
ICANN81 | AGM – How it Works: The Regional Internet Registries
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ULRICH WISSER:

Hello and welcome to How It Works, the Regional Internet Registries. My name is Ulrich Wisser and I'm the Participation Manager for this session. Please note that this session is being recorded and is governed by the ICANN Expected Standards of Behavior and the ICANN Community Anti-Harassment Policy. During this session, questions and comments will only be read aloud if submitted within the Q&A pod. If you would like to speak during the session, please raise your hand in the Zoom, even for the on-site participants. When called upon, virtual participants will be given permission to unmute in Zoom. On-site participants will use the physical microphone to speak. Please state your name for the record and speak at a reasonable pace. All are welcome to use the chat. Please note that private chats are only possible among panelists in the Zoom webinar format. Any message sent by the panelist or a standard attendee to another standard attendee will also be seen by the session host, co-host and other panelists. I will now hand the floor over to Adiel Akplogan.

ADIEL AKPLOGAN:

Thank you and welcome everyone to this session with the ASO. Without any protocol, I will give the floor back to German and Angela to take us through this session. Thank you.

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GERMAN VALDES:

Thank you, Adiel. Thank you to your office and your staff for allowing us this time to talk about the Regional Internet Registry. My name is German Valdes. I'm the Executive Secretary of the Number Resource Organization and I'm with Angela Dall'Ara, Policy Officer from RIPE NCC. Please have in mind that this is a very introductory topic and content. It's meant for newcomers to ICANN meetings, so apologies in advance if some of this information is very basic for you. And well, today we are going to talk about the second end of ICANN, the Internet Corporation for Assigned Names and Numbers. We are going to focus on the numbers part and with that, I'll start. We have an agenda that we have distributed in different sections: an overview of the Regional Internet Registry, or RIR, as we commonly name it; something about how we develop policy between and among the RIRs; a little bit of the description of what the resources that the RIRs administer; how we are involved in routing; and some noteworthy developments that have been happening in the last years, and some information about RIR services and tools that we are managing.

So the Regional Internet Registry manages the allocations, administration, and registration of Internet number resources in a specific region. That's the basic description of what an RIR does. We have five RIRs established currently. We have ARIN, established in 1997 in the US, they are based in Reston, Virginia. We have LACNIC, established in 2002, based in Montevideo, Uruguay. We have RIPE NCC, established in Amsterdam, started operations in 1992. We have APNIC, established in Brisbane, Australia, started operations in 1993. And the youngest of our brothers is AFRINIC, they are based in Port Louis, Mauritius.

The functions of the RIRs can be divided into three basic functions. First of all, as described before, we are managing and distributing the Internet number resources named IPv4, IPv6, the autonomous system number. I will explain a little more about those protocols later in my presentation. We maintain also a directory of the resources that we distribute, try to keep an accurate record of who is holding what resources, it's called WHOIS and all other similar databases. We have a routing registry as well. And also we provide reverse DNS, I will talk about that later on as well. And of course, we as part of the biggest ecosystem of the Internet, we support the Internet infrastructure in general, through technical coordination with other bodies. We also offer a platform for community discussion related to the distribution of Internet resources. And of course, we also invest a lot of resources in capacity building and training in the different regions.

It's always difficult to summarize the history in a single slide, but we focus only on the Internet number resource administration history. Well, it all started in the early 80s, maybe, before the Internet that we know. There was one person that administered and managed the domain names and the IP addresses. His name was Jon Postel. He may be considered the first manager of the IANA, a function that still happens inside the ICANN structure. And eventually, when the boom of the Internet started to happen, people in charge of those institutions realized that it was not possible to maintain that level of administration. So they started to have a series of creation of the organizations that could manage the Internet resources. InterNIC was an organization that was part of the Stanford Research Institute, which passed a contract to Network Solutions in 1991. Network Solutions

divided the services of domain names and number resources. And eventually, Network Solutions passed this contract to ICANN in 1998. Before the creation of ICANN, the process of creating the RIRs happened in a case-by-case situation. There were three RIRs that were created before ICANN. That was ARIN, RIPE NCC, and APNIC. And that's kind of the summary, the history of where we started all this process.

