For instance, the tariffs for transit services purchased by ISPs in France have experienced a steady decrease since 2012. They can currently be purchased within a range of between €0.10 plus VAT and several euros plus VAT per month and per Mbps, depending on exchanged volumes, (flow rate measured at 95th percentile) upon interconnection. Considering the volumes exchanged, the size of the transit market in France is estimated at around 4 million euros per year.

The paid peering tariffs applied by certain ISPs in the event of a marked asymmetry between incoming and outgoing traffic, ranged between around €0.25 plus VAT to several euros plus VAT per month and per Mbps, as at end 2016.

e) Smaller ISPs

Furthermore, Arcep has observed that most other ISPs in France belong to the Tier 3 operator class: they mainly use transit to access Internet. They have relationships with multiple transit providers, for redundancy purposes; their number is generally between 2 and 3, or even 4 in some cases. These operators are also most often interconnected with the main Internet exchange points in France. Due to their lower traffic volumes, the transit prices applied to them are higher.

Other information could be used for upcoming publications, including quantitative information on medium-sized or small players.

3.3 Encouraging the transition to IPv6

The IPv4 protocol, which has been used on the Internet since its beginning, offers an addressing space of nearly 4.3 billion IP addresses.

However, the Internet's success, the ever-increasing number of uses and the multiplication of connected objects have directly resulted in the gradual exhaustion of available addresses. Some regions of the world are more affected than others.

Due to this shortage, the transition to a new protocol is unavoidable. Too much delay in the transition would result in harmful consequences, such as:

- an explosion in costs due to the need to managed the shortage in IPv4 addresses;
- dysfunctioning in certain service categories.

In addition, the IPv6 protocol provides a practically unlimited addressing space to cover all current and expected needs. It makes it possible to assign to each terminal or network node an individual IP address to make it accessible directly from any point of the Internet; prospectively, it even offers the opportunity to identify several "hardware or software objects" within a given terminal or server.

Beyond its adressing aspects, this new version of the IP protocol integrates new functionalities, in particular enabling the simplification of certain network layer functions, such as routing and mobility, or natively guaranteeing better security of exchanges.

More broadly speaking, the transition to IPv6 offers strong potential for innovation and competitiveness. By offering more freedom to users and publishers, it allows them to overcome limitations introduced by intermediaries and to develop future innovations.

3.3.1 Situation analysis

On 11 January 2016, the Government called upon Arcep to produce an opinion on the state of IPv6 deployment in France, inviting the Authority to draw up a precise situation report on the deployment of IPv6 in France, to identify the difficulties and obstacles associated with this transition, to suggest a series of measures and initiatives capable of encouraging and providing support to users and businesses and, lastly, to set up an annual observatory on the IPv6 transition in France making it possible to assess the transition's progress.

IPV6 COMPATIBILITY FOR TERMINAL EQUIPMENTS

The Law for a Digital Republic provides, in Article 42, that as of 1 January 2018, any new terminal equipment intended for sale or rental in France must be compatible with the IPv6 standard.

In its report – drawn up with the assistance of Afnic (the French acronym for "Association Française pour le Nommage Internet en Coopération" i.e. the French Network Information Center) submitted to the Government on 30 June 2016 and made public on 30 September 2016, the Authority suggests multiple

// Observatory
on the transition to IPv6

Read the observatory
in French on Arcep website

actions likely to promote and support the transition to IPv6.

3.3.2 Arcep Observatory

a) First version of the observatory

On 9 December 2016, Arcep also set up an observatory on the transition to IPv6. This interactive observatory describes the status of IPv6 protocol deployments in France and tracks the evolution of its adoption over time. Hence, it allows to promote coordination between Internet stakeholders in order to enhance deployment (Action no. 4) and to provide users with information that may be considered of public interest on the state of the transition in France.

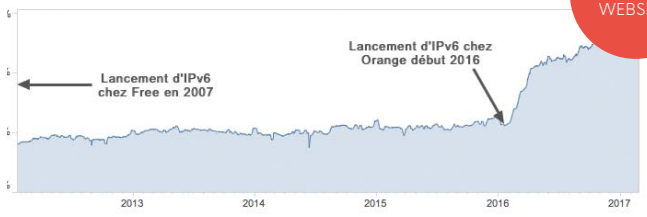
Arcep selected a number of indicators reflecting the level of deployment at various levels: access providers (fixed and mobile), content providers and technical intermediaries, equipment manufacturers and DNS infrastructure. The complementarity of these indicators

