RIPE NCC

June 2025

The State of IPv4 and the Evolving Transfer Landscape

Report

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Words or concepts masked with an asterisk (*) are included in the Glossary at the end of the report.

Introduction

This report combines insights from interviews conducted in 2024 by an external consultancy (NEXOP) with network operators, ISPs, cloud providers, regulators, and industry experts, alongside an analysis of RIPE NCC's registry data. It explores the evolving role of IPv4 transfers as a mechanism for managing address space in a post-exhaustion environment, alongside broader trends in availability, pricing, and usage. The report also highlights the operational and policy context in which transfers take place and offers practical observations for those involved in managing IP resources. The report is designed for those in the telecom sector, such as ISPs, cloud service providers, managers, as well as regulators and government representatives who oversee the operation of the Internet in their countries.

IPv4 Scarcity and Its Impact on Network Operators

An IP address is a critical element of our connected world as it identifies every device connected to the Internet. The last available IPv4 /8 blocks (16 million IPv4 addresses) were allocated to the Regional Internet Registries* (RIRs) by the Internet Assigned Numbers Authority (IANA) in 2011. It wasn't long after this that the IPv4 pools held by the RIRs dropped to levels where they could no longer meet the demand for addresses in their respective regions.

As new technologies and services drive further demand for IP addresses, the transition to IPv6 has become a critical step in addressing the limitations of IPv4 and allowing for further growth of the Internet. While significant progress has been made in IPv6 deployment globally, its adoption remains uneven across regions, with the more developed and technologically advanced countries typically leading the way. Over time, this may increasingly disadvantage those that fall behind and contribute to a new kind of digital divide.

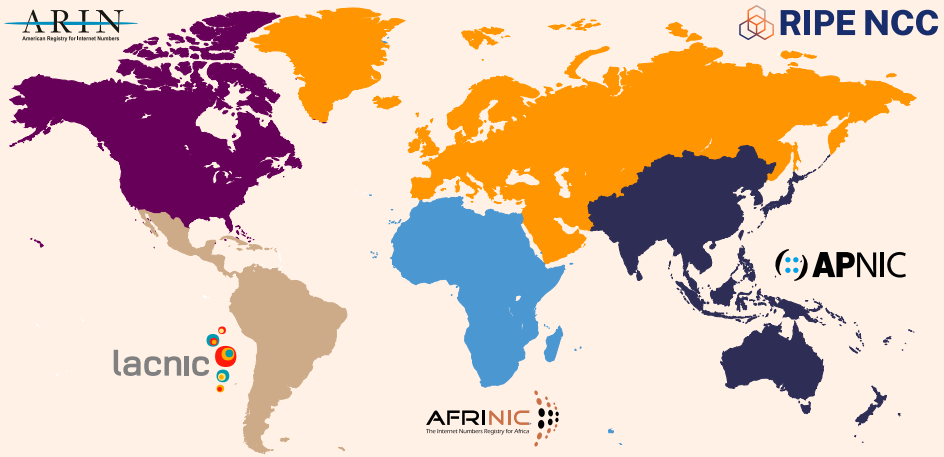
What is the RIPE NCC's role in the IP address ecosystem?

As the Regional Internet Registry for Europe, Middle East and Central Asia, the RIPE NCC serves over 20,000 members in 76+ countries. We register IP addresses and ASNs, and act as the secretariat to the RIPE community*. We maintain a registry of all Internet number resources in our service region, the details of which can be found in the RIPE Database. Our members act as Local Internet Registries* (LIRs) to provide Internet services in their own countries. The RIPE NCC membership consists mainly of Internet service providers, telecommunication organisations and other companies that manage their own network infrastructure. Members pay an annual fee to fund our operations.

How to get IPv4 addresses from the RIPE NCC?

New or existing RIPE NCC members who have never received any IPv4 space from the RIPE NCC can request a /24 IPv4 block (256 IPv4 addresses) from our waiting list. Members will then be eligible to receive an allocation* once any addresses become available in the future, according to their place in the queue. This can take quite some time.

REGIONAL INTERNET REGISTRIES MAP



To explore the available options for obtaining IP addresses in more detail, take a look at this report.

How Operators Address IPv4 Scarcity

Participants in the interviews conducted by NEXOP said they believed that IPv4 will remain the primary protocol for Internet connectivity for the next decade or two. This prevailing sentiment highlights the perceived necessity of IPv4 for most Internet users in the foreseeable future. Many operators also thought that the complexity of deploying IPv6 in large networks was underestimated.

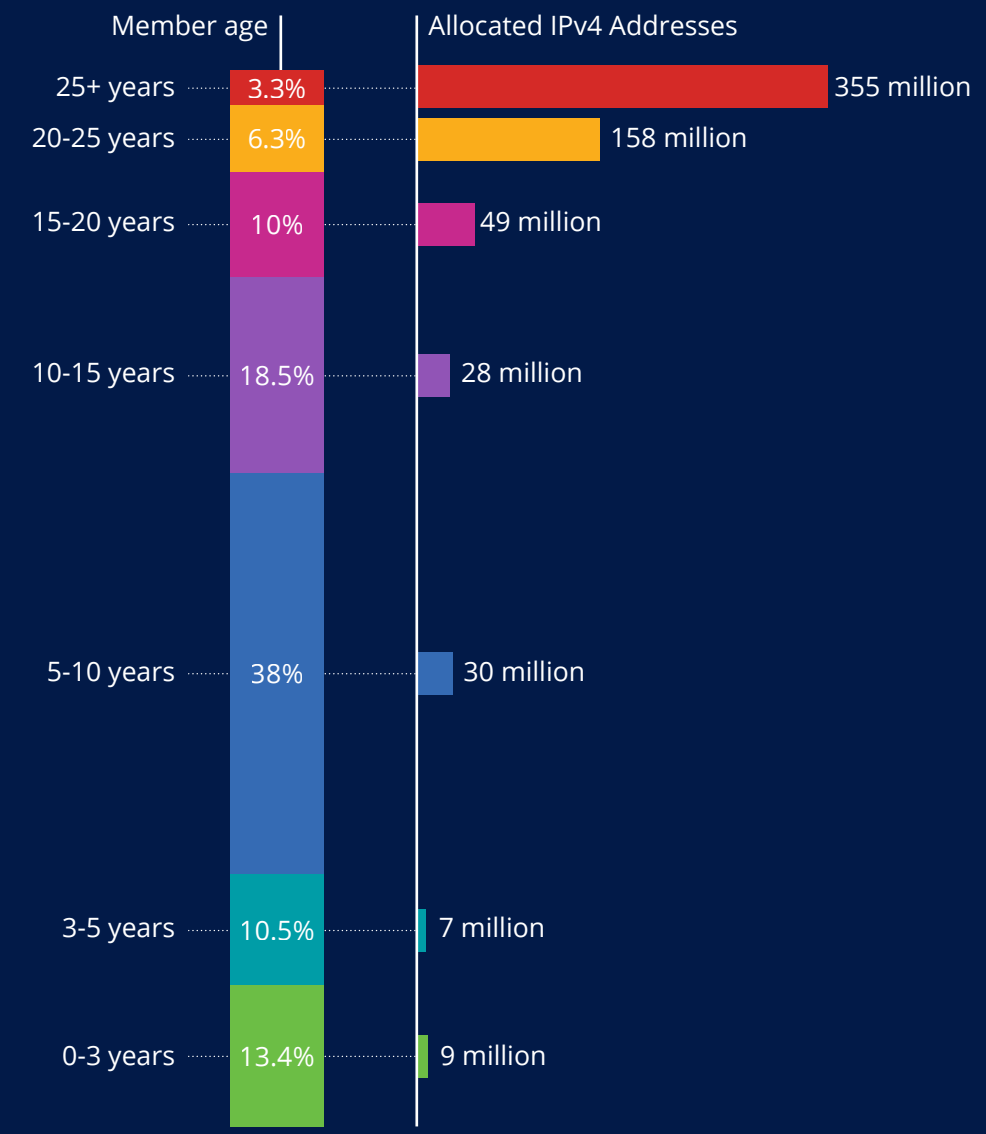
In response to IPv4 scarcity, organisations have adopted various approaches to acquire and optimise addresses for their networks. Some receive addresses directly from Regional Internet Registries or acquire them on a secondary market through permanent IPv4 transfers. Others explore more short-term solutions, such as renting or receiving a temporary transfer of IPv4 addresses. The RIPE NCC has exhausted its pool of IPv4 addresses, though small amounts of recovered addresses are made available via a waiting list for those who have not previously received addresses – this can take some time. Therefore, organisations that can afford to do so will often find their IPv4 space on the market.