There is a very important concept that we manage in the world of IP address administration, which is the legacy space. The legacy space is that space of IP addresses that were allocated before the creation of RIRs. It was before the explosion of the Internet. And basically, organizations made requests with not many requirements. Jon Postel, the person I mentioned before, was kind of keeping this record of how these were distributed. And eventually, with the incorporations of the RIRs, certain rules started to apply, and certain policies needed to be fulfilled. And that's when all this legacy space started to be named that way. But still, the RIRs maintained that legacy space before their creation.

Something that the RIRs have in common is an RIR governance structure. One important aspect of the RIR life is they provide a platform for community discussions to develop the policy. So many of the policies are based on the community input. At the same time, the five RIRs depend on a national legal framework. As I mentioned before, all RIRs are established in different countries. They respond by law to the laws of those countries. And of course, they fulfill a specific function in the global Internet governance system. They have a technical reason of being, basically. Also, the five RIRs share the same characteristics. They

are independent organizations, not governmental bodies. They are not for profit. They are 100% funded by the community. They are membership-based. Membership is open for all types of organizations: Internet service providers, governments, corporations.

One important aspect of the characteristics of how the RIRs work is an open floor for participation in community discussions. The community participates in the policy process. They are open, transparent, and documented. We share a key value of the multi-stakeholder approach, where we allow participation of different sectors. The technical sector, private, government, civil society, or academia. All of them can participate on equal footing in policy discussions. You don't need to be a member of RIR to participate in policy discussions. We also provide remote participation tools, in case you cannot be on site during the RIR events, where we conduct part of the process of the policy. So, we are trying to give enough room for participation for different entities.

Each RIR manages a policy development process. They have similarities, they have some difference, but all of them are inclusive, bottom-up and transparent. The timeline also is different. But in any case, it requires a cycle of discussions, consensus and evaluation of implementation [and against review of the needs] of a new policy. Secretariats in each RIR also have an opportunity to be an input of the impact of an implementation of any policies in case there is a consideration of what's going to be impact of any implementation of a possible discussion, policy discussion that may happen.

Now, the RIRs are organized in conjunctions beneath an umbrella organization. It's named the Number Resource Organization. And the

three main reasons of the NRO is to provide and promote a coordinated internet number registry system, protect the general pool of internet number resources, being a channel to be a voice to promote the multi-stakeholder model and the bottom-up policy that we defend in many forums, and coordinate among the five RIRs in different activities, could be technical or could be political.

The NRO also offers different publications. We report about global statistics at quarterly basis. We have global stats on IPv4, IPv6. We have information about RPKI adoptions. That report, that information is updated daily. And we also have a comparative policy document that is also published every quarter comparing how the RIRs are managing policies in the different regions regarding specific resources.

Now, moving to where we fit in ICANN. The RIR fits as part of the support organizations. We are part of the Address Supporting Organization, the ASO. That doesn't preclude that RIR staff might participate in other advisory committees, could be the root server system or could be the SSAC, depends on the qualification and expertise of the RIR staff. But as organizational level, we are part of the ASO.

Now, as part of this participation with ICANN, the NRO signed an MOU with ICANN. We have a council named the NRO number council. The council is made of 15 members, three members from each RIR. Two are elected by the community and one is appointed by the RIR board. The term of office depends on the regions. Some are two years, others three. And they have, according to the MOU, they have three specific responsibilities, and we are very strict that they attach to those responsibilities.

The first one is to oversee and advise the ICANN board in the global policy development process, and I will talk more about that aspect of the global policy development process later on. Also, the ASO has the responsibility to appoint two members to the ICANN board, seat 9 and seat 10, and also appoint a representative to different bodies within the ICANN. A good example is the ICANN NomCom. They have a seat where the ASO sends a representative to the ICANN NomCom.

