Abstract

India is the most recent of the nations in Asia to begin operating a National Internet Registry (NIR), named IRINN; and it is likely that other NIRs will be set up soon. We also believe that the sponsoring organisations of new NIRs will be Government-related, and will be involved with internal regulation.

As members who receive allocations of resources from an NIR cannot receive allocations from APNIC as well, it may be important for new NIRs to encourage LIRs to shift their primary membership from APNIC. We look at a number of policy choices that can be made to achieve this.

We make no recommendations as to which, if any, is the best option to pursue; this paper is a preliminary review. We use the example of IRINN only as a current example to help illustrate the issues.

Policy Options for Encouraging Membership of an NIR

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1 Formation of new National Internet Registries

India launched a new National Internet Registry (NIR) following the successful conclusion of talks with APNIC, in March 2012. This was widely reported, both officially [4] and in local media [5].

It is quite likely that other countries will also establish NIRs in the near future; that these NIRs will be primarily related to the national Governments; and that national objectives and regulations will be drivers in their policy formulations.

Although ISPs utilise the bulk of IP addresses, end-user enterprises also often request direct allocation from an RIR or NIR. The main advantage to such enterprises is that these addresses do not change if the enterprise switches its upstream ISP. As such, these enterprises are also stakeholders in the RIR to NIR delegation. There are technical and financial costs associated with such allocations, which discourage all but the largest of enterprises to become members.

2 Current Global Registry Structure

There is substantial background literature explaining the current structure and its operation (*eg* [6]), but these are *post facto*, descriptive representations, and not usually normative.

The current hierarchy for assignment and management of IP addresses, ASNs, and similar numbers is typically depicted as in Figure 1 (from [3]). Note that not all levels (NIR, LIR) may be present in a Region. It is also common for EUs to be direct members of an RIR. This is just one example of the difficulty, even by a RIR, to document existing processes.

The above system is stable and has grown internally *via* self–regulation, mostly driven by its users through an open membership structure. Though members do not typically have equal voting rights, policies are developed openly and transparently, and usually by consensus. Disagreements have centred mostly on alternative technical solutions to issues.

It should be noted that each RIR acknowledges the value of Policies adopted by the others, and attempts are made to, subject to local concerns, align both regulations and implementations across the RIR structure. This is important, as it minimizes the incentive for members to shop for an RIR with better rules.

RIRs conduct training within their region, to disseminate Best Practices, provide technical up-gradation for Operators, and encourage members to better utilise services. Outreach activities, and assistance to and cooperation with other policy bodies are also conducted.

