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CEO Heficed [Vincentas Grinius]

IP Address Summary _

IPv4 Address Exhaustion

Many technology companies around the globe but particularly in North America, faced a considerable challenge in the summer of 2015. Mostly the larger technology companies it has to be said, but these included the likes of Microsoft, whose business rely on network connectivity and the supply of IP addresses, specifically 32-bit IPv4 addresses.

The move away from on-premise software platforms and the increasing migration to SaaS cloud solutions has only exacerbated this problem.

Since 1981, when a fledgling internet's governing body decided on the protocol of IPv4 as the addressing system, the American Registry for Internet Numbers (ARIN) has been distributing or llocating IP addresses to North American organisations. The other global registries have been doing the same in their respective global regions.

> "I wish we'd just bite the bullet and migrate to IPv6. I get really fed up with being asked for IPv4 addresses when we simply don't have any to allocate."
>
> **Senior Microsoft Engineer**
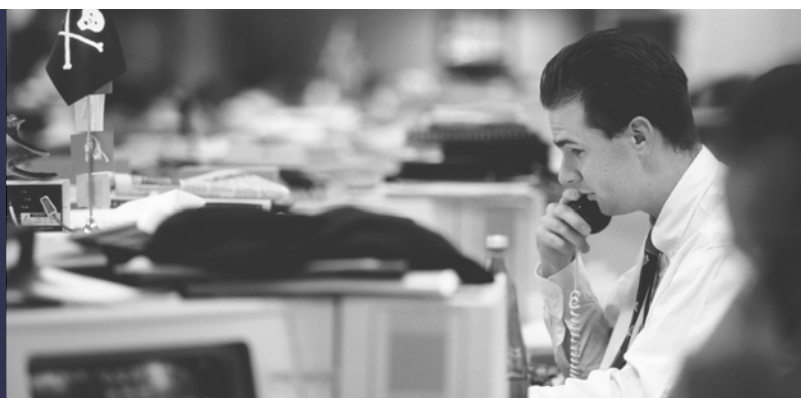
At inception, there were more than 4 billion IP addresses available for world distribution. One can hardly presume short-sightedness as no one envisaged the explosive growth the internet was about to undertake whereby every device connected to the internet, desktops, laptops, tablets, smartphones, printers and scanners and more would need an IP address.

Since the IPv4 inception, allocation of these addresses in considerable numbers to large organisations happened without attributing much thought as to any logical distribution formula.

According to The Wall Street Journal, Asia was the first region to run out of IP addresses, quickly followed by Europe and then North America fast on their heels. Incidentally, ARIN currently handles around 30% of the entire IP address register worldwide and this is not expected to reduce anytime soon.

So, a little like the anticipated oil crisis that'll hit the world one day, the technology world has already experienced its Armageddon, the IP shortage.

So how have some of these larger companies managed their IP drought? Well, two cases reported again by the Wall Street Journal were Salesforce and Microsoft.

Salesforce's expansion plans called for an absolute requirement for many more IP addresses for their growing data centres to deliver their B2B solutions. In 2014, they acquired just over 250 million IP addresses that gave them a mid-term relief. No mention of the price by WSJ but you can rest assured it wasn't cheap.

Microsoft spent $7.5 million in 2011 on around 670,000 IP addresses previously allocated to Nortel, a technology company that went into bankruptcy. The appointed receivers were savvy enough to recognise the asset value of Nortel's IP allocation and managed to get around $11 per address from Microsoft. (See IPv4 Price Movement table on Page 6)

As large technology companies planned their expansions, especially those with large numbers of business customers and others with consumercustomers, in particular, the telecoms companies, the 'CSuite' directors started asking their IT departments "what's the hold up".

Any company that was anticipating growth in its services, an increase in its customer base or expanded horizons was in trouble if they hadn't planned for their requirement for more IP addresses. Moreover, in most cases, they were talking of hundreds of thousands of addresses, not just hundreds.

Enter the answer to IPv4 exhaustion, the 128-bit IPv6 protocol. Great, but if it's the answer, why the delay in roll-out?

Fears With IPv6 Adoption

IPv6 has been readily available for over ten years, well before the crisis of IPv4 availability was even a consideration. Since last 1998 it's been around in draft form but as a standard was released only in July 2017.