Now, I have talked about the regional policies that each RIR have a policy development process where it allows them to adopt the policies that will apply to distribution of internet number resources within a specific region. But also, we have a set of global policies where the ASO is responsible to oversee the process, and this global policy basically is the policies that IANA applies to the five RIRs. IANA has, in terms of distribution of internet numbers, five customers. Those are the five RIRs, and the rules and the policies that require IANA to distribute resources to the five RIRs are those global policies. Those global policies need to be discussed in the same text in each region in order to be adopted. Right now, we have policies about distribution of ASNs, IPv6, and also we have a global policy about how the IPv4 will be distributed in the last days of the existence of IPv4 pool in IANA. But in case that any global policy is required, the ASO will participate in that as part of the functions according to the MOU.

Now, going back to the very basic, well, the RIRs administer the internet protocol address as part of the Internet number resources that have been mentioned. The original protocol is IPv4 and we have also IPv6. Both protocols are distributed by the RIRs. And also, we have the

autonomous system numbers, which is a unique identifier for a set of IP networks under the administration of a single entity or a single operator. It allows the routing of the packets and the routing of the information across the internet. And it's one of the key numbers that any internet service provider or a big corporation requires in order to route their information and their packets to the internet. And that number needs to be unique and distributed by the regional internet registries.

An important distinction is the IP address are not domain names. We are not part of the domain name world. We focus on the IP address world, which is used to identify devices, computers. Each domain name has a match with a specific IP address. While the domain names can be related to trademarks or a brand, we don't enter to that part of the discussion or ICANN world. We keep our functions to the distribution and the accurate record of the distribution of these internet number resources.

How this distribution is made is basically an inverted tree, where in the top is ICANN IANA, who has the universal pool of internet number resources. According to the global policies are distributed to the five RIRs. And then according to each regional policies are distributed could be to an internet service provider or could be an end user and go on and on in that going to the bottom of the tree. An ISP can also distribute to another ISP customer or co-located to end customers. This is the way that it works. That's the distribution.

Now, talking about routing. As I mentioned, the routing depends on the data packets that are destined. Destination has a unique IP address and

the DNS work to translate domain name to IP address to allow that routing. The RIRs provide the inverse process. So, from IP address you can obtain a domain name. That's one of the services that the RIRs also provides, the reverse resolution.

By design, many aspects of the routing are not secure. Angela will talk more about how the RIRs are working to make the routing a little more secure as part of technical coordination and support to the internet infrastructure. Also, that's related to some of the aspects of the traditional way that we verify the routing information and through some of the databases named Internet Routing Registry. Also, the RIRs are involved in maintaining this information so people know what routing information is shared by different organizations.

The internet is the big cloud. It can be connected with different devices. We can have different networks. We can have mobile networks, a traditional copper or fiber network, or wireless and satellite networks. All of them are IP-based networks, all of the different network connected to a router system or internet backbone, and each of these backbones will require an autonomous system number that would allow the traffic of packets, and each of those devices will require a unique IP address that could be IPv4 or IPv6. And the RIRs works that all these devices have a unique identifier so all the routing works smoothly going from the source to the destination. Pass it to Angela now.

ANGELA DALL'ARA:

Thank you, Herman. So I'm Angela DALL'ARA, RIP NCC policy officer, and I would like to tell you a bit more of what is happening lately in the

world of regional internet registries. In 2011, the pool of available IPv4 addresses was exhausted and in that moment each RIR received the last slash 8. You saw that IP addresses are, I can say, a finite number of addresses, and that was the last pool that was distributed to the RIRs. From that moment, things were different. And nowadays, as you see, the RIRs that still have some IPv4 addresses in their pool are only AFRINIC and APNIC. All the other RIRs have exhausted the reserves of IPv4 addresses.