In terms of optimisation, effective IP address management is essential for ensuring the efficient operation and security of network infrastructures. Many operators choose to adopt technologies that allow them to share public IPv4 addresses between multiple customers or services. This is mostly achieved using Carrier-Grade Network Address Translation (CGNAT), which is the most widely used way for an organisation to grow a customer base without acquiring more IPv4 addresses. Research participants noted that while CGNAT has become an industry standard, it also introduces operational complexities, which makes organisations carefully evaluate the trade-offs between NAT deployment and the long-term viability of IPv6 adoption.

Additionally, effective network management practices require comprehensive monitoring and analysis to optimise IP address usage. While IP Address Management (IPAM) tools are widely used for this purpose, it was observed that in medium to large networks, resource optimisation is often driven by economic factors – particularly when operators consider transferring unused or underutilised address space. As a result, this focus on optimisation has contributed to a steady flow of IPv4 addresses being transferred to networks that are in greater need of additional resources.

A recurring theme in the interviews was the importance of having absolute control over the address space used on your own network. When considering options, there's a clear divide between obtaining additional IP space directly (whether by acquiring it from another organisation or obtaining it from an RIR) and alternative means like renting from an LIR or other entity. The latter options mean placing future business operations in the hands of a third party. This introduces risks, as the third party could change their business strategy, transfer their IP resources, or encounter financial difficulties, potentially jeopardising organisations' access to the rented space. In contrast, obtaining address space that organisations directly hold provides significant autonomy over their networks' future.

Figure 1:
Member Age and IPv4 Resource Distribution



The State of IPv4 and Resource Distribution

This section looks at the distribution of IPv4 resources among RIPE NCC members. The RIPE NCC is the Regional Internet Registry (RIR) for Europe, the Middle East and Central Asia. By becoming a member, an organisation can request (IPv6, IPv4, ASNs) resources from the RIPE NCC. While a member can easily get IPv6 addresses and AS Numbers, it is no longer possible to get IPv4 addresses directly. A new member needs to wait until addresses are returned to the RIPE NCC and become available via the waiting list.

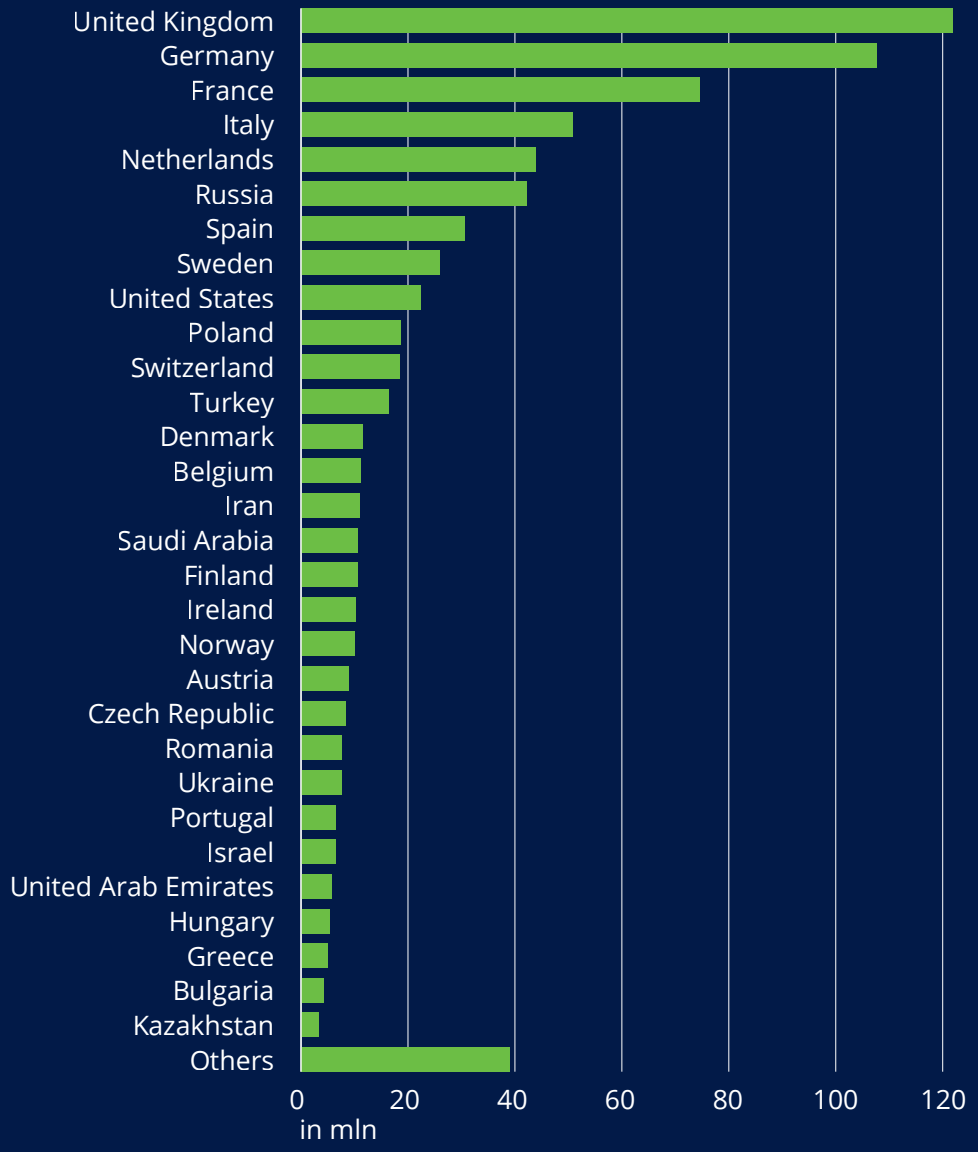
Overall, members that joined the RIPE NCC over 20 years ago have significantly more IPv4 addresses than newer members (see Figure 1). Those with over 25 years of membership hold the majority of IPv4 resources (over 50%), due to previous policies, and large incumbent telecom providers joining the RIPE NCC when IPv4 resources were more readily available. Until 2012, IPv4 allocation sizes were based on documented need, allowing members that joined prior to IPv4 exhaustion to accumulate more IPv4 addresses. In contrast, newer members (0-5 years of membership) have around 3% of allocated IPv4 space.

