

AFRINIC-29: Taking the African Internet to the Next Level Through Policy, Collaboration and Education



AFRINIC-29 took place in Hammamet Tunisia, from 26 November to 30 November 2018. The meeting was organised by AFRINIC and generously hosted by ATI.

Over 254 people from 43 countries took part in training sessions, policy development discussions, plenary sessions, and networking events. Some key highlights of the event included discussions on policies guiding Internet number resource distribution in Africa, IPv6, Internet Governance, DNS and security. We would like to extend our heartfelt thanks to the sponsors: ATI, ICANN, Internet Society, and ZACR for the most valuable support.

The AFRINIC-29 agenda can be found here. Click here (<https://meeting.afrinic.net/afrinic-29/agenda/programme>) on

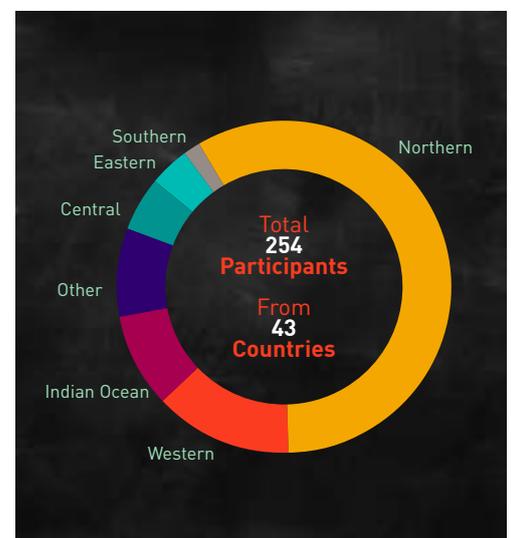
the Info section to see the presentation slides.

More information about Meeting statistics can be found here. (<https://meeting.afrinic.net/afrinic-29>)

The session recordings are available here. (<https://meeting.afrinic.net/afrinic-29/agenda/video-archive>)

The full Meeting report is available here

<https://meeting.afrinic.net/afrinic-29/images/022019-af29-meeting-report.pdf>



Dealing With Recent Routing Registry Changes

AFRINIC Internet Routing Registry

A database of routing policy information for networks both within and outside the AFRINIC region.



Presented at SAFNOG 4, Dar es Salaam, Tanzania.

AFRINIC CEO Alan Barrett gave an AFRINIC perspective on routing registries, paying particular attention to some recent changes made by the RIPE NCC, how they affect AFRINIC members, and some forthcoming changes to be made by AFRINIC.

A routing registry is a database where network operators can register information about their routing policies, and the routes that they plan to announce in BGP. There are tools that can use the registered routes and policies to create filters that can be used in configuring routers.

Several organisations maintain routing registries, which collectively form the Internet RoutingRegistry, or “IRR” system. Each of the five Regional Internet Registries maintains a routing registry, several large network operators maintain their own routing registries, and there are a few provider-independent routing

registries. Many of the routing registries mirror each other’s databases.

Different routing registries have different usage restrictions. The AFRINIC routing registry is open for use by holders of AFRINIC address space.

In AFRINIC’s case, the same underlying database is used for both WHOIS and the IRR, so there’s a mixture of information related to routing, and information related to address space allocation.

“route” and “route6” objects

Each “route” or “route6” object describes the linkage between an IPv4 or IPv6 prefix, and the autonomous system that plans to announce the prefix as a BGP route. Essentially, each route or route6 object says “This IPv4 or IPv6 prefix may be announced in BGP by this ASN.” There is also information about the organisation, contact persons or role accounts, and maintainers who are allowed to edit the object.

These are possibly the most critical objects for most operators. If you don’t register a route or route6 object, then your peers or upstream providers may configure their routers with filters that do not accept your prefix in BGP announcements.

“aut-num” objects

Each “aut-num” object describes an autonomous system or ASN. The objects include information about the organisation that the ASN has been assigned to, contact persons, and information about the ASN’s routing policy, such as which other ASNs they peer with, and how they filter routing announcements.

“inetnum” and “inet6num” objects

The inetnum and inet6num objects describe IPv4 or IPv6 prefixes. They may be prefixes that were allocated or assigned directly by an RIR, or more-specifics that were sub-allocated or assigned by a network operator.

