NRO

Continuing Cooperation
The NRO and Internet Governance

The Annual Update from the
Internet Number Community

ABOUT THE NRO

The Number Resource Organization (NRO) is the coordinating body for the five Regional Internet Registries (RIRs) that manage the distribution of Internet number resources, including IPv4 and IPv6 addresses, and Autonomous System (AS) numbers.

NRO MISSION

To actively contribute to an open, stable, and secure Internet by:

» *Providing and promoting a coordinated Internet number registry system*

» *Being an authoritative voice on the multistakeholder model and bottom-up policy process in Internet governance*

» *Coordinating and supporting joint activities of the RIRs*

GLOBAL COORDINATION AND THE REGIONAL INTERNET REGISTRIES

The fundamental operation of the Internet, and the services it provides, relies on the combined efforts of several key organizations within the Internet ecosystem. Among these organizations are the world's five RIRs, which work collaboratively with the countless stakeholders who depend on the Internet's secure, robust, and scalable infrastructure. The essential building blocks for this infrastructure include IP addresses and AS numbers, collectively known as Internet number resources.

The RIRs are responsible for the regional management of Internet number resources. Together, the RIRs formed the NRO to serve as a coordinating body, providing global industry partners with a single point of contact. Each RIR community manages Internet number resources according to established, bottom-up, community-developed technical and operational policies, and works with the other RIR communities on policies that require global coordination.

ARIN, serving Canada, many Caribbean and North Atlantic Islands, and the United States

RIPE NCC, serving Europe, the Middle East, and parts of Central Asia
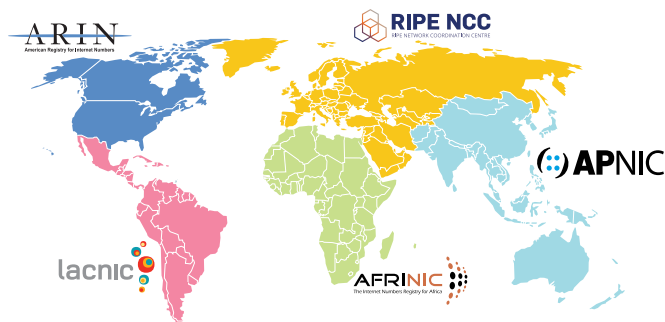
LACNIC, serving Latin America and the Caribbean

AFRINIC, serving Africa and the Indian Ocean

APNIC, serving the Asia Pacific region

ABOUT THE RIRS

Each RIR is a not-for-profit, member-based organization governed by open and transparent processes developed by the community in a bottom-up manner. The five RIRs and the regions they cover are:

» AFRINIC – Africa and the Indian Ocean

» APNIC – Asia and Oceania

» ARIN – Canada, United States, and parts of the Caribbean

» LACNIC – Latin America and parts of the Caribbean

» RIPE NCC – Europe, the Middle East, and parts of Central Asia

The larger community includes Internet Service Providers (ISPs), network engineers, governments, regulators, educational institutions, and other groups and individuals interested in IP networking.

Each RIR maintains a publicly-accessible, region-specific Whois database which contains information about organizations that hold Internet number resources. These databases show the organizations that hold the resources, where the allocations were made, and contact details for their networks. These databases are critical to network operators and serve an important function for all stakeholders, including law enforcement agencies (LEAs).