IPv4 CIDR Chart (Common IPv4 Prefixes)

Prefix	IP Addresses
/24	256
/22	1K
...	...
/18	16K
/16	64K
...	...
/8	16M

Note: Only selected prefix sizes are shown above. For a comprehensive overview, please visit this page.

Figure 2:
Top 30 Countries with IPv4 Space



In terms of the countries where those IP resources are registered, the UK, Germany, France, Italy, the Netherlands and Russia hold the largest amount of IPv4 space (see Figure 2). This is likely due to some major operators that received large blocks of IPv4 in earlier days. In the graph below, you can see the IPv4 addresses per country (including Allocated, Assigned, and Legacy* addresses).

> Legacy IPv4 address space was distributed before the formation of the RIR system. Legacy space makes up approximately 36% of today's IPv4 Internet. The RIPE NCC is responsible for close to 13% of that 36%, which amounts to around 12 /8 blocks (close to 200 million IPv4 addresses).

Thus, it is evident that IPv4 distribution reflects the current economic landscape with early technology adopters and academia having the majority of the resources, while the geographical distribution also shows that the organisations registered in large developed nations are among the top IPv4 resource holders.

Useful resources

RIPE NCC Begins to Allocate IPv4 from Last /8

10 Years of Legacy Policy

Inside IPv4 Transfers: History and Current Dynamics

With a high concentration of IPv4 resources among early adopters and an urgent need for addresses to support Internet growth, transfers have become a regular practice for organisations that need to acquire additional addresses. In this section, we will look at IPv4 transfers, the history of transfer policies, and the current state of transfers within the RIPE NCC service region.

What is the IPv4 Transfer?

IPv4 transfers are about transferring the rights to use specific blocks of IPv4 addresses from one organisation to another. This process is facilitated by the RIPE NCC according to policies that have been set by the RIPE community. Typically, a transfer involves financial compensation from the recipient to the transferring party (Not the RIPE NCC). Organisations also sometimes transfer their IPv4 space when changing their business structure (e.g. merger/acquisition). In order to receive a transfer of IPv4 addresses in our service region, an organisation must be a member of the RIPE NCC, which also implies additional costs such as an annual membership fee and a sign up fee.

Any legitimate resource holder is allowed to transfer complete or partial blocks of address space or number resources (IPv4, IPv6 and AS Numbers) that were previously allocated or assigned to them by the RIPE NCC or otherwise through the Regional Internet Registry (RIR) system. Resources are excluded from transfers when RIPE policies mandate their return to the RIPE NCC or when subject to transfer restrictions. Please note, there is no transfer 'market' for IPv6 as there is sufficient supply of addresses. However, transfers of IPv6 do sometimes happen because of various changes in the business structure of organisations.

Under current RIPE policies, scarce resources such as IPv4 and 16-bit ASNs cannot be transferred for 24 months after they were received; this applies regardless of whether the addresses were received from the RIPE NCC, via a transfer from another organisation, or following a change in business structure (e.g. merger/acquisition). This is to prevent speculative activities with these resources.

In this report, the term IPv4 Transfer Market refers to transactions involving IPv4 address space registered by RIRs, including the RIPE NCC. These transactions take place between organisations and typically involve financial compensation paid by the receiving organisation directly to the transferring party.

The RIPE NCC's role in IPv4 transfers is solely to maintain accurate registry records within our service region. We do not receive any financial compensation from the transactions made directly between organisations transferring IPv4 addresses.

IP addresses are not property. The right to IP addresses is the right to registration of IP addresses, which comes with exclusive rights to use and to transfer them, based on and subject to a contractual relationship between the right holder and the relevant RIR.

Overall IPv4 Transfer Market Dynamics

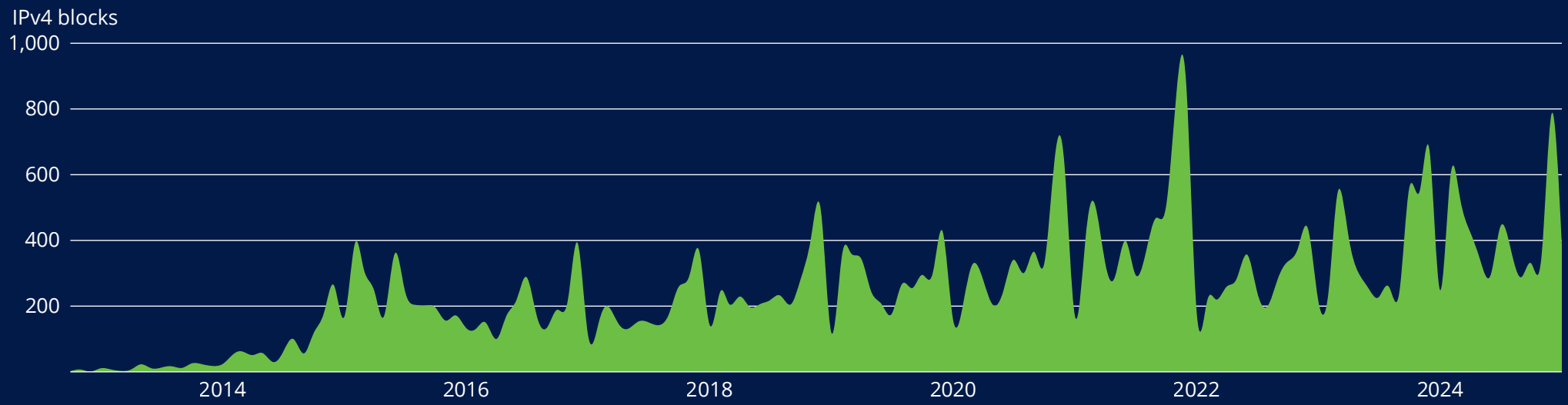
According to NEXOP's research, the IPv4 Transfer Market continues to evolve in response to changing demand dynamics, economic conditions, and technological trends. While prices for IPv4 addresses on the transfer market have stabilised in recent years, market volatility remains a key concern for stakeholders. Factors such as supply constraints, geopolitical tensions, and industry consolidation can contribute to fluctuations in IPv4 prices, which determines who can afford and access addresses. Navigating the IPv4 market landscape requires careful consideration of factors such as pricing trends, time to market, availability, contractual terms, and compliance.