3“mntner” objects

The “mntner” objects specify maintainers, who may create or make changes to other objects. Every object is linked to one or more maintainers, and every maintainer has one or more passwords or cryptographic keys that are used to authenticate updates.

About AFRINIC’s IRR

The AFRINIC routing registry is a free service, open to AFRINIC members, and to legacy resource holders in the AFRINIC region. It is mirrored by several other IRR operators, and it has never experienced anydown time.

The AFRINIC routing registry was launched in 2013. Prior to that, AFRINIC members were encouraged to use the RIPE routing registry, and more than 1000 AFRINIC members have created more than 48000 route and route6 objects in the RIPE IRR.

Since the AFRINIC routing registry was launched, we have encouraged AFRINIC members to use the AFRINIC IRR. We also help members to register or change their objects. We do this through initiatives such as tutorials, face to face consultations, one on one “bootcamps” conducted remotely, and assistance via email.

As of end of September, 32% of AFRINIC members are using AFRINIC’s IRR. That’s a big increase from 23% a month ago, and we’d like to increase it to 50% over the next 12 months.

What has changed in the RIPE IRR

In the past, the RIPE IRR was open to anybody, and it was possible for AFRINIC members to register route and route6 objects in the RIPE IRR. This was even encouraged, before AFRINIC’s IRR was created in 2013.

In 2017, the RIPE membership decided to close access to the RIPE database, and the change was implemented about a month ago, on 4 September 2018.

This means that it is no longer possible to register non-RIPE ASNs in the RIPE IRR, and it is no longer possible to register route or route6 objects for non-RIPE address space in the RIPE IRR. Any existing out of region objects will not be deleted, but the “source” attribute will be changed from “RIPE” to “RIPE-NONAUTH”, and it will not be possible to edit the objects.

How many AFRINIC members are affected?

More than 1000 AFRINIC members have registered more than 48000 route and route6 objects in the RIPE routing registry. All of these AFRINIC members will be affected eventually.

What is the impact on AFRINIC members? If you had routes with AFRINIC address space, registered in the RIPE IRR, then the change from “source: RIPE” to “source: RIPE-NONAUTH” may have affected you. Some operators create filters for their routers using information from the IRR, and the tools that they use to generate the filters might not recognise “source: RIPE-NONAUTH”.

What should you do?

If you still have route6 objects in the RIPE IRR, for AFRINIC address space, then you may be OK in the short term, but you will not be able to edit those objects, so you really should migrate them to another routing registry. Of course we encourage you to use the AFRINIC IRR, but you may choose one of the paid routing registries.

If your peers or upstream providers don’t accept objects from the AFRINIC IRR, then please ask them to start using it. The AFRINIC IRR supports the same query mechanism as other routing registries, and it’s mirrored by several other routing

registries, so it is a simple configuration change for organisations to query the AFRINIC IRR in addition to any other sources that they already use. You may ask the AFRINIC team for help by sending mail to irr@afnic.net.

If you are an upstream provider that uses the IRR to create filters, then please ensure that you are using the AFRINIC IRR along with any other IRR sources that you also use. To make things easier for your customers who might still have objects in the RIPE IRR with non-RIPE address space, you can configure your tools to accept “source: RIPE-NONAUTH”. We’d also like you to encourage your customers to use the AFRINIC IRR.

How to register in the AFRINIC IRR

The AFRINIC IRR is a free service for AFRINIC members, and also for holders of legacy address space in the AFRINIC region. Essentially, if you have IPv4 or IPv6 space that’s registered through AFRINIC, then you may use the AFRINIC IRR.

You can send updates to the database through a form linked to the WHOIS web client, or through an email robot. We have documentation on a web page, and we can help via email.

Current process

As of 24 September 2018, route and route6 objects in the AFRINIC IRR must be authorised by both the holder of the address space, and the holder of the ASN. We will remove the need for ASN authentication later this week, and I'll discuss that a little later, but now I'll describe the process as it is today.

In the simplest case, where the ASN and the address space are both associated with the same organisation — actually, with the same maintainer — then you simply send the route or route6 object to AFRINIC's database frontend, via email or web service, using a password or cryptographic key that is specified in the maintainer object.

