ARDC 44.128/10 Allocation Proposal

Presented by the Technical Advisory Committee (TAC) of
Amateur Radio Digital Communications (ARDC)

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Abstract

This proposal reserves the prefix of 44.128/10 primarily for radio networks and amateur radio use and not to be announced or routed on the Internet by end-users.

Introduction

The 44/8 address space was first allocated to be used by the amateur radio community in the 1980s. Early use of this address space was for Packet Radio over the AX.25 protocol to pass IP traffic between amateur 2 meter and 70 cm stations using Terminal Node Controllers[1] (TNC) such as the AEA PK-232MBX. Modulation modes such as PACTOR and WINMOR provided a way for short wave frequencies to support packet delivery.

44/8 was used for many years only for these radio-to-radio networks. The 44/8 address space was assigned to geographic regions such as countries and US states. Most regions would be assigned a /16 and in some cases a /16 adjacent to it for "expansion".

For decades 44/8 has been announced to the public Internet. IPIP tunneling was enabled for amateurs and prefixes were assigned to amateurs that could justify the use of the address space for HAM use. Later, in 2012, direct BGP announcements were approved. The minimum prefix size that could be assigned for eBGP was /24 as smaller prefix sizes were not supported on the Internet. With the availability for amateurs to be able to be assigned address space out of 44/8, the ability to announce this space on the public Internet, and the popularization of low-cost high speed radios, there is renewed interest in using 44/8 space by radio amateurs.

As mentioned previously, with the commoditization of Part 15.247 802.11 radios, the cost of equipment has gone down, and data rates have gone up by orders of magnitudes. Amateur

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[1] https://en.wikipedia.org/wiki/Terminal_node_controller

radio bands overlapped many of the ISM bands so they were able to leverage the low cost and high data rates of these radios with networks like HAMNET[2][3] in Europe and AREDN[4] worldwide.

Even with higher-speed radios, amateur radio-based networks typically will have limited bandwidth and higher latency than the public Internet. For instance, HAMNET is an active network deployed as a mix of a static, dynamic, and mesh routed network. There can be many hops over radio nodes to get to the destination. Each node will add latency and most links will have less than 100Mb/s of bandwidth. Considering these conditions, these networks should not be used for high bandwidth applications such as consumer video streaming (eg. Netflix, Hulu).

Proposal

Amateur radio-based networks need unique address space.

Amateur radio-based networks use IPv4 address space for communications between devices. Some networks use RFC1918 and Carrier Grade NAT/RFC-6598 (CGNAT) address space knowing that these address spaces are designed to never be announced on the public Internet. RFC1918 and CGNAT address space is employed when it is used within a local organization's network as IPv4 space is finite and not available. In order to limit resources and exploitation, almost all public Internet router configurations filter/block these "Bogon" address prefixes[5]. Devices using these addresses need to use Network Address Translation (NAT) in order to reach the Internet.   NAT breaks the end-to-end principle[6] as devices behind NAT by default cannot serve traffic to the Internet, but only be a client. This arrangement normally works well in small deployments such as homes and enterprises where all devices are clients and need to be firewalled from the public Internet. This doesn't work in larger deployments where devices can be servers.

As RFC1918 and RFC6598 prefixes are used behind NAT/Firewalls and are managed by the organization behind the firewall, the address space is reused by other organizations. A good example are the RFC1918 subnets 192.168.0.0/24 and 192.168.1.0/24 that are the default LAN prefixes for many routers.

Radio-based networks such as HAMNET need unique addresses for each node in the network. Using RFC1918 and RFC6598 prefixes would prevent HAMNET from passing traffic to other networks also using RFC1918 and RFC6598 prefixes as there would be address collisions.

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[2] https://www.tapr.org/pdf/DCC2014-TheEuropeanHAMNET-DG8NGN.pdf
[3] https://hamnet.eu/
[4] https://www.arednmesh.org/
[5] https://team-cymru.com/community-services/bogon-reference/
[6] https://en.wikipedia.org/wiki/End-to-end_principle

Routing to amateur radio-based networks needs to be easy to implement and can be supported by low-cost routers

Users and operators of amateur radio-based networks typically will have routers that are connected to both the radio-based network and the Internet and will want to pass traffic to the respective networks. This creates a challenge for these users: how to tell the routers which network connection should be used, based on the packet destination. If dynamic routing protocols such as BGP were used, this would lock out almost all operators as consumer-grade routers do not support these protocols. Dynamic routing protocols also require much more memory and CPU power than these routers support.

Manually updating every consumer and enterprise router on a network with static routing entries would be cumbersome as prefixes would be updated frequently so routing tables would be typically out of date and not fully reflect the current prefixes on the network.

