

Decoding ASN and ISP Data for In-Depth Business Insights



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Executive Summary

An autonomous system number (ASN) is a unique identifier assigned to an autonomous system (AS), which controls a set of IP addresses as a single organization that could be an internet service provider (ISP), a hosting company, or a large corporation.

ASNs have traditionally served as an essential tool for network engineers and operators in tracing traffic routes through different ASs and understanding the complex interconnectivity of the Internet. This capability enables network administrators to identify potential bottlenecks and optimize routing for better performance.

ASN data also offers a wealth of insights that organizations can leverage for strategic business and market analyses. Aside from analyzing network performance, ASN data is also valuable for identifying the entities that manage specific groups of IP addresses, scoping the competitive landscape and assessing market shares.

This white paper demonstrates the multifaceted applications of ASN data, focusing on its potential to provide valuable intelligence for organizations and analysts. Specifically, the study dove into the following:

- The ISP and geolocation distribution of all ASNs in the dataset
- The top 20 ASNs with the highest number of associated IPv4 and IPv6 ranges
- The top 20 ASNs with the highest number of associated IPv4 and IPv6 addresses
- The ASNs of the top 100 resolving IP addresses
- The ISPs of the top 100 resolving IP addresses
- The geolocation of the top 100 resolving IP addresses



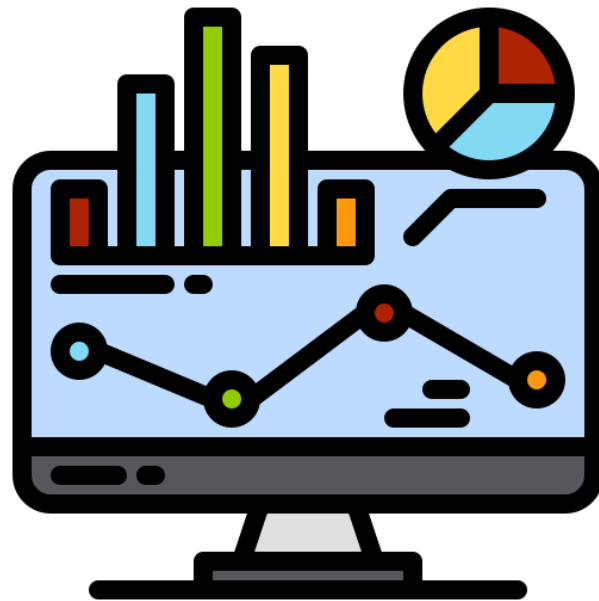
Research Data and Methodology

The study sought to uncover the most used ASNs, ISPs, and geolocation countries. To achieve this goal, we gleaned data from our [IP Netblocks Database](#) file dated 6 August 2024, where we retrieved 78,997 ASNs for IPv4 addresses and 40,235 for IPv6 addresses. In total, we analyzed 87,415 unique ASNs.

We then extracted one IP address from each ASN and ran them on [Bulk IP Geolocation Lookup](#). This step allowed us to sample the geographic distribution of the IP addresses associated with all the ASNs.

Subsequently, we wanted to see which ASs controlled the biggest IP networks. For this step, we ranked the ASNs based on how many IPv4 and IPv6 ranges they were associated with and how many actual IP addresses they had in each IP space.

In addition to the ASN analysis of the registered IP ranges, we explored the [Premium DNS Database Download](#) A file dated 7 August 2024. From this database, we retrieved the top 100 IP addresses and extracted their corresponding ASN, geolocation, and ISP information.



Research Findings

Analyzing the Underlying Network Infrastructure of All the ASNs

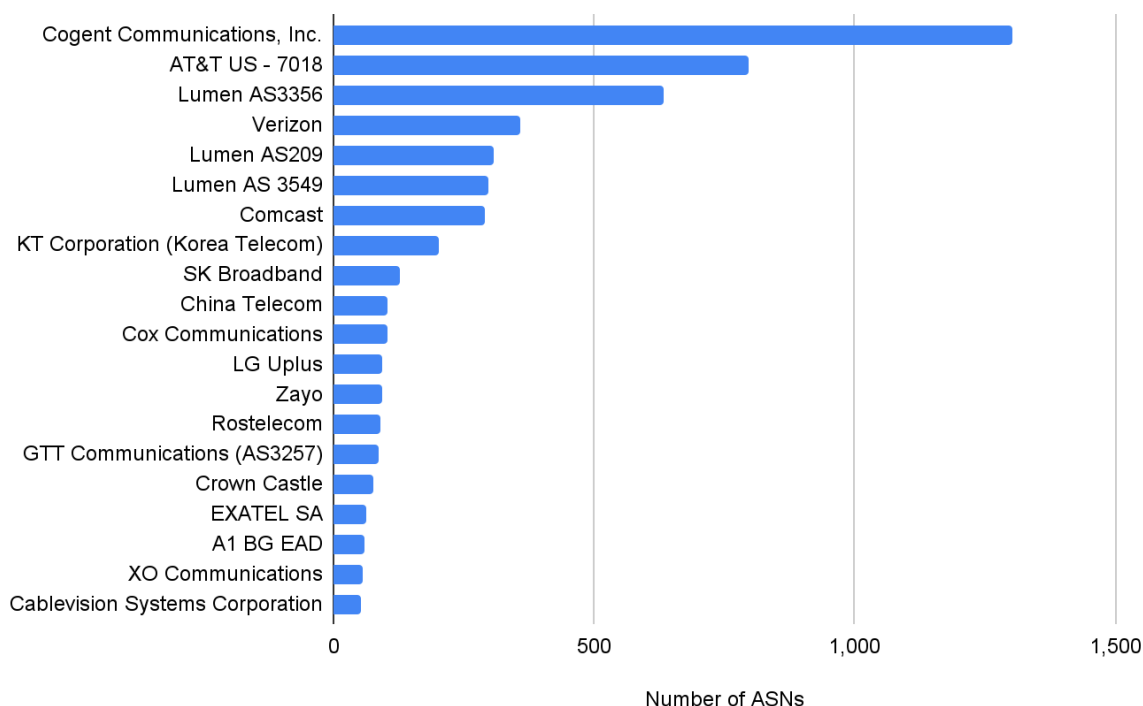
The first part of our study analyzed the ISP distribution and geolocation information of all the ASNs in our dataset using one random IP address taken from each ASN.