So over time, all the network operators had to think about moving to IPv6. The transition is still ongoing; it's not probably going as fast as everybody would wish to go, but we still see an increase in IPv6 adoption and traffic, and we see in the RIRs more operators asking for IPv6 addresses. There is still a high demand for IPv4. Unfortunately, we do not have in our pool for RIPE NCC, LACNIC, and ARIN, we do not have any more IPv4 addresses, so what we can do is only redistribute the addresses that we receive in return from some operators. And this leads to operators going to the IPv4 market to find IPv4 addresses. And also, for the few addresses that are available, we see some fraudulent requests, so operators pretending to have some needs or pretending to be eligible entities for IPv4 addresses, and they submit falsified business records, personal ID documents, etc. So you can understand that for us RIR, the task of validating these requests and verifying that the requesters are eligible to receive resources is getting more challenging.

Here we have some statistics. We see that in the latest years, the traffic of IPv6 is increasing, and very slowly we are going towards more traffic

in IPv6, but IPv4 is still predominant. And the most significant gains are interestingly seen in Asia-Pacific. So here you see how much space has each RIR allocated in IPv6. Keep in mind that the fact that the space has been allocated doesn't mean that it is used. This means that operators have a pool of IPv6 addresses, and they can implement IPv6 in their network, but let's say that these statistics do not mean that there is a correspondent deployment in reality in the networks. Again, here we can see how many members in percentage for each RIR have IPv6, and this is the latest situation recently seen. You can also imagine that the number of members for each RIR is different, so let's say everything is related to the total number of each RIR members.

So I was telling you that there is now a market for IPv4, and there are no IPv4 addresses available anymore, so operators started transferring IPv4 to each other, and also these IPv4 addresses got financial value over time. The choices for the RIRs were all to acknowledge the IPv4 market transfers through regional policies, so having a way to still have the registration of the rightful holders of IPv4 registered correctly in the WHOIS and in the internal registries, and to have new policies, to adapt policies in order to have this registration regulated correctly. Because the RIR's role is to ensure compliance with policies and to maintain the accuracy of the registry. It is one of our core functions. Still, the RIR is not aware, is not interested, is not involved in any financial transaction that goes on between parties when a transfer is happening.

You can see that the yearly transfers per RIR are very different. The highest numbers are in RIPE NCC. I assume this is because we have the oldest transfer policies, and our policies are a bit more flexible than in

other RIRs. So you can see that in other RIRs almost no transfers are happening, and here we are looking at intra-RIR transfers, so the transfers that are happening between operators that are registered, that are members of the same RIR, resources that are registered by the same RIR.

Instead of talking of inter-RIR IPv4 transfers, these are the transfers that are moving resources between different RIRs. There are policies that are reciprocal between different RIRs, but if you see, AFRINIC doesn't have any transfer, any intra-RIR transfer, because they do not have an intra-RIR transfer policy yet. And you can have a look at the numbers of the addresses transferred by the number of transfers.

So, which are the services and the tools that are offered to members and to the community by RIRs? You saw that we have a public directory service, it's also known as WHOIS or the database in general, and in those databases you find the resources, so the IPv4 and IPv6 addresses and the AS numbers, and the holders of those resources. This is to, also, the correct registration is to guarantee that addresses and AS numbers are uniquely assigned, because it's very important in routing not to have, let's say, the same IP addresses assigned to different devices. The look, the content of different databases is slightly different from each RIR but the information provided is more or less the same. And they are publicly accessible, so not only for members but everybody can access the WHOIS database without any constraint. So they are public information. They are providing information about the resources distributed by the RIRs but also about the resources distributed before RIRs existed. You can name them legacy resources. And in some RIRs,

they are also called historical resources. And you can find there the organization names and contact information, email addresses, phone numbers, and the original date of registration and the updates that have been done through the years.