Since Internet number resources are considered a public resource, they are never "owned" by any one organization. Instead, RIRs charge service fees for the registration and administration of Internet number resources, or membership fees that cover access to all the registration services, including:

» Registering Internet number resources (IPv4 addresses, IPv6 addresses, and AS numbers)

» Managing reverse Domain Name System (DNS) resolution

» Providing a public Whois database service · Maintaining Internet Routing Registry information · Providing public forums for Internet policy development
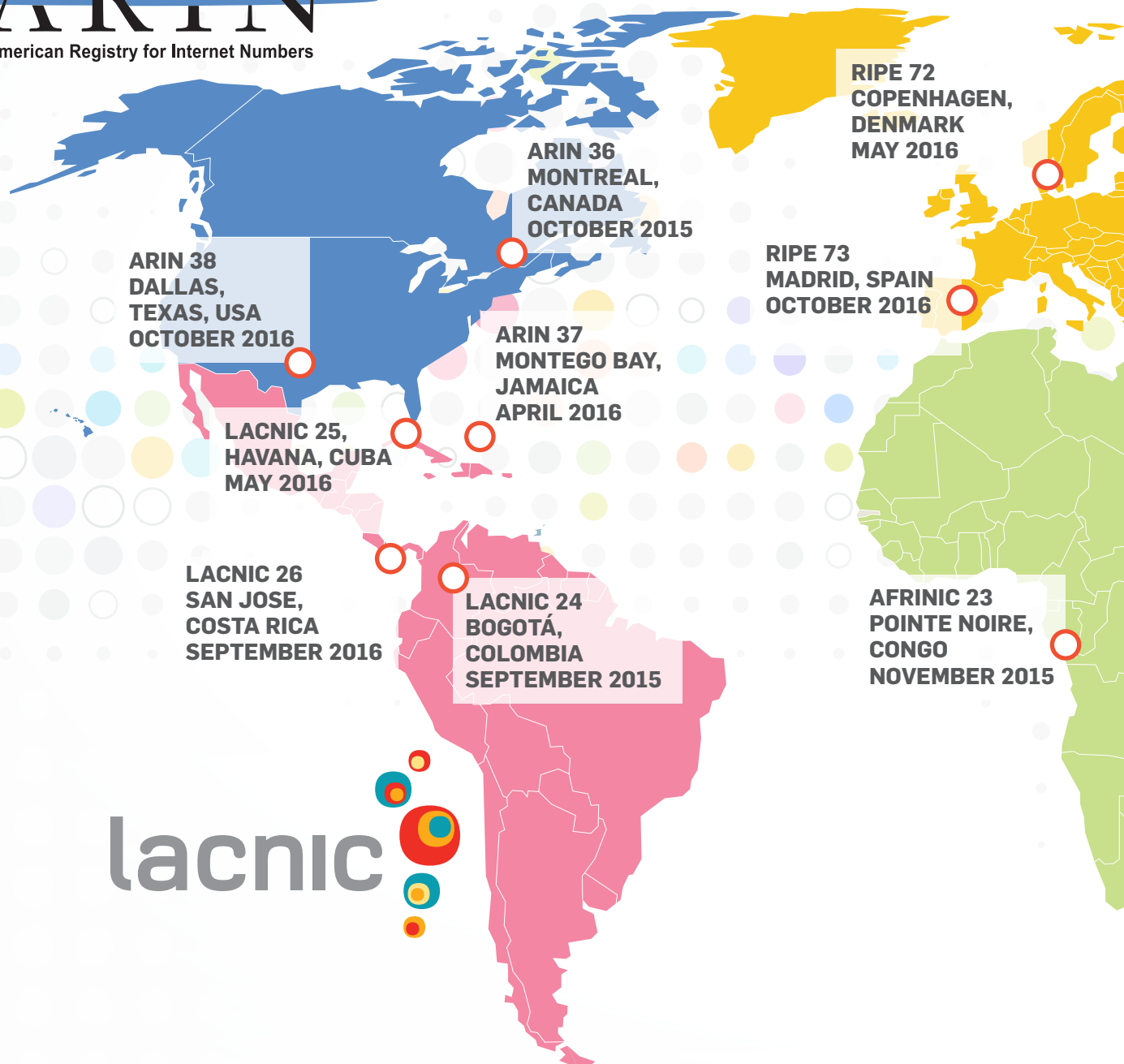

INFORMING THE COMMUNITY

Open, Transparent Policy Development

Every year, thousands of people participate in regular open policy meetings organized by the five RIRs in diverse locations around the globe.

