 1.6% of total aggregated traffic in 2024**, a slight (0.5 point) increase over 2023.

Lastly, traffic generated by the “other” category, whose share stands at 32.7%, comes from ISP-to-ISP interconnection, or from companies whose main business is not content distribution or hosting.



PUBLIC RESEARCH AND HIGHER EDUCATION NETWORKS: THE FRONTRUNNERS OF THE INTERNET

When students connect to the internet on their university campus, there is a very high likelihood that their internet service provider is not a retail market ISP, but rather a national research and education network (REN), such as Renater in France.

Little known to the general public, these national research and education networks are now specialised operators serving research labs and universities. In Europe, they are grouped together within Géant¹, which enables interconnections between laboratories and research facilities.

RENs mainly provide connectivity and play an important role in knowledge sharing and the transmission of critical data for scientific experiments, e.g. for the Large Hadron Collider (LHC) at CERN.²

It is worth noting that these networks have made a significant contribution to the history of the internet, both nationally and internationally. In France, the dissemination of Renater relied on groundbreaking work carried out around the Cyclades³ computer network, which is considered one of the precursors of the internet. This networking of higher education and research establishments actually predates the public internet. Another example took place in 1995, when the Renater public interest group took part in the creation of SFINX, one of the first IXPs in Europe.⁴

1 Géant, 2023 *Compendium*.

2 Renater, *LHCONE*.

3 SCHAFER, Valérie and TUY, Bernard, 2013. *Dans les coulisses de l'Internet : RENATER, 20 ans de Technologie, d'Enseignement et de Recherche*. Paris : Armand Colin. « Le sens de la recherche », p.240. DOI : 10.3917/arco.schaf.2013.01 (in French).

4 SCHAFER, Valérie, 2012. « *De Cyclades à Renater : Des réseaux de données pour la recherche et l'enseignement (années 1970-1990)* », Histoire de la recherche contemporaine. La revue du Comité pour l'histoire du CNRS, 11 octobre 2022. (in French).

11 This on the heels of a very sizeable increase between 2021 and 2022, attributed to a rise in the consumption of content hosted by this company, and to changes in the CDN market where players switched from an other CDN provider to Akamai, which also explains why Akamai's market share stopped growing.

12 The “GAFAM” category includes traffic from networks owned by Google, Amazon, Meta, Apple, and Microsoft. As it is impossible to distinguish the interconnection traffic of these different companies' services, it is also impossible to break down the different services according to the categories listed in the graph. This is why, for instance, Instagram is not classified in “social media” or YouTube in “video and streaming”.

13 Twitch was still using a separate AS number in 2024 but displayed as “Amazon IVS”. While listed separately, Twitch is included in Amazon's share since the two belong to the same group. Moreover, Twitch's decreasing share may be explained by traffic being switched over from the old AS to Amazon's main AS.

3. STATE OF INTERCONNECTION IN EUROPE IN 2024

Published in December 2024, the BEREC report on IP interconnection in Europe¹⁴ provides a state of the art on interconnection in Europe since 2017. **For the first time, it draws upon a data collection campaign carried out across Europe in autumn 2023, in a coordinated fashion with each national regulatory authority (NRA).** It focused on European ISPs' interconnection agreements, drawing on 174 contributions.

The report analyses overall changes in interconnection traffic from 2017 to 2023, along with cost and pricing trends. The data and stakeholder feedback suggest that traffic growth is levelling off, while costs and prices are decreasing steadily. The report also details the market's competition dynamics, and the power relations

between players. The growing prominence of CDNs and direct peering is, for instance, putting competitive pressure on transit providers, and especially on the price of transit services.

Although many of the points corroborate the analyses conducted by Arcep (notably the growing entrenchment of CDNs in the interconnection landscape since 2017, which is equally evident across Europe), the report's findings also reveal the specificities of the French market, particularly the role of paid peering, which tends to be minor at the European level.

From this analysis, the report deduces that competition in the IP interconnection market is satisfactory, which aligns with BEREC's earlier conclusions on this subject. In addition to continuing to monitor the market, BEREC suggests that a more in-depth investigation may be warranted into this market segment's compliance with the open internet principle, and the applicability of solutions resulting from the Electronic Communications Code and Open Internet Regulation.



EUROPEAN WORK ON THE TOP CONTENT AND APPLICATION PROVIDERS (CAPS) AND THEIR RELATIONSHIPS WITH ELECTRONIC COMMUNICATIONS OPERATORS

In addition to IP interconnection, Arcep and BEREC have been actively working on the various technical and commercial relationships between content providers, infrastructure operators, and electronic communications networks, to inform current European discussions on this topic. In particular, Arcep co-chaired BEREC's work on the entry of large CAPs into the markets for electronic communications networks and services.¹

The report, which includes stakeholders' feedback to the public consultation, aims to identify those parts of the internet in which gatekeeper platforms are investing, and to analyse their strategies for moving up the value chain, their business models, and their relationships with traditional ENC/ECS providers in terms of competition, cooperation, and interdependence. The report thus provides an overview of the impact that these Big Tech companies are having on networks and certain electronic communications services in Europe.

Relations between large CAPs and electronic communications operators are multifaceted. Both players can form partnerships to provide joint or complementary services (e.g. ISPs provide broadband internet access services, and CAPs provide content and applications; home routeurs

deliver both internet access and access to Over-The-Top or voice assistant services). ISPs and CAPs can also compete directly, notably when it comes to calling and messaging services, the supply of cloud services, CDNs, submarine cables, etc.

In its report, BEREC analyses these different dynamics through three case studies on CDNs, on submarine cables, and on internet relay services that are akin to virtual private networks (VPNs). The analysis reveals how gatekeeper platforms have deployed their own physical infrastructures (e.g. CDNs, data centres etc.) and network infrastructure (submarine cables), and are now operating a large portion of the services internally, that they had previously contracted from electronic communications operators (e.g. international transit).

The report also details some of the restrictions imposed by operating system (OS) providers that affect, or could affect, the ability of electronic communications operators to provide internet access or access to certain services.

For further details on Arcep's work on digital technology, see Volume 1 of the 2025 Annual report

¹ <https://www.berec.europa.eu/en/document-categories/berec/reports/draft-berec-report-on-the-entry-of-large-content-and-application-providers-into-the-markets-for-electronic-communications-networks-and-services>

¹⁴ BEREC, 2024, [Report on the IP Interconnection ecosystem](#).

Giving the floor to

ALENA MURAVSKA

Programme Manager on the Community & Engagement at RIPE NCC



The RIPE NCC: At the Heart of a Stable and Open Internet

The RIPE NCC (Réseaux IP Européens Network Coordination Centre) is one of the five Regional Internet Registries (RIRs) in the world. As a not-for-profit membership organisation, the RIPE NCC is responsible for the allocation and management of Internet number resources in Europe, the Middle East, and Central Asia. These resources include IPv4 and IPv6 addresses, as well as Autonomous System Numbers (ASNs). But beyond its technical mission, the RIPE NCC also plays a key role in supporting the global interconnection ecosystem and the open Internet.

Infrastructure for a Stable Internet

One of the RIPE NCC's main objectives is to ensure that the Internet remains open, stable, and accessible to all. By ensuring the accurate registration of Internet number resources, the RIPE NCC enables networks around the world to connect with one another. Every Internet service provider, network operator, hosting company, or enterprise needs these resources to be identified and to route Internet traffic properly.

Without careful and fair management of these resources, the Internet would be chaotic, unstable and vulnerable to abuse. The RIPE NCC applies policies that have been developed by the RIPE community itself, through an open, transparent, and bottom-up process to ensure a fair and transparent distribution of resources. This collaborative governance model is one of the cornerstones of our open Internet.

Building Consensus

In its role as secretariat to the RIPE community, the RIPE NCC organises two RIPE Meetings each year, in addition to other regional events. RIPE meetings bring together a broad community: Internet service providers, researchers, policymakers, network engineers, representatives from governmental and non-governmental organisations, and many others. Here people share best practices, discuss technical developments, debate resource management policies, and strengthen human relationships in what is often a highly technical field.

While much is discussed at RIPE Meetings, the actual policy-making process occurs on public mailing lists, which are open to anyone and form the backbone of the [RIPE Policy Development Process \(PDP\)](#). These mailing lists are where consensus is built, objections are addressed, and proposals are refined. The RIPE NCC also facilitates this process as the community's secretariat.

Supporting Research and Network Resilience

The RIPE NCC also provides tools and technical services for monitoring and understanding the Internet. For example, [RIPE Atlas](#), a global network of distributed probes, allows real-time measurement of Internet connectivity. [RIPEstat](#), another key service, provides a complete and freely accessible overview of the state of IP resources, routing, and global connectivity. The Internet community can also publish ideas, data tools and analyses on [RIPE Labs](#), which is managed by RIPE NCC and also includes [a podcast](#) covering a range of topics relating to Internet infrastructure and governance.

These services support not only academic research and innovation but also the operational resilience of networks. In the event of an incident, they enable a faster response and better coordination between operators, thus contributing to the overall stability of the Internet.

Promoting Education and Cooperation

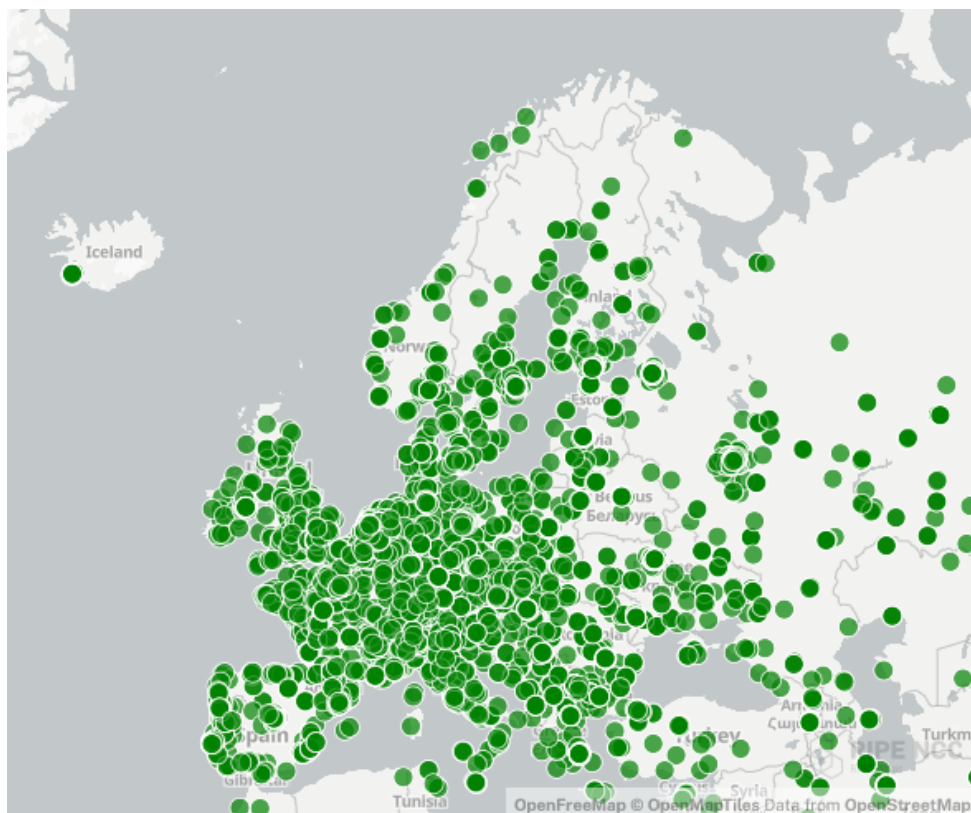
The RIPE NCC regularly organises training sessions, webinars, and certification programmes to help network professionals develop their skills. This includes face-to-face training across its service region, a [free online academy](#) and, for those who want to go further, a [certification programme](#) that validates these competencies.

The RIPE NCC also participates in key multistakeholder forums such as the Internet Governance Forum (IGF), the ITU, and other regional platforms, where it works to ensure that decisions about the Internet's future are inclusive, transparent, and evidence-based. It also supports capacity building and informed participation among its community members, helping them engage in policy dialogues and contribute to shaping Internet governance from the bottom up.

The organisation also plays a key role in raising awareness about critical issues such as Internet security, IPv6 adoption, and Internet governance, particularly among audiences less familiar with the technical landscape, such as government representatives and the general public.

A Voice for an Open Internet

In a global context where geopolitical tensions, national regulations, and commercial interests can threaten the neutrality of the network, the RIPE NCC remains a trusted steward of the open, inclusive, collaborative Internet model. By staying true to its mission, the RIPE NCC retains the trust of its members and its community, a mission it is determined to uphold in support of a single, stable and resilient Internet.



Atlas probes coverage map.

Source: <https://atlas.ripe.net/statistics/coverage>

CHAPTER 2

Continuing to accelerate the transition to IPv6



THE BOTTOM LINE

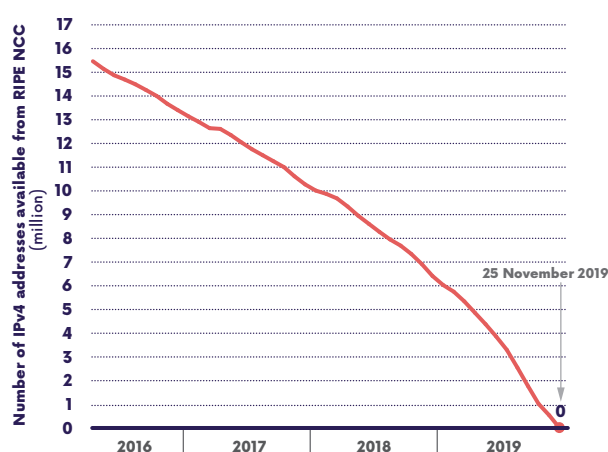
- The transition to IPv6 has become a **pressing issue, to prevent the internet from being split into two with IPv4 on one side and IPv6 on the other.**
- At the end of 2024, **87% of residential fixed access customers** (FtTH, cable, ADSL) in France were IPv6-enabled, compared to **70% of mobile network customers**. There continue to be disparities between operators, however, particularly in terms of enabling IPv6 on business plans.
- Of the 100 countries with the most internet users, **France ranks second in IPv6 adoption**, with a combined residential and business adoption rate estimated at 68.6% in February 2025, behind India (73.4%).
- The rate of IPv6 **mail** hosting increased by 15 points in the past two years (from 8% to 23%), compared to a three-point increase in the previous four years.
- Arcep chairs the **IPv6 task force** which is launching a forward-looking working group, "IPv6 2030: requirements for a future IPv6 internet".

1. THE TRANSITION TO IPV6: VITAL TO THE FUTURE OF THE INTERNET

Every device connected to the internet has an IP address. Public IP addresses are registered and routable on the internet and are therefore unique. Internet Protocol version 4, or IPv4, which has been used on the internet since 1 January 1983, provides an addressing scheme of close to 4.3 billion IP addresses. However, the overwhelming success of the internet, the range of uses, and the proliferation of connected objects have led directly to the **gradual exhaustion of IPv4 addresses**. Since 25 November 2019, RIPE NCC (the regional internet registry that allocates IPv4 addresses in Europe and the Middle East) has been experiencing a shortage of IPv4 addresses.

To tackle this situation, IPv6 specifications were finalised in 1998. They incorporate functions for increasing security by default and optimising routing. Above all, IPv6 delivers an almost infinite number of IP addresses: 667 million billion IPv6 addresses for each square millimetre of the Earth's surface.

History of IPv4 address exhaustion



Source: RIPE NCC data.

However, the sluggish pace of IPv6 development is creating a **risk of seeing the internet split in two, with IPv4 on one side and IPv6 on the other**. By way of example, if a website or an application is hosted in IPv6-only, that means it cannot be accessed by users who only have an IPv4 address.

The shortage of IPv4 addresses and the ensuing risks, mean that the transition to the new internet communication protocol has become **an especially pressing issue**.

To assess IPv6 deployment in France, Arcep uses data collected in accordance with its [Decision No. 2024-0589](#) along with [data from Afnic](#) to produce an annual Barometer of the Transition to IPv6 in France, providing an overview of IPv6 adoption in France. This Chapter covers the main findings of the [2025 edition](#).

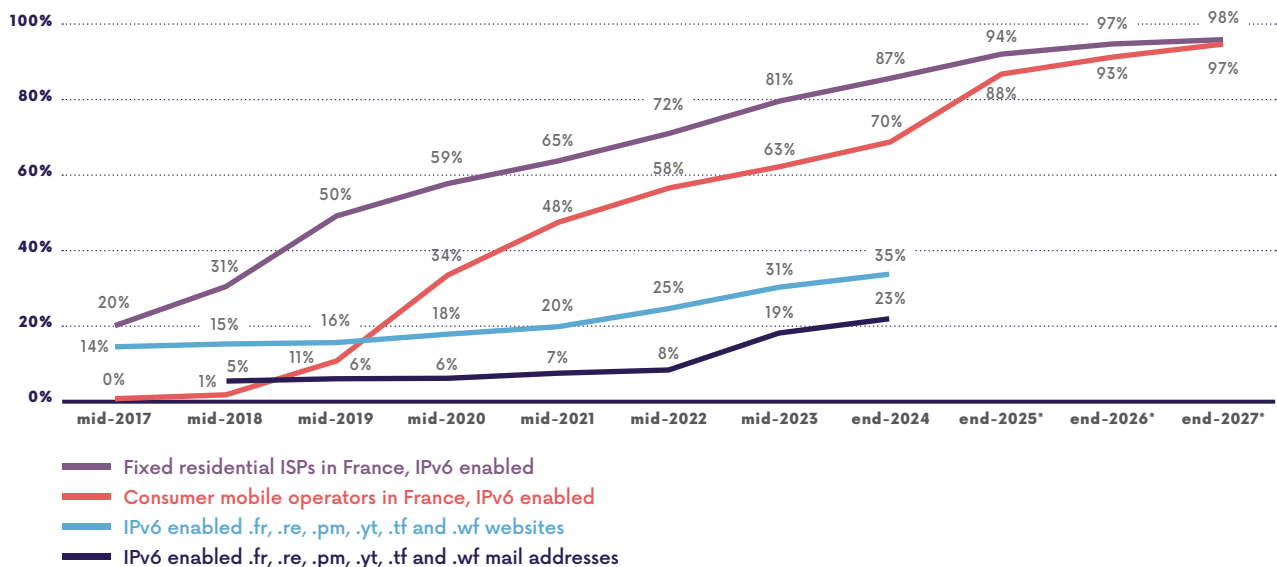
viders were IPv6-enabled, compared to 70% of mobile customers. With regards to content providers and hosting companies, 35% of websites were IPv6-ready (23% for email addresses). Although these figures are low, there has been a notable uptick in the pace of the transition. For email, the rate of IPv6 readiness almost tripled in two years. And virtually all residential customers are expected to be IPv6-enabled by 2027.¹

2. STATE OF THE TRANSITION TO IPV6 IN 2024

2.1. A host of players, at different stages in their transition

Operators are making the transition to IPv6 more rapidly than web hosting companies and other content providers. At the end of 2024, 87% of customers of residential internet service pro

Status of the transition to IPv6 in France



* Figures subject to change (operator forecasts, except for Free mobile: Arcep forecasts)

Operator source: data from end of December 2024, collected by Arcep from the main operators and aggregated according to market share as of Q3 2024. For the sake of the analysis, the assumption is that Android has a 61% market share and iOS 39%.
Website and email source: Afnic data from December 2024.

¹ On fixed networks, by 2026, customers who do not have access to IPv6 will be on networks at the end of their life (ADSL/VDSL/cable), and the legacy copper network is due to be switched off by 2030. On mobile networks, the only devices that are not IPv6-enabled are old devices that will gradually be removed from circulation.

2.2. Fixed internet service providers

According to forecasts provided by operators, **the transition to IPv6 amongst residential customers should be virtually complete by the end of 2027** and could end in 2030 with the switchoff of the copper network. Some operators have chosen not to migrate infrastructures that are coming to the end of their life to the IPv6 protocol. For internet plans designed for businesses and professionals, the transition could take a few years longer.

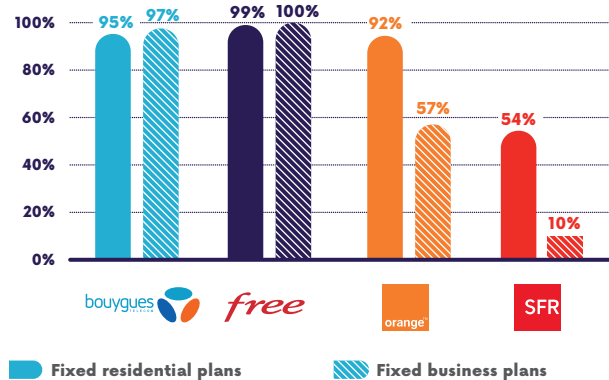
On **residential fixed networks**, Arcep notes significant disparities between the main French telecom operators' transition to IPv6:

- **Bouygues Telecom** enables IPv6 for all of its residential FttH, ADSL, VDSL, and 5G customers with a compatible modem/router connected to its own network. IPv6 is not yet available for ADSL or VDSL on a third-party backhaul network (these are Bouygues Telecom customers who are connected to an Orange DSLAM).
- **Free** enables IPv6 for all of its residential FttH, ADSL, and VDSL customers connected to its own network. IPv6 is not available for ADSL or VDSL on a third-party backhaul network (aka non "unbundled" customers) nor on 4G+/5G Free modem.
- **Orange** enables IPv6 for all of its residential FttH, ADSL, VDSL, 4G Home, and 5G Home customers with a compatible modem/router and connected to a network that assigns its DHCP addresses. IPv6 is not available for a small number of residential ADSL customers (addresses assigned via PPP). In addition, all new ADSL customers are assigned by DHCP scope.
- **SFR** is phasing out the replacement of network equipment that was not IPv6-compatible on the FttH network. IPv6 is not systematically enabled. It is, therefore, left up to the customer to do so by configuring their modem/router. At a time when the copper access network is gradually being switched off, in 2023 SFR elected to eliminate IPv6 support on ADSL/VDSL plans. IPv6 (encapsulated in IPv4) had previously been available with ADSL and VDSL plans but was not enabled by default (at the end of June 2022, 1% of ADSL and VDSL customers had enabled this option). IPv6 is also not available on the operator's cable network.

For "pro" plans designed for small businesses, operators emulate residential market strategies, with two exceptions:

- **Orange:** IPv6 was not offered to ADSL or VDSL "Pro" small business customers at the end of 2024, but should become available to all of these customers in 2025;
- **SFR:** IPv6 is only available for fixed 4G and 5G plans (no IPv6 for FttH, ADSL, VDSL, or cable plans for small businesses). The forecast up to the end of 2026 does not include any changes in this area for FttH plans.