We identified 24,062 ISPs for the IPv4 space and ranked them according to their number of associated ASNs.

→ Cogent Communications, Inc. placed first in the top 20, with 1,301 ASNs, followed by AT&T U.S. - 7018 with 797; Lumen AS3356 with 633; Verizon with 359; Lumen AS209 with 308; Lumen AS 3549 with 298; and Comcast with 291.

→ The rest of the top 20 were KT Corporation (Korea Telecom) with 202 ASNs; SK Broadband with 129; China Telecom with 105; Cox Communications with 104; LG Uplus with 93; Zayo with 93; Rostelecom with 91; GTT Communications (AS3257) with 88; Crown Castle with 76; EXATEL SA with 62; A1 BG EAD with 58; XO Communications with 55; and Cablevision Systems Corporation with 54.

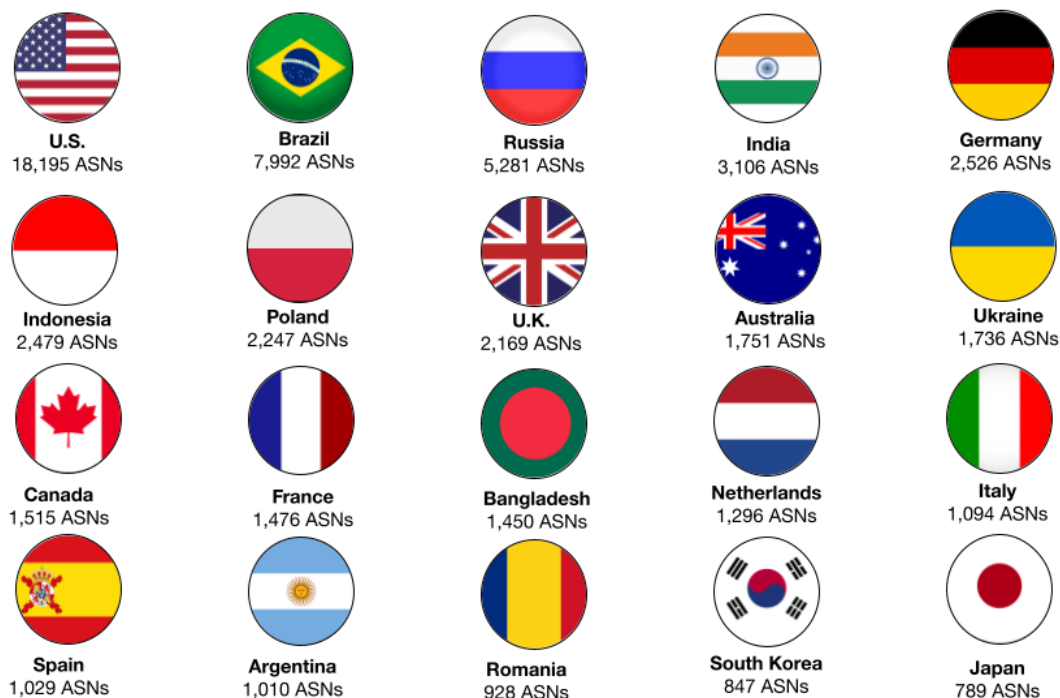
TOP 20 ISPs OF THE IPv4 ASNs



The geolocation details of the IPv4 addresses revealed that:

➡ 18,195 ASNs traced their origins to the U.S.; 7,992 to Brazil; 5,281 to Russia; 3,106 to India; 2,526 to Germany; 2,479 to Indonesia; 2,247 to Poland; 2,169 to the U.K.; 1,751 to Australia; and 1,736 to Ukraine. The rest of the top 20 geolocation countries are shown below.