The RIRs host meetings throughout their regions, providing the opportunity for all community members to attend in person. Remote participation technologies enable those who cannot attend in person to contribute to these events and follow discussions in real time.

Connecting Our Community

The following are major RIR meetings held around the world in 2015 and 2016. Each RIR also facilitates many other regional and sub-regional meetings for its stakeholders throughout the year.

ARIN
American Registry for Internet Numbers

ARIN 36
MONTREAL,
CANADA
OCTOBER 2015

RIPE 72
COPENHAGEN,
DENMARK
MAY 2016

ARIN 38
DALLAS,
TEXAS, USA
OCTOBER 2016

RIPE 73
MADRID, SPAIN
OCTOBER 2016

ARIN 37
MONTEGO BAY,
JAMAICA
APRIL 2016

LACNIC 25,
HAVANA, CUBA
MAY 2016

LACNIC 26
SAN JOSE,
COSTA RICA
SEPTEMBER 2016

LACNIC 24
BOGOTÁ,
COLOMBIA
SEPTEMBER 2015

AFRINIC 23
POINTE NOIRE,
CONGO
NOVEMBER 2015

lacnic

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

**RIPE 71
BUCHAREST,
ROMANIA
NOVEMBER 2015**

**APNIC 42
COLOMBO,
SRI LANKA
SEPTEMBER/
OCTOBER 2016**

APNIC

**AFRINIC 25
FLIC EN FLAC,
MAURITIUS
NOVEMBER 2016**

**AFRINIC 24
GABORONE,
BOTSWANA
JUNE 2016**

**APNIC 40
JAKARTA,
INDONESIA
SEPTEMBER 2015**

AFRINIC
The Internet Numbers Registry for Africa

**APNIC 41
AUCKLAND,
NEW ZEALAND
FEBRUARY 2016**

CONTINUING COOPERATION: THE NRO AND INTERNET GOVERNANCE

THE IANA STEWARDSHIP TRANSITION

On 1 October 2016, the US Government ended its oversight role and transferred stewardship of the Internet Assigned Numbers Authority (IANA) functions to the global multistake-holder community. This represented the final step of a transition process that began in early 2014. The Internet Number Community was heavily involved as a key stakeholder throughout this entire process and developed its own plan for the number-related IANA functions.

For these number-related functions, US Government oversight was replaced by a Service Level Agreement (SLA) with IANA that was signed by the five RIRs. A community-selected IANA Numbering Services Review Committee will advise the NRO Executive Council when it periodically reviews the services the Internet Number Community receives from IANA.

SAFEGUARDING THE OPEN AND INCLUSIVE INTERNET

The goal of the Internet Number Community's IANA Stewardship Transition proposal is to ensure that the Internet remains open, inclusive, and collaborative, and that its infrastructure continues to be scalable and secure. For more details about the proposal, next steps, and timelines, please visit:

www.nro.net/nro-and-internet-governance/iana-oversight

WSIS+10: A DECADE OF ENHANCED COOPERATION

From the World Summit on the Information Society (WSIS) processes in 2005, consensus arose that Internet governance should reflect the "multistakeholder" nature of the Internet.

"Enhanced Cooperation" defined an over-arching strategy for the development of new and innovative forms of multistakeholder governance.

