

Uber Solves IPv4 Exhaustion at Scale

Uber was founded in 2008 to provide a way to tap a button and hail a ride. Now, Uber is a household name and people took 14 million rides in 2019. Uber has 91 million customers and 3.9 million drivers. Bookings with Uber Eats, which addresses another massive market opportunity, grew 72 percent in 2019, and Uber continues to expand with on-demand freight and health transportation.

With Thunder CGN, the network team can control our own destiny.

– Jason Back
Head of Global Network Infrastructure
Uber



Uber

Industry | Technology



Network Solution
A10 Thunder CGN



Critical Issues

- Preserve IPv4 connectivity resources to ensure application operations with an operationally simple, scale-out solution



Results

- Mitigate exhaustion of private IPv4 addresses
- Simplify service creation and troubleshooting across DevOps teams
- Centrally configure and manage policies for large-scale network address translation
- Reduce costs with flexible consumption-based licensing
- Simplify IP address capacity planning for innovation with self-driving cars

Challenges

The magic of satisfying a French fry craving or getting a ride to work in the rain is powered by Uber's cloud. The company's rapid growth and expansion also means that Uber is consuming more of its IPv4 subnet for internal usage. Acquisitions of other companies can result in overlapping IP addressing schemes.

Making the most of finite IPv4 resources is critical, and large-scale network address translation (LSN) is the way forward.

"IPv4 addresses are exhausted," says Jason Black, head of global network infrastructure at Uber. "The secondary market for IP addresses isn't cheap, and we wouldn't be able to get as much address space as we needed anyway."

Black oversees global network infrastructure for Uber's services, including the advanced technology group, which is inventing self-driving cars. The global network infrastructure group is part of Uber Metal, which builds and manages its data centers, cloud services, and the automation software to manage it all. The data centers also support all business operations and logistics.

Uber has long used open source software for carrier-grade network address translation (CGNAT). But in the end, "free" software wasn't really free.

"Our different teams needed to touch the NAT software," says Black. "We had too many hands in the cookie jar." Operational costs and internal frustrations were mounting.



Selection Criteria

"We needed a better way to operate CGNAT for the long haul," says Black.

Black and his team set out to find the best-fit CGNAT solution to address IP address exhaustion. The company tested two leading solutions against three primary criteria.

"I was looking for three things: zero-touch provisioning, a good CLI, and not having to manage licensing features," says Black.

"We did a bakeoff in our lab in San Francisco, and both products had issues during the test," says Black. "But the A10 team was quick to provide a fix. The A10 account manager and systems engineer were in lockstep to make sure we got what we needed."

A10 Networks Thunder® Carrier Grade Networking (CGN) solution met Uber's criteria for a large-scale network address translation solution with zero-touch provisioning, automation hooks, simple licensing—and a trusted partnership.

Solution

Uber operates a hybrid multi-cloud, using a mix of on-premises infrastructure, private cloud services, and public cloud providers and data centers. Uber deployed Thunder CGN for large-scale network address translation in its Phoenix, AZ and Ashburn, VA data centers. There, Thunder CGN provides high-performance, always-on transparent network address and protocol translation to extend finite IPv4 addressing resources to support Uber’s applications and services.

Deployment of large-scale network address translation was methodically planned and executed. Thunder CGN fit neatly into Uber’s zero-touch provisioning mindset and automated tooling. A10 Networks’ open RESTful API and Thunder CGN’s powerful CLI provided full control and automation so Thunder CGN could be easily integrated into Uber’s Metal team processes. The team migrated the Phoenix data center to Thunder CGN first, moving traffic loads over several weeks. Once it knew the solution was successful, it did the same with the Ashburn data center.