OBSERVATOIRE DE LA TRANSITION VERS IPv6 EN FRANCE
31 MARS 2017

Voir l'observatoire

ARCEP
WEBSITE

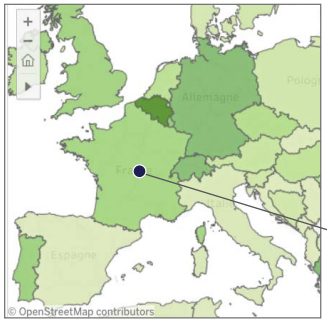
Evolution du taux d'utilisation d'IPv6 en France, tel qu'observé par Google
Source : Cisco - 6Lab



Etat de la transition IPv6 en France à différents maillons de la chaîne technique

Maillon	Source	Taux d'IPv6
Equipementiers	Questionnaire Arcep (2016)	100%
Fournisseurs d'accès internet (fixe)	Google (2017)	15%
Fournisseurs d'accès internet (mobile)	Arcep (2016)	0%
Fournisseurs de contenus	Cisco (2017)	50%
Infrastructure DNS	Observatoire de la résilience de l'Internet français (2015)	60%
Intermédiaires techniques	Cisco (2017)	70%

Etat de la transition IPv6 dans le monde au 31/03/2017
(Taux d'utilisation)
Source: Cisco - 6Lab



Sélectionnez l'indicateur à visualiser sur la carte Utilisation d'IPv6

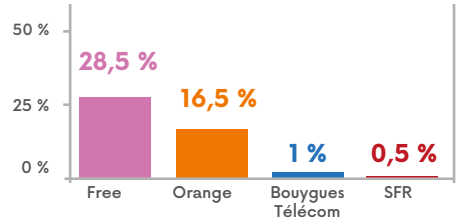
Utilisation d'IPv6 : *Taux d'utilisation d'IPv6, tel qu'observé par Google.*

Contenus IPv6 : *Taux de sites web accessibles en IPv6 parmis les sites web les plus visités dans chaque pays.*

Intermédiaires IPv6 : *Taux d'intermédiaires techniques (par ex. transitaires) empruntés utilisant IPv6, pour chaque pays.*

Pays **France**
Utilisation d'IPv6 : **14,60 %**

Taux d'utilisation d'IPv6 sur les principaux réseaux fixes en France au 31/03/2017
Source: World IPv6 Launch données recueillies par l'Arcep



En France, Free a été le premier opérateur fixe majeur à proposer une connectivité IPv6 à ses clients. Ce déploiement remonte à 2007.
Orange a été le second opérateur à faire bénéficier ses clients fixes d'IPv6, début 2016. La grande majorité de ses clients FttH et VDSL est désormais dotée d'une connectivité IPv6 par défaut.

makes it possible to gain broad view of the state of the deployments.

In the first version of the observatory, Arcep has mainly used data produced and made available by third parties.

b) Lessons learned

The current observatory was updated on 31 March 2017. It confirms the increase in IPv6 use rate in France between December 2016 and March 2017. This increase was mainly due to the migration initiatives already undertaken by Free in 2007 and by Orange in 2016, both for their fixed subscribers only.

The observatory also highlights the role of content providers in the transition to IPv6. CAPs, which remain at around at 50% in terms of IPv6 deployment, have a responsibility in the global transition process to IPv6. In order to benefit from this protocol, all stakeholders must jointly migrate.

Arcep wishes to specify that this 50% rate, calculated as a weighted average, masks the fact that many medium-sized or small CAPs have not yet migrated to IPv6. It invites these players to initiate the transition.

c) Enhancing the observatory

Arcep intends to extend its transition to IPv6 observatory to include data and information directly collected from the main fixed and mobile ISPs [32] in France – as part of Arcep's annual survey [33].

These data will include in particular:

- the number of available IPv4 addresses and the percentage of these addresses already assigned;
- the IPv4 address sharing implemented mechanisms;
- the percentage of IPv6 enabled subscribers;

[32] This applies to ISPs that manage their IP addressing plan and have more than 1 million active subscribers.

[33] Arcep Decision no. 2017-0290 dated 7 March 2017 on the implementation of surveys in the electronic communications sector.

AFNIC SERVING
the development of a secure, stable, innovative and inclusive internet

afnic

Association française pour le nommage internet en coopération i.e. the French Network Information Center

AFNIC, recognised for its expertise on IPv6 for more than 15 years, was pleased to work with Arcep, in particular in the series of hearings and consultations organised with companies and digital players involved in the transition.

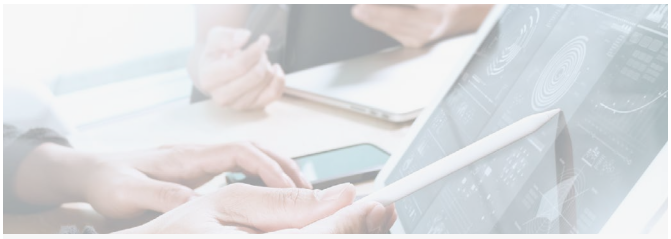
The extremely rewarding process made it possible to draw up a situational report and diagnostic review reflecting as accurately as possible the realities of IPv6 in France. The results produced by the hearings and consultations provided fodder for exploratory discussions, followed by the proposals for a six-action plan to accelerate the IPv6 transition.