Ten years after the original WSIS events, the RIRs contributed to a review of the outcomes and achievements over the last decade together with Internet technical community partners, governments and inter-governmental organizations, law enforcement agencies (LEAs), and civil society representatives. RIR representatives were actively involved in the WSIS+10 events throughout 2014 and 2015, culminating in the WSIS+10 United Nations High Level Meeting in December 2015. To learn more, visit http://unpan3.un.org/wsis10/

The NRO has been an active supporter of the WSIS process since 2005

THE FUTURE OF INTERNET GOVERNANCE

One of the outcomes of the original WSIS process was a mandate to establish the Internet Governance Forum (IGF) in order to allow "organizations responsible for essential tasks associated with the Internet to contribute to an environment that facilitates this development of public policy principles." The NRO is a key contributor to the IGF and supports this open forum for the exchange of ideas from a diverse group of stakeholders. The NRO has contributed to the IGF during the last ten years in many ways:

EXPERTISE

The NRO routinely sends experts to participate in forum proceedings, where they provide commentary, conduct sessions, give presentations, and answer questions. Senior RIR staff members have served on the IGF Multistakeholder Advisory Group (MAG) since its inception. Currently, German Valdez, Executive Secretary of the NRO, serves as a MAG member.

FUNDING

Over the years, the RIRs and the NRO have made financial contributions to the IGF, while encouraging all stakeholders to contribute to the financial stability of the IGF.

ENGAGING TO ENHANCE COOPERATION

Each RIR engages with governments and multinational forums in their respective regions to address the needs and questions of those representatives.

Activities such as RIR-organized government roundtable meetings and dedicated working groups provide government representatives and regulators with vital insights, facilitating the exchange of knowledge and views on the issues surrounding Internet number resources.

INTERNATIONAL TELECOMMUNICATIONS UNION (ITU)

All five RIRs participate in ITU proceedings, and four are Sector Members of either the Standardization or Development sectors. They provide technical guidance on address management issues facing Member States and the Internet at large. NRO representatives actively engage with ITU forums such as WSIS, the World Telecommunication Policy Forum (WTPF), the World Telecommunication Development Conference (WTDC), and the ITU Plenipotentiary Conference.

Several RIRs are also working with the ITU on programs to build technical capacity in the developing world, including regional and national initiatives to develop IPv6 skills and expertise.

THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

To inform its development of Internet policy, the OECD formalized the crucial advisory role of the technical community as the Internet Technical Advisory Committee (ITAC). The NRO is a founding member of this group, and it continues to actively engage with the OECD.

REGIONAL INTERGOVERNMENTAL FORUMS

In addition to participation at the global IGFs, RIR participants represent their communities and the Internet technical community at many national and regional IGF events, such as the African IGF, Arab IGF, the Asia Pacific IGF, the Latin American and Caribbean IGF, IGF-USA, and EuroDIG.

Asia-Pacific Economic Cooperation (APEC)

APNIC is a Guest Member of the APEC Telecommunications and Information Working Group (APEC TEL). To assist APEC members in the transition to IPv6, APNIC supported the group's activities by facilitating the organization of IPv6 workshops and contributing to the IPv6 Guidelines produced by APEC TEL.

Inter-American Telecommunication Commission (CITEL)

ARIN and LACNIC are Associate Members of CITEL, a forum for governments and the private sector to coordinate regional efforts relating to the global Information Society. Both RIRs have been active participants in this forum since 2005.

Caribbean Association of National Telecommunications Organizations (CANTO)

ARIN and LACNIC have both participated in CANTO's Annual Conference and Trade Exhibitions, including the most recent one in Miami in August 2016. These meetings bring together telecom companies and government representatives from numerous economies throughout the region.

Telecommunications Technical Commission of Central America (COMTELCA)

LACNIC has been an associate member and an active contributor to this relevant forum for Central America countries since 2014.

African Conference of Ministers in Charge of Communication and Information Technologies

AFRINIC has been appointed as an Observer to the African Union (AU) Conference of Ministers in Charge of Communication and Information Technologies (CITMC).

European Conference of Postal and Telecommunications Administrations (CEPT)

RIPE NCC has participated as an official observer in the CEPT's Committee for ITU Policy (Com-ITU) since 2012, helping to inform the position of Member States from the region going into ITU events and participating in discussions.

PROTECTING CRITICAL INTERNET RESOURCES

IPv4 and IPv6 addresses as well as AS numbers are critical components of the Internet's operational infrastructure. The Internet community created the RIRs to protect and administer these resources.