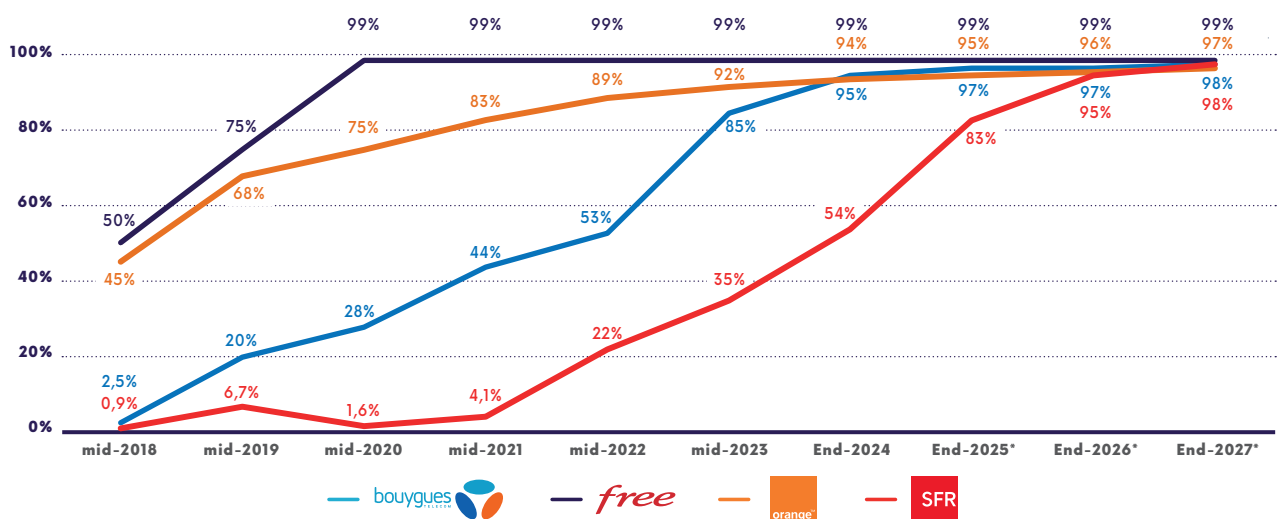
Fixed networks: percentage of IPv6-enabled customers



Source: Data as of end of December 2024, collected by Arcep from operators.

The transition to IPv6 for retail market operators with fewer than three million customers (in metropolitan and overseas France) is detailed in the annual [Arcep Barometer of the Transition to IPv6 in France](#). Arcep has observed the adoption of IPv6 by new operators every year, although a certain number of those with fewer than three million customers still do not offer IPv6.

Residential fixed network: progression of IPv6-enabled customers



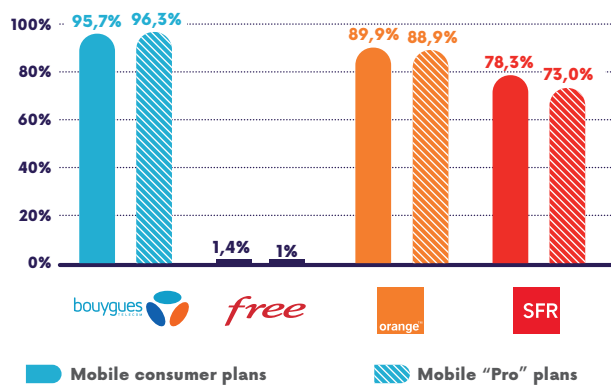
*Figures subject to change

Source: Data as of end of December 2024, collected by Arcep from operators.

2.3. Mobile internet service providers

According to the forecasts provided by France's four largest ISPs, the transition of mobile access lines to IPv6 should be complete by the end of 2027, for both consumer and business customers. The transition could take longer for "data only" plans (4G/5G portable routers, tablets, computers, etc.). For the first time, the forecasts provided by Free indicate a significant increase in the rate of IPv6 activation on the operator's mobile network, anticipating a leap in the rate of IPv6-enabled lines from 1% at the end of 2024 to 77% by the end of 2025.

Mobile network: percentage of IPv6-enabled customers



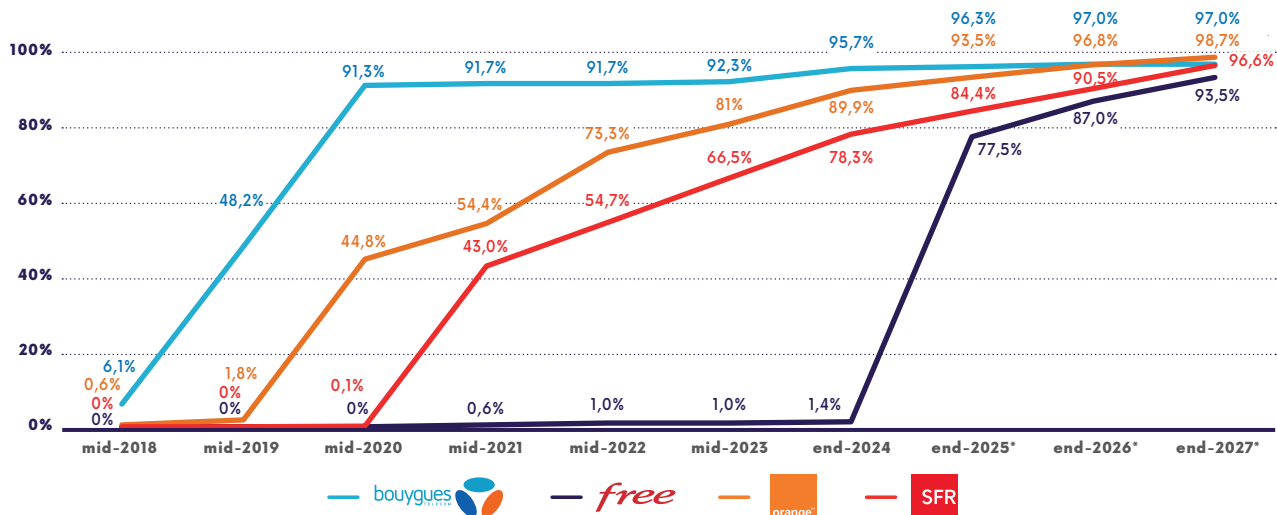
Source: Data as of end of 2024, collected by Arcep from operators and aggregated, with an assumed 61% market share for Android and 30% for iOS.

Arcep has observed sizeable disparities in the transition of **consumer mobile** plans to IPv6. Although all the main operators offer IPv6, there are real differences in their approach to enabling the protocol:

- **Android:** Bouygues Telecom, Orange, and SFR all enable IPv6 by default on Android phones released after 2018 (Bouygues), 2020 (Orange), and 2021 (SFR). At the end of 2024, Free had not enabled IPv6 by default. Free is expected to enable IPv6 for smartphones sold in 2022 onwards, over the course of 2025.
- **iPhone:** Bouygues Telecom, Orange, and SFR all enable IPv6 by default on iPhones with at least iOS 12.2 (Bouygues), iOS 13.0 (Orange for iPhone 7 and more recent), iOS 14.3 (SFR), and iOS 15.4 (Orange for iPhone 6S and SE). Free is expected to enable IPv6 by default in 2025 for iPhones running on iOS 15.4 and later.

For "Pro" **small business plans**, Bouygues Telecom, Orange, SFR, and Free offer IPv6 under the same terms as consumer plans.

Consumer mobile network: percentage of IPv6-enabled customers



*Figures subject to change

Source: Data as of end of 2024, collected by Arcep from operators and aggregated, with an assumed 61% market share for Android and 30% for iOS.

2.4. Web hosting

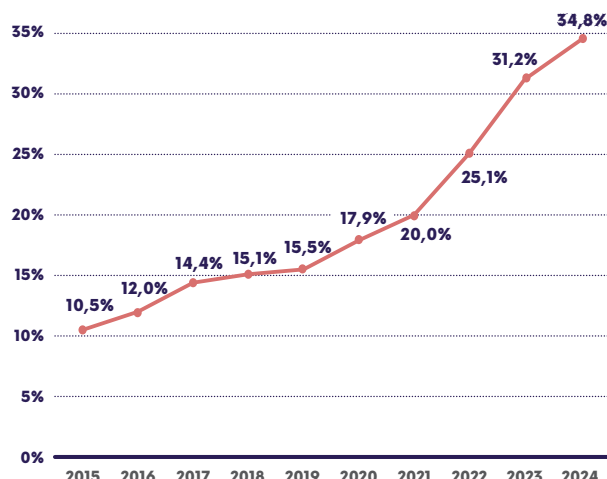
A website is considered accessible in IPv6 when it has a DNS IPv6 registration. To exclude a portion of the unused domain names, the rate is calculated using only domain names with a valid HTTPS certificate, which amounts to 2.4 million domain names ending in .fr, .re, .pm, .yt, .tf and .wf, which are analysed below.

At the end of 2024, web hosting companies were one of the weakest links in the migration to IPv6. **Only 34.8% of websites are in fact IPv6-ready.** There has nevertheless been a noteworthy 15-point increase since 2021. More domain names have been IPv6-enabled over the past two years than between 2015 and 2021.

Of the top 12 web hosting companies in France, only Cloudflare, IONOS, LWS, Hostinger, and Infomaniak have more than half the websites they host IPv6-enabled, setting an example to be followed.

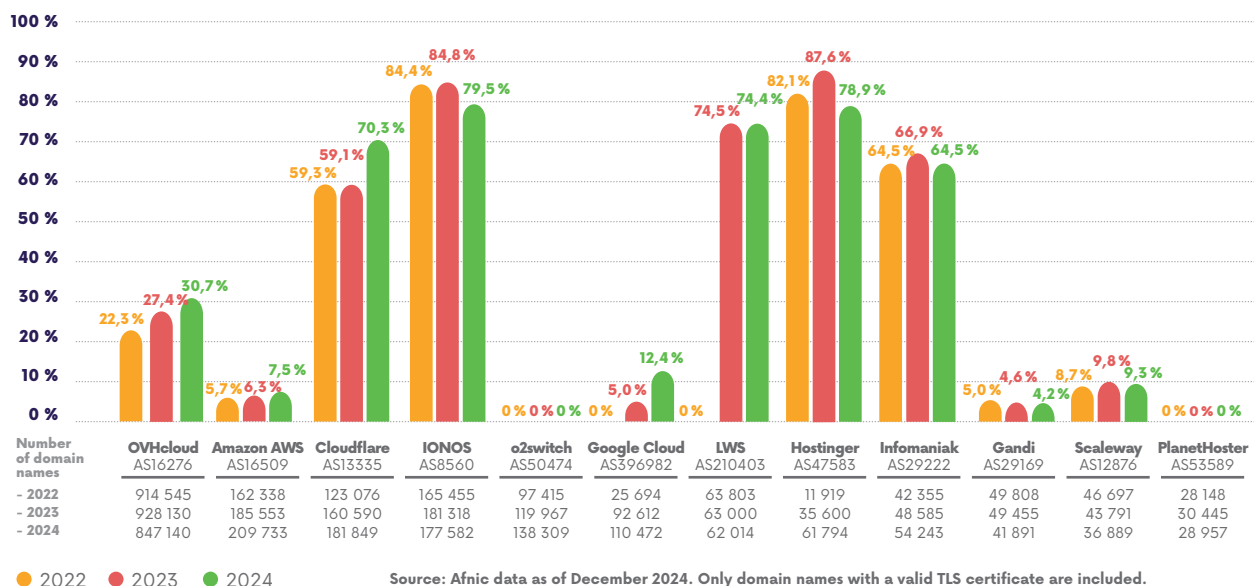
Data on all .fr, .re, .pm, .yt, .tf, and .wf web hosting companies are available in three formats: PDF, OpenDocument (which can be read with LibreOffice Calc or Excel), and CSV raw data.

Progression of IPv6-enabled websites for .fr, .re, .pm, .yt, .tf and .wf domain names



Source: Afnic data as of December 2024. Only domain names with a valid TLS certificate are included.

Percentage of IPv6-enabled websites for .fr, .re, .pm, .yt, .tf, and .wf domain names

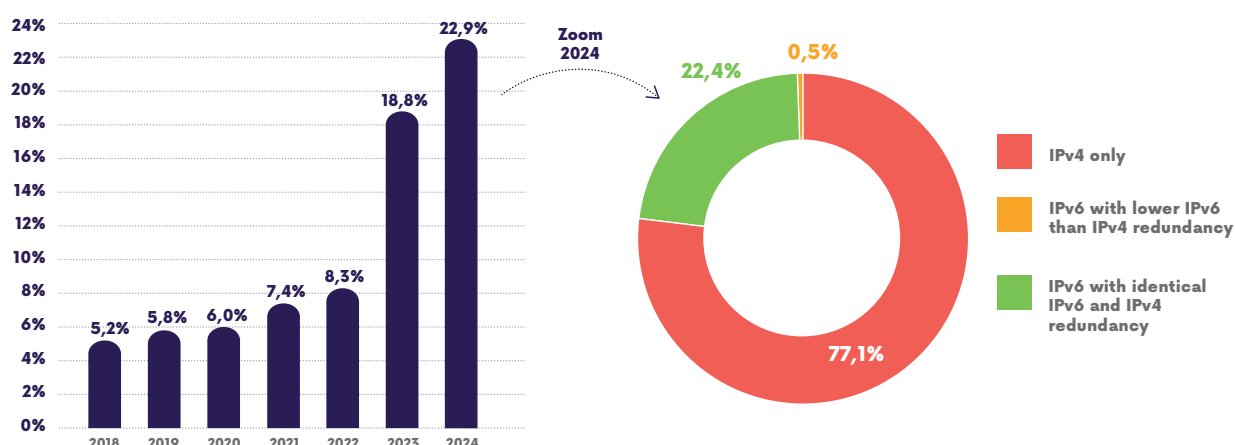


2.5. Email hosting companies

Mail hosting servers also lag a long way behind in the transition: only 22.9% of mail servers currently use IPv6 addresses.² There has, nevertheless, been a considerable increase over the past two years, during which the number of IPv6-enabled mail servers has increased by 15 points, compared to a three-point increase in the

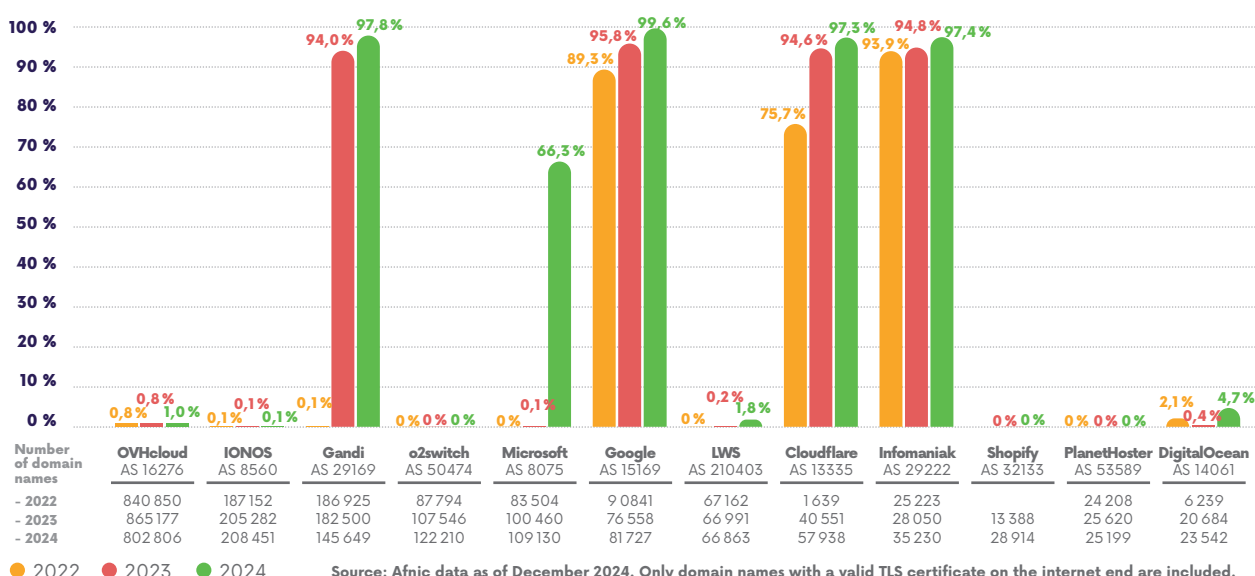
four previous years. This percentage nonetheless remains very small, compared to the other links in the internet chain.

Percentage of web mail accessible in IPv6
for .fr, .re, .pm, .yt, .tf, and .wf domain names



Source: Afnic data as of December 2024.
Only domain names with a valid TLS certificate are included.

Percentage of IPv6-enabled mail servers
for .fr, .re, .pm, .yt, .tf, and .wf domain names



Source: Afnic data as of December 2024. Only domain names with a valid TLS certificate on the internet end are included.

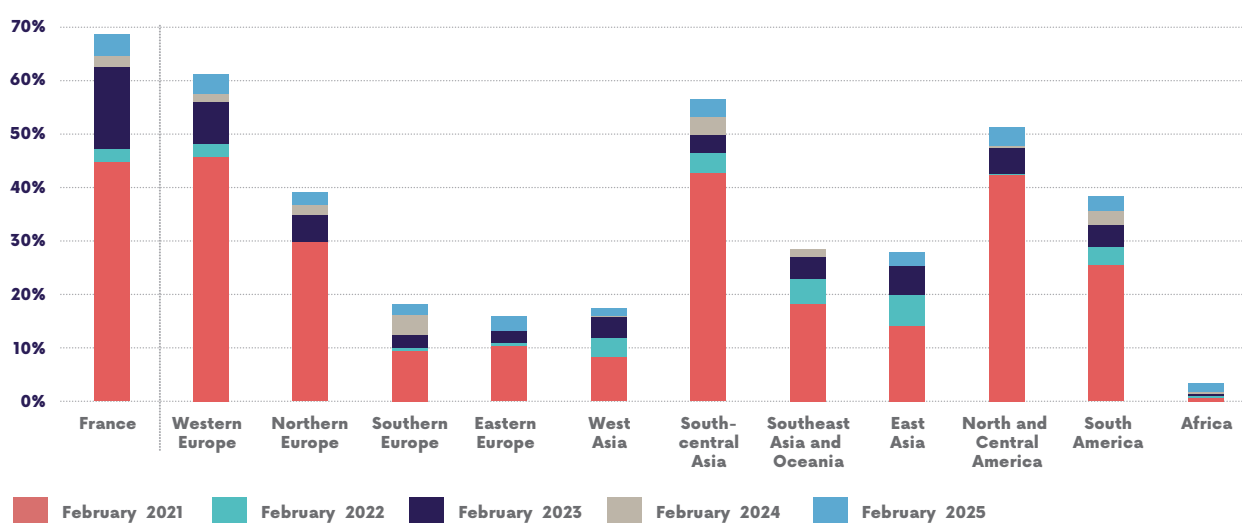
² Afnic data for the end of 2024, for all websites with domain names ending in .fr, .re, .pm, .yt, .tf, and .wf, excluding those that do not offer valid HTTPS hosting and an MX (Mail eXchanger).

3. THE TRANSITION TO IPV6 AROUND THE WORLD

Arcep has created [an interactive map](#) that lets users view both the rate of IPv6 adoption for internet access in the 100 countries with the most internet users and how the rankings have changed over time. **The IPv6 adoption rate** for internet access illustrated

on this map represents the percentage of users who have been IPv6-enabled by their ISP. This percentage is measured for hosting companies who already offer IPv6. It therefore provides an idea of the status of transition by device and internet service providers (residential and business, fixed and mobile), rather than the transition of hosting companies. **France ranks second worldwide (68.6%),** behind India (73.4%).

Regional IPv6 adoption rate



February 2025 IPv6 data from Google, Akamai, Facebook, and Apnic. Only the 100 countries with the most internet users are considered. The median of the four sources is calculated for each country, before being aggregated, prorated by the number of internet users in each region.



COUNTRIES MOVING TOWARDS SHUTTING DOWN THE IPV4 PROTOCOL ON THE INTERNET

- In **India**, major Indian websites are now only accessible in IPv6;
- **China** plans to completely shut down IPv4 in 2030 (cf. [2023 Barometer of the transition to IPv6](#));
- The **Czech government** has asked the public sector to stop providing e-government services using IPv4 as of

6 June 2032. Internet users who are not IPv6-ready in 2032 will no longer have access to Czech government websites, nor to the business applications that will follow suit and shut down IPv4 at the same time. A countdown has been created on <https://konecipv4.cz/en/>.



WORK BEING DONE BY THE IPV6 TASK FORCE

Since 2019, Arcep has been heading up the IPv6 task force, in collaboration with Internet Society France. Open to all internet ecosystem stakeholders (telcos, hosting companies, businesses, public sector, etc.), this task force meets once a year and is geared to encouraging the transition to IPv6 by giving participants an opportunity to discuss specific issues and to share best practices.

The task force launched a new working group in 2025 called “IPv6 2030: requirements for a future IPv6 internet”, the purpose of which is to establish the conditions required to guarantee an accelerated transition to IPv6 between now and 2030.

The aim of this working group is to:

- Examine new challenges created by changes to the internet around IPv6 adoption and changes to networks in the era of AI;
- Investigate the conditions needed to enable the development of innovative services and end-to-end IPv6-only ultrafast, high quality network architectures.

At the next IPv6 France workshop, this working group will present a progress report on its analysis of the issues and challenges of the IPv6 transition and the future of the internet up to 2030.



Giving the floor to

PIERRE BONIS

Chief Executive Officer of Afnic, the association for managing the domain name registry in France (Association française pour le nommage internet en coopération)



Measuring the transition to IPv6 in France. How Afnic contributes.

The transition to IPv6 may seem to be a highly technical challenge. And, indeed, in some respects it can be, which is why it is proceeding so slowly. Or at least, far slower than we would like.

For many ISPs, this transition requires the deployment of new addressing schemes and, for some, the acquisition of new hardware, even if today's equipment does make it possible to address resources in IPv6, and especially to allow the two IP protocols, the old v4 and the new IPv6, to cohabitate.

But as long as the – granted, not neutral – operational and technical aspects of the transition are held up to explain why progress has been so slow, we will overlook what is really at stake. The real issues are above all economic and political, as this change in protocol is vital to ensuring continuity of service for the global internet and, singularly, for the internet in France.

Arcep has been saying for many years (and since 2016 regarding cooperation between our two organisations) that the development of a safe and stable internet is only possible if operators have access to new blocks of IP addresses. There are no longer any available blocks of IPv4 addresses and, short of going onto a sort of secondary market, or a black market – which Afnic and all of the governing parties involved, starting with regional internet registries, formally advise against – making the transition to IPv6 is no longer optional.

To kick start this major transition, public authorities and governing technical bodies communicated well in advance about the need to migrate steadily to IPv6. But, as with any major change, it is only a sense of urgency and necessity that provide the powerful incentive needed to drive momentum. We could even say that, paradoxically, the wise foresight of those urging market players to make the transition has actually proven counterproductive. For a long time we've been saying there's still time!

When in fact, no. The more time goes on, the greater the risks of having a fragmented internet that would respond in either IPv4 or in IPv6. The more this resource that is so vital to the development of internet services increases in value (via the infamous IPv4 black market), the more painful the transition will be.

Which is why Afnic is proud to be working with Arcep to provide it with quantified information based on the requests it receives on its domain name servers, as the authority responsible for managing top-level internet domain names, and singularly .fr addresses.