TOP 20 IPv4 ADDRESS GEOLOCATION COUNTRIES OF THE ASNs

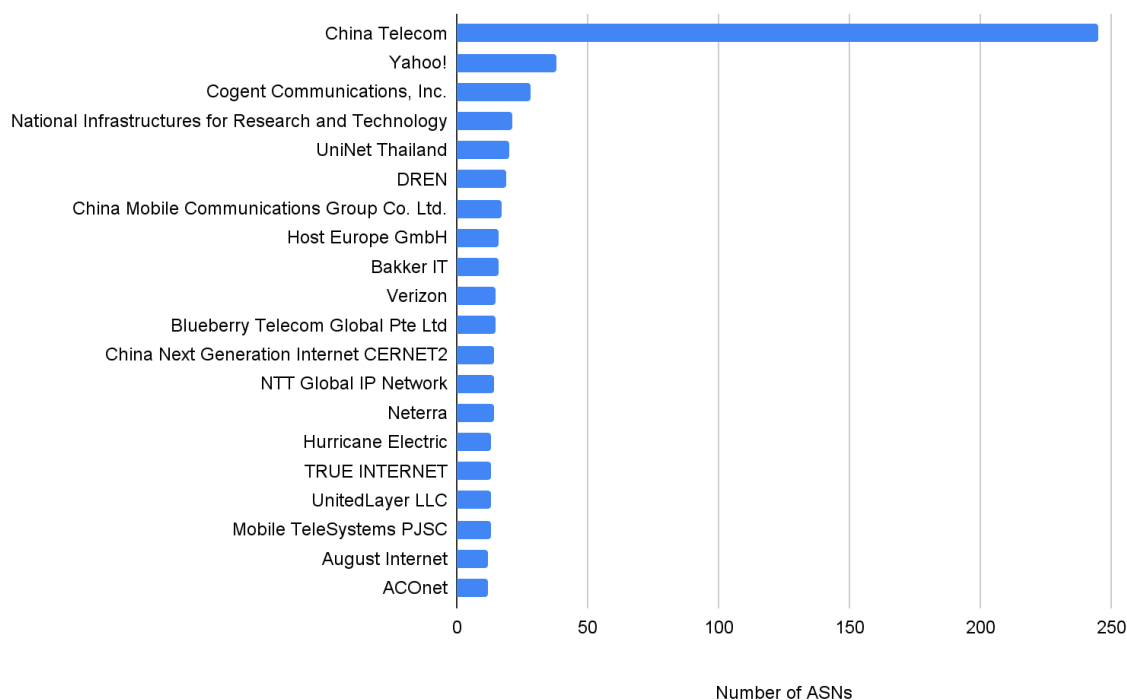


For the IPv6 space, we identified 15,880 unique ISPs. After ranking them, we found that:

➡ China Telecom had the highest number of associated ASNs, 245 to be exact. The rest of the top 20 ISPs lagged far behind. Yahoo! had 38 ASNs; Cogent Communications, Inc., 28; National Infrastructures for Research and Technology (GRNET), 21; UniNet Thailand, 20; DREN, 19; China Mobile Communications Group Co. Ltd., 17; Host Europe GmbH and Bakker IT, 16 each; Verizon and Blueberry Telecom Global Pte Ltd, 15 each; China Next Generation Internet CERNET2, NTT Global IP Network, and Neterra, 14 each; Hurricane Electric, TRUE INTERNET, UnitedLayer LLC, and Mobile TeleSystems PJSC, 13 each; and August Internet and AConet, 12 each.



TOP 20 ISPs OF THE IPv6 ASNs



The geolocation information of the IPv6 addresses revealed that:

➡ Brazil accounted for the highest number of ASNs, 6,805 to be exact. It was followed by China (4,760), the U.S. (4,408), Germany (2,111), India (1,515), Russia (1,407), the U.K. (1,292), Poland (1,066), the Netherlands (1,060), and France (961). The rest of the top 20 IPv6 geolocation countries are shown in the image below.