It was also noted that those who have been acquiring multiple /16s (large blocks of IPv4 addresses) in recent years seem to have reduced their purchasing activities, leading to a drop in prices for these blocks and subsequent market-wide adjustments.

Overall, IPv4 prices reached their peak around the end of 2022 and have been on a downward trend since then. As of 2024, prices have stabilised, offering a more predictable landscape for both buyers and sellers. However, there are expectations that prices for larger blocks, particularly /16 blocks, may continue to decline in the near future.

The research also indicated that IPv4 prices are likely to remain relatively stable, hovering around 30 EUR per IP address (for small to medium-sized IP address blocks of /24-/20) . While there are no immediate forecasts for price hikes, the emergence of new disruptive initiatives requiring additional IPv4 addresses could potentially impact prices. This suggests that while short-term stability is anticipated, the market remains susceptible to evolving technological demands.

Figure 3:
Monthly Policy IPv4 Transfers (within the RIPE NCC)



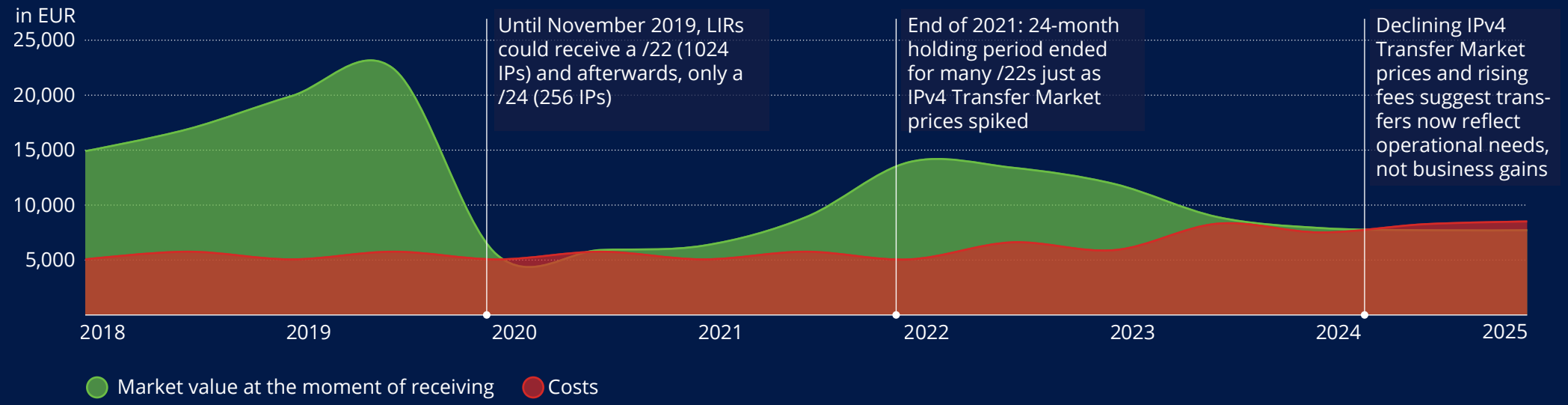
Transfer Dynamics

Figure 3 shows the number of IPv4 blocks transferred each month since the first transfer policies were set by the RIPE community. At the beginning of the observed period, the number of transfers gradually increased, with some fluctuations, indicating an initial rise in market demand. Over the past two to three years, transfer volumes have remained high, although substantial fluctuations suggest that ongoing demand is influenced by changing market conditions.

It is important to note that the above graph does not only reflect movements within the IPv4 Transfer Market, as it can also include transfers related to changes in the business structure of organisations, or transfers between different LIRs belonging to the same organisation. Generally, resource holders can request updates to resources as part of changes to their business structure, e.g., a merger or acquisition. However, some companies choose to process these updates as policy transfers for convenience.

Transfer activity has been influenced by both IPv4 Transfer Market prices and the total cost of RIPE NCC membership, which includes the one-time sign-up fee and the annual membership fees required to meet the 24-month holding period before IPv4 resources become transferable. For example, in 2018, the market value of a /22 IPv4 block ranged between EUR 17,000-20,000, while the total cost of membership over that two-year period was approximately EUR 5,000 depending

Figure 4:
Estimated Market Value vs. LIR* Costs over Time



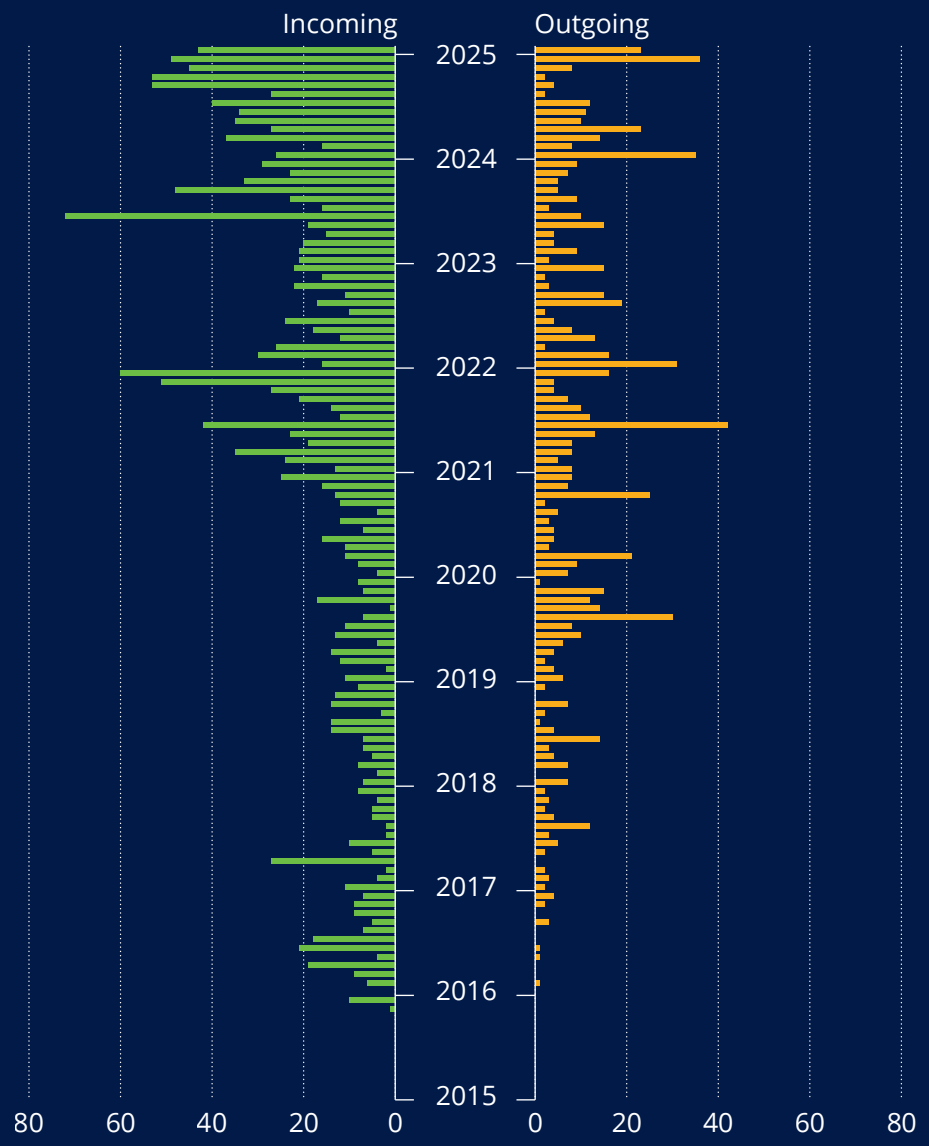
Note: This graph shows the potential profit margin at the time an IPv4 resource was received from the RIPE NCC. The costs are based on a sign-up fee, annual fees for holding time and potential waiting time plus pro-rata fee at the moment of sign-up (excluding the potential annual redistribution). Please note that this is an estimate that people could make at the time of opening a Local Internet Registry* (LIR) account based on the information available at that specific period. Actual costs may vary due to changes in the annual fee and fluctuations in the IPv4 waiting list timeframe. The indicative market value was calculated using publicly available data from various sources involved in IP resource transfers.