This has helped to fine tune Arcep's Barometer which, in our view, is currently the most effective instrument for accelerating the pace of this transition.

To those who have not yet begun this transition, we say that you need to know that IPv6 is by now an unavoidable reality of the French internet. Choosing to ignore it will mean being sidelined in the not too distant future, and will drive up your operating costs.

Those who are moving forward on the path to deploying services that are compatible with both protocols, we say keep going, and especially be mindful to ensure that any mergers or takeovers, change in ownership, or transfers of customer portfolios that are part of French tech companies' day to day, do not lead to backsliding. These trends are visible, and it is up to all of us to ensure that they do not negatively affect the ongoing deployment of IPv6 in France.

One final observation is the sizeable disparities in IPv6 hosting between services (Web, domain names, mail...). These variations lead us to hope that swift progress will be made as tech companies have mastered and deployed IPv6 for certain services. They have the skills. And the operational experience. These are encouraging factors, and the Barometer gives us the ability to measure how much farther we have to go.

CHAPTER 3

Guaranteeing net neutrality



THE BOTTOM LINE

- Ten years after its adoption, the **Open Internet Regulation** continues to be a cornerstone of the protection of end users' rights, and to support an open and innovative environment on the internet.
- In 2024, **more than 10,000 tests were performed in France using the Wehe prioritisation detection app**, and more than 690,000 tests have been performed in France since the application was launched in 2018. All the statistics on the tests carried out in France are available online.
- Arcep oversees the application of net neutrality rules and carries out forward-looking work to keep regulated stakeholders informed about the application of the regulation as **technological developments** reshape the sector.

"Net neutrality" is a concept popularised in 2003 par Tim Wu, Professor of Law at Columbia University in New York.¹ It is a concept which makes it possible to ensure **equal treatment of all internet traffic**. Net neutrality includes guaranteeing users the freedom to access and distribute information and content online, to use and create applications and services for end users, as well as applying the principle of non-discrimination to the traffic relayed across the networks that make up the internet. It excludes, in particular, any positive or negative discrimination – be it technical or commercial – based on the source, destination, or content of information transmitted over the network.

1. REGULATORY FRAMEWORK GOVERNING NET NEUTRALITY

Established by the regulation laying down measures concerning open internet access,² the principle of net neutrality or open internet help safeguard the Web as a place for freedom of expression, communication, accessing knowledge, sharing, and innovation. The regulation thus lays out:

- the right of users *"to access and distribute information and content, use and provide applications and services, and use terminal equipment of their choice, irrespective of the end-user's or provider's location or the location, origin or destination of the information, content, application or service, via their Internet access service"*.³
- and internet service providers' duty to treat *"all traffic equally, when providing Internet access services, without discrimination, restriction or interference, and irrespective of the sender and receiver, the content accessed or distributed, the applications or services used or provided, or the terminal equipment used"*.⁴

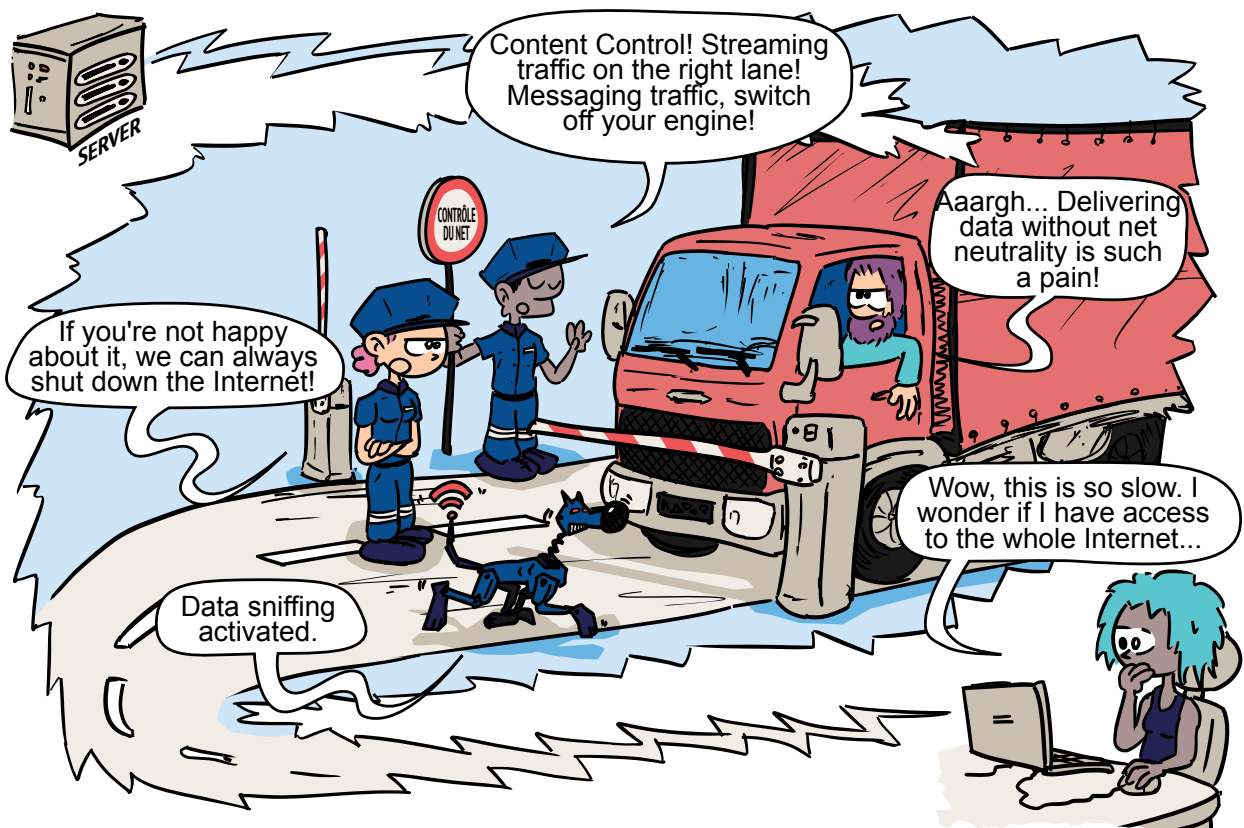
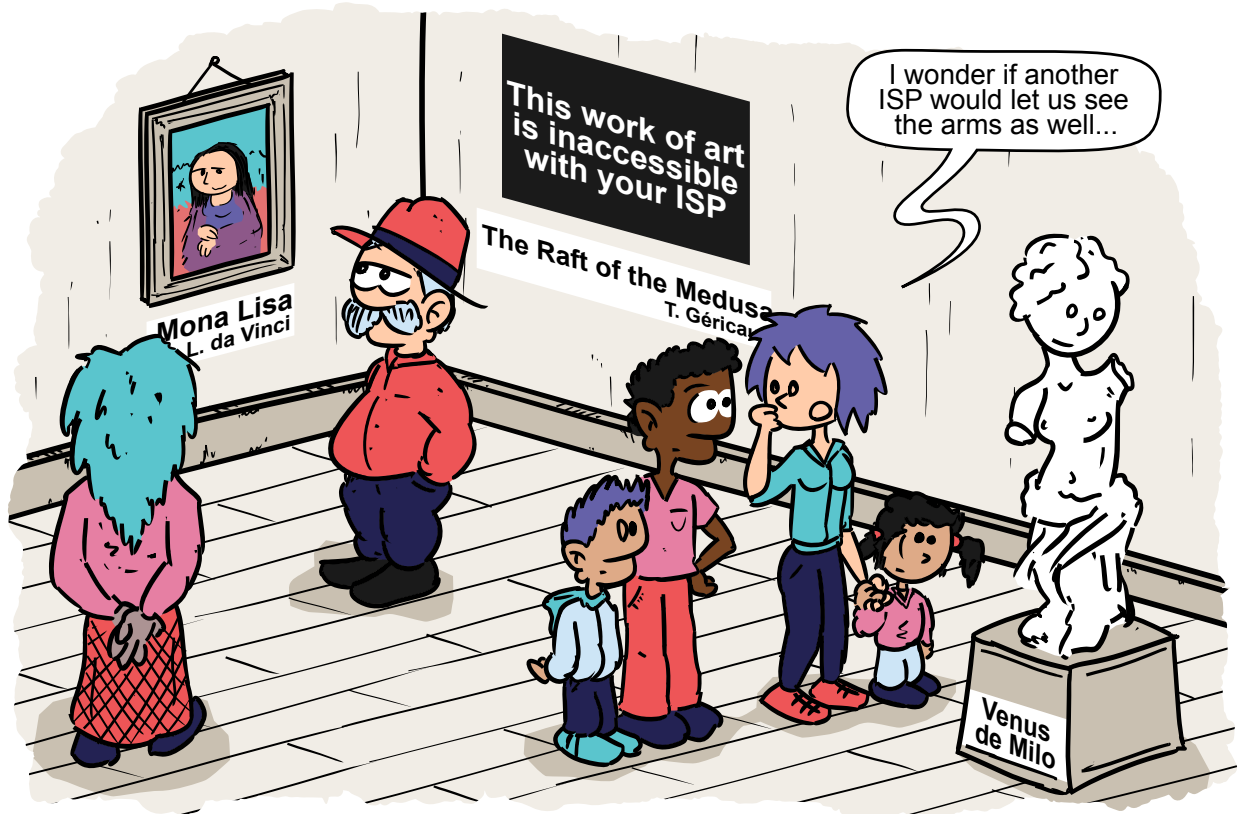
In October 2016, the French Digital Republic Act (Loi pour une République Numérique) designated Arcep as the authority responsible for implementing the Open Internet Regulation in France.

¹ Tim Wu, 2003. Broadband Discrimination, Journal of Telecommunications and High Technology Law, vol. 2. p. 141.

² Regulation (EU) 2015/2120 of the European Parliament and Council of 25 November 2015 laying down measures concerning Open Internet access.

³ Article 3(1) of the Open Internet Regulation No. 2015/2120

⁴ Article 3(3) of the Open Internet Regulation No. 2015/2120



2. THE TOOLS AVAILABLE TO ARCEP TO CARRY OUT ITS MANDATE

To oversee net neutrality, Arcep has created a **toolkit** designed to enable the Authority to obtain a detailed overview of market practices with respect to the four pillars of the Open Internet Regulation: **commercial practices, Traffic management practices, specialised services, and transparency obligations**. As part of this oversight mandate, Arcep services examine the terms and conditions of use of internet service providers (ISPs) on an ongoing basis. As an adjunct to this monitoring work, Arcep has regulatory tools at its disposal that enable it to collect information from ISPs on their network management rules.

Arcep also relies on **data-driven regulation** to detect any net neutrality violations. In particular, Arcep provides end users with

access to the “J’alerte l’Arcep” reporting platform. These reports constitute an important element in Arcep’s diagnostic capabilities. They enable the Authority to monitor issues that users are encountering in real time, and to identify recurring malfunctions or spikes in user reports, in order to better target its actions and thereby achieve more effective regulatory actions.

In 2018, Arcep provided consumers with a **detection tool** called Wehe, which is available free of charge, in French, on Android, iOS, and F-Droid.

Lastly, the Authority works regularly with industry stakeholders, academia, and associations to present the rights and obligations of this framework. Arcep has, for instance, worked with the Université Paris-Panthéon-Assas on their Masters programme in European market and regulatory law, to assist with net neutrality teaching and acculturation. Arcep services have presented the general regulatory framework that applies to the electronic communications sector, the issues surrounding net neutrality, and the role assigned to Arcep with regards to monitoring the application of open internet regulation.

Arcep’s net neutrality toolkit



Source: Arcep.



WHAT IS WEHE, THE TOOL THAT DETECTS IMPEDIMENTS TO NET NEUTRALITY?

Developed in partnership with the Boston **Northeastern University**, Wehe is a testing tool with an open-source core that analyses the traffic generated by the application to determine whether an operator might be throttling or prioritising certain data traffic or ports.

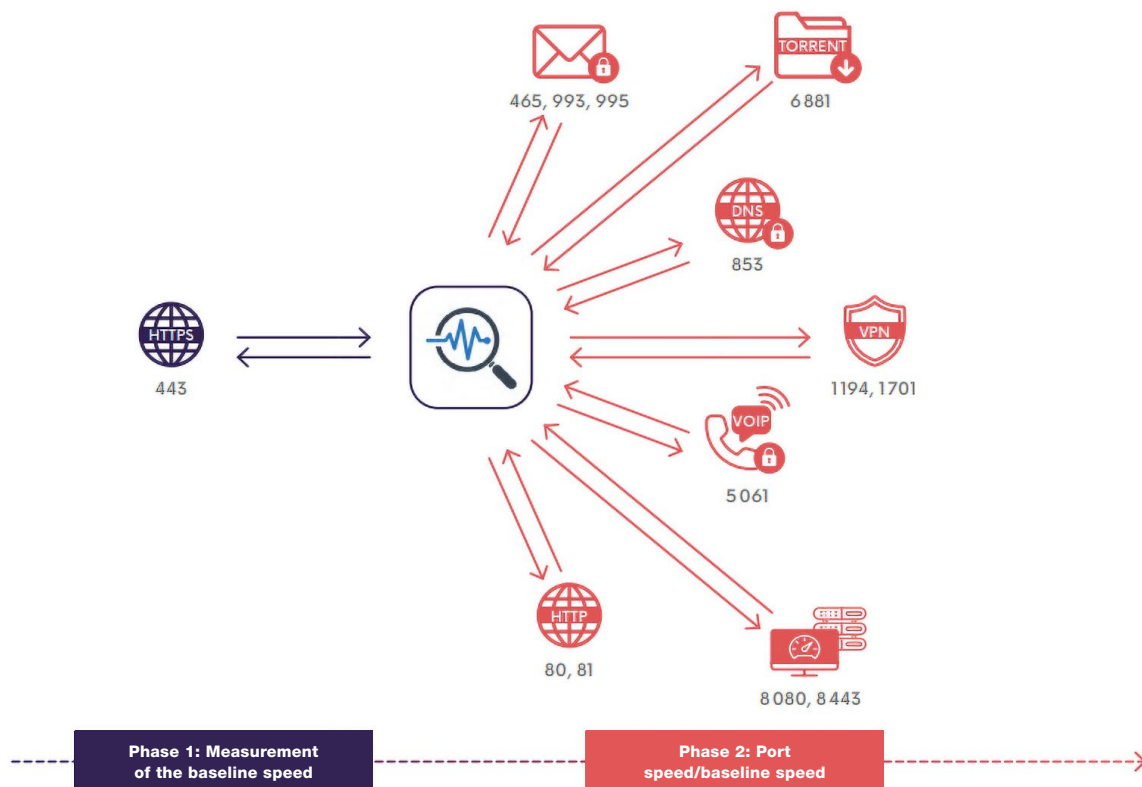
From a technical standpoint, the port test compares https traffic for each of the ports selected by the user, and compares it to traffic on port 443, which has been defined as the baseline port. If there are significant disparities between the various tests performed by Wehe, users are invited to relay any issues encountered directly through the “J’alerte l’Arcep” platform, so that the Authority can

examine any potential incompatibility with the Open Internet Regulation, on a case-by-case basis.

Updates to the Wehe app have included a review of the differentiation test by aligning it more closely with the most popular services in France. Test categories have also been introduced to facilitate the selection of services tested by users and improve how the test results are displayed to users.

Since its launch, more than 690,000 tests have been performed in France using the Wehe prioritisation detection app, made available by Arcep. All the statistics on the tests performed in France are [available online](#).

How port testing works



10 years since the adoption of the Open Internet Regulation: a review

Since its adoption in 2015, the implementation of the Open Internet Regulation has helped to improve rights and freedoms on the internet, in the European Union and in France. What have been the key stages in its implementation? What results has it produced?

2015

Adoption of Regulation 2015/2120 laying down measures concerning open internet access

Adopted in 2015, the Open Internet Regulation enshrines in law the principle of net neutrality or open internet, contributing to safeguarding the internet as a space of freedom of expression, communication, and access to knowledge and sharing, as well as innovation.

2016

Enactment of the French Digital Republic Act

The principle of net neutrality was enshrined in French law, after its adoption at the European level through the Open Internet Regulation of 25 November 2015. The Digital Republic Act designates Arcep as the authority responsible for overseeing the application of the European Open Internet Regulation.

Adoption of the first BEREC guidelines

To guide stakeholders with their interpretation of this new regulatory framework, Arcep and its European counterparts worked together within the Body of European Regulators for Electronic Communications (BEREC), and published net neutrality guidelines in 2016.

Publication of the first Arcep annual report, in accordance with the Open Internet Regulation

Following the adoption of the Open Internet Regulation, Arcep published its first monitoring report.⁵ National regulatory authorities must publish this report every year and submit it to both the Commission and BEREC.

2017

Arcep investigates restrictions on the use of tethering

Several potential restrictions had been identified since 2017, including the inability to employ tethering, along with the inability to use certain types of devices with certain internet access plans. If the principle of net neutrality were not enshrined in law, an operator could cap the amount of data used for tethering in a plan,⁶ but also prohibit or charge extra for it. Operators could also prevent customers from using another operator's SIM card in a device it sold them or block the use of a SIM card in another device.

Following Arcep's actions, operators removed the contractual clauses limiting the use of tethering and forbidding the ability use SIM cards in any mobile device. Arcep continues to monitor the inclusion of clauses of this type.

2018

Arcep launches the Wehe app

In November 2018, Arcep launched a publicly accessible detection tool called Wehe. Developed in partnership with the Boston Northeastern University, this open-source testing tool analyses traffic generated via the app to determine whether an operator is throttling or prioritising certain traffic streams or ports.

Arcep investigates the causes of the poor quality of certain consumer services on the Free network

In 2018, the Authority sought to obtain additional information on the causes of the poor quality of certain consumer services on the Free network, which appeared to be affecting a number of popular online services. It emerged that the interconnection of the Free network with the internet could be one source of the problem.

Arcep looks at the influence of terminals and platforms on the openness of the Internet

In February 2018, Arcep published a report entitled, "Devices, the weak link in achieving an open internet"⁷ to raise awareness about how user devices can influence internet openness and suggest possible remedial actions.

⁵ Arcep 2015 Annual report – Excerpts – Ensuring a neutral and open internet (30 June 2016)

⁶ Such is the case in the United States, for instance, where carrier AT&T caps the data allowance for tethering, but not for any other types of use: <https://www.att.com/prepaid/plans/>

⁷ Smartphones, tablets, voice assistants...Devices, the weak link in achieving an open internet, Arcep, 2018

2019

Arcep investigates Wi-Fi services offered by airline and railway companies

In 2019, the Authority investigated whether the in-flight Wi-Fi services offered by airline companies comply with net neutrality rules. Operating under the banner of proactive dialogue, Arcep's actions ensured that airlines take fuller account of the provisions of the Open Internet Regulation when deploying their in-flight internet access offers.

The Authority also looked into the Wi-Fi solutions available on board trains, and asked the national rail company, SNCF, for additional information on how its internet access services complied with net neutrality rules. Since then, Arcep has been working to ensure that Wi-Fi access on trains is compatible with the provisions of the Open Internet Regulation.

European Commission publishes a first report on implementation of the Open Internet Regulation

Based on an assessment of the first two-and-a-half years of implementation and in light of changes in the market development, the Commission's report⁸ concludes that the principles of the Regulation are appropriate and are proving effective in protecting end users, by promoting the internet as a driver of innovation.

2020

First review of BEREC guidelines

To reduce the risk of French and European internet stakeholders having differing interpretations of the regulatory framework, a public consultation was conducted in late 2019, and revised guidelines were published on 16 June 2020.

The first CJEU interpretation of the Open Internet Regulation

In its judgement, the Court of Justice of the European Union (CJEU) concluded for the first time that permitting the use of zero-rating (or zero tariff) for a given application once a user's data allowance has been reached, while their access to the rest of the internet is slowed or blocked, contradicts the Open Internet Regulation, per se. In doing so, the CJEU ruled on the practices in question without addressing the substance of the issue of the commercial practices authorised by the Regulation.

Arcep investigates the compliance of internet access plans in French overseas territories

In early 2020, Arcep began working with operators in France's overseas departments and territories to conduct a comprehensive assessment of the compliance of every internet access plan with net neutrality rules, inviting operators to engage in a proactive dialogue with Arcep. Certain contractual clauses were amended following discussions with the Authority.

2021

EUCJ rulings on net neutrality

In these judgements, the EUCJ stipulated that plans which do not deduct traffic to partner applications (i.e. that apply zero-rating) create a distinction, based on commercial considerations, which is incompatible with the obligations set out in the Open Internet Regulation.

2022

Second review of BEREC guidelines

In 2022, Arcep and its European counterparts updated the guidelines on the application of the Open Internet Regulation, following the three rulings on net neutrality issued by the EUCJ in 2021.⁹

Arcep publishes a briefing memo on network slicing and net neutrality

5G technology opens the way for new services as a result of a tremendous boost in capacity, notably in terms of speed, latency, virtualisation, quality of service level differentiation, and reliability. Some players in the sector continue to question the compatibility of 5G with net neutrality. To gain a more detailed understanding, Arcep published a briefing memo on network slicing and net neutrality. Among other things, it recalled that network slicing is compatible with net neutrality and the Open Internet Regulation. It also underscores that a case-by-case analysis of network slicing use is required to determine its compatibility with the Open Internet Regulation and BEREC guidelines.

2023

European Commission publishes a second report on implementation of the provisions of the Open Internet Regulation

In its second report on implementing the Open Internet Regulation,¹⁰ the European Commission emphasised that the regulation and its application have withstood the test of time, thereby confirming that the principle of open internet remains relevant, from the perspective of end users, content and application providers, and internet service providers.

2024

Arcep investigates generative AI systems and their possible role as new gateways to the internet

Early 2024, Arcep presented its initial analyses on generative AI and particularly its impact on internet openness, as part of the European Commission's public consultation on the topic. Since then, Arcep has continued to work on reconciling an open internet and the use of generative AI, to enhance the wealth of content available to users and promote innovation.

2025

Arcep and BEREC investigate the issues surrounding the development of 5G and its slicing features

BEREC hosted an internal workshop on 7 May 2025 to give regulators an opportunity to discuss how they have tackled the issues and challenges raised by the provisions of the Open Internet Regulation on specialised services in the context of 5G standalone deployment, and the increased possibility of having differentiated services on mobile networks. Arcep shared an analysis of the first hypothetical use cases, identified with economic actors.

⁸ Report from the Commission to the European Parliament and the Council on the implementation of the open internet access provisions of Regulation (EU) 2015/2120.

⁹ CJEU, 2 September 2021, Cases C-854/19, C-5/20 and C-34/20.

¹⁰ Report from the Commission to the European Parliament and the Council on the implementation of the open internet access provisions of Regulation (EU) 2015/2120.

3. 2024 NET NEUTRALITY NEWS

3.1. In France

At the national level, Arcep has continued to assess the compliance of all Internet services offered in metropolitan France and the overseas territories with the principle of net neutrality. In particular, the Authority drew on the various reports it received on practices that may violate net neutrality rules, notably those received via the “J’alerte l’Arcep” platform.