Another benefit of this collaboration is the sharing of expertise with a view toward creating the IPv6 observatory. Exchanges focused on identifying the most appropriate measurement criteria and indicators, as well as organisations with data sources able to supply material for those indicators, particularly those related to the publication of services in the DNS.

Furthermore, AFNIC, as an Office in charge of domain names in .fr, has committed to fight digital exclusion. As such, it pays 90% of the profits of .fr at the Afnic Foundation for Digital Solidarity, created in 2015. From its very first year, the Foundation financed 35 projects all over France.

Lastly, for the five years to come, AFNIC has set itself the goal of providing support to the one million French VSE/SMEs still absent from the Internet. Since 2014, the Réussir-en.fr programme has helped them to initiate their digital transformation and develop their online presence through a diagnostic review and practical tools and advice.

AFNIC also offers field teaching by participating in fairs dedicated to entrepreneurs and by co-organising educational workshops on digital technology throughout France (Les Foliweb).



Towards IPv6-Only: Microsoft example

Recently, some CAPs have migrated (partially or totally) to IPv6. Microsoft transition to IPv6 should be mentioned. Because of its new acquisitions (Nokia, Azure, etc.), Microsoft has consumed almost all the private IP adresses it had; it also faced overlaps in address ranges. Taking into account the increased complexity in operating the two protocols side-by-side, Microsoft decided to experiment a migration to IPv6-only. The deployment has begun slowly and a number of difficulties have been encountered: heterogeneous needs between regions and institutions, incompatibility of certain protocols with systems in place, unavailability of functionalities within certain platforms, etc. Despite these difficulties, Microsoft believes that the gains associated with solving the two problems (IPv4 address shortages and the duplication of private addresses) are higher than the costs generated: in the medium term, it will benefit from having a simplified network management structure and will be able to focus on its core business.

- the percentage of IPv6 traffic;
- the current IPv4 and IPv6 address allocation policy;
- the IPv6 transition programme.

This enhanced version of the observatory report will be published in Second Half 2017.

3.3.3 Contribution to the creation of advocacy events

In order to enable better sharing of information – and best practices – on the deployment of IPv6 within the digital community in France (action No. 3), Arcep wishes to foster reflections on IPv6 advocacy events.

A preliminary study of IPv6 promotion actions has been conducted. By casting the spotlight on a number of major events organised in the past, it becomes possible to better identify the specific objectives, scope, contacts and messages to convey at these advocacy events.

IPv6 World Day
8 June 2011

IPv6 World Day was one of the first events of global dimension held in this area. It helped bring greater visibility to the IPv6 transition issue. Bringing together several global pstakeholders (Facebook, Yahoo), its aim was to make participating sites accessible in IPv6. It helped coordinate efforts as the set deadline approached and bring to light the challenges and issues that remain to be addressed for global deployment.

V6 World Congress
Paris, March 2015

After a number of events held independently, the V6 World Congress, organised in Paris, was incorporated into a broader framework comprising all of the network's issues. An event of international magnitude, it brings together over 1,500 participants from more than 65 countries representing industry leaders around themed presentations and can lay claim to having a concrete impact on the initiated transition.

Conférence ION, ISOC
Bucharest, 12 October 2016

Dynamic in format, this conference held by the ISOC* has mobilised players in the form of interactive round-table around their respective transition successes. Organised on the same day as an event aimed for operators and network regulators, it brought together a diverse audience and offered feedback on the Deploy360 programme.

* *Internet Society*

UK IPv6 Council
London, 31 October 2016

By organising a day of presentations on the challenges and deployment strategies related to the protocol deployment, the UK branch of the IPV6 Forum brought together more than 100 participants from various backgrounds (national stakeholders, universities, multinationals, etc.) who shared their valuable perspective on more technical issues, long-term views and obstacles to deployment.

IPv6 Business Conference
Zurich, 16 June 2016

The *IPv6 Business Conferences*, held annually, are hailed as one of the key events in Europe. Organised by the Swiss IPv6 Council, they offer presentations by recognised speakers both in the economic sphere and in the technical community. It is thus a forum for mutual sharing of experiences and best practices, and in this regard, a regular update on the progress of the transition.