TOP 20 IPv6 ADDRESS GEOLOCATION COUNTRIES OF THE ASNs



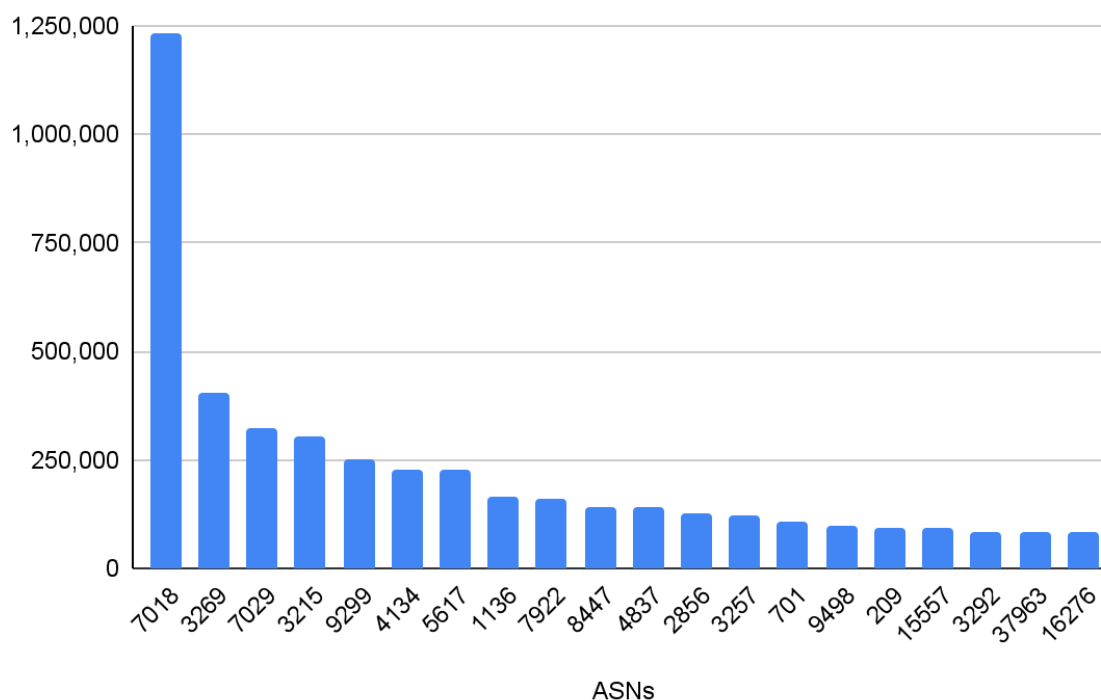
IP Range Distribution: What ASs Control the IPv4 and IPv6 Networks?

More than 4.4 million IP ranges were associated with the top 20 ASNs for the IPv4 networks led by ASN 7018 with more than 1.2 million IP ranges. The remaining 19 ASNs followed at a considerable distance with relatively fewer IP ranges.

ASN 3269 accounted for 27.6% or 407,183 of the total number of IP ranges; ASN 7029, 325,669; ASN 3215, 303,993; ASN 9299, 251,882; ASN 4134, 229,325; ASN 5617, 229,077; ASN 1136, 164,267; ASN 7922, 160,983; ASN 8447, 141,570; ASN 4837, 139,238; ASN 2856, 125,866; ASN 3257, 122,795; ASN 701, 107,306; ASN 9498, 99,747; ASN 209, 93,335; ASN 15557, 92,888; ASN 3292, 82,206; ASN 37963, 82,007; and ASN 16276, 81,818.



TOP 20 ASNs WITH THE HIGHEST NUMBER OF IPv4 RANGES

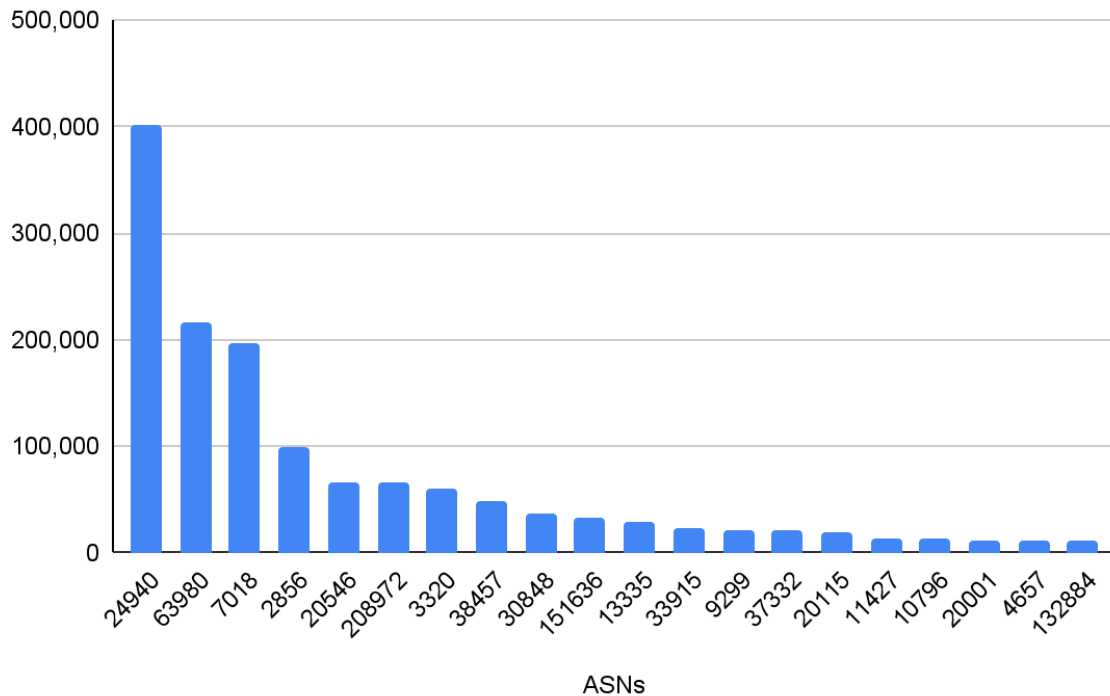


As expected, fewer IPv6 ranges were linked to the top 20 ASNs, notably since the adoption and allocation of IPv6 addresses have not yet reached the same level seen in the IPv4 space.