If the ASN and the address space are associated with different organisations, then it's more complicated. This can easily happen when the address space is associated with a downstream customer of the ASN. Here, there's a dual authentication scheme, where the same objects have to be sent to AFRINIC twice, with different passwords associated with the two different maintainers. You send the objects with the first password, and they get kept in a holding space for a week waiting for the same objects to be sent again with the second password, and then the objects are moved from the holding space to the live database.

If the ASN is registered through an RIR other than AFRINIC, then almost the same dual authentication scheme can be used, but this time the second authentication is from AFRINIC hostmaster staff, and they will do so only after verifying that the ASN is registered under the same organisation

in the other RIR. If the organisations don't match then staff will not create the route object.

New process

New authorisation rules have been implemented. Based on discussion in AFRINIC's database working group, we have decided to remove the need for route or route6 objects to be authorised by the ASN holder. This matches common practice in other IRRs.

The route or route6 objects must still be authorised by the IPv4 or IPv6 address space holder. If you are the ASN, and the address space is allocated to your customer, then you may have to ask your customer to submit the route or route6 objects using their maintainer password. Alternatively, the address space holder may authorise the upstream provider to manage any route or route6 objects associated with their address space; they can do this by adding "mnt-routes" attributes to the inetnum or inet6num objects.

More difficult cases

When we say that route or route6 objects must be authorised by the holder of the address space, the underlying technical meaning is that the IPv4 or IPv6 prefix that is mentioned in the route or route6 object must exactly correspond to a prefix that is mentioned in an inetnum or inet6num object in the AFRINIC database, or must be more-specific, and the relevant maintainer must use their password or cryptographic key to add or edit the route object.

That's easily workable if the route is the same as the address block, or if the route is more-specific than the address block,

but there's a problem when the route is an aggregate that's less-specific than the address blocks inside the aggregate. We do not yet have a plan to deal with this.

How to get help

AFRINIC is ready to help you use the IRR, whether it's migrating objects from the RIPE IRR, updating existing objects, resetting a forgotten password, or any other issue.

IRR changes are discussed in our Database Working Group; you can subscribe through <https://lists.afrinic.net/>.

Please also see our IRR information page at <https://afrinic.net/en/services/afrinic-irr>, and the comprehensive guide linked from that page.

Assessing the current status of Internet Measurement in Africa



Internet use in Africa has recorded tremendous growth since the turn of the century with the penetration rate of 35.2% at the beginning of 2018 against the rest of the world's average of 58.4%. According to Cisco, the leading global company in the supply of networking equipment, Africa is one of the two regions — the other being middle-east — with the fastest growth in Internet traffic in the world and this is set to continue over the next half-decade. The increase in traffic across the continent is largely due to the widespread use of smartphones and the gradual migration of day-to-day services to online platforms. As smartphone use becomes ubiquitous, there is increased access to videos online, significant growth in average traffic per device, an increase in bandwidth-hungry applications, as well as the impact of 4G connections.

As the traffic volume increases, network

operators are faced with the vital task of ensuring that users access Internet service with a reasonable quality that is commensurate to the level of their subscriptions. There is also the need for regulators and civil society organisations to regularly monitor the Internet — albeit for different reasons — to ensure that users are provided with the services as per the service level agreement in the case of regulators, and to monitor surveillance, net neutrality, censorship, manipulation, etc., with regards to the civil society groups. There is also a number of users who are interested in knowing the quality of service (QoS) provided by the ISP or the Telecom operator providing them with the Internet service. Enterprise and institutional networks also try to ensure that the users of their networks are provided with a quality service to ensure smooth running of operations on these networks. The

need to understand the behavior of the Internet and its performance from the perspectives of these different entities in the Internet ecosystem prompted the need for a regular, precise, and longitudinal measurement of the Internet.

Internet measurement is vital in improving network design and provisioning by an operator and could also enable the operator to build new protocol/architecture or modify an existing one to suit a unique need of their network. Furthermore, an Internet measurement project could help a network operator and/or a regulator in accounting the quality of services provided to clients. Performance measurement could also provide insights necessary for network modelling and development of network services on the Internet. In order to have a good understanding of the needs of the African Internet community in terms of Internet measurement, AFRINIC is conducting a survey with the aim of capturing the state of Internet measurement platforms availability, capabilities, and challenges in Africa.