Now that IPv6 has a standard; it's effectively a statement by the governing body that "it's time to migrate"! However, estimation is that there has only been around a 15% adoption rate.

If you are going to migrate, you need a plan. The new millennium came, and the IETF (Internet Engineering Task Force) were under no illusions that it would be non-viable to flick a switch and transform the Internet from IPv4 addressing to IPv6 overnight. So for some considerable time, the IETF devised and planned technologies and strategies in the hope of providing a staged and reliable transition to the new IPv6 addressing format.

Would you believe that the IETF had a plan in place to migrate the internet entirely over to IPv6 by 2011, and this plan reached out to all networks to render support for IPv6 transition and even insisted on mandatory governance?

For one reason or another, the plan lost traction and IPv4, and IPv6 continues to live alongside each other.

The reticence to part with IPv4 is palpable throughout the technology industry. True, the likes of Facebook embarked on a successful (and expensive) project to switch a few years ago as they realised the expansion of their data centres depended on moving away from IPv4. Facebook's success (and a seemingly bottomless pot of money) still hasn't convinced many companies to take this route and they continue to defer such a significant decision.

At some point, companies are going to have to consider IPv6. In the meantime, there are workarounds and monetisation opportunities for owners of IPv4 addresses (see Page 8, Heficed's Route To IPv4 Monetization).
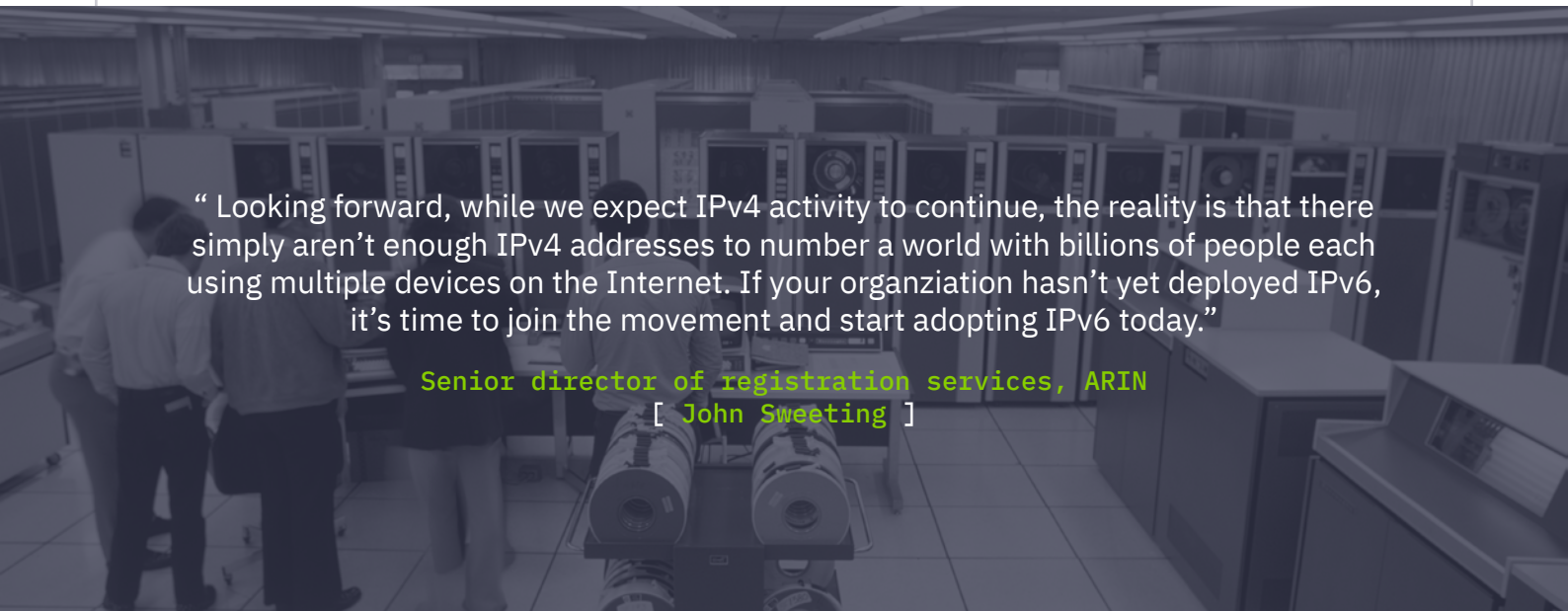
Any way you view this, it's a long term transition, and for IPv6 to coexist with IPv4 and also work within the current internet framework, engineers have had to come up with some ingenious methods to have the two protocols work alongside each other.