on when the membership began (see Figure 4).

This presented a significant profit margin for members who obtained addresses and transferred them after the holding period. A spike in transfers occurred in 2021, aligning with high IPv4 prices and the expiration of the 24-month holding period for many /22 allocations issued just before the RIPE NCC's IPv4 pool ran out. Another increase followed in 2023, when expected market gains continued to outweigh the costs of membership.

However, as shown in the graph below, this dynamic has shifted. With the increase in sign-up and membership fees, and the decline in IPv4 market value, acquiring space through the RIPE NCC with the intention to transfer has become less profitable. Over the past two to three years, the decreasing market value of IPv4 addresses alongside rising membership costs suggests that transfers are now primarily driven by operational network needs rather than business opportunities.

Figure 5:
Policy IPv4 Transfers to and from the RIPE NCC (Inter-RIR Transfers)



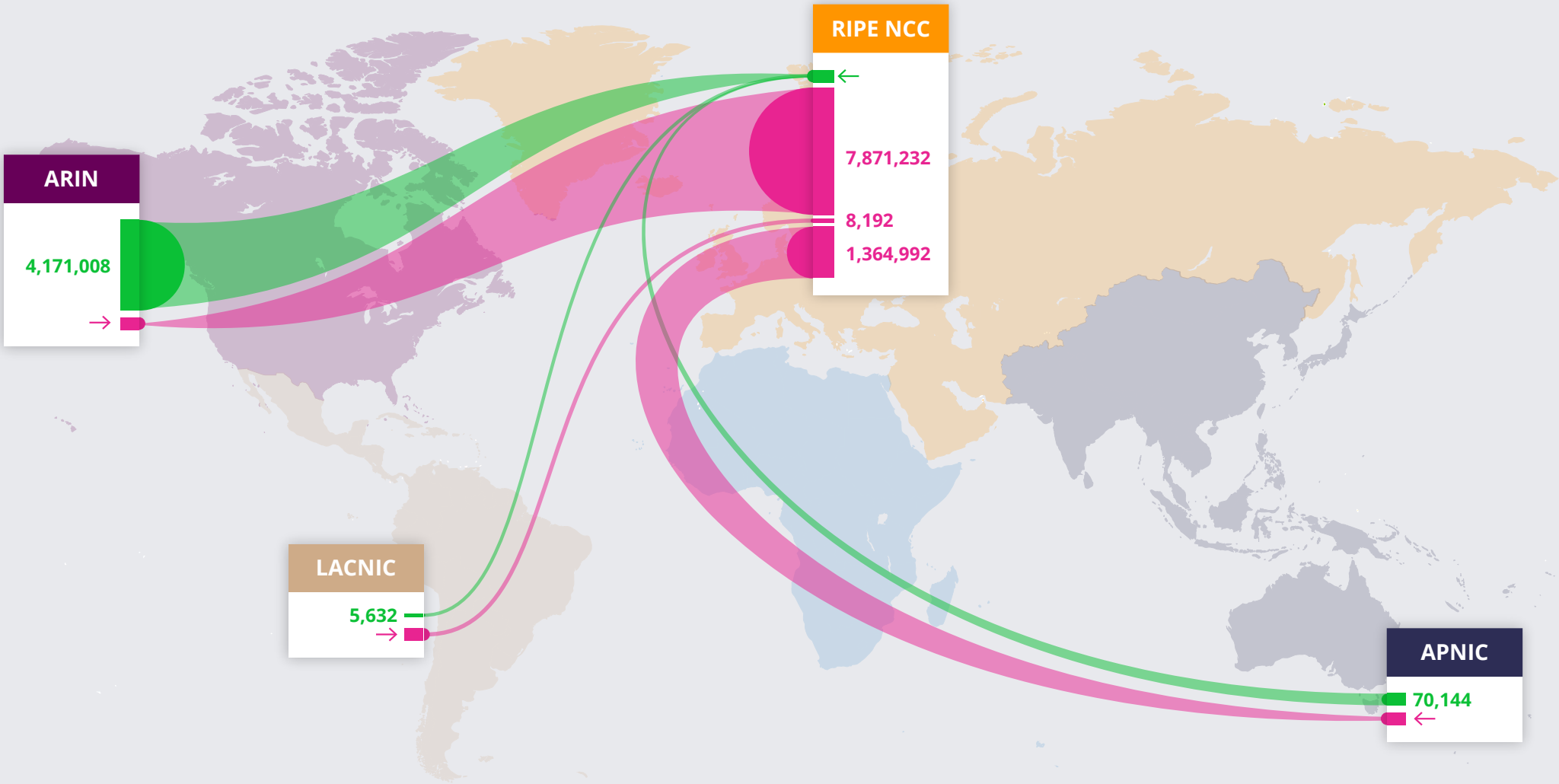
Transfers from Other RIRs to the RIPE NCC

Transfers between Regional Internet Registries were not a common practice until the end of 2015, when the first inter-RIR transfer policy reached consensus and was implemented. Overall, the number of transfers to the RIPE NCC from other RIRs (and vice versa) has been increasing, with more addresses coming into our service region than leaving it (see Figure 5). Over that period, the largest block of transfers came from the ARIN region, with approximately 25 million IPv4 addresses received from this region and around 8 million addresses transferred. This is followed by APNIC, where our region received about 3.5 million IPs and transferred approximately 2.5 million. Transfers with LACNIC are significantly lower, with fewer than 100,000 addresses exchanged in both directions. Note that each RIR has its own distinct IP address allocation policies which may impact inter-RIR transfers.

Useful resources

- Learn more about Transfers from another RIR to the RIPE NCC
- RIPE Policy: Transfer of Internet Number Resources and Change of a Member's Official Legal Name
- The procedure on Mergers, Acquisitions or Other Change in Business Structure

Figure 6:
Inter-RIR transfers in 2024 (IPv4 addresses)



The Evolution of IPv4 Transfer Policies and Future Outlook

The RIPE community began discussing resource transfers nearly 20 years ago, leading to the first transfer policy in December 2008. This policy was initially limited to allocated IPv4 space for RIPE NCC members. However, transfers only started in October 2012, once the RIPE NCC's IPv4 free pool was exhausted and members could only receive a single /22 (1,024 addresses) per LIR, which was later reduced to a /24 (256 addresses) via a waiting list. This forced organisations in need of IPv4 to find solutions elsewhere.