In its May 2017 report titled 'The Future of Jobs and Skills in Africa', the World Economic Forum identified the dearth of ICT skills in Africa and the need for Africa's educators to "design future-ready curricula that encourage critical thinking, creativity and emotional intelligence as well as accelerate acquisition of digital and STEM skills to match the way people will work and collaborate in the Fourth Industrial Revolution." To bridge the skills

gap, we aim to use the responses from the survey to guide AFRINIC in building an Internet measurement programme to train network operators, regulators, end users, and other stakeholders on the subject of Internet measurement. The survey seeks input from potential beneficiaries of the training programme. Responses from participants will help AFRINIC to understand the available measurement infrastructure on the continent as well as the gap in the infrastructure and skills that need to be filled.

In a remote presentation delivered at AFRINIC-29 meeting held in Hammamet Tunisia last November (from time 3:13:25 on the video here), I highlighted different aspects of the survey and what we plan to do with the outcome in addition to building a training programme. While respondents remain anonymous as no personal data or IP addresses will be collected, we intend to share the findings with the general public for the perusal of the different stakeholders in the Internet ecosystem. This will be achieved through journal publications, mailing lists, AFRINIC's website, presentations at Internet related fora, and through social media platforms.

The short survey is available in English and French. Responses are expected from myriad of sources including but not limited to Internet Service Providers, Internet Exchange Points, Cable Operators, Enterprise Networks, Academic Networks (NRENs), Content Delivery Networks, ccTLD/DNS operator, Telecom Operator, Regulator/Government Agency, Wireless Network Operator, Community Network, Civil Society groups, Academic Institutions, End-User (Home/Mobile Broadband), and other network operators and users.

Workshop on Internet Measurements at AFRINIC-29



The Research and Innovation department organised a full day workshop on Internet Measurements at AFRINIC-29, in Hammamet, Tunisia, in which 25 engineers and students from different African organisations and companies actively participated. The workshop was organised in two parts with a half day dedicated to presentations on previous and ongoing measurement research in Africa and the second half of the day was dedicated to tutorials on Measurement Lab and RIPE Atlas.

Roderick Fanou from CAIDA/UC San Diego, started by presenting his research work on the causes of Interdomain congestion in the African IXPs, paper which was previously published at ACM IMC 2017. The goal of this work is to investigate the prevalence, causes, and impact of congestion on the African IXP substrate. The study suggests the need for ISPs to carefully monitor the provision of their peering links, so as to avoid or quickly mitigate the occurrence of congestion. This presentation provided good insight on how congestion at an IXP can impact

performance.

The second presentation from Musab Isah (AFRINIC), provided some details on the forthcoming AFRINIC Internet Measurement awareness survey, which intends to capture the Internet measurements needs of the different stakeholders on the African Internet community. It will also help to understand the state of Internet measurement platform deployment, availability and challenges such as "retainability", bandwidth costs, etc. AFRINIC intends to launch the survey in the coming weeks and we expect network operators, regulators and end users to provide us their perspective. The end goal of the survey will be to redesign our platform distribution strategy, identify strategic partners/hosts and to develop the right training material to satisfy the needs of the community.

The third presentation was from Amreesh Phokeer (AFRINIC), on a recent research study that was done in collaboration with Research ICT Africa. The topic of the talk was about internet development in Africa

(from a latency perspective) and the state of content use, hosting and distribution on the continent. It investigates how local content (new websites) popular in different African countries are mostly hosted remotely (85%), either in Europe or the US. With the exception of South Africa, where 50% of websites surveyed in South Africa were locally hosted. It was found that remote hosting adds considerable delay to the RTT because of the use of international links, but we also found that in certain cases, locally hosted websites have high delay characteristics mainly because of circuitous routing.

Following the above research work presentations, Johan terBeest (RIPE NCC) introduced the RIPE Atlas platform and gave an overview of the latest features the RIPE Atlas team has been working on. A fourth version of probes are now available and the RIPE NCC will start to distribute them soon. The V4 probe would come without a USD disk, feature which will provide more stability and less failures. The RIPE NCC has also announced the launch of "VM Anchors" meaning that it would now be much easier to deploy Atlas anchors around Africa, as it would not be necessary to ship network equipment, should the hosts agree to offer VM capacity. From the backend side of things, the RIPE NCC is currently experimenting with the Google BigQuery platform.