Following the work that Arcep performed in 2022 on applying net neutrality rules to **new use cases in the sector**, the Authority has continued to work with stakeholders to analyse the conditions of their compliance with the Open Internet Regulation, notably when using new network slicing technologies made possible by 5G.

3.2. European workstreams

At the European level, 2024 was marked by the review of the application of the Open Internet Regulation and the BEREC guidelines that were updated in 2022.

Echoing requests from the sector’s stakeholders and from the European Commission in **its report on implementation of the provisions of the Open Internet Regulation**¹¹ to have additional information on its application to the supply of specialised services, in 2025 BEREC’s “Open Internet” working group will also

be working on the issues surrounding the development of 5G and its slicing features. An internal workshop will provide regulators with an opportunity to discuss the regulatory issues surrounding specialised services, open APIs, and network slicing to address the questions raised by market players (operators, service providers, and hardware manufacturers) in the context of 5G standalone (SA) deployment, and the increased possibility of providing differentiated services on mobile networks.

3.3. Promoting an open internet beyond networks

Lastly, because safeguarding open internet access does not stop at ISPs’ networks, Arcep has continued to work on promoting the **issue of open devices**¹² as part of the work being done within BEREC on the role of content and application providers (CAPs) in the networks (see Chapter 1: “Supervising data interconnection and relations between internet service providers and content providers”).

Arcep is also investigating **the impact of generative AI on internet openness, as a new intermediary between users and its content** (see Chapter 5: “Fostering the development of generative AI systems that uphold openness and freedoms on the internet”).

The goal is to establish diagnostic information and to identify tools and recommendations to foster the development of more open, transparent, and efficient generative AI service models, thus safeguarding the capacity to innovate on the internet, for the benefit of all users.



“J’ALERTE L’ARCEP”

Launched in October 2017, the “J’alerte l’Arcep” platform allows any citizen, company, or local authority to report any malfunctions encountered in their use of the mobile internet, fixed internet, postal services, or press distribution services.

Arcep reviewed its actions on behalf of consumers in 2024 and its “J’alerte l’Arcep” reporting platform. In 2024, users submitted more than 57,000 reports to the Authority.

Of these reports, 108 concerned net neutrality. A large majority of them (98) came from consumers. The number of reports regarding net neutrality logged on “J’alerte l’Arcep” has been decreasing steadily since 2018, when

618 such reports were received. This decrease can be attributed to market players’ steady alignment with the regulations, resulting in the elimination of plans that violate the provisions of the Open Internet Regulation. These user reports have enabled the Authority to identify possible net neutrality infractions, and to encourage a swift resolution to the problems that arise.

The “J’alerte l’Arcep” platform is continually evolving, and aims to be seamlessly integrated with other data-driven regulation tools developed by Arcep: *Mon réseau mobile* (My mobile network), *Ma connexion internet* (My internet connection), and the Wehe app developed in partnership with Northeastern University.

¹¹ Report from the Commission to the European Parliament and Council on the implementation of the open internet access provisions of regulation (EU) 2015/2120.

¹² BEREC Report on the entry of large content and application providers into the markets for electronic communications networks and services.

Giving the floor to

CLÁUDIO TEIXEIRA

*Senior Legal Officer,
Digital and Consumer Rights at BEUC
(European Consumer Organisation)*



BEUC contribution: Ten years of Open Internet Regulation

The Open Internet Regulation¹ (the Regulation) is a fundamental milestone in digital consumer protection. One decade after its adoption, the Regulation stands as one of the strongest legal frameworks globally that safeguards the principle of net neutrality, becoming the basis for the open internet and a competitive digital environment. The impact of net neutrality rules for consumers cannot be underestimated. It has provided consumers with essential protections and enshrined their rights to equal access to content, applications and services without interference or discrimination by telecom companies, and transparency measures, e.g. on quality of internet access services.

Moreover, the Regulation has proved to be future-proof, even in times of crisis: during the Covid-19 pandemic, internet traffic saw a steep increase which put network infrastructure to the test. BEREC monitored the market and concluded that telcos coped well with the increased demand and that net neutrality rules were not an obstacle to the integrity of EU connectivity.²

The work of civil society and other actors to provide legal clarity on the interpretation and enforcement of the Regulation has been key to ensure that internet access service providers (ISPs) refrain from blocking, throttling or paid prioritisation of internet traffic: from guidelines by EU national regulatory authorities (NRAs) in BEREC to the complaints brought by civil society organisations, to the rulings by the EU Court of Justice (CJEU), starting with the landmark Telenor ruling in 2020.

In 2021, cases brought by BEUC German member vzbv³ and German regulator BNetzA against Vodafone and Telekom Deutschland⁴ landed a landmark ruling where the CJEU considered that “zero-tariff” offers (such as exempting specific apps from data caps) violated Art. 3(3) of the Regulation, as they result in traffic differentiation based on commercial considerations. In 2022, BEREC revised its Guidelines to reflect the CJEU rulings, explicitly recognising that most “zero-rating” practices are incompatible with EU law. This led to the overall withdrawal of discriminatory offers from the EU market, reinforcing consumer protection and restoring a level playing field for online services.

However, challenges for consumers remain: some ISPs continue to make discriminatory offers, as well as incomplete or misleading information to consumers on speed, latency, and traffic management. This is possible due to an overall lack of sufficient enforcement across Member States, as NRAs have different approaches and some lack resources. This also contributes to limited action against emerging network behaviour by ISPs that may affect net neutrality in more subtle ways.

BEUC members have been actively challenging such practices and calling for more effective enforcement. For example, in 2024 BEUC’s member vzbv launched the “Netzbremse”⁵ campaign to denounce widespread throttling in fixed broadband offers by Deutsche Telekom, exposing how net neutrality can be undermined even without explicitly blocking or prioritising traffic.

Yet, the most significant threat to net neutrality today does not come from non-compliance, but from some proposals to change EU rules. Since 2022, major telco operators have actively lobbied for “network access fees” to compel large content and application providers to contribute to the cost of network infrastructure. Recently, the European Commission has signalled that similar measures could be introduced in an upcoming legislative proposal in 2025, a “Digital Networks Act”.⁶

Network fees are incompatible with the principle of net neutrality and the objectives of the Regulation. If introduced, such measures could potentially undermine the open internet by incentivising discriminatory treatment of traffic, entrenching gatekeeping positions, and shifting costs onto consumers, who would foot the bill through higher prices and reduced choice.

Ten years later, it is unquestionable that the Open Internet Regulation has delivered real, lasting benefits to consumers. Looking ahead to its scheduled review in 2027, net neutrality must remain a non-negotiable foundation of EU digital policy. Consumers need NRAs like Arcep to stay vigilant and act swiftly to ensure consumers keep enjoying an open and competitive internet.

¹ Regulation (EU) 2015/2120.

² BEREC Report on COVID-19 crisis – lessons learned regarding communications networks and services for a resilient society, 09.12.2021.

³ Verbraucherzentrale Bundesverband, Vodafone-Pass verstößt gegen EU-Recht, 21.02.2022.

⁴ Cases C-854/19, C-5/20, C-34/20, 2021

⁵ <https://netzbremse.de/>

⁶ European Commission, White Paper – How to master Europe’s digital infrastructure needs?, 21.02.2024.

PART 2

Working to create open digital ecosystems and AI systems

CHAPTER 4

**Building trust and increasing competition
in the data economy**

CHAPTER 5

**Fostering the development of generative AI
systems that uphold openness and
freedoms on the internet**

CHAPTER 6

**Participating in regulating digital platforms
at the European level**

CHAPTER 4

Building trust and increasing competition in the data economy



THE BOTTOM LINE

- 2024 was marked by the adoption of the **French Act on Safeguarding and Regulating Cyberspace (the Loi SREN)** which entrusts Arcep with new responsibilities in regulating data intermediation services, as set forth in the European Data Governance Act (DGA), and in anticipation of the European Data Act.
- Arcep has become the regulator of **data intermediation service providers** and is tasked with drafting a pricing and technical regulatory framework for **cloud services**.
- Arcep is working to achieve a consistent application of these regulations at the European level by playing an active role on the **European Data Innovation Board (EDIB)**, and by contributing to the work being done by BEREC.

Announced by the European Commission in 2020, the **European data strategy** seeks to create a single data market that safeguards Europe's global competitiveness and data sovereignty. To realise this vision and thereby foster the emergence of a data-driven economy, the European Commission proposed two major legislative initiatives: the **Data Governance Act (DGA)**, which came into force in September 2023, and the **Data Act (DA)**, which will come into force in September 2025. It was against this backdrop that Arcep was entrusted with new mandates in digital technology and data regulation by the French Law of 21 May 2024 on Securing and Regulating Cyberspace (known as the Loi SREN, in French).

1. THE DATA GOVERNANCE ACT: FOSTERING THE EMERGENCE OF NEW DATA-DRIVEN ECONOMY ACTORS

The first piece of legislation to emerge from this strategy was the DGA,¹ which came into force in September 2023. It creates a legal framework for all data intermediation service providers to **promote data sharing between and within different sectors**, such as industry and agriculture, while strengthening trust in these exchanges. Also known as data intermediaries, these players operate as neutral, trusted

third parties connecting individuals and businesses who own data with data users, for instance through data marketplaces.

Within this context, the **French Law on Safeguarding and Regulating Cyberspace of 21 May 2024**² entrusted Arcep with a new mandate to work on furthering the development of the data economy, in particular as the competent authority for the regulation of data intermediation service providers. It is in this capacity that Arcep receives notifications from data intermediaries operating in France and is responsible for assigning the label of "EU recognised data intermediary". It is responsible for ensuring the framework of mutual trust established by the DGA. It performs this role in collaboration with the French Commission on Information Technology and Freedoms (CNIL), which provides its expertise on matters relating to personal data protection. To develop a harmonised European approach to regulating data intermediaries, Arcep is engaged in an ongoing dialogue with its EU counterparts, notably within the **European Data Innovation Board (EDIB)**.

Upon the adoption of the French Law on Safeguarding and Regulating Cyberspace, Arcep opened notification and certification request windows for data intermediation service providers. It received seven notifications in 2024, from companies operating in a variety of economic sectors, including agriculture, airport logistics, and training.

¹ Regulation (EU) 2022/868 of the European Parliament and of the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act).

² Law No. 2024-449 of 21 May 2024 on Securing and Regulating Cyberspace.

2. PROMOTING MORE FREEDOM OF CHOICE FOR CLOUD SERVICE USERS

The **Data Act** is also an integral part of Europe's data strategy and pertains to both the **Internet of Things (IoT)** and the **cloud computing market**. In both cases, the Act aims to give users control over their data.

Since 2020, multiple reports from national and European authorities on the functioning of the cloud sector have highlighted the risk of users being locked into the ecosystems of certain cloud service providers, due to the existence of barriers to switching providers and to the use of multiple providers at once (multi-cloud).³ These barriers consequently inhibit users' ability to take advantage of more competitive offers or to have access to complementary features offered by different cloud service providers and so, ultimately, limit competition in the sector. Giving users the freedom to choose their cloud services is thus a key imperative, and one that is likely to help achieve the goal of sovereignty, providing them with an opportunity to adopt trusted cloud solutions. Lastly, this freedom is also vital to enabling the free flow of data and, thus, the emergence of a data-driven economy, as underscored by the European Commission in 2020 in its "Strategy for Data".⁴

The development of artificial intelligence (AI) increases the risks that have already been identified. The cloud plays a crucial role in businesses' adoption of AI. Cloud service providers can market turnkey AI solutions, or dedicated development platforms, to facilitate and optimise the adoption of these tools by business. As with other cloud services, the risk of technical dependence is a major issue for businesses wanting to adopt AI tools in order to improve productivity, which they have to balance against the benefits of these innovations.

The adoption of the Data Act⁵ on 22 December 2023 marked a major step towards giving users the ability to choose their own cloud services. Chapters VI and VIII of the Act seek to make it easier to switch data processing service providers, which include cloud services.

In preparation for application of the Data Act, the French "SREN" Act on Securing and Protecting Cyberspace tasked Arcep with **establishing a pricing and technical framework to remove a number of obstacles to switching providers and to multi-cloud practices**. More specifically, two courses of action are being pursued to this end:

- capping data transfer and provider switching fees;
- clarifying the rules and methods for implementing the essential requirements of interoperability, portability, and open interfaces.

After a series of discussions with different stakeholders in the cloud computing value chain, and with businesses using these services, Arcep held a public consultation from 14 October to 16 December 2024 to gather input from all of the parties affected by the use of cloud computing services (including cloud service providers, systems integrators, infrastructure managers, and business users) on the directions and measures the Authority plans to take under the "SREN" Act.

The contributions to this public consultation will inform future Arcep decisions and guidelines, as well as discussions on the application of the Data Act⁷ on the European level.



PEREN INTERCLOUD PROJECT

To enhance its deliberations, the Authority joined forces with the French digital regulation expertise hub, PEReN (Pôle d'Expertise de la Régulation Numérique) on a project devoted to assessing virtual machine portability (VMP). These services, which are central to Infrastructure-as-a-Service (IaaS) solutions, are subject to an obligation of functional equivalence under both the "SREN" Act and the Data Act.

PEReN data scientists have assessed the ease of virtual machine migration according to:

- the source and destination host, by conducting trials on French hyperscalers and providers' services;

- the method of migration: graphic user interface (GUI), prompts, services dedicated to migration, infrastructure-as-code tools;
- the virtual machine's features: network configuration migration, encrypted discs, etc.

Testing revealed that it is currently possible to migrate virtual machines, even if some methods are cumbersome. These conclusions lay the groundwork for enabling virtual machine portability as part of the implementation of the Data Act, to allow every type of user to benefit from the ability to switch services. The project will continue through 2025, focusing on the portability and interoperability of AI cloud services.

³ See, for instance: Autoriteit Consument & Markt, "Market Study Cloud services", September 2022; Autorité de la concurrence, "Opinion 23-A-08 of 29 June 2023 on the competitive functioning of cloud computing", June 2023; Office of Communications, "Cloud services market study (final report)", October 2023.

⁴ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0066>.

⁵ Regulation (EU) 2023/2854 of the European Parliament and of the Council of 13 December 2023 on harmonised rules on fair access to and use of data and amending Regulation (EU) 2017/2394 and Directive (EU) 2020/1828 (Data Act).



A NEW ARCEP TEAM DEVOTED TO CLOUD COMPUTING AND DATA



From left to right: Marie Chambrette, project officer; Rubing Shen, project officer; Marion Panfili, head of the 'Economic Analysis and Digital Intelligence' unit; Charles Joudon-Watteau, project officer; Judith Herzog; Léo Quentin, head of the 'Data and Cloud Services' unit; Philéas Samir, project officer

To carry out these duties, a new “Data and cloud services” unit was created and trained in 2024, operating within the Arcep “Internet, Data, Press, Postal, and User Affairs” department. The mandate of the unit includes:

- regulating data intermediation service providers;
- creating open cloud services, notably in terms of data interoperability and portability;

The Authority also relies on the expertise of the “Economic analysis and digital intelligence” unit which is part of the “Economics, Markets, and Digital Technology” department, to analyse the competition dynamics of cloud services market, and to fulfil pricing regulation duties.

3. COORDINATION AT THE EUROPEAN LEVEL

The **European Data Innovation Board (EDIB)**, created by the DGA, and whose mandate was expanded by the Data Act, is central to the development of a harmonised European approach to implementing these regulations. It began its work in 2023 and, as the authority empowered to implement the DGA, Arcep is already playing an active role, alongside the CNIL.

The Board is intended to act as a platform for facilitating cooperation between competent authorities and helping them develop their expertise in the areas covered by these regulations. A sub-group was therefore created in 2024, made up of NRAs empowered to implement the DGA, and it has have worked on issues such as

data intermediation services and exceptions to this status, and the structural separation of data intermediation services' business areas. It also assists the European Commission in defining harmonised standards applicable to European data spaces, which were a key focus of the work that EDIB conducted in 2024, but also to cloud services and smart contracts,⁶ notably to facilitate the interoperability of these services.

The Data Act also stipulates that the competent authorities for cloud-related provisions must have expertise in electronic communications. To this end, having already produced several reports on the subject, BEREC plays a particularly active role in the application of the Data Act. Arcep co-chairs the BEREC Digital Markets working group, through which it began in 2024 to share its knowledge and the experience it has acquired at the national level with its European counterparts, thereby contributing to a consistent application of the Data Act.

⁶ The Data Act defines a smart contract as “a computer program used for the automated execution of an agreement or part thereof, using a sequence of electronic data records and ensuring their integrity and the accuracy of their chronological ordering”.

Giving the floor to

JACQUES CRÉMER

Toulouse School of Economics



Analysing the cloud: should “egress fees” be eliminated?

At first glance, the development of the cloud seems in many ways akin to the recent development of equipment rentals in multiple branches of industry. But the cloud is ushering in far more vast and fundamental technological changes than, for instance, switching from buying to renting airplane engines. These technological shifts are triggering profound upheavals in the hardware economy.

The pricing of cloud services in particular is a real conundrum. Incredibly complex, it makes it difficult to compare to any other service. Because server and software rental are intrinsically tied to one another, users have a plethora of choices and have to juggle a complicated set of options. Because the cloud industry is so heavily concentrated (observers estimate that the top three providers, Amazon Web Services, Microsoft Azure and Google Cloud, together controlled 67% of the market in 2024), regulators are faced with tricky choices if they want to maintain competition while not imposing restrictions that would diminish quality of service.

There is ample food for economic debate here, but to understand the challenges that providers, users and this industry’s regulators are facing, let us focus on one burning issue for regulators: “egress fees”. Europe’s Data Act stipulates that *“Unnecessarily high data egress charges and other unjustified charges unrelated to actual switching costs inhibit customers from switching, restrict the free flow of data, have the potential to limit competition and cause lock-in effects for the customers by reducing incentives to choose a different or additional service provider. Switching charges should therefore be abolished after three years from the date of entry into force of this Regulation”* (Recital 88). I am agnostic about the relevance of abolishing these fees, but the reasoning applied is not entirely rigorous: the fact that overly high fees are harmful does not automatically mean they should be nil.

Very little economic research has been done on egress fees, in fact. Which has led regulators to react without having all of the necessary information. Added to which, studying egress fees is a good testbed for better understanding the industry’s competitive (or uncompetitive) dynamics. With my colleagues at the Toulouse School of Economics, we undertook a formal analysis of this practice, which revealed that its effects are rather subtle.

While the analysis itself is quite complex, it is based on a classic observation of economic literature. Vendor switching fees weaken ex-post competition but stimulate ex-ante, in the new customer acquisition phase. This allows us to show that the benefits of egress fees regulation depend heavily on the type of relationship that cloud service providers have with their customers. If it is a long-term contract – which means that a provider commits, explicitly or implicitly,

not to increase prices in an undue manner – prohibiting vendor switching fees can increase vendors’ profits at users’ expense. On the contrary, under other circumstances, and particularly when the contracts are short-term, capping or prohibiting vendor switching fees can be pro-competition. In practice, it seems that most cloud service contracts are formally short-term ones (some contracts with large customers are negotiated, and it is difficult to know whether they contain long-term commitments). It is, however, difficult to know the extent to which hyperscalers are subject to pressures that prevents them from making drastic changes to the terms of their contracts; if these pressures are strong, it makes them more akin to long-term agreements.

It would be beyond the scope of this brief note to draw economic policy implications from this analysis and, as I said earlier, I am not sure that the Data Act is wrong on this point. I do, however, have serious doubts that prohibiting vendor switching fees would fundamentally alter the state of competition in the industry, added to which most market observers agree that egress fees charged at the end of a contract are low. Under other circumstances, for instance for the development of new products, this prohibition could carry a high cost.

Notes

- Cloud computing research at the Toulouse School of Economics is financed in part by Microsoft. The opinions expressed here do not necessarily reflect those of Microsoft, or TSE.
- Readers wanting to explore this topic further can find a more in-depth discussion of the cloud economy in: *The Economics of Cloud*, by G. Biglaiser, J. Crémer and A. Mantovani, TSE Working document 24-1520, tse-fr.eu/sites/default/files/TSE/documents/doc/wp/2024/wp_tse_1520.pdf.
- The Arcep public consultation (in French) can be accessed at the following URL: https://www.arcep.fr/uploads/tx_gspublication/consultation-cloud-changement-fournisseur-services-architectures-tarifs-oct2024.pdf.
- The above analysis draws on an upcoming TSE working document: “Should Egress Fees Be Eliminated? An Analysis of Cloud Services and Beyond”, by G. Biglaiser, J. Crémer, A. de Cornière, A. Montavani.

CHAPTER 5

Fostering the development of generative AI systems that uphold openness and freedoms on the internet



THE BOTTOM LINE

- Arcep is mobilising its expertise to assess and control the impact that generative AI has on **competition dynamics** in the digital sector, on electronic communications networks, and on the environment. It participated in the **French AI Action Summit in 2025**.
- In 2024 and 2025, the Authority has been working to bring the still largely unaddressed issue of **the impact of generative AI on open internet** access to the forefront of public debate. As generative AI becomes the new interface between users and online content, it can influence users' freedom of choice, as well as innovators' capacity to offer services and content on the Web.
- Arcep's new **"Ambition 2030" strategy** includes the publication of a deliverable to highlight tools for **reconciling the development of generative AI and the safeguarding an open internet and the freedom to innovate**.

As artificial intelligence continues to play a growing role in the internet ecosystem, Arcep has sought to understand the particular **effects of this technology on digital services**, and to examine the associated regulatory issues, in order to then ensure that the technology develops in a way that benefits everyone, in a lasting fashion.

The Authority has taken a particular interest in issues specific to **generative AI**. These technologies are characterised by their capacity to generate and publish new data (images, text, audio, etc.). Unlike "conventional" AI systems, which are confined to classification and prediction, generative AI can produce new outcomes, typically by employing deep learning models or neural networks. It thus operates based on assimilating and synthesising models obtained from a training corpus, then reproducing these learned patterns to generate new data.

Generative AI is a major catalyst for innovation for a great many sectors of the economy. It also raises a number of technological, societal, economic, and social issues and challenges, which have been the subject of both national and European studies and work-streams, to which Arcep has been keen to contribute.

1. ARTIFICIAL INTELLIGENCE, A CENTRAL THEME OF ARCEP'S WORK ON THE FUTURE OF NETWORKS AND THE INTERNET

Arcep has taken an interest in the economic and technical impact of artificial intelligence (AI) for several years now. Back in 2018, Arcep's report on *"Smartphones, tablets, voice assistants... Devices, the weak links in achieving an open internet"*¹ invited readers to consider the ways in which AI systems built into user devices and voice assistants might affect the openness of the internet. Arcep then focused specifically on **AI's impact on the electronic communications sector**, as part of its forward-looking analysis exercise on "Future networks". In 2020, it published a briefing note on "Electronic communication networks and artificial intelligence", analysing the role of AI role in the networks and possible regulatory issues. This theme continued to drive work carried out in 2024 as part of the resumption of the Authority's *"Future networks"* cycle of inquiry. A briefing note on "Telecoms networks with an IT core,"² published in 2024, provided a summary of how the integration of AI

¹ ARCEP, 2018, *Smartphones, tablets, voice assistants... Devices the weak link in achieving an open internet*

² Arcep, 2024. *Future networks briefing note: Theme 1 – Telecoms with an IT core*.

into telecoms infrastructures was evolving, a topic that will be further explored in the forward-looking work being carried out in 2025.