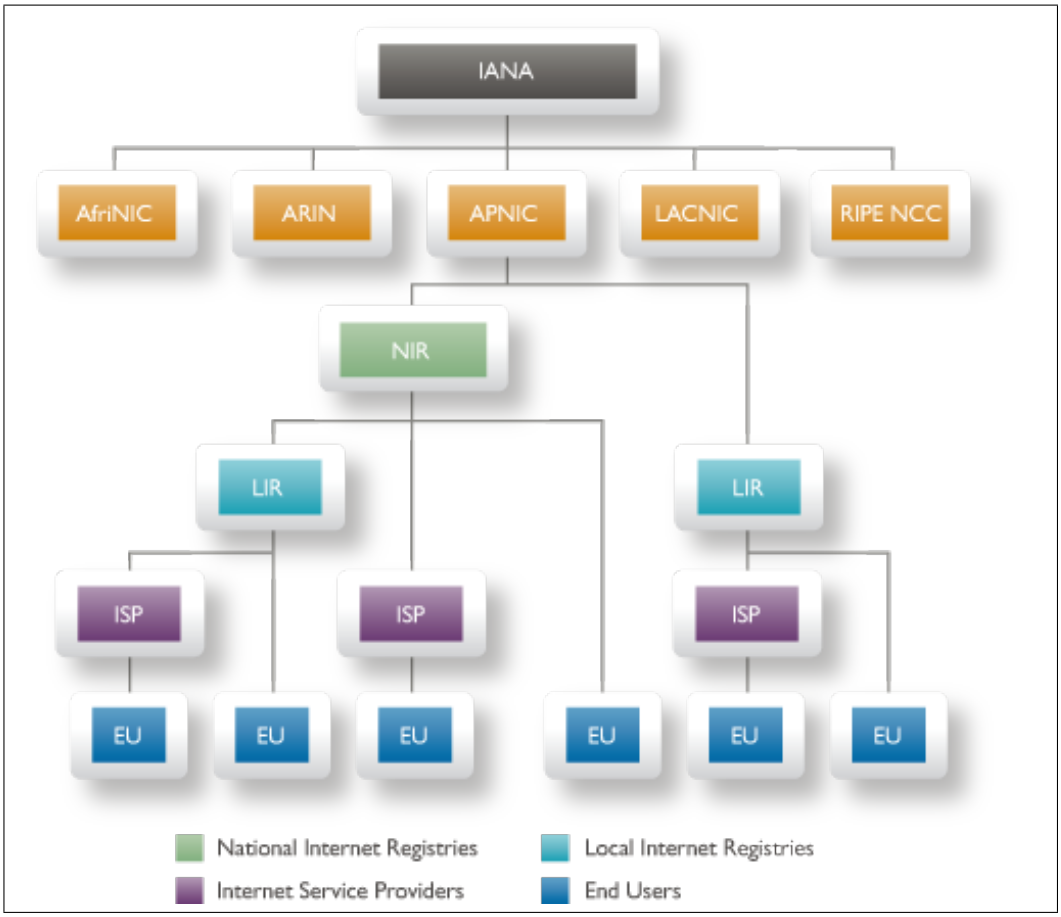

Figure 1: Current typical hierarchy of RIRs. IANA is delegated authority to be at the root of this tree by ICANN.

Another focus of the RIRs, perhaps the most visble and discussed, is to operate the actual Registries, which document assignments and operational delegations. These are publicly exposed *via* the whois interface, and are an important resource. They were originally meant for Network Operators to be able to contact each other during outages, and have also been used by law enforcement. The correctness and availability of this resource is seen as critical.

3 Problem Area

It should be noted that RIRs are not set up to compete with each other, or meet membership targets. Newly created NIRs may however be under pressure to show growth and membership acceptance, and hence may need to encourage membership.

We now examine options that NIRs may pursue to grow membership rapidly. The list below is not exhaustive, but meant to demarcate the broad areas in policy choices.

4 Policy Choices to encourage membership

Although it is possible for an LIR to be a member of both the NIR and APNIC, it may receive resources only through one Registry. To be effective, an NIR should therefore encourage local LIRs to consider their NIR membership to be primary, and transfer resource allocations from APNIC to it.

We postulate four possible alternatives:

1. An NIR could continue to follow all applicable APNIC policies and guidelines, including resource allocation. The effect of this would be to lower slightly the transaction overheads of ISPs and end-user Enterprises in the country.
2. The NIR could implement its own Policies, which may differ substantially from APNIC. However, Members would still retain the right to apply either to it or to APNIC. It would be in the interest of Members to choose their jurisdictions such as to advantage them. This option seems little different from Option 1. It should be noted that APNIC seems to think that this is what the new model will be (see Paul Wilson in [4]).
3. An NIR could effectively lower resource allocation costs by *not* charging members tiered pricing, but by paying for a very large allocation, and sharing costs proportionally. This would advantage smaller ISPs, and most end-users, but raise slightly pricing for larger ISPs, which may wish to continue with allocations from APNIC. The cheaper pricing is due to non-linear model that APNIC uses.
4. An NIR, going beyond Option 2, could place regulatory restrictions on local LIRs such as to forbid them to approach APNIC directly. This would require legislation, and Governmental approval. It is not clear how it would impact its relationship with APNIC.

4.1 Policy Choice 1: Follow APNIC policies

We draw attention to APNIC's *NIR Operational Policies* [2]:

> 3.1: As members of APNIC and of the Asia Pacific Internet community, NIRs are required to fully implement all applicable APNIC address management policies. As NIRs, they also take responsibility for ensuring policy compliance with respect to all Internet resources which are under their management.

In this scenario, an NIR would not be able to substantially modify policies and rules, including those for allocation of Internet Resources, from those from APNIC. In effect, the NIR would act as a local coordination branch of APNIC. The main benefits would be slightly lower transaction costs for local members, and perhaps the removal of exchange risks for annual payments. Other benefits would include a reduction in telecommunication costs and the efficiency gain of being in the same time zone, as well as reduction of language barriers.

4.2 Policy Choice 2: Differing policies, no restriction on LIR affiliation

If the NIR was to implement a different set of rules in the allocation and management of its Resources, the question raised is how to prevent jurisdiction shopping. Existing members of APNIC, and prospective members of both APNIC and the NIR, would look at the two differing, possibly substantially, set of policies, and decide which Registry they wish to associate with. In the worst case, this could lead to members playing off the Registries, not only *vis-a-vis* their policies, but interpretations thereto. To some extent, this already happens between RIRs (see Section 2 above).

We draw attention to APNIC's *NIR Criteria* [1]:

> 2.5 Choice of registry by ISPs: ISPs in the service region of an NIR are not bound to use the services of that NIR, and may choose to join and request resources from APNIC. APNIC and each NIR must cooperate fully in facilitating the free choice by ISPs of their preferred Internet registry. However, an ISP may receive resources from only one registry at any one time.