IPv6 Council - Belgium
Antwerp, May 4, 2016

The Belgian branch of the IPv6 Forum held a meeting between IPv6 migration stakeholders by offering a perspective on national performances. This annual event had a very positive effect on the deployment of IPv6 in the country – among the best-equipped in Europe – as many large companies made their transition following this session.

Three QUESTIONS TO

Internet Society France

Nicolas CHAGNY, *Président*

Internet Society

IPv6, THE PILLAR for the future of Internet and innovation

1 Where are we in the transition to IPv6 in France and across the world?

In France, Arcep has launched an observatory that has already offered significant learnings. It will complement the measurement tools launched by the Internet Society at the global level, at the worldipv6launch.org website.

We are pleased with the growing awareness of IPv6, in particular through the Minister in charge of the electronic communications and through Arcep. We remain concerned about the timorous deployment of IPv6. Yet it is a key prerequisites if real-time services are to take off and for the deployment of the Internet of Things. We feel that the government must set the example by imposing IPv6 in all its infrastructure and public procurement dimensions.

This awareness also implies training and a degree of "evangelisation", so that the subject does not remain the domain of a handful of geeks.

2 How is the Internet Society organized and what role does it play in this transition?

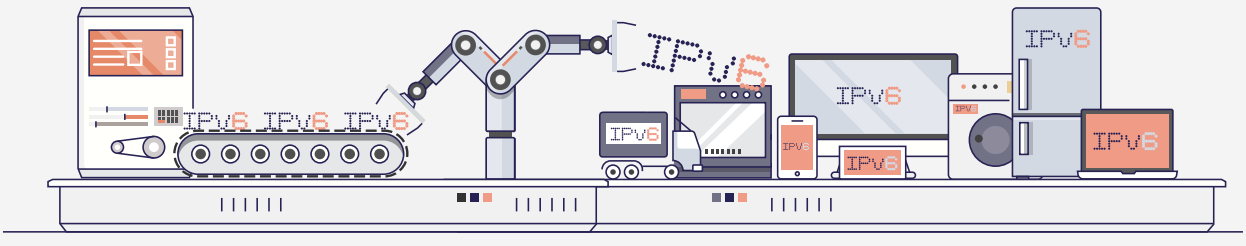
The Internet Society has always been strongly mobilised around IPv6. Historically, because we are the organisation hosting IETF's activities, which is the main source of the Internet standards. And then, because we are careful and vigilant that internet access is the same for everyone, all over the world.The Internet Society has produced a number of White Papers and launched an "IPv6 Day", a one-day end-to-end trial of IPv6. As a result, in 2012, this led us to create a global "World IPv6 Launch" event, as a way of affirming that IPv6 is no longer a utopia.

We are thus creating an environment through which we can evangelise IPv6, and are maintaining a set of measures with operators.

> We remain concerned about the timorous deployment of IPv6. Yet it is a key prerequisites if real-time services are to take off and for the deployment of the Internet of Things.

3 Which other Arcep issues is the Internet Society interested in addressing?

The Internet Society is very sensitive to topics related to Net neutrality and we will be happy to work on this topic with Arcep. ■



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ARCEP, COMMUNICATIONS NETWORK ARCHITECT AND GUARDIAN

Internet, fixed and mobile telecom and postal networks constitute the **"Infrastructures of freedom"**. Freedom of expression, freedom to communicate, freedom to access knowledge and to share it, but also freedom of enterprise and innovation, which are key to the country's ability to compete on the global stage, to grow and provide jobs. Because it is essential in all open, innovative and democratic societies 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 high standards in terms of accessibility, universality, performance, neutrality, trustworthiness and fairness.

Democratic institutions therefore concluded that independent state intervention was needed to ensure that no power, be it economic or political, is in a position to control or hinder users' (consumers, businesses, associations, etc.) ability to communicate with one another.

The electronic communications and postal regulatory authority (Arcep), a neutral and expert arbitrator with the status of quasi autonomous non-governmental organisation, is the **architect** and **guardian** of communication networks in France.

As network architect, Arcep creates the conditions for a plural and decentralised network organisation. It guarantees the market is open to new players and to all forms of innovation, and works to ensure the sector's competitiveness through pro-investment competition. Arcep provides the framework for the networks' interoperability so that users perceive them as one, despite their diversity: easy to access and seamless. It coordinates effective interaction between public and private sector stakeholders when local authorities are involved as market players.

As network guardian, Arcep enforces the principles that are essential to guaranteeing users' ability to communicate. It oversees the provision of universal services and assists public authorities in expanding digital coverage nationwide. It ensures users' freedom of choice and access to clear and accurate information, and protects against possible Net neutrality violations. From a more general perspective, Arcep fights against any type of walled garden that could threaten the freedom to communicate on the networks, and therefore keeps a close watch over the new intermediaries that are the leading Internet platforms.