Since 2024, Arcep has been working on the more specific question of the impact of generative AI and is lending its expertise to public discussions on these technologies, that are disrupting the internet ecosystem. In March, the Authority presented its initial analysis in its response to the [European Commission's](#) call for contributions on competition in the generative AI sector. It also participated in the work being carried out by BEREC which, in response to this same call, published an opinion on generative AI and virtual worlds, in line with its previous report on AI and other work conducted by its Digital Markets working group.

In 2025, Arcep's "Ambition 2030" strategy lists three priority work-streams pertaining to generative AI:

Ensure an open generative AI market, marshalling existing regulatory tools on online platforms and cloud computing;

- **Uphold the application of the principle of an open internet** for the development of generative AI systems that respect users' choices and are open to innovation;
- **Measure and minimise the impact of AI, including generative AI**, on the environment, a topic explored in more detail in Part 3 of this report: "Working to achieve a sustainable internet".

2. ARCEP'S CONTRIBUTION TO CREATING AN OPEN GENERATIVE AI MARKET

Although the large-scale adoption of generative AI has been marked by the emergence of several new companies, it nevertheless raises competition concerns. AI relies on key resources, such as **cloud services, data, computing power, and technical skills**, which can be supplied and controlled by only a small number of large companies. The current push to innovate and increase service take-up rates is creating a momentum that will shape future competition dynamics, for both generative AI and digital services in general. **The development of a competitive and open market for generative AI and the services it incorporates therefore appears vital to ensuring that the technology will benefit as many people as possible.**

In its [response to the Commission's public consultation on generative AI](#) in March 2024, Arcep went into greater detail, pointing out that the evolution of the competition dynamic around generative AI will be shaped to a large extent by the competition conditions in the digital sector as a whole, at a time when incumbent tech companies have a competitive advantage, particularly when it comes to cloud services, data, and technical expertise. Through their partnerships with model developers and the integration of their AI development platforms, cloud computing companies in particular are emerging as essential intermediaries for easy access to generative AI services. BEREC also responded to the Commission's consultation, in a [document](#) that largely shares Arcep's analysis.

Leveraging market **power in a specific digital ecosystem is nothing new**, which is why it is important to attenuate the risks and ensure that the key resources involved in generative AI remain accessible to new entrants, under fair and non-discriminatory conditions. This will help prevent a small handful of Big Tech companies from having preferred, if not exclusive, access to these key resources, thereby creating an insurmountable barrier to entry for competitors, at the expense of end users.

The Data Act and Digital Markets Act will have an important role to play in countervailing the power that certain players can exercise. These two regulations impose several obligations – including in relation to access, portability, and interoperability – on players holding core inputs such as data and cloud services. By creating a new regulatory framework that promotes competition and innovation in these markets and the services upstream of or which depend on AI, these obligations could serve to attenuate structural competitive advantages or advantages of an ecosystemic nature enjoyed by the targeted companies, and to prevent anticompetitive practices.

Arcep and BEREC continue to be deeply committed to this issue. Actions are planned as part of [Arcep's "Ambition 2030" strategy](#) and the Authority is co-chair of the Digital Markets working group, which is responsible for BEREC's work on AI.

Giving the floor to

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QUENTIN DELTOUR

Rapporteur to the Autorité de la Concurrence



Generative AI: creating an opportunity for new players to emerge

In 2024, France's Competition Authority, *l'Autorité de la concurrence*, wanted to provide stakeholders with a competitive analysis of the sector, with a particular focus on examining the strategies that Big Tech companies were deploying to expand their existing market power in this fast-growing sector.¹ The benefits of generative AI will, indeed, only materialise if every household and business has access to a range of models tailored to their needs.

Barriers to entry are high in this sector, where start-ups and research labs specialised in AI are competing with Big Tech. The development of large foundation models requires massive computing power, which itself requires the use of cloud computing, as well as access to a large volume of data. Equally necessary is the recruitment of engineers specialised in AI who are drawn by large salaries and attractive working conditions, including access to massive computational resources. All these reasons help to explain model developers' need for substantial financing.

Several developments are, nevertheless, likely to limit these barriers to entry, such as the use of public supercomputers to train models and the publication of open-weight models. At the same time, innovations in model architectures and the use of synthetic data can improve training efficiency and fine tuning to reduce their costs.

Big Tech companies, notably Microsoft and Google, enjoy significant advantages in the generative AI sector. In addition to their financial power, they control most of the access to the inputs needed to develop foundation models, and their vertical and cross-company integration give them the ability to control the development of their own models and the deployment of downstream third-party models.

All these factors combined constitute a considerable barrier to competitors' entry and expansion in this market, and the advantages enjoyed by Big Tech can be a threat to competition, particularly further down the value chain.

The Autorité de la concurrence has thus delivered its opinion on issues that will be key in shaping the sector's future, including a competitive assessment of the minority shares held by Big Tech companies in innovative start-ups, abusive practices that limit access to vital inputs, notably data, and new practices that are likely to limit access to talent.

The Autorité de la concurrence has formulated ten concrete proposals to guarantee an effective regulatory framework and promote innovation. The use of public supercomputers can, indeed, stimulate academic research and the emergence of new players. Moreover, greater consideration must be given to the economic value of data, thereby ensuring a balance between fair remuneration for rights holders and access to the data required to innovate, while taking the diversity of use cases into account.

The sector remains a hotbed of news, between announcements of massive investments in AI infrastructure, notably following the AI Action Summit in Paris, the emergence of DeepSeek, a newcomer boasting that it had trained a state of the art model for a fraction of its competitors' costs, and the conclusion of new data agreements, such as the one signed between Mistral AI and AFP on the use of data at the inference stage. Special attention also needs to be given to the growing energy requirements being driven by the massive deployment of AI. The Autorité de la concurrence will continue to monitor competition in the sector and could, if required, intervene by leveraging all its available tools.

¹ [Opinion No. 24-A-05 of 28 June 2024 on the competitive functioning of the generative AI sector.](#)

3. ARCEP'S EFFORTS TO RECONCILE OPEN INTERNET ACCESS AND GENERATIVE AI

3.1. Generative AI systems: new gateways to the internet?

As with search engines, operating systems and social media,³ generative AI could become a new gateway to accessing online content and services for a great many internet users.

The use of generative AI has seen an exceptionally fast uptake.

By means of illustration: ChatGPT was logging over 100 million unique users within two months, compared to nine months for TikTok and two and a half years for Instagram to reach a comparable number of users. According to the 2025 edition of the Digital Market Barometer published by Arcep, the French General Council for the Economy (CGE), the French Agency for Territorial Cohesion (ANCT), and Arcom, and based on a survey carried out by CRÉDOC,⁴ 69% of people in France between the ages of 18 and 24 use artificial intelligence tools at work or for their studies, compared to 41% of people between the ages of 25 and 39. Meanwhile, 58% of 18 to 24-year-olds use AI in their private lives, compared to 41% of 25- to 39-year-olds. Another study produced by Ipsos⁵ confirmed this take-up rate for generative AI, reporting that **48% of the French people surveyed said they use generative AI services for online searches.**

Aside from chatbots, generative AI systems are increasingly integrated into digital services and software, including the most widely used ones such as search engines (the integration of CoPilot based on GPT in Bing, Google's Gemini chatbot and "AI overviews," and the generative AI assistant integrated into Qwant⁶), social media (Meta, for instance, integrates its own Llama model into its products;⁷ while X, formerly known as Twitter, offers Grok⁸). Applications that may or may not be based on generative AI can

also be installed on certain smartphones and smart devices, such as the Alexa voice assistant on Amazon devices⁹ or Google's Gemini AI assistant.¹⁰ Although generative AI B2C applications are the most visible, there are also multiple business use cases that incorporate generative AI as a new Human-to-Machine interface to carry out a variety of tasks (administrative, technical expertise, decision-making support, etc.).

It is within this context that generative AI is becoming a **new gateway for accessing content generated from information shared online.** This in turn creates challenges around the application of the principle of an open internet, which European Law defines as, *"the right to access and distribute information and content, use and provide applications and services, and use terminal equipment of their choice [...]"*.¹¹

a. How generative AI affects the ability to access online content

The main providers of generative AI represent a new algorithmic intermediary with a growing influence on the conditions under which content is made available to users on the internet. By relying on generative AI systems to access content, these users hand over their choices to systems that are often opaque in terms of the sources and parameters they employ. Indeed, generative AI is based on very powerful algorithmic systems, but still struggles to explain how the responses were guided.

Moreover, generative AI technologies do not merely share or organise content produced by third parties, they generate *ad hoc* content, thereby amplifying the weight of the choices and the settings used by AI providers. This is why generative AI is likely to accentuate the risks of enclosure, bias, and "filter bubbles"¹² resulting from users' loss of control over their online choices, as they surrender that power to this new intermediary.

3 Arcep, 2018, *Smartphones, tablets, voice assistants... Devices the weak link in achieving an open internet*.

4 Arcep, the General Council for the Economy (CGE), the French Agency for Territorial Cohesion (ANCT), and Arcom, and carried out by CRÉDOC, 2025. *Digital Market Barometer*.

5 Ipsos & CESI, 2025. *Intelligence artificielle : quels sont les usages des Français*.

6 Laurent, A., 2024, "Qwant lance un programme de fidélité, en attendant sa future techno de recherche", Next. <https://next.in/155084/qwant-lance-un-programme-de-fidelite-en-attendant-sa-future-techno-de-recherche/>

7 Koebler, J., 2025. «Meta's AI Profiles Are Indistinguishable From Terrible Spam That Took Over Facebook», 404 Media.

8 Guyot, L. 2024. «Grok: en rendant son IA accessible à tous, Elon Musk ouvre la boîte à fake news», Le Progrès

9 Le Figaro/AFP, 21 September 2023. "Amazon ajoute de l'IA générative dans son assistant vocal Alexa".

10 Google, 04 October 2023, <https://blog.google/products/assistant/google-assistant-bard-generative-ai/>

11 Article 3(1) of the Open Internet Regulation No. 2015/2120

12 Pariser, E., 2011. *The Filter Bubble: How the New Personalized Web Is Changing What We Read and How We Think*. Penguin.



GENERATIVE AI AND INFORMATION SEARCH: THE LATEST DEVELOPMENTS

Large Language Models (LLM) are increasingly being used for information searches. Although this is not their primary function, recent and upcoming technological developments are expected to improve their performance in this area.

2022-2023: Emergence of conversational models

Conversational models generate answers based on data. They generate a “probable” text based on the dataset used to train them. It is virtually impossible to retrace the sources used to generate that text response with any accuracy.

2023-2024: RAG (Retrieval-Augmented Generation)

AI systems developers added a documentary search system to enhance the responses generated by LLMs, thus making it easier to identify the sources used for that search.

2025: Agentic models (Gemini 2.0, GPT DeepResearch)

Depending on the user’s question, these models are capable of:

- generating an action plan that resembles reasoning, including the search tool (e.g. Google Search, YouTube, Maps) and the search keywords to use;
- generating the computer code for executing this action plan;
- executing the generated code and extracting the search results obtained;
- generating the final response given to the user based on these search results.

This last type of model allows a better understanding of the path taken by the request, something that was inconceivable in 2022. Challenges nevertheless remain in terms of explainability (or interpretation), reliability, and transparency. It should also be noted that these new models require far more computing power to respond to user requests, as a result of which they have a **larger environmental footprint** than classic models.

b. Generative AI’s impact on content creation

The advent of generative AI as a **new gateway to the internet brings with it deep-seated changes in content sharing and distribution methods**. Generative AI clearly makes it easier to produce content. It has never been easier to produce a text, an image, or a line of code. The potential assistance in content creation provided by generative AI tools can, therefore, stimulate innovation in an array of sectors.

Using generative AI to produce content nonetheless raises serious copyright issues.

Without the **means to distinguish original content from AI-generated content** and given the risks of content appropriation inherent in generative AI systems, end users and professionals may be disinclined to engage in creation, including open licence or Creative Commons content. This in turn will affect the wealth and diversity of the content that can be accessed online. In addition to the societal issues raised by these questions surrounding authorship and content creation, such a process could also affect the quality of future AI models.

Due to the limitations of recursive algorithms, when AI models are retrained on content created by other generative AI systems (i.e. regurgitative training), the quality and diversity of the data generated could steadily deteriorate (the “model collapse” theory¹³).

Generative AI is profoundly redefining technical-economic relationships in the content market by challenging the business models used by traditional content providers (both media and digital commons models such as Wikipedia), as well as their ability to make content available to users. These traditional content providers could thus be forced to sign agreements with generative AI providers in order to reach users. At a time when only a handful of players dominate the generative AI market, it is by no means certain that free competition will suffice to guarantee a normalisation of the relationships between generative AI providers and traditional content providers, since gatekeeper content generators could lock in users and lock out content providers who have not signed an agreement with these dominant players.

¹³ See the article by Martin Clavey which explains the scientific publication from which this idea originates: Clavey, M., 2024, *Entraînement sur des données synthétiques, talon d'Achille de l'IA générative*, Next.

3.2. Arcep's commitment to ensuring open internet access is integral to discussions on AI

In 2024, Arcep began working to raise these issues in public debates, entering into dialogue with experts from the AI ecosystem and academia to share its initial analyses. The goal was also to create opportunities for discussions about the means required to guarantee the development of trusted generative AI systems, in accordance with the core values of a free and open internet.

On 2 July 2024, the Chair of Arcep, Laure de La Raudière, published an **op-ed in *Le Monde***,¹⁴ sharing the warning signs identified by the Authority in its capacity as internet watchdog, as well as preliminary tools to foster neutrality and openness to innovation in generative AI systems.

"By having direct control over the access to knowledge and sharing at the very heart of the internet model, generative AI thus threatens our freedom of choice in accessing online content and our freedom of expression. This is a fundamental challenge to the principle of an open internet. Every ISP is prohibited from discriminating against access to the content being relayed over their network."
Laure de la Raudière, Chair of Arcep¹⁵

Arcep then hosted a panel discussion in its offices, entitled **"Generative AI, the new gateway to online content"**, to coincide with the publication of the 2024 edition of the report on the State of the

Internet in France. Moderated by Arcep, this event brought together key experts in this area to shed light on the issue. Participants included Célia Zolynski, Law professor and Coordinator of the Université Paris 1 AI Observatory, Jean Cattán, Secretary-General of the French Digital Council, and Frédéric Alexandre, Director of Research, and Mnemosyne team leader at Inria.

The panel agreed that generative AI is ushering in a new era for the internet and its users, raising a host of challenges, some of which are only partially addressed by the current regulatory framework. Panel members emphasised that economic regulation, users' right to choose their settings, and raising user awareness could all play a crucial role. The environmental issues created by the increasing use of generative AI systems to access online content were also discussed.

As a participant in the **Internet Governance Forum (IGF)**, Arcep was invited to take part in the **"From Internet Openness to AI Openness"**¹⁶ conference hosted by two dynamic coalitions.¹⁷ The discussion – which included several experts, including Vint Cerf, one of the co-authors of the TCP Protocol, and Luca Belli, Law professor at the *Fundação Getulio Vargas University* – helped to highlight the need to adapt the principles of transparency, interoperability, and accountability to the context of AI, and to stress the importance of building a fair and inclusive digital future, in line with the core values of an open internet.

Replay: (1 hour): [Video \(74 Mb\)](#) – [Audio \(34 Mb\)](#)



Panel discussion "Generative AI: new gateway to online content" at Arcep on 4 July 2024 featuring, from left to right: Célia Zolynski, Jean Cattán, Frédéric Alexandre, and Sandrine Elmi Hersi
Credit: Arcep

¹⁴ Arcep, 2024. [Laure de La Raudière: "Les IA génératives menacent notre liberté de choix dans accès aux contenus en ligne"](#).

¹⁵ Ibid.

¹⁶ Dynamic Coalitions Core Internet Values and Net Neutrality, 2024. ["From Internet Openness to AI Openness"](#), IGF 2024.

¹⁷ The "Core Internet Values" and "Net Neutrality" coalitions. The IGF dynamic coalitions are targeted working groups devoted to internet governance issues, whose work takes place between IGF sessions.

Arcep Executive Board member, Sarah Jacquier-Pélissier, also had an opportunity to speak on these topics at the RAID (*“Regulation of AI, Internet & Data”*) conference in September 2024, hosted by Cavendish Group International. She was part of the *“Internet Governance: Protecting Societies and Consumer Rights”* panel, which explored the ways in which AI affects the diversity of content and users’ freedom online.

To deepen the dialogue **with academia**, Arcep produced **an academic poster** (see page 56) recapping its core work and areas of research into the impact of generative AI on open internet access, in an easily shareable format. The Authority has shared this document and its thinking at several academic events, including the study day on *“AI for all, all for AI?/IA pour tous, tous pour AI?”* co-hosted by the Ascencia school and Internet Society,¹⁸ and an academic workshop in November on AI openness hosted by Mozilla, Fondation Abeona, the École Normale Supérieure (ENS) and the Columbia Institute of Global Politics.¹⁹ Arcep also attended a seminar on AI imaginaries, hosted by an information and language sciences laboratory in Lyon.

Following these discussions, Arcep Chair, Laure de la Raudière, published an article in *Les Annales des Mines*²⁰ in March 2025 on the initial findings of this work.

“Generative AI is dramatically redefining technical and economic relationships in the content market. Will traditional content providers (both media and digital commons models such as Wikipedia) continue to have the capacity to make content available to users? [...] Based on our experience with net neutrality, it will be vital to ensure that the market power of “gatekeeper content generators” does not impede the wealth of online content and gives users and innovators enough freedom to access and share the content of their choice.”
Laure de la Raudière, Chair of Arcep²¹

3.3. Courses of action to tackle these challenges

In response to these issues, and as part of its new “Ambition 2030” strategy, the Authority is working on drafting recommendations to ensure open digital markets and AI systems.

Among the courses of action planned to safeguard the neutrality, plurality, and quality of online content in response to the development of generative AI, is the promotion of high standards in terms of the efficiency, transparency, and auditability of the models. Arcep also wishes to explore avenues for guaranteeing that users are truly empowered in their choice of digital practices, notably by having the right to control their settings and ensuring algorithmic pluralism. Lastly, technical and economic regulation could help to maintain competition in this sector, drawing from or based on existing tools when crafting a framework that applies to digital industry stakeholders.

In spring 2025, Arcep launched a **series of interviews** with the different stakeholders the Authority identified, to explore these avenues in greater detail (researchers, ecosystem stakeholders, civil society), along with **testing work with French digital regulation expertise hub, PEReN, to qualify how the use of generative AI affects access to online content.**

These workstreams will help to expand the Authority’s analysis of the ways in which generative AI systems can alter methods for accessing content and information, and to identify appropriate responses to these challenges. This work will thus inform **Arcep’s report on AI and an open internet**, which is due to be published in late 2025.

18 Internet Society France, 2024. *Café IA et Journée de recherche “IA pour tous, tous pour AI”*, 19 November in Paris with Internet Society France and Ascencia Business School. Arcep’s keynote is available on YouTube (in French)

19 Mozilla, 2025. *Navigating the Future of Openness and AI Governance: Insights from the Paris Openness Workshop*, 4 February 2025.

20 DE LA RAUDIÈRE, L., 2025. *“Pour un développement de l’IA au service du bien commun”*, *Annales des Mines*, 2025, No.29.

21 Ibid.

Open Internet and Generative Artificial Intelligence: What challenges?

Generative AI: New Gateway to the Internet

- Strong dynamics in the use of **chatbots**, sometimes replacing traditional search engines.
- **Generative AIs are gradually integrated** into the most used digital services and devices (search engines, social networks, smartphones, etc.).

Open Internet, principle at the heart of the EU digital model

- Net neutrality is guaranteed by **Regulation 2015/2120 on the open internet**.
- **The European Declaration on Digital Rights and Principles for the Digital Decade** reaffirms the right of EU citizens for internet openness and freedom of choice towards algorithms.

IMPACT ON USERS' ACCESS TO INTERNET CONTENT

- The **very refined interface** of generative AI tools leaves the user **little control over the content they access** : single response, lack of transparency, sources, no choice of settings.
- The use of generative AI **accentuates the phenomenon of delegation** (Rieder, 2006), since the user accesses ad hoc content, the contours of which depend on the choices of AI providers and the parameters of the model used.
- **The inherent limitations of AI** must be taken into account: reinforcement of **existing biases** by statistics, risks of **erroneous responses presented in a credible manner** ("hallucinations").
- The combination of **personalization of results and generation of content** carries the risk of locking the Internet user into his own representations and of **intensifying the presence of algorithmic "filter bubbles"** (Pariser, 2011).

IMPACT ON USERS' BROADCAST OF INTERNET CONTENT

- **The statistical nature of generative AI models favors the repetition of widely disseminated** or easily accessible content, to the detriment of more specialized information.
- **While generative AI can facilitate content creation, there are of risks of disincentivizing end users from publishing original content** (Epstein et al., 2023) as no specific tag or added value is defined for original context.
- In addition to an impact on creation, the production of original content is necessary to mitigate risks of **model collapse**: when AI models are retrained on content created by generative AI systems, the quality and diversity of the data can gradually deteriorate (Shumailov et al., 2024).
- At a time when only a handful of players dominate the generative AI market, some **"structuring" content generators** could choose to enter into agreements exclusively with certain content providers, thus creating **a bottleneck**.

FIRST RECOMMENDATIONS FOR RECONCILING GENERATIVE AI AND OPEN INTERNET

- Support research to **improve the efficiency, transparency and auditability** of AI systems;
- Give users more information and means to control the content they access via generative AI through a **right of configuration, transparency of the sources used and algorithmic pluralism**.
- Role of regulation: i. **existing regulatory** tools to preserve the openness of the generative AI market (AI Regulation, DMA, Data Act, etc.); ii. Consider possible complementary tools, inspired by the existing framework regarding net neutrality, in particular concerning **"structuring content generators"**.

METHODOLOGY

- Literature review and collaborations with researchers working on related issues (study days, partnerships, etc.);
- Testing of generative AI tools (transparency, interface, choice of sources);
- Case studies;
- Semi-directed interviews with economic actors, institutions and stakeholders.

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 Bernhard Rieder (Nov. 2006). "Metatechnologies and delegation: towards a society-centered design in the era of web 2.0". Theses. Paris VIII Vincennes-Saint Denis University. url: <https://theses.hal.science/tel-00179980>
 Illia Shumailov et al. (2024). "AI models collapse when trained on recursively generated data" In: *Nature* 631, p. 755-759. URL: <https://doi.org/10.1038/s41586-024-07566-y>

Source: Academic poster from Arcep on the challenges raised by Generative AIs on internet openness, January 2025.