Also, resources can be reassigned or reallocated by ISPs, and those ISPs are registering their assignments, so which prefixes they are assigning to their customers in these databases. And also you can find, for example, for all resources which is the RIR that is responsible for a certain block of resources.

We spoke about the WHOIS, so actually it is a protocol, and there is a development of this protocol, it's called RDAP, and the improvements that are being worked on developing this protocol are to provide a machine-readable way to have the output once the query is done to find information. There is also a big work done on internationalization so that different languages can be supported, and it is a bit more secure. Also, this protocol is providing information not only on internet resources in terms of numbers and AS numbers, but also on domains.

And then we have routing security tools, the latest development is RPKI, this is providing a certification of the holders of the resources and a certification of the announcements that these holders are making for their resources. So let's say that the previous systems, the LOAS and the authorization on the validation on the registry were less secure. In this case, we have a chain of trust that is providing a certificate for the resources themselves, so saying this resource is actually held by a certain operator or a certain legal entity, and that legal entity can

certify, can provide an authorization to a certain AS to announce their resources.

Another effort that the RIRs are doing is on the validation of the Internet Routing Registry. There are objects that are called, for example, maintainers for validating updates and creation of objects in the routing database, and this is an effort of, how can I say, promotion that RIRs are doing with their members in stimulating, in supporting the correct registration of resources in the WHOIS.

Talking a bit more about RPKI, it uses cryptography to create a certificate for certifying which is the holder of a certain resource, and holders can create ROAs, Root Origin Authorizations. Actually, they are creating in a repository, are creating a certificate of an authorization that is saying this AS number can announce my resources, and also is giving a maximum length. So it's saying if you find a more specific announcement than the maximum length in your routing table, I'm not allowing this, so please discard it. So there is a stronger validation of the routing announcement in BGP.

It is, how can I say, a different thing to create ROAs and to implement RPKI, because you can create ROAs for your resources, but then to implement RPKI you need to have a validator, so a software that is checking all the ROAs that the announcements are accompanied by, and to see what to do with those ROAs. If there is a valid root, you can accept it, and if you see an invalid root, it's up to you to decide with your validator what you want to do with that announcement. And this is, let's say, a work on RPKI that is done in collaboration with all the RIRs and the NRO.

Why is it important? Because we see very often hijacks of routes, and this is creating disruptions in the data traffic, and it is offering a better system for the security of BGP announcements to all operators. RPKI RIR adoptions, here you have some numbers, but again, this is related to the creation of ROAs. We do not know exactly which operators are actually implementing a validator and how they are implementing it. Then, as I said, the Internet Routing Registry is maintained by operators of networks, so you can find the RO objects that are actually saying which AS number is announcing a certain prefix. Let's say that the update of these objects is totally up to the operators, and this is an important part, an important aspect for maintaining correct information that other operators can find in the database. And here you have the websites of all the RIRs for more information, and if you have any questions, I think German and I are ready to hear from you.

GERMAN VALDES:

Thank you, Angela. Do we have questions online?

ULRICH WISSER:

So if anybody has any questions, please write your questions in the Q&A pod, and right now there's no questions. We have one question here online in the room.

POOJA NARANG:

Hello, my name is Pooja, and I'm from New Zealand. My question is, can an individual member become an RIR member, like individual, because

I've heard that the RIR members are either organizations or groups, but how does it work for individuals?

ANGELA DALL'ARA:

So you wanted to know if a natural person can become a member of an RIR. So, rules are different per RIR. I can say, for example, in RIPE NCC it is possible for natural persons to become members. The rules and the requirements are exactly the same for legal organizations, so let's say the documentation and that the possibilities to receive resources are exactly the same, but you have to refer to other RIRs for their regulation.