Compatibility does already exist within computer systems entailing a dual-stack configuration that will support both versions of the IP address versions.

Other interim techniques were designed by engineers to connect IPv6 networks with the global mass of IPv4 and include:

- IPv4-mapped IPv6 address.

- IPv6 tunnel.

- Automatic "6to4" mapping.

- Teredo (developed to use UDP to work on private networks hidden behind NAT devices).

Eventually, these creative entities will not be necessary as the whole of the web moves across to IPv6. However, and this is the dilemma, nobody has an inkling as to when this will be. It's not going to be any time soon, and in the meantime, as already stated, this provides opportunities for owners of IPv4 addresses.

" Looking forward, while we expect IPv4 activity to continue, the reality is that there simply aren't enough IPv4 addresses to number a world with billions of people each using multiple devices on the Internet. If your organziation hasn't yet deployed IPv6, it's time to join the movement and start adopting IPv6 today."

Senior director of registration services, ARIN
[John Sweeting]

Monetizing Your IP Assets _

Reasoning Behind IPv4 Valuations

Firstly, 'Peering Arrangement' disputes between networks carrying IPv6 traffic have been surfacing, showing that the implementation of IPv6 has found yet another hurdle to get over before full acceptance. The free peering agreements held between major networks for years with IPv4 has stumbled into issues. Where one network company refuses to peer with another for free or on terms they feel are unfair, you know this is not going to end well.

The big tier-one carriers are having their noses put out of place as smaller networks attempt to become tier-one providers for IPv6 and they're not very happy about it.

Organizations are refusing to peer with another for free or on terms they feel are wrong with the outcome that some parts of the world have far less resilience because a smaller number of companies are providing them with internet access.

Secondly, a report published in August 2018 by Qrator Labs, their researchers looked into each country's internet infrastructure and their ability to handle a loss of connectivity from one or more ISPs.

The results identify that IPv6 networks would seem to be less stable than IPv4 networks and mentions that in 86 per cent of countries, IPv6 is significantly less reliable than IPv4.

Why is all of this relevant to the monetization of IPv4 addresses? Well, it just confirms that the next-generation technology of IPv6, although not fatally flawed is a way off full adoption and IPv4 addresses are going to continue to be in significant demand.

By way of example, in 2017, the collapsed US retail store RadioShack auctioned off its 32,000 addresses in /24 and 20/ subnets raising around $410,000 ($12.50 to $13 per address).

In April of the same year, the respected MIT (Massachusetts Institute of Technology) announced it wanted to sell its vast/8 block of 16 million addresses to fund the expansion of its IPv6 network. That's like pocketing a check for $208,000,000.

The purchase of IPv4 addresses by the big technology companies such as Microsoft, Amazon and Google completely undermines the opposition of the RIR's to the sale of IPv4 addresses so this practice is going to continue unabated.

There have been various claims that the value of IPv4 addresses would eventually hit $100 each. We're a long way off as the price chart below shows but even our own CEO, Heficed's Vincentas Grinius has entered this conversation when he recently stated, "My discussion with industry experts have come to the conclusion that IPv4 addresses could rise to as much as $35 each in the foreseeable future".