Giving the floor to

LINDA GRIFFIN

Vice-Chair Global Public Policy

MAXIMILIAN GAHTZ

AI Policy Lead



Openness in AI: Progress for all of us, not just some of us

Openness in research and technology has been a driving force of progress for decades: Open protocols still form the backbone of the internet and the web. Open source software is an indispensable part of the tech stack everywhere. We also know that openness was a key driver of early progress in AI.

Yet walled gardens and black boxes are the dominant features of AI development today. Over the course of the last few years, AI companies have moved to share less, not more. We need to reverse this trend if we're going to build AI ecosystems that drive positive change.

At the beginning of the century, when one large tech company had cornered the browser market by leveraging its control over an entire ecosystem, it was an open source browser project — Mozilla's Firefox — that broke this chokehold and brought back competition to this market. Today, it may seem as though innovation in AI is primarily driven by new market entrants, like OpenAI, Anthropic, or Mistral. But established tech companies are leveraging their capital and dominant position in other verticals to consolidate their influence across the value chain. For example, AI start-up after AI start-up has entered into strategic partnerships with cloud service providers, and, with them, access to critical computing power for developing and scaling AI. When it comes to training data, companies running social networks have unique access to users' valuable data. And those with vast distribution ecosystems, for example through productivity tools, have direct access to myriad consumers when it comes to bringing new AI services to market.

What is all this adding up to? Early market consolidation dominated by developers of closed systems. Given the history of the web, it is hard to see how this is good for innovation in the long run. Advancing openness — and open source AI — can help curtail this. By openly sharing AI models, data, code and other tools, AI developers can help ensure that access to the components of this technology is not concentrated in the hands of a few actors, but widely distributed across the ecosystem. This can also help prevent vendor lock-in and reduce barriers to market entry. Openness in

AI has also significantly advanced AI safety, since it is easier to audit open-source AI models and datasets to discover flaws and develop mitigations. Similarly, investing in open source AI safety tools accessible to everyone, like the Robust Open Online Safety Tools (ROOST) initiative launched at the French AI Action Summit, can help advance safety across the AI ecosystem.

As governments invest in regional and national AI ecosystems, policymakers have the task to support and incentivise openness. Without leadership, this is by no means guaranteed.

At the same time, the rise of generative AI is impacting the open web. For instance, to secure a competitive advantage by tapping into new sources of training data, AI companies are casting aside data minimization principles, kickstarting a race to the bottom when it comes to user privacy. As developers are crawling the web in search of new training data, web publishers and creators are moving more of their content behind paywalls or are restricting open access to their content. And generative search offerings that aim to replace traditional search, which directs traffic to original sources rather than AI-generated summaries, may curtail publishers' ability to monetize content. All of this risks eroding the web commons and compromising people's privacy on the open web.

Advancing openness — in AI and for the web — requires investment and stewardship. Openness comes with myriad benefits: driving innovation, making technology safer and more accessible, and giving people more choice. But it doesn't come for free. At Mozilla, we know that bringing this idea to fruition requires a collective effort. In a technological world that steers further toward consolidation of power and governance, governments that believe in public-interest AI and the public-interest internet should join and invest in such an effort.

CHAPTER 6

Contributing to regulating digital platforms at the European level



THE BOTTOM LINE

- The obligations of the Digital Markets Act apply since March 2024.
- As part of its “Ambition 2030” strategy, Arcep has reiterated its **commitment to safeguarding healthy competition in digital markets, and announced the launch of deliberations to prepare for the DMA review scheduled for May 2026.**
- Arcep co-directed the drafting three BEREC opinions on the reference offers to facilitate the interoperability of WhatsApp and Messenger.
- Arcep represents BEREC within the High Level Group, and is an active contributor to its three sub-groups (interoperability, data and AI).

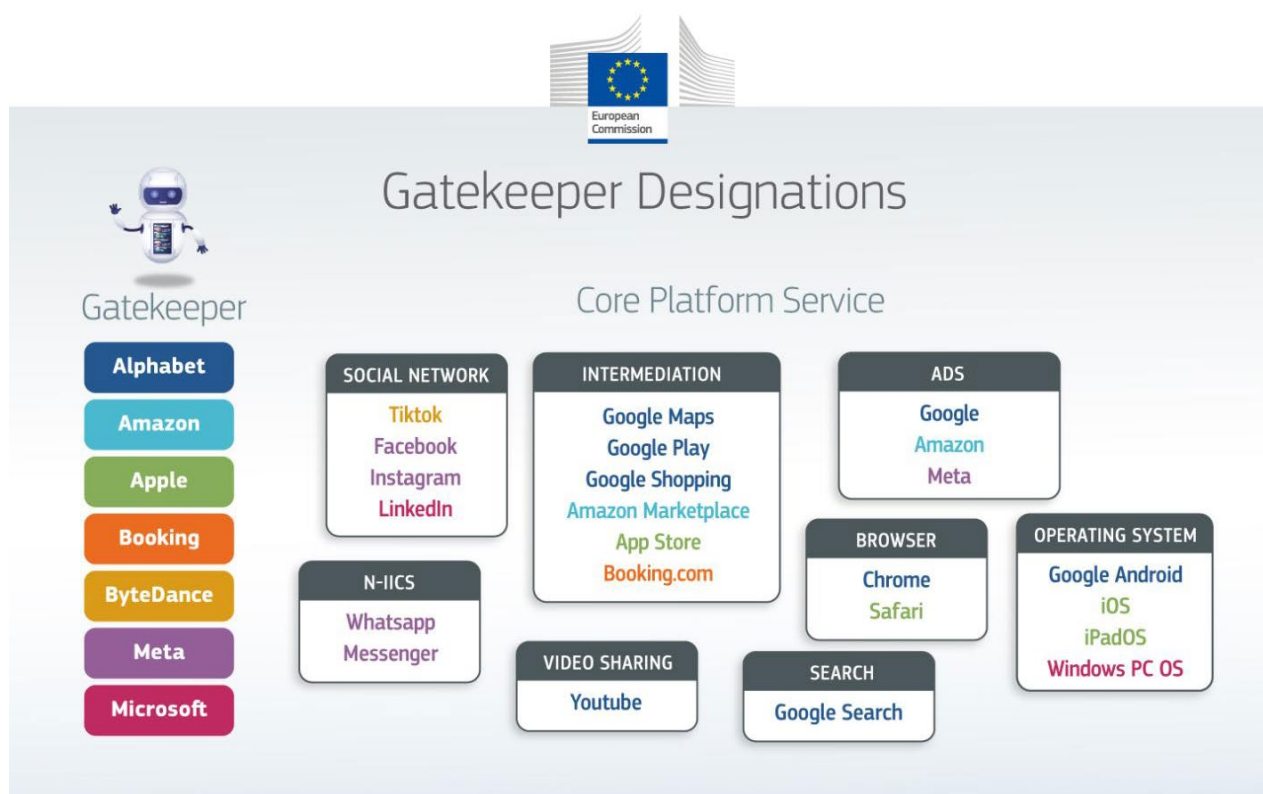
1. THE DIGITAL MARKETS ACT: A REGULATION TO SUPERVISE THE INTERNET’S GATEKEEPERS

To make digital markets both fair and contestable, and to combat the dissemination of illicit or harmful content, and of illegal products, in 2022 the European Union adopted the **Digital Markets Act** (DMA) and the **Digital Services Act** (DSA).

The DMA defines, *ex ante*, a series “do’s and don’ts” with which companies qualified as “gatekeepers”¹ must comply. These are the large digital platforms that serve as a major point of access between user companies and consumers. Some of them exercise tremendous control over entire digital economy ecosystems.

2024 was marked by important stages in the implementation of this Regulation. After having designated the **first 7 gatekeepers** (Alphabet, Amazon, Apple, Booking, ByteDance, Meta and Microsoft), and their 24 core platform services, including WhatsApp, Android and iOS, YouTube, Chrome and Safari, Amazon Marketplace and Google Search, the DMA’s obligations came into force on 6 March 2024, and companies must now comply with them. These include several interoperability obligations: gatekeepers must, for instance, make their instant messaging service interoperable with competing services that so request (cf. Section 2 p. 60 for details), and ensure that their operating system is interoperable with third-party app stores.

¹ As defined in Articles 2 and 3 of the Digital Markets Act (DMA).



Source : https://digital-markets-act.ec.europa.eu/gatekeepers_en



EXAMPLES OF OBLIGATIONS SET FORTH IN THE DMA FOR GATEKEEPERS

+ Gatekeepers must :

- make it easy for users to cancel their core platform services;
- make it easy to delete apps installed by default on devices, such as phones, computers or tablets;
- ensure the interoperability of their instant messaging services (such as WhatsApp or Facebook Messenger) with competing services that so request;
- allow vendors to promote their products and complete transactions with their customers outside the gatekeeper's platform;
- allow vendors to access their marketing and advertising performance data for the platforms;
- notify the European Commission of all acquisitions or mergers.

- They can no longer :

- pre-install key software (web browsers, search engines, virtual assistants) by default when installing operating systems. Users must be given a multiple choice option to select competing services;
- give preferential treatment to their own products or services over those of other vendors using their platform, or use other vendors' data to compete with them;
- require app developers to use specific accessory services (such as payment systems).

The DMA also created a High Level Group² composed of five European bodies and networks, including BEREC³ which can advise the European Commission and provide it with recommendations on the Regulation's implementation or application, and on the need to amend, add, or remove obligations imposed by the DMA. It can also provide its expertise to achieve a consistent regulatory approach between the DMA and the sector-specific regulatory frameworks applied by national authorities that make up European bodies and networks.

The High Level Group met in Brussels on 22 May 2024 and on 7 March 2025. Laure de La Raudière is part of the delegation that represents BEREC. As co-chair of BEREC's Digital Markets working group, and of the High Level Group's three expert sub-groups created by the Commission (dedicated to interoperability, data and AI), Arcep also plays an active role in contributing to these meetings.

To contribute to deliberations over digital issues, Arcep also took part in several conferences, including: *"Data-sharing in Europe: the implementation challenge"* and *"Mise en œuvre de la réglementation numérique européenne: le défi de la gouvernance"* (Implementing European digital regulation: the governance challenge) hosted by the Governance and Regulation Chair, in September and November 2024, respectively, as well as Digital Platforms Summits hosted by CERRE in January 2024 and March 2025. Arcep also hosted academic seminars in its offices on digital commons, with Serge Abiteboul (Director of Research at Inria and former member of the Arcep Executive Board) and on the attention economy, with Dominique Boullier (Professor emeritus at SciencesPo Paris).

In addition to the DMA, and to more effectively tackle the different issues raised by digital gatekeepers' platforms, the Digital Services Act (DSA) came into force in February 2024. The DSA comes to replace the e-commerce Directive of 2000, and contains measures (e.g. the removal of illegal content, transparency on content moderation, etc.) that apply to all online intermediaries offering their services in the European market: marketplaces, app stores, social media platforms, but also to ISPs, cloud service providers, etc. DSA rules are modulated according to the type of service and company size. Several members of BEREC will be responsible for implementing the DSA at the national level. BEREC hosted a workshop in 2024 to give these NRAs an opportunity to discuss and coordinate their efforts around their shared challenges, notably in terms of aligning with the European Electronic Communications Code. A workshop was held on 7 February 2025 under the aegis of the Arcep-Arcorm joint division, to discuss the issues and challenges surrounding the implementation of the DMA and the DSA, and on the interaction between these two regulations.



Left to right: Chiara Caccinelli, Deputy head of Arcep's "Economic analysis and digital intelligence" unit, and co-chair of BEREC's Digital Markets working group, Thomas Courbe, Director-General of Entreprises, Joëlle Toledano, Economist, at the conference hosted by the Governance and Regulation Chair on 18 November 2024.

2. INTEROPERABILITY OF INSTANT MESSAGING SERVICES, A PRO-CONSUMER TOOL: LEGAL OBLIGATIONS AND BEREC WORK

Since the DMA came into force, Arcep and BEREC have been playing an important role in the application of interoperability obligations imposed on instant messaging apps by the Regulation.

The DMA requires gatekeepers providing instant messaging services⁴ to make them interoperable⁵. The European Electronic Communications Code (EECC) also contains interoperability measures to ensure end-to-end connectivity⁶.

In particular, as part of the DMA's application, the European Commission submitted a request to BEREC to assess both the draft and final versions of Meta's proposed reference offer to facilitate WhatsApp interoperability. BEREC thus submitted two opinions to the Commission, which were published on 15 February and 4 June 2024. On 3 March 2025, BEREC also submitted a third opinion, this time concerning reference offers to facilitate Facebook Messenger and WhatsApp interoperability. In this last opinion, BEREC acknowledges the improvements made by Meta following the first two opinions, but also points out several weaknesses that Meta must correct: restrictions on the interoperability of Messenger that need to be justified, and the lack of details on service availability for users roaming outside the EU.

² See Article 40 of the DMA.

³ As well as the European Data Protection Supervisor and the European Data Protection Board (EDPB), the European Competition Network (ECN), the Consumer Protection Cooperation Network, and the European Regulators Group for Audiovisual Services (ERGA)

⁴ And, more broadly, number-independent interpersonal communication services

⁵ Article 7 of the DMA

⁶ Article 61(2) of the EECC

Arcep plays an active role in the implementation of these obligations. It co-chairs the BEREC working group responsible for this task, and has represented BEREC on multiple occasions at technical workshops and meetings that the Commission has hosted on

this subject⁷. These events brought together Meta, BEREC, the Commission and certain stakeholders to discuss the implementation of the interoperability of WhatsApp and Facebook Messenger.



CONTRIBUTING THE FIRST REVIEW OF THE DMA

The DMA stipulates that the European Commission will review this regulation, and submit a report to the European Parliament, the Council and the European Economic and Social Committee before 3 May 2026 ¹.

The purpose of the review is to assess “*whether the aims of this Regulation of ensuring contestable and fair markets have been achieved and assess the impact of this Regulation on business users, especially SMEs, and end users. Moreover, the Commission shall evaluate if the scope of Article 7 may be extended to online social networking*

services”. The evaluations also aim to establish whether the rules need to be modified, notably by amending the stipulated obligations and prohibitions and/or the list of targeted services.

In 2025, Arcep will help lead BEREC’s work on identifying avenues for improving the regulation, and will contribute to assessments within the DMA High Level Group, and its three sub-groups dedicated to interoperability, data and AI.

¹ Article 53 of the DMA

⁷ The first was held on 27 February 2023 and the recording is [available online](#). Participation in the second workshop (1 February 2024) was reserved for the affected platforms and BEREC.

Giving the floor to

PEREN: LE PÔLE D'EXPERTISE DE LA RÉGULATION NUMÉRIQUE

*French digital regulation expertise hub
Leveraging expertise in data science
to inform digital regulation*



Photo : Jeanne Accorsini-SIPA Presse

Interoperability of social media platforms: technical options and issues

Based on advertising revenue, the business model for the vast majority of social media platforms aims to maximise users' screen time. To this end, platforms are using a growing number of attention-grabbing mechanisms, such as infinite scrolls, notifications and increasingly sophisticated recommendation systems. This situation is driving some players to put forth proposals in support of "open" social media platforms, to give users back control over their content choices.

PEReN thus examined the technical conditions of four interoperability (or "unbundling") proposals from social media platforms, submitted for public debate:

- **Interfaces:** enable third-party applications to access and display content from another platform. For instance, users of an independent application will be able to access TikTok videos from that app. This would give them the ability to choose an interface that suits them, e.g., one that is less addictive.
- **Settings:** give users the ability to choose their settings (notifications, parental control, accessibility...) on different social media platforms in the same way. Users could apply the same settings everywhere, and more easily, for instance through a central tool.
- **Recommendation systems:** give users the ability to choose a third-party algorithm to select suggested content, to counter filter bubbles, for instance.
- **Moderation:** give every user the ability to opt for their moderation

policy of choice, the one best suited to their practices, for instance content that is more suitable for children or with verified sources. Moderation for one user should not be able to affect moderation for others, while complying with legal obligations.

Without addressing the question of the economic effects each measure will have on the platforms themselves, nor of the most apposite legal framework, we can observe that some of these proposals carry technical challenges which, today, seem difficult to overcome.

The challenge of massive data sharing. Opening up interfaces, recommendation or moderation systems involves sharing personal usage, profile and content data. Every time a user wants to test a new third-party service, they will have to agree to share these data with that service. This also raises questions of consent, particularly in the case of private groups where every member of the group will need to give their consent for a third-party service used by one of their members to access the entire group's content and profiles.

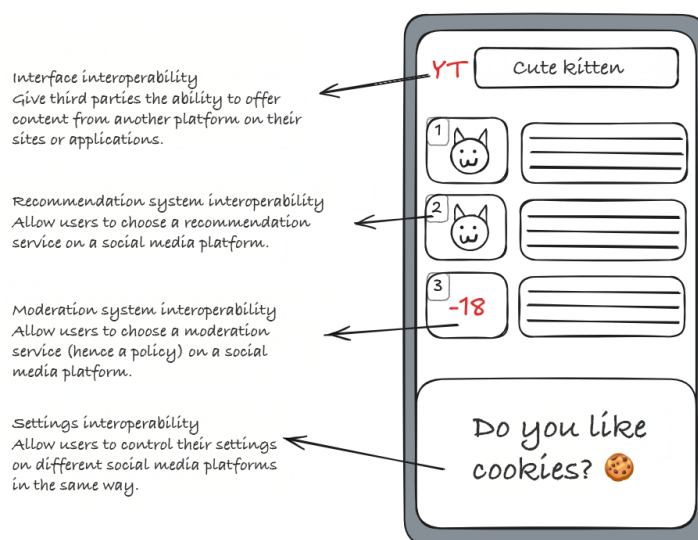
Challenge of heterogeneous platforms and the complexity of establishing and monitoring common standards. Current social media platforms contain such a diversity of services and features that standardising settings or APIs for accessing content (for opening interfaces, moderation or recommendation) requires a serious governance effort to establish these standards, along with substantial investments for players in order to comply with them. Lastly, these “unbundling” processes will create a more complex ecosystem, which could in turn make it more difficult for regulators to investigate practices (e.g. to understand the health implications of user interfaces) and to regulate effectively (e.g. in the case of moderation).

Challenge for future new entrants wanting to interface with platforms in a lasting fashion. The development of automated, powerful, large-scale recommendation or moderation systems requires a capacity to process massive volume of data and dedicated infrastructures. These technical requirements could restrict access to the social media market to only Big Tech companies that already have those resources. On the flipside, insufficient resources or exacerbated competition could also affect quality of service by encouraging policies that generate more revenue at the expense of users' security. In the case of moderation, limited resources could create an incentive to reduce human resource costs, by altering moderators' working conditions or increasing process automation, even if that leads to more errors.

In addition to this list of challenges, some measures could undermine the goal of increasing the diversity of content available to users. In the case of recommendation algorithms, for instance, giving every user the ability to choose their own algorithm could result in an uptick in filter bubble or disinformation phenomena, and an even greater polarisation of users.

Social media platform interoperability is therefore a technically complex subject. It can create opportunities to reduce the risks attached to using these platforms, and some forms of unbundling appear better delineated than others in this respect. As part of its technical support mandates, PEReN remains available to digital sector regulators to examine these mechanisms.

(Re)read Éclairage sur... No. 9 from PEReN, “Ouvrir” les réseaux sociaux: 4 pistes en 5 questions” (December 2024) that provides a more detailed exploration of the technical challenges involved in this drive to achieve the interoperability of social media platforms – https://www.peren.gouv.fr/actualites/2024-12-19_eclairage_sur_interoperabilite_rs/



PART 3

Working to achieve a sustainable internet

CHAPTER 7

**Measuring the environmental impact
of digital services**

CHAPTER 8

**Promoting ecodesign to reduce the
environmental impact of digital services**

CHAPTER 7

Measuring the environmental impact of digital services



THE BOTTOM LINE

- Arcep continues its work on **measuring the environmental impact of digital technology**. The fourth edition of the Achieving Digital Sustainability survey, published in April 2025, marks the ongoing expansion of the Authority's environmental data collection.
- **The study on the environmental impact of audiovisual media use**, produced by Arcom and Arcep in collaboration with ADEME, was published on 7 October 2024. It reveals that audiovisual media use accounts for **2.9% of electricity consumption in France, or 13 TWh, and 0.9% of the country's carbon footprint**.
- In its "Ambition 2030" strategy, Arcep stressed the importance of obtaining a more accurate assessment of the environmental impact of digital practices and AI.

1. SHARING KNOWLEDGE ON THE IMPACT OF DIGITAL TECHNOLOGY ON THE ENVIRONMENT

In 2019, as part of its work on "Future networks", Arcep decided to examine the carbon footprint of digital technologies, interviewing experts from civil society, industry players, and public sector actors, and publishing an initial briefing note on the topic. The following year, Arcep wanted to open a new regulatory chapter devoted to environmental issues.

Arcep's "**Achieving Digital Sustainability**" initiative, which began at this time, called on NGOs, institutions, operators, tech companies, and interested experts to contribute to its reflections and the work being done to reduce digital technology's carbon footprint.

This collaborative process, combined with a series of discussions, culminated in the publication of an initial report in December 2020. This report set out 11 proposals for successfully combining the ongoing increase in the use of digital tech and reducing its environmental footprint. In 2021, the French government's "Digital and the Environment" roadmap, along with legal texts adopted over the course of the year, expanded Arcep's responsibilities in this area. The question of achieving digital sustainability has been an integral part of Arcep's actions, and the subject of several publications, since 2022.

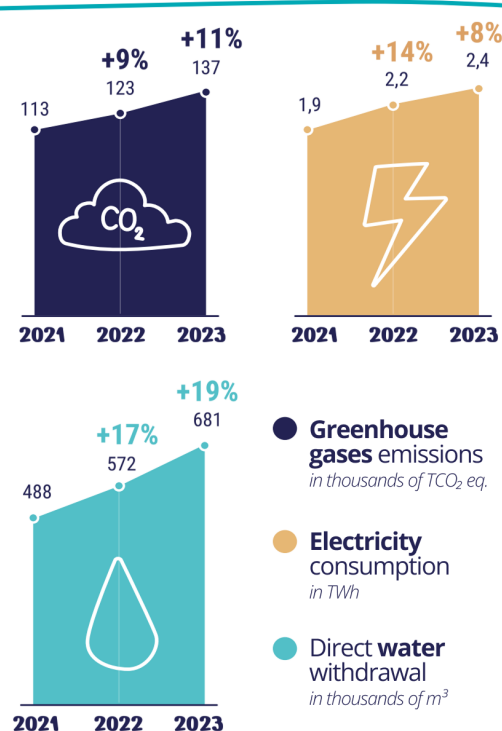
Data collection in particular has been vital to obtaining a detailed assessment of digital industry stakeholders' carbon footprint. There continues to be a shortage of quantitative information, as well as ongoing difficulties stemming from heterogeneous methodologies and the unavailability of certain data. The goal is to ensure that this footprint is assessed, monitored, and managed.

Arcep has been collecting indicators from France's four main telecoms operators since 2020, in order to monitor the trajectory of their impact on the environment. It has published its findings on an annual basis in its "Achieving Digital -Sustainability" survey, which is intended to be expanded gradually over time, as much in terms of the players queried as the number and nature of the indicators collected, to achieve the most detailed view possible of digital technology's environmental footprint.