In order for the Internet to function correctly, it is vital for Internet number resources to be managed efficiently. The management and distribution of Internet number resources are guided by the following principles:

» Conservation
» Aggregation
» Registration

Internet number resources are managed according to community-defined technical and operational policies that safeguard the efficient use of these finite resources (conservation), minimize the impact on the routing of data (aggregation), and ensure that networks receive unique IP addresses (registration).

SUPPORTING THE ROOT NAME SERVER SYSTEM

Root name servers are a vital part of the Internet: they are the first step in translating domain names into the IP addresses that are used in communication between Internet hosts.

Globally, there are 13 root name servers, supported by hundreds of root server instances. These instances improve network reliability and response times for users, and are an important factor in maintaining a robust and secure Internet.

The RIRs support the deployment of root name server instances, particularly in developing economies, through funding and technical support.

MAP OF RIR - OPERATED OR SUPPORTED ROOT NAME SERVER INSTANCES
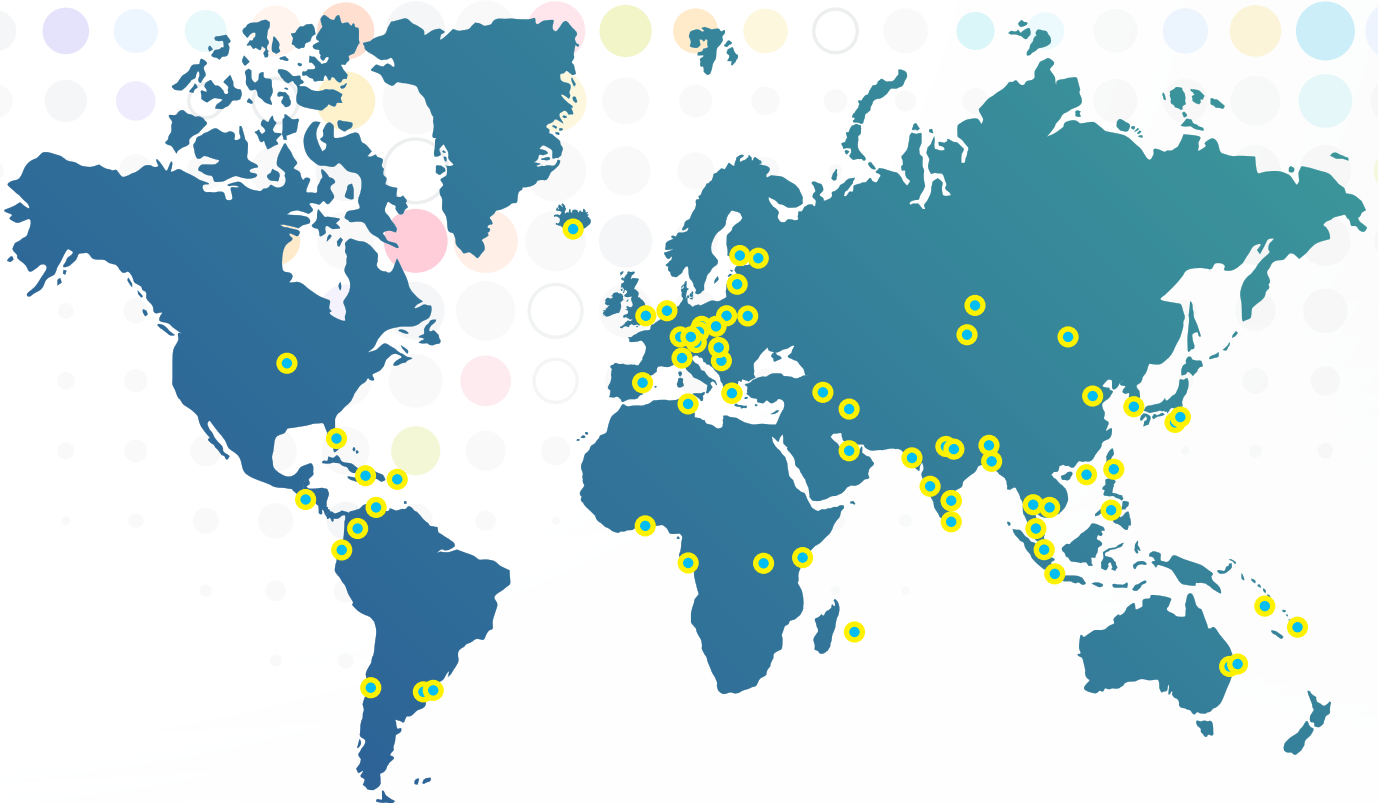
For more information about root name servers, please see *root-servers.org*