In using 44.128/10 for radio-based networks, we are able to answer the most common question the radio users are challenging us with: *Which route do I need to put into my router to address the radio network?*

To Use Net 44 for what it was originally intended for

The renewed interest in amateur use of radio-based networks has directed focus back to the 44/8 address space. During this period, the 44.192/10 part of the 44/8 prefix was sold. This left two prefixes out of the 44/8 address space for Amateur use: 44.0/9 and 44.128/10.

The TAC analyzed the current allocations within 44.0/9 (USA) and 44.128/10 (RoW). Based on the existing use-cases within both ranges and the necessary effort to renumber, the TAC proposes to use 44.128/10 as the prefix for the radio-based network.

By using 44.128/10 for radio-based networks we:
- Provide unique address space that can be assigned without overlap of other networks
- Provide address space for services that should only be accessible from radio-only networks and not from the Internet
- Support simple routing by adding just one static route to routers
- Establish a policy of not announcing the prefix on the Internet[7]

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[7] ARDC always reserves the right to appoint people or entities to advertise the entire prefix on the Internet for any reason, including but not limited to, dark-space IP research, prevention of BGP hijacks, etc.

What about the rest of the space?

Interestingly, the use case defined above requires some guarantees from the people using it for it to work better than today: it needs to be "isolated". That means that IP addresses outside of the range cannot talk to it. This is similar to what a corporate network would need and assume: people from the Internet cannot directly reach their 10/8 devices unless they specifically allow it with technology such as NAT, netmap, or port forwarding.

That said, the TAC needs to propose and make adequate reservations of the remaining IP space, for people who want to use their addresses on the Internet, without any special ham radio meaning. Note that with the current proposal if you want to join the Intranet and also be on the Internet, you will need to receive two allocations: one in each part of the space.

To accommodate for this, the TAC proposes the use of 44.0/10, the first IPv4 block, of equal size to 44.128/10, to be used for Internet-connected purposes such as Direct BGP. That means that people who want to use 44 addresses that are publicly routed will get an allocation from there. The remaining 44.64/10, is a network with light usage (mostly within a /16). The plan is not to move these users anywhere, but to make no further allocations from that space. This space can be used in the future if, for example, one of the two /10s is getting full and we need additional space.

The 44.0/10, 44.64/10, and 44.128/10 have been chosen carefully: we want to have as few users as possible renumbering, as it is not an easy process, especially for remote sites with no physical access in case something goes wrong. Most current Intranet users reside on 44.128/10, and most Internet-connected users reside on 44.0/10, so it makes sense to pick these networks for the respective use cases. Note that a single person can receive multiple allocations from both spaces if they want to participate in both networks / use cases.

A pilot of the above proposal has already run in a limited fashion in 44.31/16[8]. Users who want to be on the Internet have been allocated addresses within a single /16 of 44.0/10. This has gone well so far and all indicators show a viable and successful strategy. In addition to that, we also made a pilot allocation of a non-US country: Italy. They received 44.3/17[9] as part of 44.0/10 as they confirmed to ARDC that they are interested in connecting to the Internet simply and not to other amateur radio operators via the Intranet.

Although the TAC has no role in the selling of 44 IP space and is not within its responsibilities to decide or advise on that, we recommend that ARDC proceeds to no further sales of the space. The TAC has included it as a resolution for the Board of Directors to vote on. Note that the TAC cannot protect this space, but we can make strong recommendations.

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[8] https://portal.ampr.org/networks.php?a=region&id=5192
[9] https://portal.ampr.org/networks.php?a=region&id=5201

Evaluation

The above changes aim to increase the adoption of the space and further global reach and use of it. However, we cannot know if they were successful until we give them some time and collect metrics and data that can be used to back up claims of success or not.

The time horizon that we set for this is 5 years, which is a long enough timeframe that the ARDC Board of Directors agreed upon. After that time, we will allow for a period of 6 months for the ARDC and the TAC to assess the situation and jointly agree whether these changes have increased participation and ease of use or not. Corrective action can then be taken for the future. Of course, the TACs of this period will still bear the responsibility of monitoring and being able to accommodate any new needs, use cases, and suggest corrective actions when required. The Board of Directors will also have to get an overview to ensure that all global radio amateur needs are addressed to the best possible degree.

Resolution

In order to achieve the above, the TAC proposes that the ARDC Board votes on the following:

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The ARDC Board of Directors votes to:
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   - Reserve 44.128/10 as an Intranet for radio amateurs for at least the next 5 years.
   - Reserve 44.0/10 for Direct BGP use by radio amateurs on the Internet for at least the next 5 years.
   - Reserve 44.64/10 for future use and make no further allocations to end-users for at least the next 5 years.
   - Not sell or rent any of the remaining ARDC Net44 IPv4 address space for a period of at least 5 years.
   - Adequately fund the TAC-proposed Global PoP infrastructure to interconnect all 44 users, regardless of use case, and easily provide them with access.
   - Give the users that will have to renumber their networks and resources adequate time and coordinated support from ARDC to transition.