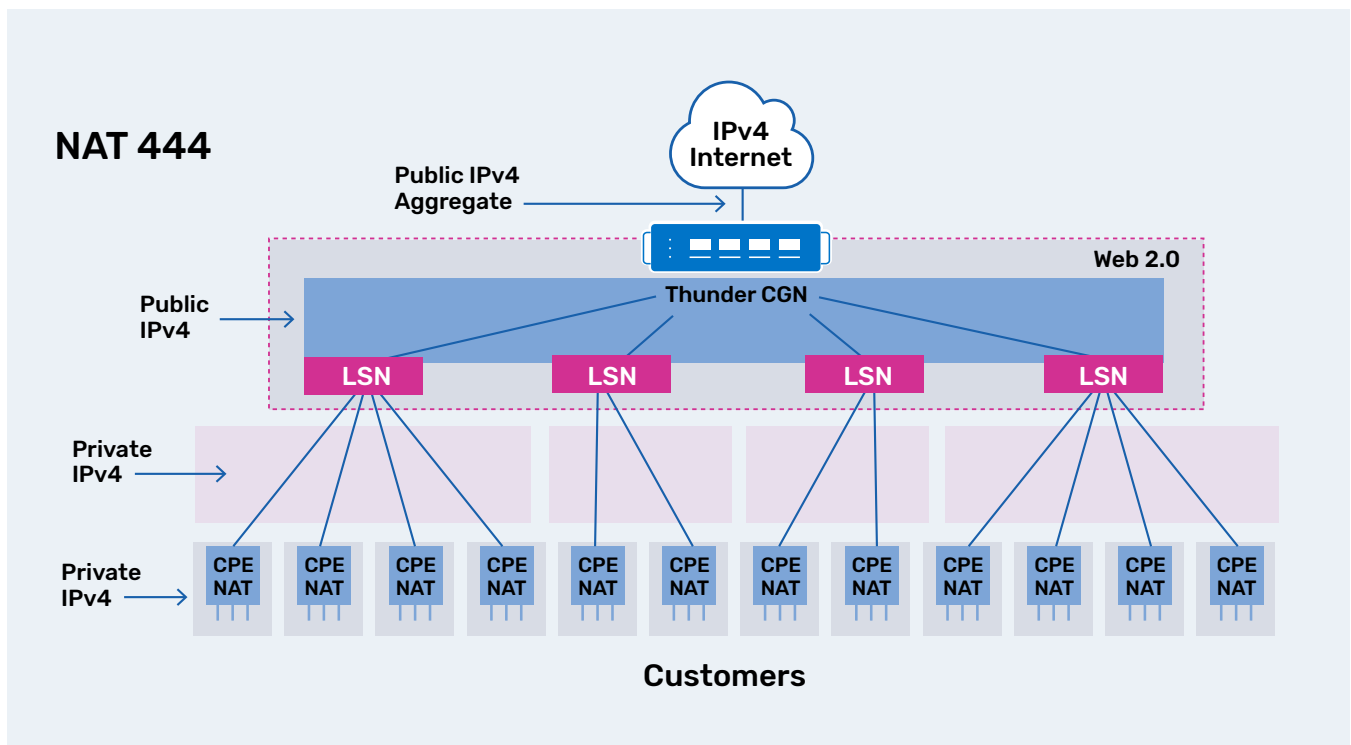


Figure 1: NAT 444/CGN - A Triple NAT (IPv4 to IPv4 to IPv4)



Results

With Thunder CGN managing network address and protocol translation, gone are the frustrations of different Uber Metal teams who previously had to touch the open-source CGNAT software. The network team can configure and manage network addressing policies across Uber's on-premises and cloud environments.

"With Thunder CGN, the infrastructure team can control our own destiny," says Black. "We don't have to scale across four different teams to manage the hosts."

"With Thunder CGN, we have a standard monitoring pipeline," says Black. Automated tooling manages and monitors network configurations and large-scale network address translation. That improves service reliability and operational efficiency, and it also simplifies capacity planning for future innovation.

"The ability to operate, maintain and monitor CGN services within the infrastructure team is especially beneficial when staff are on-call for after-hours support," says Black. "We can jump in quickly and mitigate outages in the network space."

Thunder CGN is built on A10 Networks' proven Advanced Core Operating System (ACOS®) to deliver advanced functionality with performance up to 385 Gbps. "We can scale faster and more easily with the A10 solution," says Black.

A10 Networks FlexPool® licensing was another must-have. With FlexPool, Uber has consumption flexibility to distribute CGN services wherever and whenever they are needed across its cloud. CGN services are dynamically allocated to ensure application availability and over-provisioning is eliminated to reduce unused resources. "With A10, we can make sure we're not over-licensed," says Black.

"A10 Thunder CGN delivers the most value for CGNAT products," says Black.



"We want to work together with our vendor partners to benefit both parties, so we can grow together," says Black. "For example, if we suggest doing a feature differently, A10 will ingest that feedback, and if it makes sense, will work on that feature to benefit us and other customers. Others benefit from the partnership we established, and that serves the community."

Success and Next Steps

Black has advice for other tech leaders when buying network solutions, including large-scale network address translation. The product itself is important, of course, but even more important is the partnership with the vendor.

"Make sure you have strong partnership from the vendor's engineering and support teams," says Black. "I've had great success with A10. In my experience, unless you have a partnership, it won't work out." The partnership is mutually beneficial.



About Uber

We ignite opportunity by setting the world in motion. Good things happen when people can move, whether across town or toward their dreams. Opportunities appear, open up, become reality. What started as a way to tap a button to get a ride has led to billions of moments of human connection as people around the world go all kinds of places in all kinds of ways with the help of our technology.

Uber



Find out how to manage
IPv4 exhaustion using CGNAT
IPv6 – Are We There Yet?

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A10 Networks (NYSE: ATEN) provides secure application services for on-premises, multi-cloud and edge-cloud environments at hyperscale. Our mission is to enable service providers and enterprises to deliver business-critical applications that are secure, available and efficient for multi-cloud transformation and 5G readiness. We deliver better business outcomes that support investment protection, new business models and help future-proof infrastructures, empowering our customers to provide the most secure and available digital experience. Founded in 2004, A10 Networks is based in San Jose, Calif. and serves customers globally.

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