More than 1.4 million IPv6 ranges were associated with the top 20 ASNs, 28.7% or 402,538 of which were under ASN 24940. The other ASNs included ASN 63980 with 215,642 IP ranges; ASN 7018 with 196,031; ASN 2856 with 99,937; ASN 20546 with 65,641; ASN 208972 with 65,564; ASN 3320 with 61,227; ASN 38457 with 48,077; ASN 30848 with 37,789; ASN 151636 with 33,468; ASN 13335 with 30,028; ASN 33915 with 22,785; ASN 9299 with 22,066; ASN 37332 with 21,972; ASN 20115 with 19,680; ASN 11427 with 13,845; ASN 10796 with 13,514; ASN 20001 with 11,905; ASN 4657 with 11,787; and ASN 132884 with 11,1991.



TOP 20 ASNs WITH THE HIGHEST NUMBER OF IPv6 RANGES



Note that three ASNs appeared in both IPv4 and IPv6 analyses, indicating their significant involvement in both protocols. These ASNs were 7018, 9299, and 2856. Their presence in both lists could suggest these entities have made strategic investments in [dual-stack networks](#).

IP Address Distribution: What ASs Have the Highest Number of IP Addresses?

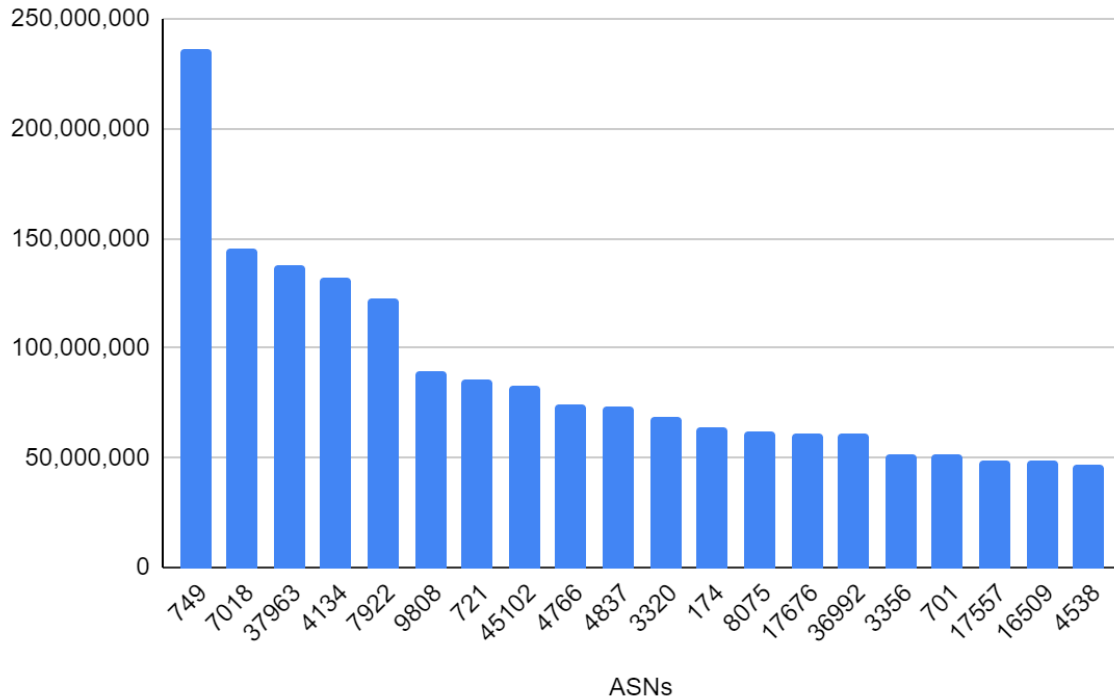
In terms of the actual number of IPv4 addresses, the list of top 20 ASNs changed. It was led by ASN 749 with 236.3 million IPv4 addresses.

However, six of the ASNs with the highest number of IPv4 ranges were also among the top 20 for IPv4 addresses, namely, ASN 7018 (145.7 million), 37963 (137.9 million), 4134 (131.8 million), 7922 (123.1 million), 4837 (73.7 million), and 701 (51.3 million).

The rest of the top 20 ASNs for IPv4 distribution were ASNs 9808, 721, 45102, 4766, 3320, 174, 8075, 17676, 36992, 3356, 17557, 16509, and 4538. In total, all 20 ASNs accounted for more than 1.7 billion IPv4 addresses.