In March 2024, Arcep published the **third edition of its annual "Achieving Digital Sustainability" survey**. The scope of this report was expanded to include device manufacturers and data centre operators, in order to obtain a deeper understanding of the impact of the digital sector on the environment. This edition includes indicators on the greenhouse gas emissions, energy consumption, and water use of data centres operating in France, the rapid development of which is escalating their environmental footprint. It also reveals the scale of the use of ISP routers/modems, set-top boxes (STB) and Wi-Fi repeaters, which are all key levers to reducing the environmental impact of digital technology. Lastly, indicators on the number of devices with the biggest environmental footprints (televisions, computer monitors, computers, tablets, and mobile phones) being placed on the market reveal that the decrease in volumes that should help reduce the environmental footprint of these devices is being offset by their larger (hence more polluting) screens.

The **fourth edition of the "Achieving Digital Sustainability"** survey was published on 17 April 2025. It is based on a decision published in February 2024 that expands environmental data collection to include mobile network equipment suppliers, as well as new indicators from stakeholders already being surveyed. This edition revealed that, despite a slight improvement in the energy efficiency of **data centres**, their **impact on the environment** is increasing rapidly for all indicators (GHG emissions, energy consumption, and water use). It also reveals that digital devices' screens continue to get larger and larger.

The environmental footprint of data centre operators is increasing on the 3 main indicators



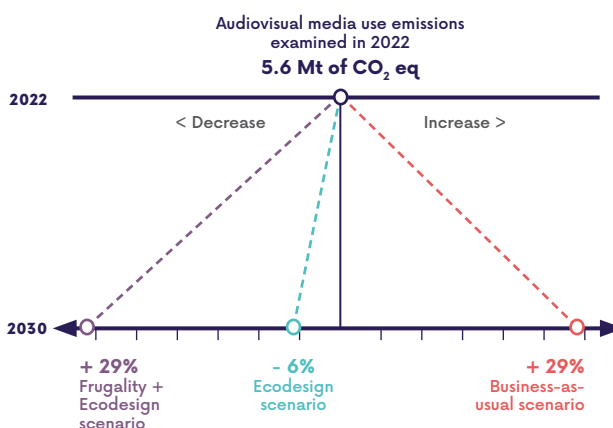
The addition of indicators on the average power consumption of certain devices provides the ability to assess how this increase in screen size affects the environmental impact of the devices when in use. These indicators show that large-screen devices consume more power. By way of example, on average, a large-screen TV consumes six times more power than a smaller model. Lastly, data collected from mobile network equipment suppliers indicate that the production of mobile access network equipment sold in France required 2.4 tonnes of precious metals, which is down for the second year in a row. This decrease is due chiefly to a significant drop in equipment sales, rather than to a change in the composition of the products. The average volume of precious metals used to produce each piece of hardware has, in fact, remained steady since 2021, at around 17 g.

Arcep has continued this steady expansion in subsequent editions of the survey. To this end, in July 2024 it held a public consultation, and in March 2025 published a decision on expanding its data collection to include a new category of player, namely fixed network equipment suppliers manufacturing fibre optic cables, and to incorporate indicators for assessing the environmental impact of manufacturing modems and set-top boxes.

2. NEW STUDIES TO DEEPEN OUR KNOWLEDGE OF THE ENVIRONMENTAL IMPACT OF DIGITAL SERVICES

Arcep has contributed to multiple studies aimed at improving and sharing knowledge of the environmental impact of digital services.

Growth forecasts for the carbon footprint of audiovisual media use in 2030 compared to 2022, according to three forward-looking scenarios



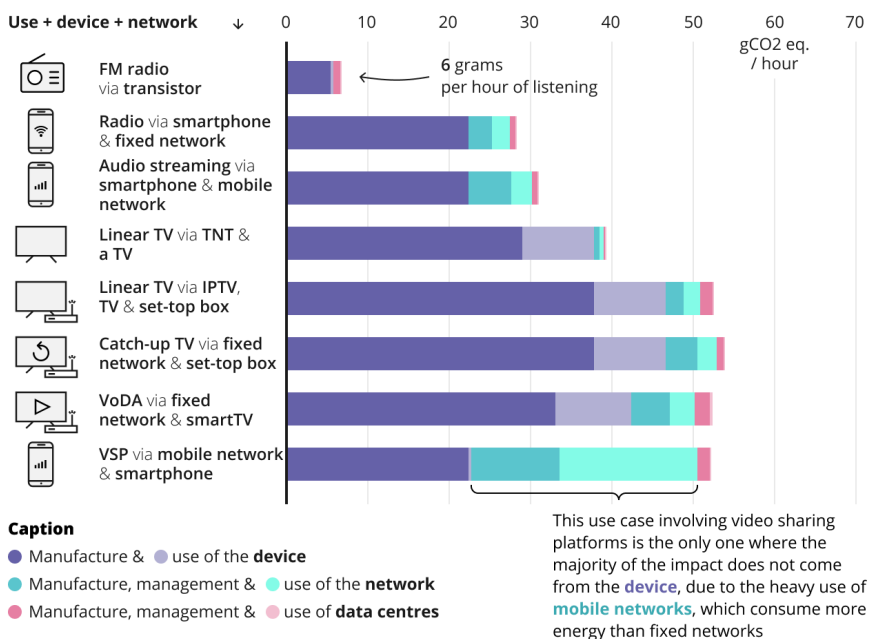
Study on the environmental impact of audiovisual media use in France

A study on the environmental impact of audiovisual media use in France, conducted by Arcom and Arcep in collaboration with ADEME, and in accordance with the French “Climate and Resilience” law, was published on 7 October 2024. The study assesses the environmental impact of audiovisual mass media consumption in 2022, taking all the component parts into account, including hardware (user devices), networks (fixed broadband and superfast broadband, mobile, and digital terrestrial and satellite) and data centres. It covered the main systems used to access audiovisual media, including linear and time-shifted TV and radio, video on demand, audio and video streaming, and video sharing platforms.

In 2022, audiovisual media use accounted for 2.9% of power consumption in France, or 13 TWh, and 0.9% of the country’s carbon footprint. Audiovisual media use represents 5.6 million tonnes of CO₂ equivalent, or around a third of the digital technology carbon footprint in France, as calculated in the [Arcep-ADEME study](#). If no steps are taken to limit the growing environmental impact of audiovisual media consumption, its carbon footprint could increase by 30% between now and 2030. A combination of ecodesign and sustainability measures could, on the contrary, reduce it by a third. Ecodesigning devices and extending their lifespan are thus major levers for reducing the carbon footprint of audiovisual media use. Sustainability measures (such as reducing video resolution, especially on mobile networks) would help lessen the impact of video on demand.

For almost all use cases, the majority of emissions come from end-user devices, and in particular from their manufacture

Emissions in grams of CO₂ eq. per hour per use case and per ICT components (devices, network and data centres), excluding advertising



2.1. ADEME-Arcep study on the environmental impact of digital technology in France

In August 2020, the French Ministry of Ecological Transition and the Ministry of Economics, Finance, and the Recovery assigned ADEME and Arcep the joint task of measuring the environmental impact of digital technology in France, and of identifying levers for action and best practices for reducing it. After the publication in 2022 of the first two volumes of their study assessing digital technology's environmental footprint in France in 2020, the third and final volume, published in 2023, provided a forward-looking estimate of the environmental footprint of digital technology up to 2030 and 2050. In January 2025, an update to the ADEME-Arcep joint study was published with data from 2022, along with a scope that was expanded to include an assessment of data centres' carbon footprint. This study revealed that the carbon footprint generated by the use of digital goods and services in one year in France (2022) represented the equivalent of 4.4% of the national footprint, or 29.5 Mt of CO₂eq.

One of the shortcomings stated in the ADEME-Arcep 2022 study was the failure to factor in the French population's consumption of digital services that are hosted on infrastructures located abroad. To continue to document changes in the environmental footprint of digital technology, the studies published by ADEME in 2025 include overseas consumption in the estimated total footprint. This ongoing work to achieve a more detailed assessment continues within the Technical Experts Committee on measuring the environmental impact of the use of digital.

3. DELIBERATIONS UNDERWAY TO OBTAIN A MORE ACCURATE ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF DIGITAL PRACTICES AND AI

Arcep is deliberating upon various aspects of the environmental impact of digital practices, notably the impact of artificial intelligence, in partnership with other institutions.

In March 2024, the Authority contributed¹ to the **European Commission's public consultation on generative AI**, by including an analysis of the environmental issues surrounding this technology. It also contributed to BEREC's response to this consultation².

Arcep collaborated on the **General Framework for Frugal AI**,³ led by Ecolab, the French innovation lab operating under the aegis of the General Commission for Sustainable Development, in partnership with AFNOR, as part of the National Strategy for AI. Published in June 2024, this framework was the culmination of six months of work with 150 contributors, from businesses, research, NGOs, and the public sector. The framework contains a methodology for assessing the environmental impact of AI using several impact criteria (energy, carbon, water, metal and mineral resources, etc.) and lists best practices that organisations can implement in order to reduce their footprint. Arcep has been contributing to monthly meetings with other public and NGO stakeholders since

¹ [Arcep's contribution to the call for contributions on competition in generative AI](#), March 2024.

² [BEREC High-level position on Artificial Intelligence \(AI\) and virtual worlds \(VW\)](#), March 2024.

³ [Press release on the publication of the General Framework for Frugal AI \(in French\)](#), June 2024.

the publication of this framework, the aim of which is to monitor the adoption of publications, and to coordinate national work being done on sustainable AI to ensure joined-up working.

In October 2024, Arcep hosted a seminar entitled “AI and the environment,” with Anne-Laure Ligozat, a French researcher at the LISN Interdisciplinary Computer Sciences Laboratory and specialist in the environmental impacts of AI.

In the run-up to the **French AI Action Summit**, Arcep helped prepare for the event as part of the Sustainable AI task force led by the Ministry of Ecological Transition, Energy, Climate, and Risk Prevention.

Arcep also partnered with the **“Y a-t-il une IA pour sauver la planète?”** (Can AI save the planet?) Future Generations Tribunal,⁴ held on 7 February 2025 at the Sorbonne, as part of the AI Action Summit, alongside eight other public institutions (ADEME, CESE, Ecolab, CNum, IGN, Inria, Sciences Po, IRJS, and the AI Panthéon-Sorbonne Observatory). This Future Generations Tribunal format provided an opportunity to investigate the capacity of AI to contribute to the green transition, while taking planetary limits into account, with the goal of informing strategic decision-making through a rigorous assessment of the environmental threats and opportunities associated with the development of AI.

To coincide with the AI Action Summit, the Chairs of Arcep, ADEME, and Inria published an op-ed in Les Echos on 7 February 2025, entitled *“Pour une IA durable, Europe doit tracer une nouvelle voie”* (Europe must map out a new path to achieve sustainable AI”).

Artificial intelligence is as much as a source of fascination as it is a source of concern. But hiding behind every model being presented as revolutionary is a harsh reality: an unsustainable ecological footprint. AI is poised to become one of the greatest climate challenges of the 21st century. Europe must take immediate action to ensure a sustainable AI, and the AI Action Summit on 10 and 11 February is the ideal opportunity to kick start this change of course.” Read the full op-ed (in French) on the [Arcep website](#).



Future Generations Tribunal – Can AI save the planet? - February 7th, 2025

⁴ Tribunal pour les générations futures – Y a-t-il une IA pour sauver la planète ? (in French) February 2025.

Giving the floor to

DR LOÏC LANNELONGUE

University of Cambridge, UK



Green Algorithms: lifting the veil on the environmental impact of AI

The environmental impact of high-performance computing, and of AI in particular, is becoming a growing source of concern for stakeholders. A recent estimate of the global carbon footprint of data was calculated at 126 MT CO₂ eq., equal to the total footprint of the US aviation sector. In the case of AI in particular, training a large language model, such as ChatGPT – i.e. without factoring in the research, optimisation, and ongoing improvement stages – a single time can have a carbon footprint of around 550t of CO₂eq. To put this in context, the target set by the Intergovernmental Panel on Climate Change (IPCC) is two tonnes per person, per year. Questioning the role that algorithms and AI play in climate change is therefore both legitimate and necessary. While it is clear that there are models for accelerating the green transition (optimising electrical grids, reintroducing biodiversity, etc.), most of today's consumption practices are far removed from sustainability considerations.

The purpose of the Green Algorithms project, launched in 2020, is to give scientists and developers the means to quantify the environmental impact of their use of AI and other types of computing.¹ The suite of tools includes an [online calculator](#) that provides energy use and carbon footprint estimates based on details fed to the algorithm (computing time, number of CPUs employed, locations, etc.). One of the use cases for this calculator is an a priori estimate of the carbon footprint of an AI model, to determine whether the hoped-for benefits can offset the environmental cost of its development. Using this logic, the French Ministry of Ecological Transition elected to impose use of the Green Algorithms tool on calls for proposals regarding the use of AI for the green transition.² This obligation to incorporate an estimate (in tCO₂ eq) of the carbon footprint of an AI solution in responses to calls for proposals satisfies several objectives: (1) project owners must incorporate sustainability considerations from the design stage; (2) it encourages sustainability behaviours that

align with the principles of frugal AI (e.g. reusing computer hardware, using less energy-hungry models such as single-task rather than general-purpose (or foundation) AI models³; and (3) it clarifies the requirement of proportionality: every project must aim to achieve societal benefits that outweigh its environmental costs. Tested for the first time in the “Frugal AI demonstrators for territories’ green transition” call for proposals,⁴ the inclusion of this criterion was a success, and led the Ministry to extend the measure to all their France 2030 AI and sustainability calls for proposals.

This inclusion of a quantitative and mandatory criterion in large-scale national projects is, to my knowledge, a global first, and puts France at the vanguard of frugal AI. It is also an excellent case study in the feasibility of this type of criteria, and a clarion call for them to be widely adopted by international financing organisations.

Albeit an initial and crucial stage, quantifying the environmental impact of is far from sufficient on its own. These data must be used to inform frugality strategies for drastically reducing these impacts, the only solution to slow the unchecked growth the impact of AI on the environment, growth that is both unconscionable and incompatible with planetary limits.⁵ It is indeed unrealistic to count on energy efficiency savings in processors’ and data centres alone to reverse the current trend. Although energy efficiency has improved steadily over the past few decades, the energy use in the sector has also been increasing year after year. It is now vital to rethink current practices.

1 Lannelongue, L., Grealey, J. & Inouye, M. Green Algorithms: Quantifying the Carbon Footprint of Computation. *Advanced Science* 8, 2100707 (2021).

2 Lannelongue, L., Propier, J. & Matencio, E. How to include environmental sustainability criteria in national AI funding schemes? Reflecting on the example of France and the Green Algorithms tool. (2025) doi:10.5281/ZENODO.14607021.

3 Luccioni, A. S., Jernite, Y. & Strubell, E. Power Hungry Processing: Watts Driving the Cost of AI Deployment? In *The 2024 ACM Conference on Fairness, Accountability, and Transparency* 85–99 (2024). doi:10.1145/3630106.3658542

4 In French: “Démonstrateurs d’IA frugale pour la transition écologique dans les territoires”.

5 Crawford, K. *The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*. (Yale University Press, 2021). doi:10.2307/j.ctv1ghv45t.

Giving the floor to

YOLANDE CHAVANE

Director of the Data & Transformation programme for the General Secretariat for Ecological Planning (SGPE)



Data sharing infrastructures: an invisible but decisive driver of the Green transition

Be it water consumption, monitoring EPR¹ or assessing the impact of home renovation in terms of energy consumption, the decisions being currently made by private and public sector players are based on obsolete (at least two years old) and patchy data. Confronted with the major and systemic challenge that is the Green transition, digital technology proves an indispensable tool for targeting the most effective actions, managing complexity, shortening turnaround, modelling, anticipating crises, networking, and mobilising.

Mirroring physical infrastructures, data sharing infrastructures create the ability to collect data and provide a multitude of players with access to them, according to their right to know. Many, mostly foreign, businesses are thought to have the technical and financial means to develop these data sharing infrastructures but, in certain cases of public interest or data sensitivity, only the State has the standing to guarantee the sovereignty and neutrality of these infrastructures, and so to create the framework of trust that is needed for data sharing, while ensuring the protection of personal data and secrecy (e.g. business secrecy, tax secrecy). As with a city, the State defines the rules of use (ethics, security, interoperability), builds the roads and networks (data sharing infrastructures) that enable other stakeholders (local authorities, businesses, operators, citizens...) to offer innovative services, applications and sectoral platforms. Depending on their reach, some of the infrastructures need to be designed from the outset on a European scale. Such is the case, for instance, with the Digital Product Passport, introduced by the European Ecodesign for Sustainable Products Regulation (ESPR) adopted in June 2024, that tracks the life of a product from its design (composition, production) to the end of its life (repair, reuse, and recycling), thereby supporting the circular economy.

In order to deploy these data sharing infrastructures, France's General Secretariat for Ecological Planning (SGPE) published the digital and data roadmap for ecological planning² in late 2023. It lays out the focus of ecological planning (transportation, housing, sustenance, protecting biodiversity, protecting resources, production and consumption) and describes the different building blocks to put in place: identifying and authenticating the different users, managing their rights based on their right to know, safety and security rules, ethical framework (including personal data and secrecy protection), interoperability rules, identity data for the objects in question (e.g. the residence or building in the case of renovating for energy efficiency policies, the vehicle in the case of decarbonising modes of transport) and business data. These data sharing infrastructures can support core business information systems (e.g. life cycle analysis software, GIS portals for renewable energy sources), digital services for citizens (e.g. J'Agis³, the household coach for the Green transition in France) and businesses, as well as observatories for research or control purposes. The SGPE is currently in the process updating this roadmap, and conducting a one-year interim review, for the sake of transparency, which will be published this summer.

At a time when AI is dazzling and grabbing all of the attention, let's not forget that the availability of high-quality data is a prerequisite for this technology's development. And data sharing infrastructures are the key link in the data collection and sharing chain, and the one that guarantees their reliability.

¹ Circular economy processes that extend the life of products and reduce waste, EPR = Extended producer responsibility

² <https://www.info.gouv.fr/grand-dossier/france-nation-verte/a-propos/feuille-de-route-numerique-donnees>

³ <https://jagis.beta.gouv.fr/>

CHAPTER 8

Promoting ecodesign to reduce the environmental impact of digital services



THE BOTTOM LINE

- Arcep and Arcom, in connection with ADEME, published the **General Policy Framework for the Ecodesign of Digital Services** on 17 May 2024. Produced in collaboration with DINUM, Inria, and CNIL, this document sets out 78 criteria for working towards reducing the environmental footprint of digital services.
- In 2024 and 2025, the Authority advocated for the ecodesign of digital services at multiple events attended by digital ecosystem stakeholders and with European and international institutions.
- In 2025, BEREC and its **Sustainability working group**, which is co-chaired by Arcep, is focusing on the ecodesign of digital services, hosting a workshop on the topic in Brussels in April.

Digital technology is a powerful driver of societal change. It now plays a central role in our lifestyles. Our practices and the hardware underpinning them (devices, networks, data centres) are increasing exponentially. Even if innovations can provide solutions to combat climate change, as its environmental footprint continues to grow, digital technology cannot be exonerated from efforts to reduce its own impact. Every player at every link in the chain (devices, networks, data centres, digital services) must contribute towards the effort to reducing these environmental impacts.

Arcep has opened a **new regulatory chapter** devoted to the environmental impact of digital technology. In addition to improving and sharing knowledge of the impact that digital technology has on the environment, Arcep is now ready to take action.

The studies and modelling that have been carried out – notably the studies on the environmental footprint of digital technology conducted jointly with ADEME¹ – have shown that only **a combination of sustainability and ecodesign will be successful in reducing the impact of digital technology on the environment**. Implementing ecodesign measures is thus crucial in stemming digital technology's growing environmental footprint.

The term “ecodesign” refers to the process of integrating environmental aspects into the design of a product or service, and into the processes implemented across the product's entire value chain.

1. THE GENERAL POLICY FRAMEWORK FOR THE ECODESIGN OF DIGITAL SERVICES

1.1. Networking and collaborating with the ecosystem and civil society

Although the ecodesign of hardware is the subject of a regulation that is already in force across the EU, the ecodesign of services is still largely overlooked by public policymakers. The environmental footprint of digital services has long been considered as secondary, with many viewing them as being “intangible”. And yet, the **supply and use of a service relies on the use of very concrete infrastructures and devices, which have a real impact on the environment**. In order to access a video, website or application, a user must use a device connected to an internet network, which is often backed by storage infrastructures. Ensuring that service providers are environmentally responsible is therefore part of a holistic approach to the issues surrounding the environmental footprint of digital technology. It was against this backdrop that the French government's REEN Act on reducing digital technology's environmental footprint entrusted **Arcep** and **Arcom**, in connection with **ADEME**, with the task of defining “*the content of a General Policy Framework for the Ecodesign of Digital Services*” (Article 25 of the REEN Act).

¹ ADEME – Arcep study on the environmental footprint of digital technology in 2020, 2030, and 2050 <https://www.arcep.fr/la-regulation/grands-dossiers-thematiques-transverses/lempreinte-environnementale-du-numerique/etude-ademe-arcep-empreinte-environnemental-numerique-2020-2030-2050.html#c32954> (in French).

After several months of work, Arcom and Arcep, in collaboration with ADEME, published the **General Policy Framework for the Ecodesign of Digital Services (RGESN)** on 17 May 2024. It was produced in collaboration with three other public bodies, namely the Inter-ministerial Directorate in charge of the State's digital transformation (**DINUM**), the Internet freedoms and innovation watchdog (**CNIL**), and the National Institute for Research in Digital Science and Technology (**Inria**).

The Policy Framework was unveiled at a launch event at the Conservatoire national des arts et métiers (CNAM), with special guests Marina Ferrari, Secretary of State for Digital Affairs, Arcep Chair, Laure de La Raudière, Arcom Chair, Roch-Olivier Maistre, and ADEME Chair, Sylvain Waserman. The event was attended by 200 guests from the digital ecosystem, from ecodesign, and academics, public authorities, and members of civil society.



...
 @lauredlr, présidente @Arcep, @romaistre, président @Arcom.fr & @SylvainWaserman, président @ademe sont réunis, en présence de @Marina_Ferrari, secrétaire d'état chargée du numérique pour la publication du référentiel général d'écoconception des services numériques



1.2. A tool to support tech companies with ecodesign

The RGESN compiles **78 criteria for ICT professionals** (project managers, developers, designers, corporate social responsibility (CSR) managers, etc.) wishing to engage in an ecodesign process. It is an operational tool to encourage the development of more ecofriendly digital services (applications, websites, platforms, software, AI, etc.).