See also the *NIR Operational Policies* cited above, which state, *inter alia*:

> It should be noted that APNIC cannot delegate to an NIR sole responsibility for managing all address space within its country or economy. APNIC must remain able to accept direct membership from any organisation in the Asia Pacific region, both to promote maximum Internet routability and to meet its obligations as an open membership organisation.

It should be noted that ISPs (and LIRs) can receive Resources from either APNIC directly, or the NIR, but not both. Unless NIR policies are sufficiently member–friendly, members may not be willing to shift their affiliation to it.

4.3 Policy Choice 3: Offer lower resource pricing by splitting large allocations from APNIC

APNIC has a tiered pricing structure for its fees,[1] such that the marginal cost of having an additional /24 allocation drops sharply. This discourages requests for small allocations. The actual formula used for IPv4 is:

$$Fee = 1180 \times 1.3^{(log_2(Addresses)-8)} \quad (1)$$

It will be seen by inspection that *doubling* the allocation will increase costs by 30%. As such, the larger a member's allocation, the lower its *marginal* cost per address resource, and hence its *average* cost.

We show in Table 1 the average cost of a single /24, depending on how large an APNIC member's resource allocation is.

An obvious policy for members would be to create pools or special–purpose vehicles, and use these entities to manage APNIC membership. For example, two medium–sized ISPs with an individual /17 would each pay $7400, but if they asked for an equivalent /16 and divided it equally between themselves, they would each have to pay only $4800. The reason this is not common is likely to be three–fold:

1. Resource costs and APNIC fees are a small part of operating expenses
2. The natural members of such a cartel would also be natural competitors of each other
3. APNIC membership in ones own name has prestige value

However, the NIR could effectively provide such a 'pool', and request a large allocation from APNIC. This would provide a clear commercial reason for smaller ISPs and end–users to use NIR membership to lower costs. Larger ISPs would still continue to use APNIC, both because they are likely to have operations outside the NIR's geographical area, as well as because they have large (and hence economical) allocations.

Allocation	IPv4	Fees	/24s	Average per /24
/24	256	1180.00	1	1180.00
/23	512	1534.00	2	767.00
/22	1024	1994.20	4	498.55
/21	2048	2592.46	8	324.06
/20	4096	3370.20	16	210.64
/19	8192	4381.26	32	136.91
/18	16384	5695.63	64	88.99
/17	32768	7404.33	128	57.85
/16	65536	9625.62	256	37.60

Table 1: Average cost of /24 address block

[1] All APNIC pricing and fees are in Australian Dollars

Even after correcting for the 190% premium charged by APNIC on NIR and confederation holdings, the cost of resources would be cheaper for members if they were able to affiliate through an NIR.

We believe that, at least in the short term, this would be the easiest method to encourage NIR membership.

4.4 Policy Choice 4: Regulatory Restrictions on LIRs being APNIC members

If an NIR can arrange to mandate, through Government Regulations, that all local LIRs MUST (in the RFC sense) become members, these members would lose access to future allocations from APNIC.[2] The NIR could then ostensibly give members the choice of approaching APNIC, while reminding them of Government restrictions. This would allow the NIR to be in compliance with APNIC rules, and plead helplessness on the legislative framework.

It is likely that this would be an "ideal" framework, from the point of view of a Government-linked NIR.

5 Conclusions

We stress again that although we are presenting at the Policy-SIG, we offer no policy recommendations. Each NIR is different, in its own way. The four choices offered above are in no way comprehensive, or mutually exclusive.

We strongly welcome review and criticism of this paper, and would be grateful for any corrections and suggestions for further investigation of the problem area.

References

[1] APNIC. NIR Criteria. https://www.apnic.net/policy/nir-criteria/text., December 2002.

[2] APNIC. NIR operational policies. https://www.apnic.net/policy/operational-policies-nirs/text, August 2008.

[3] APNIC. Understanding address management hierarchy. https://www.apnic.net/services/manage-resources/address-management-objectives/management-hierarchy, December 2009.

[2] One possible way would be that ISP licences would be available for NIR members only

[4] APNIC. NIXI to run new NIR in India. https://www.apnic.net/publications/news/2012/nir-india, March 2012.

[5] INFOWEEK. India and APNIC reach agreement on National Internet Registry. `http://www.informationweek.in/Internet/12-03-05/India_and_APNIC_reach_agreement_on_National_Internet_registry.aspx`, March 2012.

[6] KARRENBERG, D., ROSS, G., WILSON, P., AND NOBILE, L. Development of the Regional Internet Registry System. *Internet Protocol Journal 4*, 4 (December 2001).