ABDALMONEM GALILA:

I am working for the Telecom Regulator of Egypt. The first question is related to: Are there any advice or any steps from RIRs to the local Internet registries or other ICBs in every country in order to go for the steps towards IPv6 adoption with a deadline? This is the first question. The second question is related to leasing IPs from different regions to the other one. Are there any regulations to handle all of this? As I think leasing IPs from one region to another one opens a black market or something that is not good for the market of IPs inside the country. Thank you.

ANGELA DALL'ARA:

So for the first question, if I understand correctly, you wanted to know which are the initiatives of RIRs to promote IPv6 deployment. All RIRs are offering trainings, are offering webinars, are offering also on their websites best practice documentation that are helping new entrants,

let's say new operators to deploy IPv6. And also, I must say that the amount of IP addresses, the size of allocations that are provided to new operators are pretty satisfactory. So there can be room, let's say, to test and implement IPv6 freely. So there is a very open mind from RIR towards IPv6. So if you need information, I think you can refer to all the training material on all RIRs. There is a lot offered there.

Concerning leasing, I think the first issue is to define leasing, because also in many communities there is discussion about when leasing is happening, and there is still not yet a definition. What is seen is a suballocation or a subassignment sometimes, but considering that RIRs are totally oblivious to the financial transactions that there are between their members and their customers, this is the difficulty. In some RIRs, leasing is specifically prohibited, and in other RIRs, suballocations are allowed. So in this sense, there are many policy proposals that have been discussed, but at the moment there is not a defined prohibition or allowance in policy, let's say. It is more regulated for what is concerning this suballocation and subassignments of resources.

ABDALMONEM GALILA:

Actually, suballocation is a workaround. It is not a solution for the sake of the customer. Actually, if there is suballocation, it means the prices will be high for this IP version for addresses, and of course the operator itself or ICBs will be happy to have more revenue. So I think it is a workaround rather than a solution in order to handle such need for the scarcity of IP version.

ANGELA DALL'ARA: I understand your point, but you know that the revenue part is not a concern of the RIR, so we do not ... If an ISP is assigning addresses to one of his customers, it actually can be seen as leasing for a certain period of time. So for the RIR point of view, it is difficult to distinguish what are the things.

ABDALOMENM GALILA: Yeah, last point for today. Is there any arrangement between the RIR and the local telecom regulator in order to handle such cases for the scarcity of IPv4 and encourage IPv6 for the local ISPs?

ANGELA DALL'ARA: Well, RIRs are implementing the policies defined by their regional communities. So actually, this is the agreement that is on paper to, let's say, regulate these kinds of cases. So for each regional community, there are the policies that are leading in these cases.

GERMAN VALDES: Just additional two comments. As I mentioned, the RIRs have a strong training and capacity building program. There is a lot of information that you can access online on each RIR website. It could be IPv6 deployment, DNS, BGP routing, and RPKI. So I extend an invitation to check the RIR website and check those courses that you can access in their academia or training sections. And also referring to the previous question from the lady, you are from New Zealand, right? And New Zealand is served by APNIC, and you can be part of it. As Angela said,

every RIR has different rules regarding memberships, but APNIC allows individuals to become members of APNIC.

SHAFIQ CHIA:

Good morning, everyone. Shafiq Chia from RIPE NCC, working from Dubai office. Just to reply to my friend, Abdalmonem. Thank you for your question. We do have an excellent relationship with governments and regulators, and we do coordinate with them. Next week, we have a government roundtable in Amman, Jordan to discuss and coordinate our common interests and how we can help operators in collaboration with regulators. Same thing, we do have other roundtables in Europe and in other service regions that RIPE NCC is serving. So yes, we have this collaboration. Yes, we are coordinating with the regulators to check the best practices, how we can help them, how we can support them without forcing operators or any other service providers to do whatever doesn't suit their businesses. Thank you.

GERMAN VALDES:

With that, I just want to thank you again, the CTO office, Adiel, Ullrich, for the time and the opportunity and the space to talk about the RIRs, how they work. And thank you all for spending your time here with us this morning. Thank you.

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