These criteria are laid out in the form of questions, designed to assess whether the digital service, be it operational or in the design stage, can be considered part of an **ecodesign approach** (such as "can the digital service be used on older device models?"). By answering these questions, the provider, publisher, or designer of the service can identify the priority areas for improvement by assigning criteria priority levels ("top priority," "recommended," "moderate"), as well as a degree of difficulty ("low," "medium," "high"). Each of these criteria is accompanied by a **factsheet** that is structured into nine parts covering "strategy", "specifications", "architecture", "content", "user experience" and "user interface (UX/UI)", "frontend", "backend", "hosting", and "algorithms".

The purpose of the RGESN is to guide the design process of a digital service towards **more sustainable choices**. ICT players implementing the RGESN have the option of drafting an **ecodesign statement**, providing an account of the actions taken to minimise the environmental footprint of digital technology. This statement can include a progress score, creating the ability to track the maturity of the service over time with respect to the criteria in the RGESN. A An ecodesign declaration of conformity template is included, to make the process easier.



Launch of the RGESN on May 17, 2024, at CNAM with Marina Ferrari, Secretary of State for Digital Affairs; Marianne Serfaty, Head of the Content and Competition Department at Arcom; and Sandrine Elmi Hersi, Head of the Open Internet Unit at Arcep

TOOLS PROVIDED TO HELP PROFESSIONNALS TAKE OWNERSHIP OF THE RGEN



78 factsheets that specify the methods for implementing each criterion



Ecodesign declaration of conformity template, to clarify the measures that have been taken



A methodology for calculating a progress score, measuring the maturity of the service in the light of the RGEN

WHAT DOES AN RGEN FACTSHEET LOOK LIKE?

Name of the criterion in the form of key questions for the ecodesign of a service.

Three priority levels: top priority, recommended, and moderate. Needed to assess the progress score.

Examples of roles which may be affected by the implementation of the criterion. Provided for information purposes.

Steps to follow to implement the criterion.

1 - Is the service... ?

Level of difficulty :

Priority level :

N/A :

Roles involved :

Targets

Implementation

Testing or monitoring method

Three levels of difficulty: high, medium, low. Provided for information purposes.

Level of priority and conditions for considering whether the criterion is applicable or non-essential for calculating the score.

Conditions to consider whether the criterion is applicable.

The criterion's impact reduction target

Method for verifying that the criterion and information to be listed in the ecodesign declaration of conformity have been validated.

1.3. Helping stakeholders take ownership of the RGEN, and maintaining a dialogue with the ecosystem

1.3.1 Presenting the RGEN to digital sector stakeholders

Following the publication of the RGEN on 17 May 2024, Arcep presented it and raised awareness of ecodesign issues at multiple annual events for digital ecosystem stakeholders.

The RGEN was presented at the 2024 edition of Vivatech, and at the “Numérique en Communs” summit in Chambéry in the form of a Masterclass entitled “How to use the new policy framework on ecodesign”².



Arcep Executive Board member, Xavier Merlin, delivering a keynote speech at the Internet Governance Forum on 3 October 2024.

In October 2024, Arcep Executive Board member, Xavier Merlin, spoke at the Internet Governance Forum, France. This event also included a technical workshop hosted by Arcep on, “A practical guide to the RGEN: designing more sustainable digital services”. Xavier Merlin also took part in a panel discussion on the ecodesign of digital services at the “Alliance Digitale” forum in December 2024.

Arcep also had an opportunity to present the RGEN to the video game industry, which is showing a growing interest in ecodesign and the green transition. The Authority spoke during two key sector events: Game Camp in Lille in June and Paris Games Week in October 2024.

1.3.2 Distributing the RGEN at annual sustainable tech events

Various events devoted to the green transition and sustainable digital technology provided Arcep with opportunities to disseminate the RGEN and its criteria, through keynote speeches and panel discussions.

Through its involvement in the “Planet Tech’Care” initiative, Arcep had a chance to host a seminar on the new RGEN in June 2024, which was attended by tech companies and consulting firms specialised in CSR strategies.

Arcep Chair, Laure de La Raudière, delivered the opening remarks for the fourth edition of the GreenTech forum held in Paris in November 2024. It was a chance to talk about the work that Arcep is doing on assessing the environmental footprint of digital technology, and to underscore the importance of using the RGEN to adopt an ecodesign approach to digital services, to be able to take action affecting all the components and hardware in the digital value chain. Arcep also took part in a panel discussion on how to scale up ecodesign during this same event.

After its initial participation in the 2024 edition of the “Journée de l’écocoception” (Ecodesign Day) event hosted by the Designers Ethiques association, the Authority became a partner for its 2025 edition. This provided an opportunity to discuss the challenges of efficient implementation of the RGEN and **new issues raised by AI**, during a collaborative workshop co-hosted by ADEME. Previously, the Authority had spoken about the RGEN alongside ADEME at the Code Green Paris event in September 2024.



1.3.3 Digital Ecodesign Stakeholders Forum

In addition to the opportunities to present the RGEN and to encourage ownership of ecodesign, Arcep wishes to **pursue the collaboration and co-construction process** that was central to producing the document. To this end, to monitor the implementation of this new incentivising framework, and to promote an exchange of best practices between stakeholders, Arcep and Arcom announced the **creation of an RGEN monitoring committee, known as the Digital Ecodesign Stakeholders' Forum**, which was inaugurated on 19 May 2025 at Arcep.

The aim of this Forum is to **monitor the implementation of the RGEN** in relevant sectors, providing a space for stakeholders to share their experiences with applying the framework. It is also tasked with providing input for the preparation of an evaluation of the current version of the RGEN published in 2024, incorporating feedback from the ecosystem into account, to adapt the RGEN to identified needs and to make it more efficient. The Forum also provides an opportunity **to share initiatives with stakeholders that the authorities and administrations are taking in relation to the RGEN** and, more broadly, to the ecodesign of digital services.

2. PROMOTING THE ECODESIGN OF DIGITAL SERVICES AT THE EUROPEAN AND INTERNATIONAL LEVEL

2.1. A springboard for discussions at both the european and international levels

Promoting ecodesign and the RGEN at the **european and international level** is also one of the top priorities on the Authority's environmental agenda.

In July 2024, Arcep presented the RGEN to digital technology experts from the European Commission and EU Member States, at the launch of the Best Practice Accelerator platform that is part of the "Europe's Digital Decade: 2030 targets" programme. This launch event for the initiative and its environmental component was co-hosted by DG Connect and the French Directorate-General for Enterprise.

Arcep Chair and BEREC Vice-Chair in 2024, Laure de La Raudière was called upon to deliver the opening remarks at the **Workshop on Sustainability in Telecommunications and Space** in July last year, an event hosted by the Hungarian Presidency of the Council of the European Union. She highlighted the challenges relating to ecodesign and the environmental responsibility of services at European level. She used the publication of the RGEN in France as an example of how to respond.

Arcep also shared the RGEN with its counterparts within BEREC, notably through its co-chairing mandate of the BEREC Sustainability Working Group since 2020.

In 2024, several BEREC documents emphasised the need to focus on the ecodesign of digital services to achieve a more sustainable digital industry, notably its high-level position on artificial intelligence and virtual worlds,³ and its report on ICT sustainability for end-users.⁴

"As the different elements that compose the digital ecosystem are interdependent; the deployment of new networks involves growth of data centres infrastructures and terminal devices. In this context, attention should be given to minimise digital services impact on devices and infrastructures' footprint by promoting proper ecodesign criteria and environmental transparency on these services."

Excerpt from the BEREC report entitled "ICT sustainability for end-users: Empowering end-users through environmental transparency on digital products" (June 2024)



Launch of the Digital Ecodesign Stakeholders Forum at Arcep on May 19th 2025.

³ BEREC high-level position on artificial intelligence and virtual worlds (March 2024)

⁴ BEREC Report on ICT sustainability for end-users: Empowering end-users through environmental transparency on digital products (June 2024).



Laure de La Raudière delivers the opening remarks⁵ at the Conference on Sustainability in the Telecommunications and Space Sectors in July 2024

In April 2025, **BEREC** hosted a workshop on the **ecodesign of digital services**, offering a chance to gain an overview of existing initiatives across Europe, including the RGEN presented by Arcep, and to gather stakeholders' views on the efforts that had been undertaken.

At the international level, Arcep helped to organise a panel discussion entitled *"Let's Look Up! Go Green to Preserve Future Generations' Connectivity,"* which took place in June as part of the International Telecommunication Union (ITU) Council in Geneva, on World Environment Day. Arcep Executive Board member, Xavier Merlin, discussed the work that Arcep is doing on assessing the environmental impact of digital technology, and particularly the RGEN as tool for fostering environmental responsibility amongst service providers.

The Authority had a chance to present its work, including the RGEN, at the **United Nations Conference on Trade and Development** (UNCTAD), during the presentation event for the 2024 Digital Economy Report.⁶

Arcep hosted a panel discussion on the issues surrounding governance of the digital industry in support of **ecodesign** as part of the **RightsCon Summit** in February 2025. Moderated by Arcep, the event brought together Hugues Ferreboeuf from the Shift Project, Alexander Dawson from the World Wide Web Consortium (W3C), and Kelly Widdicks from the UK Centre for Ecology & Hydrology (UKCEH), to discuss digital technology's growing environmental footprint, including how the expanding uses of generative AI are affecting this footprint. Speakers also addressed ways to remedy this increase, starting with the international adoption of **ecodesign** norms and standards.

Lastly, in April 2025, Arcep addressed the W3C Advisory Board, presenting the RGEN and discussing synergies between it and web sustainability guidelines.⁷

2.2. Arcep's commitment to promoting environmental responsibility and ecodesign for all digital products

Arcep's **new strategy "Ambition 2030"**⁸ sets forth the Authority's ambition to work towards the emergence of digital **ecodesign** standardisation, incentive, and regulatory initiatives at the European and international level, particularly those focused on digital services.

The Authority wishes to participate in the creation of a European framework for rendering large **digital service providers accountable for their environmental footprint**, with a particular focus on the fight against software obsolescence and the environmental footprint of video, which accounts for the majority of online traffic. More broadly, Arcep will contribute towards future European and international work on the **ecodesign** of digital services, by including the **ecodesign** of the ecosystem's most rapidly emerging technologies (AI, IoT, virtual worlds) in the areas it analyses.

Arcep is also committed to making its work available to enable a holistic application of **ecodesign** measures to digital hardware and electronic communications.

To this end, in July 2024 Arcep made several proposals to the European Commission with a view to drawing up **future laws on the ecodesign and energy labelling of computers, based on the RGEN**.⁹ These proposals include an obligation to guarantee, on a Europe-wide scale, that security updates for computer operating systems are available for ten years from the model's release date. The Authority has also urged the European Commission to add set-top boxes, ISP routers, and services to its future **ecodesign** workstreams.

To sum up, Arcep will continue to **contribute towards the construction of a European and potentially international approach to the environmental issues and challenges** surrounding digital technology, and to promoting sustainability and **ecodesign** measures for digital industry stakeholders, through its involvement in BEREC and in concert with the various European and international bodies working on this subject.

⁵ Laure de La Raudière's opening remarks to the Conference on "Sustainability in the Telecommunications and Space Sectors" in July 2024.

⁶ UN Trade and Development – Digital Economy Report 2024 (Digital Economy Report 2024).

⁷ W3C – Web Sustainability Guidelines (WSG) 1.0.

⁸ Arcep's Ambition 2030 strategy: January 2025.

⁹ Arcep - Ecodesign and Energy Labelling for digital products – Contribution to the European Commission regulations under preparation, July 2024

Giving the floor to

ENCARNA MARQUEZ

Director of Digital Strategy
France Télévisions



Putting ecodesign at the heart of our digital strategy

France Télévisions has made ecodesign a strategic pillar in its digital transformation. This commitment is based on the strong conviction that digital technology must evolve to become sustainable, measured, and thoughtfully conceived from the design stage, in keeping with the principles of environmental responsibility.

Our approach is based on three pillars: measuring our impact, raising our teams' awareness, and implementing concrete actions, tied directly to our digital projects' specific requirements.

Measuring to understand and progress

We have deployed testing and measuring tools at the places with the greatest impacts: data centres, networks, and user devices. Our technical infrastructures are hosted in France and operated in-house, which gives us the ability to monitor our energy consumption precisely. Regular measurements are taken via Greenspector on france.tv, including indicators such as energy, water, and data transferred.

Since January 2023, we have been receiving daily readings on the data traffic and CO₂ emissions of our CDN which distributes more than 99% of our traffic, which is largely video. On the client side, we have introduced bench testing with actual devices (mobile phones, tablets) to simulate usage scenarios.

Using the RGESN as a tool for ongoing improvement

The RGESN is used systematically in all our projects. As of this writing, in early 2025, compliance rates with the RGESN stand at 72% for the Okoo application, 67% for france.tv, and 53% for the La Première overseas site. The latter is in the process of being redesigned, with a dedicated support plan to improve teams' practices.

We have also initiated the publication of **Ecodesign declaration of conformity** to improve transparency. The Okoo Ecodesign declaration of conformity was published online in early 2025, detailing our actions and giving our users tips for more ecofriendly habits. The france.tv statement is scheduled for May 2025, covering all non-TV aspects.

Long-term commitment and awareness

More than 50% of our staff have already attended ecodesign awareness training workshops. Additional training sessions tailored to each occupation have also helped practices to evolve over time.

We further bolstered this momentum in 2024 and 2025, notably through our **participation at Eco Day France Télévisions** (with a digital stand and serious game workshops), and at the **Journée de l'éco-conception numérique** (Digital Ecodesign Day) on **6 February 2025**, where we shared our approach and our commitments with the public.

An active contribution to the sectoral framework

France Télévisions is fully committed to the transformation work taking place in our sector. We participate in the Arcep and Arcom "Audiovisual CSR" workshops, aimed at defining a framework for audiovisual industry companies. Lastly, we have finalised our **application for the Sustainable IT label** for the entire group, with an audit scheduled for May 2025.

Conclusion

Ecodesign is becoming firmly entrenched in our methods, our tools, and our products. We will sustain this momentum through concrete actions, such as the activation of **eco mode by default** on our video player and extending our approach to all our products. This reflects our desire to combine innovation, responsibility, and excellence.

Lexicon

3GPP

The 3rd Generation Partnership Project is an umbrella organisation for cooperation between standard development organisations to establish technical specifications for mobile networks.

4G

The fourth generation of mobile telephony standards. It is defined by 3GPP Release 8 standards.

5G

The fifth generation of mobile telephony standards. It is defined by 3GPP Release 15 standards.

Afnic (Association française pour le nommage internet en coopération)

The French domain name registry. A non-profit organisation (under the French law of 1901), whose mandate is to manage top-level domain names in France (.fr), Reunion (.re), France's southern and Antarctic territories (.tf), Mayotte (.yt), Saint-Pierre-et-Miquelon (.pm), and Wallis-et-Futuna (.wf).

API (Application Programming Interface)

Interface that enables two systems to interoperate and talk to one another without having been initially designed for that purpose. More specifically, a standardised set of classes, methods, or functions through which a software program provides services to other software programs.

Autonomous Systems (AS)

A collection of networks managed by the same administrative entity, with relatively homogeneous routing protocols.

BEREC (Body of European Regulators for Electronic Communications)

Independent European body created by the Council of the European Union and the European Parliament, and which assembles the electronic communications regulators from the 27 European Union Member States.

CAP

Content (web pages, blogs, videos) and/or application (search engine, VoIP applications) providers.

CDN (Content Delivery Network)

Internet content delivery network.

Codec

A device or computer program that encodes or decodes a digital data stream, for transmission or storage purposes.

Cross-traffic

The traffic generated during a QoS and/or QoE test by an application other than the one being used to perform the test, either on the same device or on another device connected to the same modem/router. Cross-traffic decreases the bandwidth available for the test.

DNS (Domain Name System)

Mechanism for translating internet domain names into IP addresses.

Dual stack

Assigning both an IPv4 address and an IPv6 address to a device on the network.

FttH (Fibre-to-the-Home) network

Ultrafast electronic communications network, where fibre is pulled right into the customer's residential or business premises.

HTTP (Hypertext Transfer Protocol)

Client-server communication protocol developed for the World Wide Web.

HTTPS

HTTP Secured through the use of SSL (secure socket layer) or TLS (transport layer security) protocols.

iOS

Mobile operating system developed by Apple for its mobile devices.

IP (Internet Protocol)

Communication protocol that enables a single addressing service for any device used on the internet. IPv4 (IP version 4) is the protocol that has been used since 1983. IPv6 (IP version 6) is its successor.

IPv6-enabled

Device or connection that actually transmits and receives traffic using IPv6 routing, either through activation by the customer or activation performed by the operator.

IPv6-ready

Device or connection that is compatible with IPv6, but on which IPv6 is not necessarily activated by default.

ISP

Internet Service Provider.

IXP (Internet Exchange Point) or GIX (Global Internet Exchange)

Physical infrastructure enabling the ISPs and CAPs connected to it to exchange internet traffic between their networks through public peering agreements.

NAT

Network Address Translation: mechanism for remapping one IP address space to another, used in particular to limit the number of public IPv4 addresses being used.

Network termination point

The physical location at which a user gains access to public electronic communications networks.

NRA (National Regulatory Authority)

A body mandated by a BEREC Member State to regulate electronic communications.

On-net CDN

Content delivery network (CDN) located directly in an ISP's network.

OS (Operating System)

Software that runs a peripheral device, such as Windows, Mac OS, Linux, Android, or iOS.

Peering

The process of exchanging internet traffic between two peers. A peering link can be either free or paid (for the peer that sends more traffic than the other peer). Peering can be public, when performed at an IXP (Internet Exchange Point), or private when over a PNI (Private Network Interconnect), in other words a direct interconnection between two operators.

QoS (Quality of Service)

In Chapter 1, quality of service on the internet as measured by "technical" indicators such as download or upload speed, latency, and jitter. The term QoS is often used to refer to both technical quality and quality of experience (QoE).

RFC (Request For Comments)

Official memorandum that describes the technical aspects and specifications that apply to the working of the internet or to different computer hardware.

RIPE NCC (Regional Internet Registry for Europe, the Middle East, and Central Asia, Network Coordination Centre)

An organisation that is distinct from RIPE (Réseaux IP Européens), it is an open forum of internet companies, but provides administrative and logistical support for RIPE. RIPE NCC is also responsible for distributing IP address resources between the ISPs requesting them. Every network is assigned an AS, which then serves to identify that network for routing and interconnection purposes.

Specialised service

Electronic communication service(s) that is distinct from internet access services, and which requires specific quality of service levels.

Speed

Also referred to as throughput. Quantity of digital data transmitted within a set period of time. Connection speeds or bitrates, are often expressed in bits per second (bit/s) and its multiples: Mb/s, Gb/s, Tb/s, etc. It is useful to draw a distinction between the speed at which data can be:

- received by a piece of terminal equipment connected to the internet, such as when watching a video online or loading a web page. This is referred to as download or downlink speed;
- sent from a computer, phone or any other piece of terminal equipment connected to the internet, such as when sending photos to an online printing site. This is referred to as upload or uplink speed.

Tier 1

Network capable of reaching every other internet network through peering without requiring a transit provider. Wikipedia lists 14 Tier 1 networks in 2025:

- Arelion (formerly Telia Carrier);
- AT&T;
- Deutsche Telekom AG;
- Global Telecom & Technology (GTT Communications);
- Liberty Global;
- Lumen (formerly CenturyLink then Level 3);
- NTT Communications;
- Orange;
- PCCW Global;
- Tata Communications;
- Telecom Italia Sparkle;
- Telxius/Telefónica;
- Verizon Enterprise Solutions;
- Zayo Group.

Depending on the criteria, some operators, such as Cogent, may not be considered to be Tier 1.

TLS (Transport Layer Security)

Used for encrypting internet exchanges and server authentication.

Transit provider

Company that provides transit services.

Transit

Bandwidth that one operator sells to a client operator, providing access to the entire internet as part of paid, contractual service.

UDP (User Datagram Protocol)

Simple, connectionless (i.e. no prior communication required) transmission protocol, which makes it possible to transmit small quantities of data rapidly. The UDP protocol is used on top of IPv4 or IPv6.

VoIP (Voice over IP)

Technology for relaying voice calls over IP-compatible networks via the internet.

VPN (Virtual Private Network)

Inter-network connection for connecting two local networks using a tunnel protocol.

WAN (Wide Area Network)

In this report, WAN refers to the internet network, as opposed to a LAN (local area network).

Web tester

Tool for measuring QoS and QoE which is accessed through a website.

Wehe

Android and iOS application, developed by Northeastern University in partnership with Arcep, to detect traffic management practices that are in violation of net neutrality rules.

Wi-Fi

Wireless communication protocol governed by IEEE 802.11 group standards.

xDSL (Digital Subscriber Line)

Electronic communications technologies used on copper networks that enable ISPs to provide broadband or superfast broadband

internet access. ADSL2+ and VDSL2 are the most commonly used xDSL standards in France for providing consumer access.

Zero-rating

A pricing practice that allows subscribers to use one or more particular online application without the traffic being counted against their data allowance.

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ARCEP, NETWORKS AS A COMMON GOOD

The internet, fixed and mobile electronic communication networks, data centres, as well as postal and press distribution networks constitute “infrastructures of freedom”. Freedom of expression, freedom to communicate, freedom to access knowledge and to share it, but also freedom of enterprise and innovation, all of which are key to the country’s economic development and cohesion within Europe.

Because it is essential to be able to enjoy these freedoms fully, national and European institutions work to ensure that these networks develop as a “common good” regardless of their ownership structure, in other words that they meet the highest standards in terms of accessibility, universality, performance, neutrality, trustworthiness and sustainability.

The genesis of the Regulatory Authority for Electronic Communications, Postal Affairs and Press Distribution (Arcep) was the acknowledgement that independent state oversight was needed to ensure that no power, be it economic or political, is in a position to control or hinder citizens’, businesses’, associations’, publishers’ or innovators’ ability to communicate or trade. A neutral and expert arbitrator with the status of independent administrative authority, Arcep is the **architect and guardian** of communication networks’ status as common goods in France.

As network architect, Arcep creates the conditions for an open and decentralised network organisation. It works to safeguard the competitiveness of the sectors it is responsible for regulating, by promoting pro-investment competition. It provides the framework for the networks’ interoperability so that, despite their diversity, they remain easy to access and seamlessly interconnected. It coordinates effective interaction between public and private sector stakeholders, particularly when local authorities are involved. It provides the trustworthiness needed for data intermediation between different enterprises. It also creates the conditions for open and competitive access to cloud computing solutions for businesses.

As network guardian, Arcep enforces the principles that are essential to safeguarding all users’ current and future ability to communicate and trade. It oversees the provision of the Universal Service and assists public authorities in guaranteeing the most extensive access possible to high-quality and resilient networks nationwide. It ensures users’ access to clear and accurate information, their freedom of choice, and protects against possible neutrality violations on both the internet and in the press. More generally, Arcep combats any type of impediment that could threaten the freedom to communicate and trade on the networks or the free movement of data and, to this end, pays close attention to the intermediaries that are devices and the internet’s gatekeeper platforms. For the sake of generations to come, the Authority is dedicated to future-proofing digital technology and its uses, measuring the progression of its environmental footprint, and making sustainability a core tenet of its regulatory actions.

MANIFESTO