After the above presentations, Georgio Bullen (Measurement-Lab) gave an introduction of the Measurement Lab (MLAB) platform from Google and how it can be leveraged to perform Open Internet Measurement. Google currently has 500+ servers in 130+ locations, which 32 servers in 9 locations in Africa. They explained the importance of such an open

platform and how they have proved to be useful to companies, data journalists, academics, researchers and policy makers over the years. Currently most tests are run from end-user devices, for e.g. to measure the full route from consumer to content, to get the throughput and latency between the client and an MLAB server. Measurement data is saved on Google cloud and can be retrieved using the Google BigQuery platform. Georgia encouraged participants to subscribe to the MLAB discuss Google group so as to be able to access the BigQuery platform.

We wrapped up the day by running two short tutorials on both RIPE Atlas (ping and traceroute) and MLAB (BigQuery commands). For more information about the workshop and to have details about future workshops, please subscribe to the measurement-wg mailing list:

<https://lists.afrinic.net/mailman/listinfo/measurement-wg>

Having trouble with IPv6 Projects? Engage us on AFRINIC's Helpdesk

AFRINIC's IPv6 deployment helpdesk offers free guidance on IPv6 projects.

Any organisation is welcome to make a request for support, share relevant experience and challenges while deploying IPv6 through the helpdesk. Follow this link: <https://vox.afrinic.net/343185?lang=en> (for English) or <https://vox.afrinic.net/343185?lang=fr> (for French).

This initiative is part of AFRINIC's IPv6 Deployment Support Program that provides continuous support to IPv6 Training provided to Network Engineers and Managers. We extend an invitation to IPv6 task forces to share their IPv6 experiences.

A series of webinars addressing specific IPv6 deployment issues and recurrent

themes that come up during AFRINIC's helpdesk sessions are organised on a regular basis.

We look forward to receive your application.



Become AFRINIC's Certi:6 Delivery Partner in your Country

Become a delivery partner for AFRINIC's Certi:6 examinations. This exam attests and formally certifies that a candidate has technical knowledge and competence in the major domains of IPv6 networking. It presupposes deeper technical knowledge, skills, and abilities in IPv4 networking practices and will validate all the major aspects and domains of knowledge and practice in IPv6.

As our partner, your organization will be responsible for conducting the AFRINIC Examinations targeting Network Engineers around the African region. As such, you will be recognized as an AFRINIC Partner and you will reap the benefits associated to the course and in return:

- Help engineers earn globally recognized IPv6 certification
- Offer discounted IPv6 certification
- Increase the value of your Internet event (training, conference, seminar) by offering onsite IPv6 certification
- Generate revenue for your organization to help with your capacity building initiatives.

Delivery Partners are not limited to but may fall under the following types of organizations, including;

- IT Training academies
- Training Units of ccTLD authorities
- IT Regulators
- Network Operator Groups (NOGs)
- IT event organizers
- Higher Educational Institutions

As a pre-requisite, your organization should be able to provide for a distraction-free room.

If you are interested in becoming our delivery partner, please fill in and submit the MoU Template which can be download from the AFRINIC Certi:6 Website: <https://certi6.io/en/>

We look forward to our future collaboration.



AFRINIC Calls for 2019 Training Workshops Hosts

Following interest expressed from several parties for hosting an AFRINIC IPv6 and INRM Training, a series of AFRINIC face-to-face training workshops will be on offer in 2019.

In the 2017-2018 period, AFRINIC was able to train over 700 engineers and managers in workshops held in 21 countries in Africa. This was with the support of

various stakeholders in the AFRINIC Community. These trainings covered the knowledge and skills of Internet Number Resources Management (INRM) and IPv6 Planning and Deployment.

The AFRINIC IPv6 and INRM Training Program has over the past years trained over 5000 engineers from the African region from 44 countries.

AFRINIC Represented at Events October - December 2018

AFRINIC had a members booth at AFRINIC-29 held in Hammamet Tunisia from 26 November to 30 November. AFRINIC addressed members in Tunisia as well as prospective ones on their queries on membership and internet resources allocation.

SAFNOG 5

AFRINIC was a gold sponsor at SdNOG-5 that took place from 30 September to 4 October 2018 in Khartoum Sudan. AFRINIC attended the event to meet with its members as well as prospective members and gave presentations on AFRINIC Updates and AFRINIC IRR. SdNOG is a non-profit group that provide an open forum to be used by any interested member from the Internet Community in Sudan to exchange technical information and expertise in networking.