TOP 20 ASNs WITH THE HIGHEST NUMBER OF IPv4 ADDRESSES

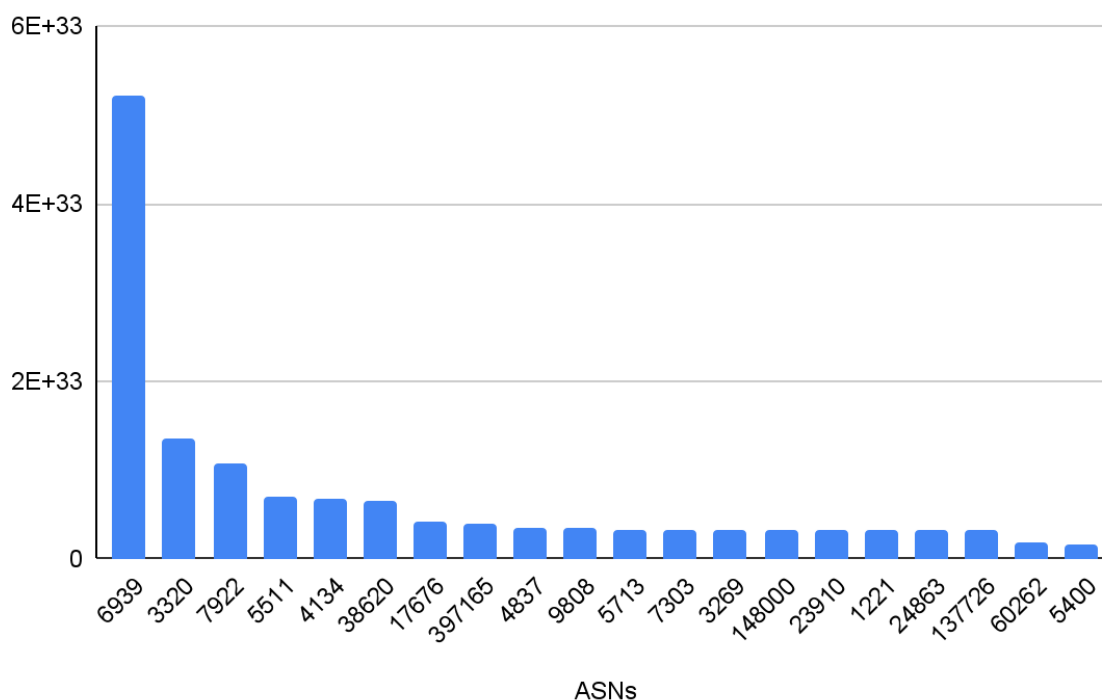


The story somewhat differed for the IPv6 address space. Only one ASN with the highest number of IPv6 ranges was among the top 20 for total IPv6 addresses. That was ASN 3320, which was second on the list with more than 1 octillion IPv6 addresses (i.e., 1.35×10^{33}).

ASN 6939 had the highest number of IPv6 addresses, 5.22×10^{33} to be exact. The rest of the top 20 ASNs for this category were 7922, 5511, 4134, 38620, 17676, 397165, 4837, 9808, 5713, 7303, 3269, 148000, 23910, 1221, 24863, 137726, 60262, and 5400.



TOP 20 ASNs WITH THE HIGHEST NUMBER OF IPv6 ADDRESSES



Next, we sought to determine if any ASN ranked high for both IPv4 and IPv6 addresses. Our analysis pointed to six ASNs, namely, 4134, 7922, 9808, 4837, 3320, and 17676. Again, this could indicate that these ASNs are engaging or preparing to engage in dual-stack networks.

ASN Analysis of Resolving IP Addresses: Who Is the Gatekeeper of DNS Traffic?

In the previous section, we explored the ASNs of the registered IP ranges. We then turned our attention to the ASNs associated with resolving IP addresses.

We focused on the top 100 IP addresses with the highest number of resolutions logged in the [Premium DNS Database Download](#) A file dated 7 August 2024. These IP addresses were found in a total of 92 million DNS records.

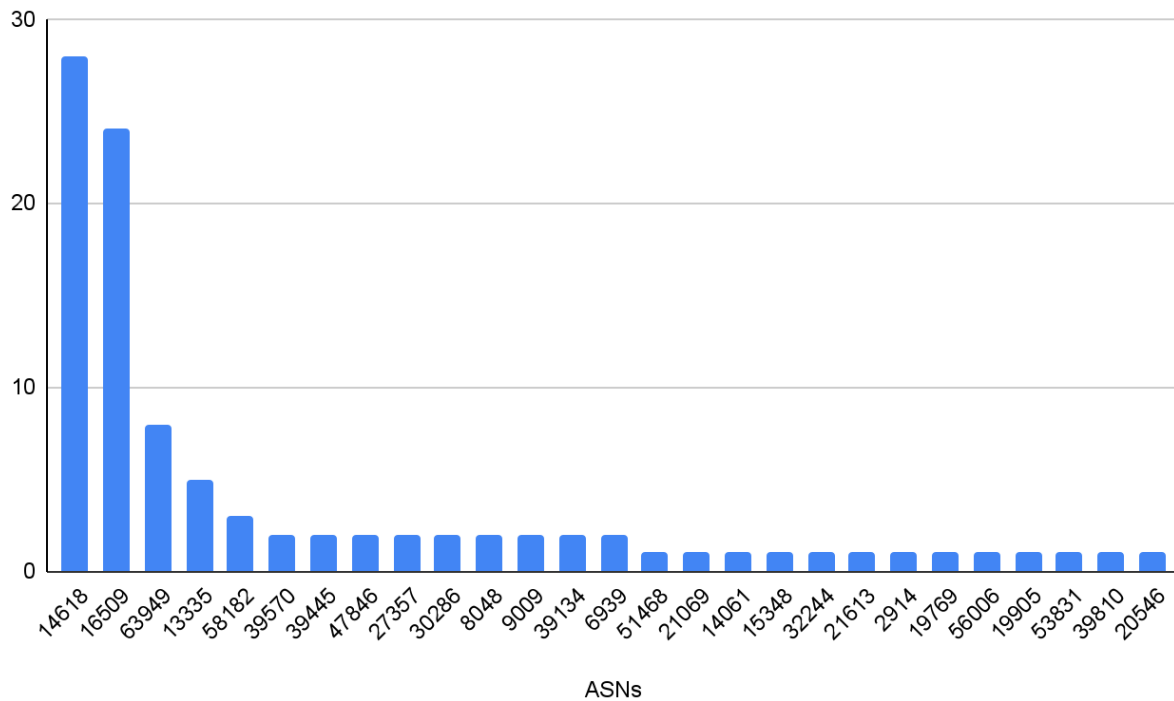
Our ASN analysis of the top 100 IP addresses revealed that:

➡ The IP addresses were spread across 27 unique ASNs. A total of 28 IP addresses were linked to ASN 14618, while 24 were linked to ASN 16509. Based on the IP Netblocks Database used in this study, these two ASNs accounted for 17.5 million and 48.6 million IPv4 addresses, respectively.



➡ The remaining ASNs accounted for eight or fewer of the top 100 IP addresses.

ASN DISTRIBUTION OF THE TOP 100 IP ADDRESSES



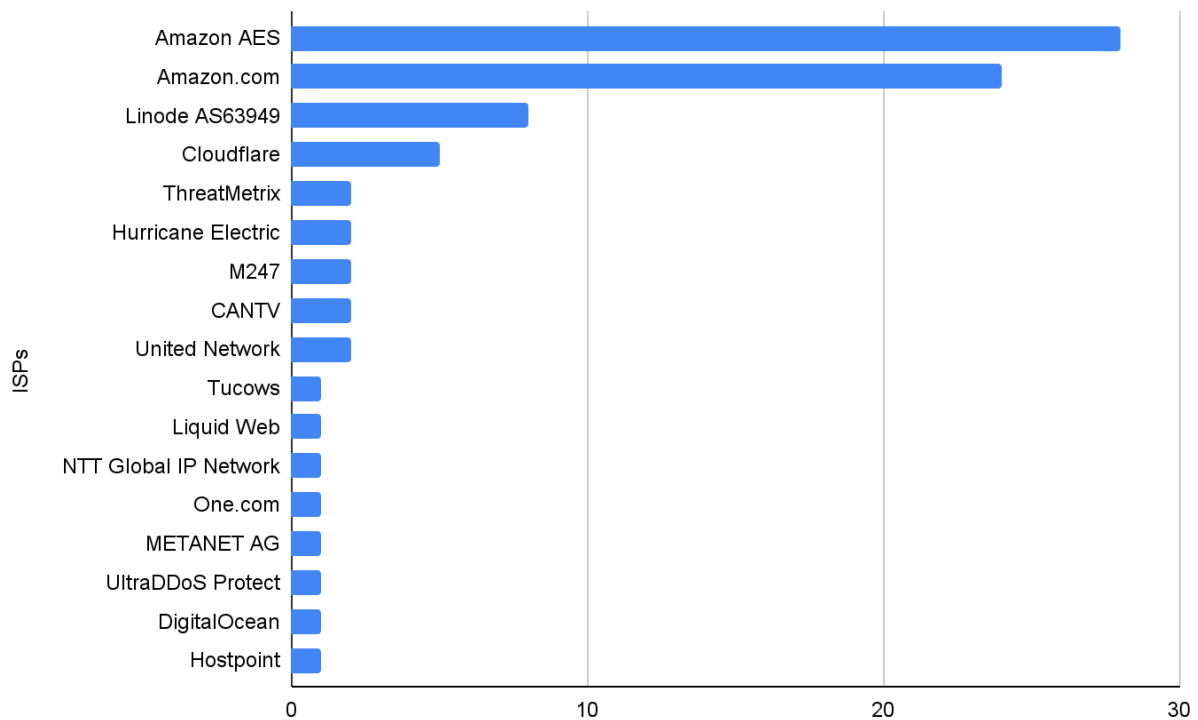
It is worth noting that two ASNs were also part of the top 20 ASNs with the highest number of registered IP addresses, namely, ASNs 16509 and 6939. To recall, ASN 6939 had the highest number of IPv6 addresses (more than 5.2 octillion). Meanwhile, ASN 16509 had 48.5 million IPv4 addresses.

Next, we studied the ISP assignments of the top 100 IP addresses, which revealed that:

➡ Amazon and its subsidiary accounted for more than half of the IP addresses, 52 to be exact. The rest of the top 100 IP addresses were distributed among 15 other ISPs, including Hurricane Electric and NTT Global IP Network, which also appeared among the top ISPs of the ASNs from the first part of this study.