Price per IP over Time for /16s

Data supplied by IPv4 Market Group
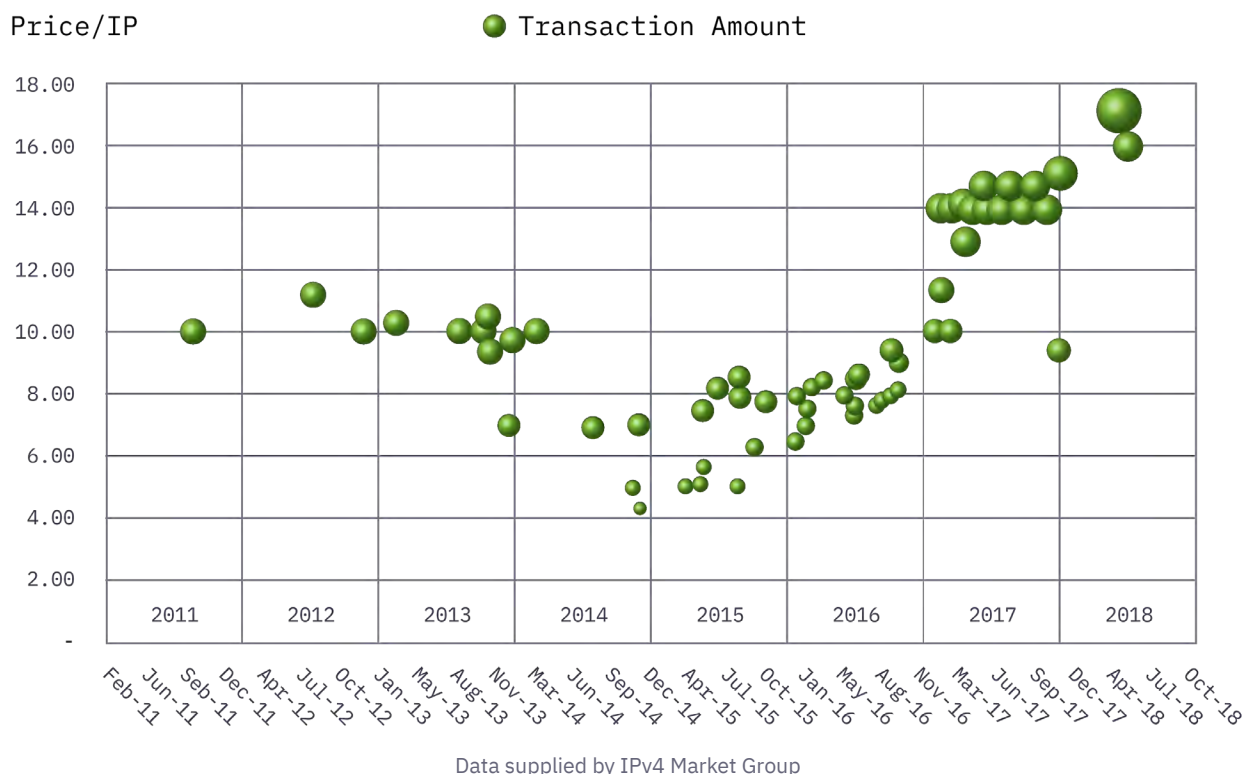
Big IP Users Equal Big IP Opportunities

Here's a brief look at just a few of the significant IP sectors.

Business Intelligence (BI) companies have an insatiable appetite for IP addresses, and there is no sign of this appetite diminishing anytime soon as more and more organizations become data-driven. Supporting these data-driven companies are organizations specializing in crawling, data scraping, finance support, data analytics and much more.

BI software makes the creation of value from big data possible and includes features and functionality that require the provision of large volumes of IP addresses. Such features and functionality will include:

- Dashboards
- Real-time Reporting
- Visualizations with Predictive Analytics
- ETL (Extract, Transform & Load) integrations
- OLAP (extremely powerful Online Analytical Processing)

Successful BI companies are on the shopping list of many of the most significant IT companies around the globe, and some of the eye-watering prices paid for these data acquisition specialists only lends weight to the importance of there being a continuation of supply of IP address.

- Salesforce purchases Tableau for $15.7 billion
- SAP invests $8 billion in adding Qualtrics into its group
- Google acquires Looker for 2.6 billion

There's nothing like a high profile breach of cyber security to send the World's tabloids and news channels into hyper-drive and the lawyers rubbing their hands together over the next class action.

Specialist Cyber Security companies and large IT companies such as IBM, Microsoft etc. will use many thousands of IP addresses for their constant Penetration Testing & Disaster Simulation Scenarios. The cyber threat is current and ongoing for the foreseeable future, a constant menace.

VPN companies need to provision IP addresses to their clients; indeed many VPN's use Heficed's dedicated servers and infrastructure and already utilize a percentage of Heficed's IP address bank of 500,000 addresses to fulfil their service and security obligations.

These are just a few of the sectors that Heficed already work within and the list is growing.

Current Issues With IP Address Brokering

The transfer brokering of IPv4 addresses isn't new. Indeed the first arrangement goes back to 2011 when a forward-thinking Sandra Brown in the US negotiated the sale of Nortel addresses to Microsoft.