NETWORK SECURITY

The RIRs work closely with their communities to develop and incorporate technologies to ensure the security of the infrastructure of the Internet.

DNSSEC

Domain Name System Security Extensions (DNSSEC) is an upgrade to the Domain Name System (DNS), the system that translates a domain name to an IP address. DNSSEC provides DNS data integrity and authentication through the use of cryptographic digital signatures. All RIRs have deployed DNSSEC over their reverse DNS delegations to add more layers of security from the root zone to the final domain name.

COOPERATION WITH LAW ENFORCEMENT

The RIRs' relationships with law enforcement agencies (LEAs) ensure widespread awareness of the registry system and facilitate access to crucial public network data. By working proactively with various LEAs and related groups, the RIRs aim to create a better understanding of how the Internet registry system works, and what law enforcement can achieve using the public resource registration data. In addition to communicating directly with specific regional agencies, several RIRs now host regular events dedicated to discussing law enforcement issues as they relate to Internet addressing.

RESOURCE CERTIFICATION (RPKI)

Internet resource certification, also known as RPKI, is a system based on Public Key Infrastructure (PKI) principles that uses digital certificates to prove that a specific Internet number resource has been officially assigned or allocated by an RIR. All five RIRs have deployed this system, which ensures that registration information is current and accurate, and can contribute to securing Internet routing.
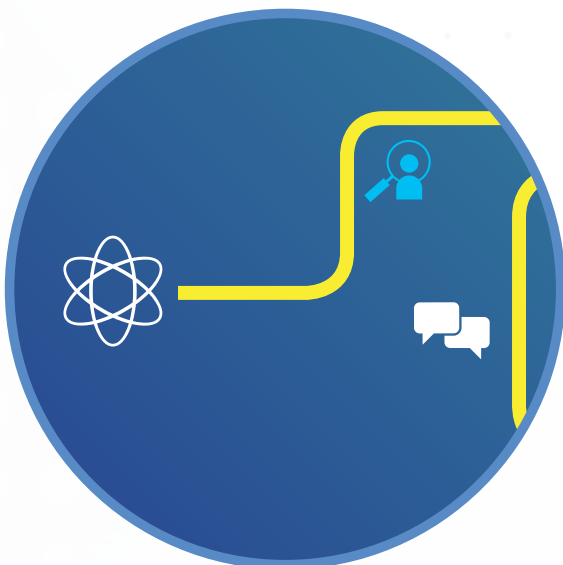
TRAINING AND CAPACITY BUILDING

The RIRs strongly support the growth and development of the Internet by conducting training programs around the world.

The goal of all RIR training programs is to help all stakeholders get the most out of their network infrastructure and conform to global best practices. The RIRs provide training on topics relating to IPv6, IXPs, security, RPKI, the regional registry system, Internet number resource policy development, wireless networks, and network management.