ISP DISTRIBUTION OF THE TOP 100 IP ADDRESSES



Meanwhile, our geolocation analysis for the top 100 IP addresses found that:

➡ They were spread across 12 geolocation countries—the U.S. (73 IP addresses); Germany (six); the Netherlands, Russia, and China (three each); Sweden, Venezuela, Switzerland, and Canada (two each); and the U.K., Singapore, and Denmark (one each). One did not have current geolocation information.



GEOLOCATION COUNTRIES OF THE TOP 100 IP ADDRESSES



U.S.
73 IP addresses



Germany
6 IP addresses



Netherlands
3 IP addresses



Russia
3 IP addresses



China
3 IP addresses



Sweden
2 IP addresses



Venezuela
2 IP addresses



Switzerland
2 IP addresses



Canada
2 IP addresses



U.K.
1 IP address



Singapore
1 IP address



Denmark
1 IP address

➡ Nine of the countries were also found in the top 20 IP geolocation countries of the ASNs from IP Netblocks Database. These were the U.S., Germany, the Netherlands, Russia, China, Canada, Sweden, Switzerland, and the U.K.

Conclusion

This white paper focused on our study of the ASN and ASN-related data of registered IP ranges (from IP Netblocks Database) and actual resolving IP addresses (from Premium DNS Database). While there were overlaps, we also found distinctions between the two datasets. Our findings hint at the interplay between theoretical IP ownership data and the practical usage of IP addresses in real-world DNS traffic.

We identified dominant players and their possible market shares in the IP address spaces. We also gained insights into the underlying network infrastructures, such as ISP assignment and IP geolocation, of both the registered and resolving IP addresses.



About WhoisXML API

For over a decade now, WhoisXML API has been at the forefront of data aggregation, providing one of the most comprehensive collections of WHOIS, IP, and DNS information. Our cyber intelligence platform boasts of an impressive repository of 21+ billion historical WHOIS records, 50+ billion domains and subdomains, 10.4+ million IP netblocks, and a staggering 99.5% coverage of active IPv4 and IPv6 addresses.

Recognized for our exceptional growth and innovation, WhoisXML API has earned its place on the Inc. 5000 list and the Financial Times list of Top Fastest-Growing Companies for several years. Our solutions have garnered the trust of more than 52,000 users, including Fortune 500 companies, leading security firms, and organizations spanning diverse industries.



Appendix

Sample IPv4 Addresses

- 1[.]33[.]0[.]0
- 1[.]38[.]40[.]0
- 1[.]46[.]0[.]0
- 1[.]11[.]128[.]0
- 1[.]6[.]229[.]0
- 1[.]66[.]20[.]0
- 1[.]18[.]123[.]0
- 1[.]24[.]32[.]0
- 1[.]37[.]0[.]0
- 1[.]7[.]246[.]0
- 1[.]40[.]0[.]0
- 1[.]11[.]20[.]0
- 1[.]0[.]64[.]0
- 1[.]0[.]4[.]0
- 1[.]51[.]0[.]0
- 1[.]20[.]0[.]0
- 1[.]18[.]116[.]0
- 1[.]81[.]0[.]0
- 1[.]0[.]4[.]0
- 1[.]10[.]10[.]0
- 1[.]2[.]4[.]0
- 1[.]32[.]192[.]0
- 1[.]38[.]0[.]0
- 1[.]9[.]0[.]0
- 1[.]6[.]219[.]0
- 1[.]45[.]0[.]0
- 1[.]11[.]96[.]0
- 1[.]65[.]190[.]0
- 1[.]18[.]121[.]0
- 1[.]0[.]16[.]0
- 1[.]2[.]166[.]0
- 1[.]24[.]0[.]0
- 1[.]36[.]0[.]0
- 1[.]7[.]225[.]0
- 1[.]38[.]209[.]0
- 1[.]11[.]8[.]0
- 1[.]48[.]64[.]0
- 1[.]12[.]0[.]0
- 1[.]71[.]16[.]0
- 1[.]18[.]132[.]0
- 1[.]32[.]192[.]0
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- 1[.]37[.]82[.]0
- 1[.]8[.]0[.]0
- 1[.]6[.]136[.]0
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- 1[.]11[.]92[.]0
- 1[.]52[.]0[.]0
- 1[.]18[.]119[.]0
- 1[.]0[.]0[.]0
- 1[.]22[.]0[.]0
- 1[.]34[.]0[.]0
- 1[.]1[.]8[.]0
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- 1[.]38[.]208[.]0
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- 1[.]48[.]0[.]0
- 1[.]21[.]96[.]0
- 1[.]12[.]0[.]0
- 1[.]71[.]0[.]0
- 1[.]18[.]127[.]0
- 1[.]28[.]41[.]0
- 1[.]37[.]35[.]128
- 1[.]7[.]247[.]0
- 1[.]6[.]0[.]0
- 1[.]44[.]0[.]0
- 1[.]11[.]32[.]0
- 1[.]51[.]32[.]0
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Sample IPv6 Addresses

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- 2001:250:2::
- 2001:218:2008::
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- 2001:250:1c00::
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- 2001:250:1001::
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- 2001:252::
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- 2001:2e8::
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- 2001:310::
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- 2001:2a8::
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- 2001:410:a002::
- 2001:410:a01c::
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- 2001:418:1439::
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