Between 2013 and 2017, policy changes expanded transfer rules to include IPv4 Provider Independent (PI)* space, AS Numbers, IPv6, and inter-RIR transfers. Refinements also addressed loopholes, such as transfers of /22 allocations immediately after receiving them from the RIPE NCC. For this, the RIPE community applied a 24-month holding period to all transfers of IPv4 and 16-bit AS Numbers. These developments culminated in March 2017 with a unified transfer policy that has remained largely unchanged for the past eight years.

RIPE policies have played a crucial role in shaping the IPv4 Transfer Market by providing structure, transparency, and stability. Later updates to the transfer policies to include additional resource types and close loopholes helped to maintain fairness and prevent speculation. The introduction of a unified transfer policy in 2017 further streamlined processes. By adapting policies in response to market needs, the RIPE community has supported a functional and transparent IPv4 Transfer Market while mitigating risks associated with scarcity.

However, declining IPv4 prices and rising membership fees have contributed to a slowdown in IPv4 transfers. While IPv4 Transfer Market may continue to exist, the most active phase appears to be behind us as the supply of unused and recycled addresses continues to shrink.

This dwindling availability of IPv4 addresses has driven efforts to maximise efficiency. In the RIPE NCC service region, there is growing interest in temporary IPv4 transfers, a practice permitted by RIPE policies. Other regions are exploring similar policy changes to extend the usability of their address pools.

These measures represent the final stretch in the long journey of optimising IPv4, from classful addressing to CIDR and now to address recycling and extreme conservation. While these efforts help sustain a finite resource, they also reinforce the urgent need to transition to IPv6, which is the only viable long-term solution that can support the continued growth of the Internet.

These IPv4 resource distribution and transfer dynamics highlight the critical role IPv4 still plays in the global Internet infrastructure, despite ongoing efforts to transition to IPv6. While older policies and early allocations have left a lasting impact on the distribution of IPv4 resources among RIPE NCC members, newer members face challenges in securing address space due to limited availability and general market competition. Meanwhile, the IPv4 Transfer Market, driven by resource scarcity, remains subject to fluctuations in price, geopolitical factors, and changes in industry practices.

Transfer trends demonstrate the adaptability of the market, with organisations leveraging transfers to meet network demands, restructure resources, or accommodate mergers and acquisitions. IPv4 addresses are already widely distributed and in use, but the availability of unused space continues to shrink. While transfers have improved efficiency in how IPv4 resources are allocated, the remaining address space is becoming harder to optimise.

We are now in the final stage of IPv4's efficient use, where most available addresses have been redistributed, leaving little room for further optimisation. This scarcity has led to an increase in inter-RIR transfers and temporary transfers. However, relying on IPv4 transfers as a long-term strategy is unsustainable – IPv4 simply cannot support continued growth indefinitely. For future-proofing, businesses and network operators must look to IPv6 adoption rather than hoping that IPv4 availability will persist.

Useful resources

- RIPE Resource Transfer Policy
- More Information on Temporary Transfers
- Temporary Internet Number Assignment Policies
- IPv4 Address Allocation and Assignment Policies for the RIPE NCC Service Region

IPv6 Adoption and Challenges

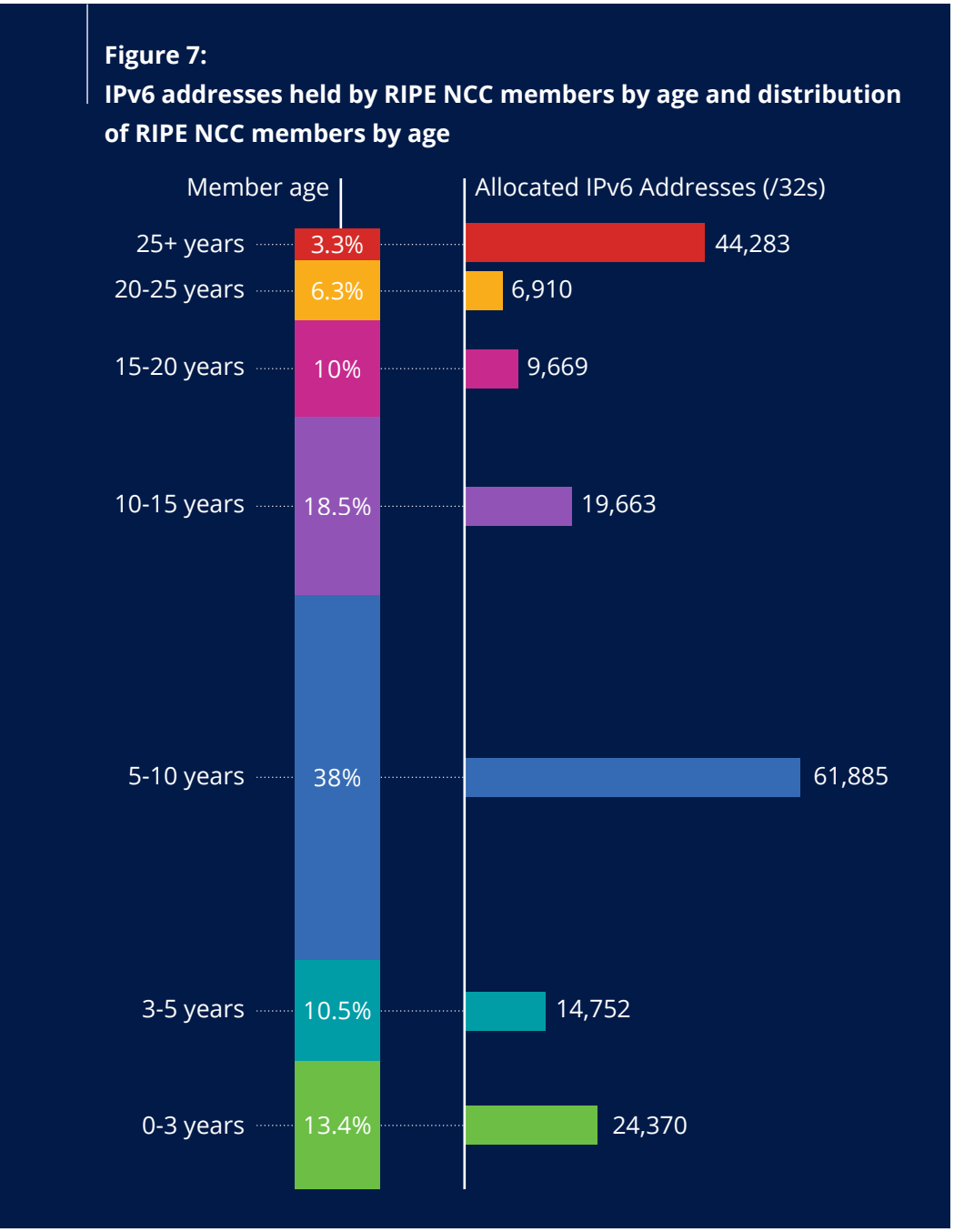
As IPv4 goes through the final stages of 'recycling' and extreme conservation, IPv6 is the most viable solution to overcome this challenge and connect more people to the Internet. IPv6 adoption has gained traction, with major content networks increasingly routing traffic over IPv6. The gradual shift towards IPv6 is growing in certain sectors of Internet services. The research participants said that the significance of IPv6 is likely to rise over the next five to ten years, driven by increasing performance demands.