RIR TRAINING ACTIVITIES 2014 - 2015			
	FACE-TO-FACE COURSES	LOCATIONS	ONLINE COURSES/ WEBINARS	TOTAL NUMBER OF PARTICIPANTS
AFRINIC	25	25	N/A	876
APNIC	80	27	147	2,363
ARIN	9	9	N/A	475
LACNIC	18	12	7	4,160
RIPE NCC	114	37	40	3,322
TOTAL	250	97	174	8,528

BRIDGING THE DIGITAL DIVIDE

The RIRs play an active role in outreach projects around the world, connecting with under-represented sectors of their communities through funding grants, awards, networking, speaking engagements, trade shows, and capacity-building opportunities.

THE SEED ALLIANCE

The Seed Alliance is a joint initiative of the FRIDA, ISIF Asia, and FIRE programs (see below). Since 2012, AFRINIC, APNIC, LACNIC, the International Development Research Centre (IDRC) and the Swedish National Development Agency SIDA, have jointly created a space to identify and build communities of practice, scale-up existing relevant initiatives, provide better visibility for their respective partners and projects, and promote networking and mentoring among project groups. *www.seedalliance.net*

FIRE Africa

AFRINIC runs the Fund for Internet Research and Education, a grants and awards program aimed at encouraging and supporting the development of Internet-related solutions to ICT needs in Africa. *www.fireafrica.org*

FRIDA

LACNIC runs the Regional Fund for Digital Innovation in Latin America program, a grants and awards program for projects and initiatives that contribute significantly to the use of the Internet as a catalyst for change in Latin America and the Caribbean. *www.programafrida.net*

ISIF Asia

APNIC runs the Information Society Innovation Fund, a grants and awards program for Internet development initiatives in the Asia Pacific. *www.isif.asia*

RACI

Through funded attendance at RIPE Meetings and publication of their Internet research, the RIPE Academic Cooperation Initiative (RACI) promotes the work of researchers and academics in the RIPE NCC service region to the wider Internet community and encourages collaboration between both communities. *www.ripe.net/participate/ripe/raci*

REGIONAL OPERATORS' GROUPS

The RIRs support regional groups that provide advanced Internet technical training and discussions:

» Middle East Network Operators' Group (MENOG), *www.menog.net*

» Eurasia Network Operators' Group (ENOG), *www.enog.org*

» Caribbean Network Operators' Group (CaribNOG), *www.caribnog.org*

» North American Network Operators Group (NANOG), *www.nanog.org*

» Latin American and Caribbean Network Operators Group (LACNOG), *www.lacnog.org*

» African Network Operator Group (AfNOG), *www.afnog.org*

» In the Asia Pacific region, APNIC actively supports and participates in many NOGs, including SANOG (*www.sanog.org*), PacNOG (*www.pacnog.org*), AusNOG (*www.ausnog.net*), NZNOG (*www.nznog.org*), btNOG (*www.nog.bt*), bd-NOG (*www.bdnog.org*), MYNOG (*www.mynog.org*), IDNOG (*www.idnog.or.id*), JANOG (*www.janog.gr.jp*), CNNOG (*cnnog.org.cn*), HKNOG (*www.hknog.net*) and MyanmarING (Myanmar Internet and Networking Group)

CARIBBEAN ICT ROADSHOW

ARIN and LACNIC support the Caribbean Telecommunications Union Information and Communications Technology Roadshow, aimed at advancing the economic and social development in that region. *www.ctu.int*

SOUTH EAST EUROPE REGIONAL MEETINGS

The RIPE NCC supports Regional Meetings specific to South East Europe, to facilitate knowledge sharing and to encourage regional cooperation.

www.ripe.net/participate/meetings/regional-meetings

ACCESS FOR EVERYONE

The RIRs constantly strive to improve the openness and accessibility of their meetings and documentation:

» Many meetings are accessible via remote participation tools, such as webcast, social media, and online chat, while real-time stenography and simultaneous translation help to bridge both geographic distance and language differences

» Each of the RIRs offers various fellowships to attend regional and international meetings and forums

» Key documents are often translated into local languages to maximize their reach into regional communities

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