While this is some years ago, the leasing of IPv4 addresses is still a major greenfield opportunity to the owners of unused IPv4 addresses.

The success of this first transaction inspired Sandra Brown to create what must be one of the first IP brokerages, IPv4 Market Group. Since its inception, they have used their network and contacts to provide a method of matching buyers to owners. However, note that this is the only service that these brokerages offer, and there is very little transparency.

Not long after, new brokerages appeared, and in common with most' supply and demand' markets, the sector became susceptible to scams and less than honest dealings. The whole IPv4 transfer market took on a somewhat 'sinister' identity and even today struggles to shake its 'shady' aura.

Without any cohesive process and any real blessings from the RIR's, gaining respectability in this field of expertise has been an uphill struggle. Heficed's management team have been well aware of this when it came to adding IPv4 services into our business model.

Heficed currently holds a bank of around 500,000 geolocated and reliable IP addresses, obtained via several successful SEO campaigns and subsequent recommendations. Not bad for a company whose core business has a stellar reputation for being a Cloud and VPS provider along with a very stable global Internet network.

So where do IPv4 addresses fit into Heficed's business expansion strategy? Well, we have big plans that will make the company unique within our sector, as we have combined an IP address management portal into a completely remodeled dashboard platform linking all of our current products.

Heficed's Route To IPv4 Monetization _

Heficed's vision is simple. To make the monetization of IP addresses both accessible and transparent to everyone, and incorporate the IP leasing function into a seamless IT and Network provisioning process that is both quick, and provides incredible flexibility in respect of scaling and affordable options.

In other words, to be a one-stop 'IT Construction Platform' that incorporates an IP Address Market.

When it comes to IT Services, competition is plentiful. IBM, Amazon, Azure etc. provide everything concerning IT services, but IP Address Centric they are not.

IP Address Brokerages are IP Address Centric obviously, but that's all they offer, and even then their services lack full transparency as their business model is dependent on personal networks and contacts.

Until now, there has been no IP Address Market available to both IP owners and users alike and, while Heficed's vision as previously mentioned was simple, realizing the IP Address Market as a fully featured product has involved investment in both dedication and resources.

To make this even possible, having strategic and global POPs (Points of Presence) is vital.

Heficed currently has seventeen premium infrastructure locations. Eight of these are owned directly in London, Los Angeles, Virginia, Chicago, Frankfurt, Sao Paulo, JoBerg and Hong Kong, with an additional nine partnered POPs strategically placed around the globe. Additionally, Heficed owned POPs in Milan, Tokyo, Singapore and Marseille are due to become operational in late 2019.

Organizations that are seeking a presence in another continent can do so utilizing the integrated platform that houses IP Address Market.

Heficed is already facilitating the growth of many US and UK companies into other continents with substantial growth in Ireland, Israel, Lithuania and Singapore.

An Integrated Platform – Seamless for IPv4 Owners & Users

Heficed can empower businesses and allow them to effortlessly scale worldwide with IP addresses, cloud servers and bare metal *all under one platform*. This makes Heficed's offering completely unique in the online world.

Ease of implementation was paramount in the design of the platform. Attaining all of this empowerment could not be simpler. Through the Heficed '**Terminal**', a simple but effective 'clients zone', the client can browse for IP addresses within each RIR and configure their geolocated cloud selection. IP Owners will be able to 'onboard' their IP addresses using '**Terminal**.'

Kronos Cloud – Bare Metal server with full KVM Virtualization. Efficiently manage, scale and run cloud servers with multiple IP addresses.
Proto Compute – Dedicated Hosting Solutions offering stable and secure shared-nothing architecture. Instantly configure and provision in minutes.
Heficed Connect – IP Transit and BGP Solutions. Direct connection via an IP Transit global network spanning the world.
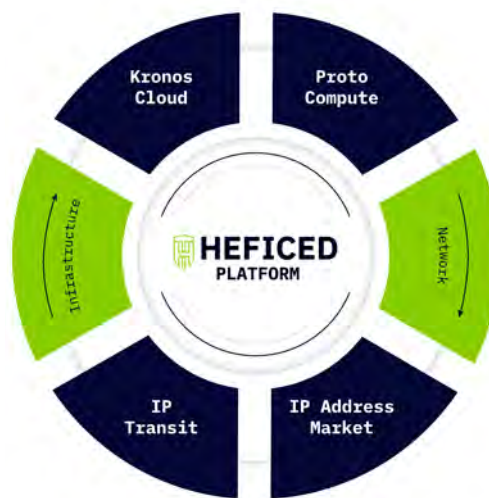**IP Address Market** – IP address solution facilitating IP address lease and management. IP space on a global infrastructure.