However, some participants also reported hurdles in migrating from IPv4 to IPv6. These included the technical complexity of dual-stack deployment, interoperability issues with legacy systems, and uncertainties about customer readiness and market acceptance. Additionally, the perceived lack of urgency in transitioning to IPv6, coupled with the perceived cost and effort involved, has contributed to slow uptake among many network operators.

The research concluded that the transition to IPv6 has been held back in large part by a prevailing sense of complacency. Despite its importance to the future growth of the Internet, IPv6 struggles to gain attention within organisational agendas. One contributing factor here is the widespread lack of understanding among C-level executives, which poses a significant barrier in advocating for its implementation.

This prevailing sentiment underscores the continued necessity of IPv4 for most Internet users in the foreseeable future. Participants also said that enterprises (outside classic Telco/ISP networks) are likely not interested in IPv6 and are great users of CGNAT, the widespread adoption of which has contributed to the delay in greater IPv6 deployment. There can also be external factors beyond the control of companies. For example, in some countries, national security agencies and other authorities faced challenges with filtering and monitoring IPv6 traffic. Given its expense and complexity, they decided to remain with IPv4 only, and IPv6 was deemed unfit for lawful use on the national public Internet. Although many of the interviewees perceived IPv6 as a challenging journey, in the past decade, adoption of IPv6 has made significant progress.

Figure 7:
IPv6 addresses held by RIPE NCC members by age and distribution of RIPE NCC members by age



IPv6 Deployment Among RIPE NCC Members

Every member of the RIPE NCC can receive an initial IPv6 allocation of /32 up to /29. Larger allocations can also be provided if justified. There is no waiting list to receive IPv6 addresses, as there's enough supply to meet the current demand. Today, most members have already received an IPv6 allocation.

The analysis of IPv6 resource distribution by membership age reveals distinct patterns in resource allocation (see Figure 7). Members in the 5-10 year range represent the largest group, making up about 38% of total membership and holding over 34% of IPv6 allocations, suggesting significant IPv6 allocation among mid-tenure members. In contrast, members with over 25 years of tenure, despite comprising only 3% of the membership, retain a substantial share of IPv6 /32 resources (over 25%), indicating an adoption of IPv6 alongside their large IPv4 holdings. Meanwhile, newer members that joined after the IPv4 run-out show a preference for IPv6, with about 14% and 8% for 0-3 and 3-5 year member age groups, respectively.

In 2023, the RIPE NCC conducted a survey of its members and the RIPE community. 3,899 respondents shared their input on the RIPE NCC's services and activities. Just under half of respondents said they deployed IPv6 in their networks, with a need to ensure readiness for future demands driving adoption. Future readiness was the most common reason for the implementation of IPv6. Almost three out of every five respondents said they also wanted to gain experience with IPv6, while a third had to adopt IPv6 as it was a requirement of their customers or partners. Only 13% deployed IPv6 because they had no more IPv4 addresses available, although this rises to 20% of respondents in the Middle East.

Over two out of every five respondents found the most challenging aspects of deployment were adding feature parity between IPv4 and IPv6 and changing the IPv4 mindset within their organisation.

Global IPv6 Adoption

Despite IPv6 being widely available and ready to deploy, its adoption continues to lag due to a range of operational, financial, and logistical challenges. While there are plenty of IPv6 addresses, deployment requires significant investments in infrastructure upgrades, software compatibility enhancements, and staff training.

As of March 2025, Google reports that global IPv6 adoption has surpassed 40%, with France (81%) and Germany (76%) leading among countries in the RIPE NCC service region. Greece is also a strong performer, with over 60% adoption. Facebook reports similarly high levels of deployment for France (70%), Germany (59%), and Greece (53%) (see Figure 8).

In the Middle East, Saudi Arabia leads in IPv6 adoption at 62%, followed by the United Arab Emirates (48%) and Qatar (28%), according to Google. Facebook data indicates that 54% of Internet traffic in Saudi Arabia is handled over IPv6, while the figures for the UAE and Qatar are 40% and 38%, respectively.

In Central Asia, adoption remains low, ranging between 0-3% in Turkmenistan, Tajikistan, Turkmenistan, and Uzbekistan, but with a higher level (18%) in Kazakhstan (Google). According to Facebook data, the level in Kazakhstan is 16% and ranges between 0-4% in the remaining four Central Asian countries.

The transition to IPv6 is a critical step in addressing the limitations of IPv4, particularly in the face of increasing demand for IP resources. While significant progress has been made, adoption

Figure 8:
Top 20 Countries - IPv6 Adoption in Europe, the Middle East and Central Asia (March 2025)

Country	IPv6 adoption (Google)	IPv6 adoption (Facebook)	IPv6 adoption (Cloudflare)
France	81%	70%	34%
Germany	76%	59%	38%
Belgium	65%	62%	39%
Saudi Arabia	64%	54%	46%
Greece	62%	55%	38%
Israel	56%	61%	28%
Hungary	51%	52%	29%
Estonia	50%	47%	21%
Luxembourg	49%	38%	27%
UAE	48%	40%	28%
Finland	48%	32%	25%
UK	47%	42%	21%
Russia	46%	15%	7%
Switzerland	42%	38%	25%
Ireland	39%	36%	11%
Portugal	38%	48%	27%
Qatar	38%	36%	0.29%
Austria	32%	38%	20%
Netherlands	32%	33%	24%
Czechia	31%	20%	13%
Iran	29%	37%	7%
Norway	24%	43%	18%

remains uneven across regions, with developed and technologically advanced countries leading the way. However, despite the challenges of infrastructure upgrades, software compatibility, and workforce training, IPv6 adoption continues to grow steadily, supported by the global technical community and initiatives from organisations like the RIPE NCC.

Useful resources

- IPv6 Address Allocation and Assignment Policy
- Schrödinger's IPv6 Cat

Policy and Regulation

The legal and regulatory landscape surrounding IP address management is complex and multifaceted, encompassing a wide range of issues related to privacy regulations and law enforcement requirements. Organisations working with IP addresses must navigate a myriad of legal considerations when receiving, and using IP address resources to ensure compliance with applicable laws and regulations.

Moreover, the transfer of IP address allocations between entities often involves contractual agreements, licensing arrangements, and compliance with legal obligations to facilitate lawful and transparent transactions. Clear documentation, accurate record-keeping, and adherence to established policies and procedures are essential to prevent disputes, mitigate legal risks, and maintain the integrity of the IP address ecosystem. It is highly important that RIPE NCC members maintain accurate entries in the RIPE Database, ensuring that all allocations to their customers are kept up to date.

Regional Internet Registries (RIRs) play a critical role in the allocation, registration, and management of IP address resources within their respective regions. The participants in NEXOP's research said that while the RIPE NCC is not a regulator, it is often seen as one in the role of overseeing address space distribution. The research concluded that collaborating with RIRs enables stakeholders to access accurate and up-to-date information, participate in policy development processes, and contribute to the ongoing stewardship of the IP address ecosystem.

Nearly all participants stressed the importance of maintaining the status quo and upholding current operational practices for the RIPE NCC. The RIPE NCC is tasked with ensuring that all entities are the rightful holders of their allocated address space. Participants underscored the critical necessity for the RIPE NCC to fulfil this vital responsibility. Their primary concerns revolve around the safety and clear registration of their resources, allowing others to verify that they are the rightful holders of their address space, and, above all, ensuring that no unauthorised party can take control of their resources.

As an organisation based in the Netherlands, the RIPE NCC must comply with EU sanctions. Such sanctions may restrict transferring rights, but RIPE

As an RIR, the RIPE NCC processes requested transfers by updating the registry in accordance with RIPE policies. In addition, we must ensure that these changes comply with our responsibilities as a membership organisation and with Dutch law (e.g. following applicable sanctions).

We must also ensure that only the legitimate holder can request a transfer. This means applying due diligence to protect Internet number resources from fraudulent or unauthorised attempts to transfer them.

NCC members do not lose any resources they already hold.

As for the options to obtain IP addresses, an interviewed government representative said they generally disapprove of IPv4 renting (leasing), as it complicates tracking IP address space usage. For law enforcement agencies, this creates problems if they need to identify who the addresses were allocated to and who is currently using them. While larger Telcos have good oversight when renting from a RIPE NCC member, multi-layered leasing setups pose tracking challenges. They believe that currently, IPv4 addresses registered in one country can be rented out elsewhere, which creates a complex trail to follow.

CGNAT doesn't seem to raise significant concerns for governments and LEAs regarding current NAT usage levels. This technology has become the common practice by many operators to accommodate the shortage of IPv4. However, there are still issues regarding this technology. For example, Italy's Piracy Shield enables the blocking of content at the IP address and DNS level, which is particularly problematic in the current time of shared IP addresses.

Overall, it is clear that ensuring the lawful and transparent distribution of IP resources relies on the accuracy and integrity of the registry, the role performed by the Regional Internet Registries (RIRs). Keeping registry information up to date is not only a procedural requirement but a shared responsibility that benefits the entire community. Accurate records support operators and business owners in securing their address space, facilitate the transfer process, and enable regulators and law enforcement authorities to address misuse and criminal activity online.

The interviews conducted for this report highlighted that stakeholders across the industry recognise the essential role that Regional Internet Registries play in maintaining the integrity of the registry. It is therefore in the interest of all parties – operators, resource holders, and regulators – that members actively engage with their RIR and ensure that their registry information is accurate and up to date. This is fundamental to preserving the stability, security, and fairness of the IP address ecosystem.

Useful resources

- Sanctions Transparency Reports
- How sanctions affect the RIPE NCC
- Information on sanctions-related restrictions for some RIPE NCC members
- Sanctions and the Internet Report

Conclusion

Effective IP address management requires a holistic approach that considers the interplay of technical, operational, legal, and regulatory factors. The current state of the Internet addressing ecosystem is both dynamic and resilient, reflecting its ability to adapt and evolve to meet the demands of operators and users alike. While the transition to IPv6 represents a significant step forward, IPv4 continues to play a crucial role, supported by technologies like NAT to extend its utility in the short term.

As the IPv4 Transfer Market evolves, stakeholders must navigate these complexities while balancing current needs with the future transition to IPv6. Effective policies, regional cooperation, and innovative solutions will be crucial in ensuring equitable access to IPv4 resources and a smoother path to a more sustainable Internet protocol ecosystem.

As economies grow and populations expand, the need for increased connectivity becomes paramount – a demand that can only be sustainably met through the adoption of IPv6, given the scarcity of IPv4 addresses. IPv6 offers the scalability and flexibility necessary to support this growth, ensuring a robust and future-ready Internet. Ultimately, decisions on IP address management should be tailored to the specific needs and environments of operators, balancing immediate requirements with long-term strategic goals. The journey toward widespread IPv6 adoption is ongoing, and while much progress has been made, there remains significant work ahead to fully realise its potential.

Glossary

Allocation – a block of addresses from which further sub-allocations or assignments can be made. Organisations must be members of the RIPE NCC and open an LIR account to receive and hold allocations.

Assignment – delegated address space to an ISP or End User for use within their own Internet infrastructure. Assignments are only made for specific documented purposes and cannot be further sub-assigned to other parties.

IPv4 Transfer Market – refers in this report to transactions outside the direct allocation of IP addresses from the RIPE NCC to a member or End User. See the full definition on page 7.

Legacy Resources – IPv4 address space that was distributed before the formation of the RIR system and is therefore not subject to many of the policies that govern RIPE NCC-allocated IPv4 space.

Local Internet Registry (LIR) – in order to receive and hold IP addresses and ASNs, a RIPE NCC member needs to open an LIR account. This happens as part of the membership application process. In the past, the term LIR was used interchangeably with "RIPE NCC Member". However, in recent years some members opened multiple LIR accounts and so the distinction is often relevant, especially as the policies that govern how we allocate resources typically focus on LIRs rather than members.

Provider Independent (PI) Resources – a category of Internet number resources that are used to provide connectivity but cannot be further assigned to an organisation's customers. PI resources can be assigned by the RIPE NCC or received via a transfer from another resource holder. Organisations do not have to become RIPE NCC members/operate an LIR to hold PI resources, though they do need to find a RIPE NCC member to handle the administration for these resources with the RIPE NCC on their behalf (called a "sponsoring LIR").

Regional Internet Registry (RIR) – allocates and registers blocks of Internet number resources to Internet service providers (ISPs) and other organisations in their respective geographical service region. These Internet number resources are mainly in the form of IPv4 and IPv6 address space and Autonomous System Numbers (ASNs). Currently, there are five RIRs: AFRINIC serving Africa, APNIC serving the Asia Pacific region, ARIN serving North America, LACNIC Serving South America and the Caribbean, RIPE NCC Serving Europe, Central Asia and the Middle East.

RIPE Community – Réseaux IP Européens (RIPE, French for "European IP Networks") is a forum open to all parties interested in wide area IP networks. The objective of RIPE is to ensure the administrative and technical coordination necessary to enable the operation of the Internet.

Transfer – transfer of the right to registration of IP resources from party A to party B.

About the RIPE NCC

We are the Regional Internet Registry (RIR) for Europe, the Middle East, and Central Asia. As such, we allocate and register Internet number resources to Internet service providers and other organisations. We are a not-for-profit membership organisation that works to support the RIPE community and the development of the Internet in general.

Learn more at: ripe.net


RIPE NCC
www.ripe.net