KRONOS CLOUD

Up to 2048 IP addresses, guaranteed free from Blacklisting. Intuitive controls with full root access and hourly billing.

PROTO COMPUTE

Proto Compute dedicated servers are suitable for a large private cloud, a full-stack application cluster, or disaster recovery site deployments. Everything is dedicated, nothing is shared.

HECIFED CONNECT

With a 99.9% uptime this is a Pay As You Go Service, providing an Optimal route table, access to Local IXP's and connectivity between PoPs.

IP ADDRESS MARKET

IP Address Market is IP refined of course but combines automation with self-service to all product offerings that allow a user to construct an IT platform that's region specific.

Policing IP Address Abuse _

'Visions' along with growth come with their inherent risks. Providing a unique IP Address Market platform comes with its own set of responsibilities. The management team at Heficed are fully aware of the burden of ensuring that IP addresses remain clean and available for service rests firmly on their shoulders.

A coherent and effective Abuse Management Process is essential to protect owners and users alike.

A guarantee of continuous service is a pre-requisite of most of Heficed's clients. These include:

- Internet Service Providers (ISPs)
- Telcos
- Email Service Providers (ESP)
- Business Intelligence Companies (BI)
- Hardware and software vendors
- Antivirus vendors
- Security vendors

BI and ESP's are two sectors that coincidentally have one of the highest risks of blacklisting and create the most significant challenges with the IP Address arena.

Of course, a known and essential methodology for operating computer networks, IP Address Management (IPAM), has been critical to the growth of the Internet and is fully endorsed by Heficed.

However, with so much at stake, the exploitation management of the IP addresses entrusted on our IP Address Market platform requires a dedicated team to handle and manage any threats to service continuity. For this purpose, we created our Anti-Abuse team.

The only way to ensure excellent deliverability and remove the risk of IP Address blacklisting is to 'police' the pre-registration process. Vetting is essential on all accounts before they go live on the Heficed IP Address platform.

As part of this process, we have introduced 'Know Your Customer' (KYC). Entity restrictions apply within the IP Address Market, personal accounts are not permitted and only registered businesses can participate in this part of the platform.

The team will verify all businesses as to their legitimacy. Full profile analysis is carried out. Due diligence on company ownership, shareholders, directors and registered office along with credit checking are an integral part of the KYC process.

Consistent blacklist monitoring of accounts once on the platform is also part of the dedicated ant-abuse management team's responsibilities. They will handle all compromised and abused accounts where possible without bothering the legitimate owner.

Using third-parties as part of the anti-spam and abuse process is essential, and Heficed is happy to use best-in-class partners to achieve this.

The Halon platform is just one such third-party partner used extensively by our engineers as part of Heficed's outbound spam protection environment. To avoid blacklisting of IP addresses, our technicians use Halon's active scripting language to create and tailor the logic to handle compromised accounts and abusive users.

Measured deliverability to external parties and deferred rate-limiting are just two of the excellent defense strategies used within the scripting that help us avoid blacklisting. For outbound email services, forwarding and even VPS (cloud) providers, this is vital.

Our active membership of the Messaging, Malware and Mobile Anti-Abuse Working Group (M3AAWG) augments our commitment to the security of protecting the IP addresses on our platform.

The M3AAWG, formed in 2004, is the largest industry association on the planet with over 200 members and is non-political and technology-neutral. It is the ideal platform for the online community to share and cooperate in developing technologies collectively to counter online exploitation, DoS attacks, spam, malware, viruses and botnets.

As a member, we contribute and receive best practice information to help fight online abuse. Additionally provided are updates on new technologies and their deployment, technical initiatives and their evaluations and access to leading field experts and senior technical advisors.

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Have a question or want to know more about
monetizing or leasing IPv4 Addresses? _

[https://www.heficed.com/contacts/]