

Eligibility for Receiving IP Address Transfers—Evaluating Alternative Policy Options

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To date, discussions of IP address transfer policy have largely focused on two alternative transfer rules: *Wholly unrestricted transfers* to anyone who reaches agreement with a seller (as in [APNIC's prop-050](#) (no longer in effect) and [RIPE proposed policy 2013-03](#)), and *needs-based transfers* (requiring both a showing of need and agreement by a seller) (as in [ARIN 2009-1](#) and [APNIC prop-096](#)).

This discussion memo sketches seven additional policy approaches to transfers and briefly examines their respective strengths and weaknesses according to characteristics such as conservation, robustness against gaming, excluding speculators, encouraging transition to IPv6, and facilitating accuracy of registration data. This memo was prepared at the request of ARIN Staff to facilitate common terminology in discussions of transfer policy proposals.

Evaluation of the effectiveness of different transfer policy approaches will vary depending on the relative importance one places on the various evaluation characteristics. At present, the analysis in this document suggests that the status quo may offer greater effectiveness at directing addresses to those who can put them to immediate use, in excluding speculators, and in encouraging transition to IPv6. That said, if sufficient weight is placed on administrative simplicity and/or on accuracy of registration records, other policy approaches may represent an overall improvement when compared to the status quo.

Evaluation criteria

Each transfer policy approach is evaluated according to nine criteria. These include criteria drawn from the ARIN Recommended Draft Policy "[RIR Principles](#)" as well as criteria specific to transfers and reflecting aspects that vary among transfer policy approaches.

Conservation—Preserving IP number resources for organizations that genuinely need them, including providing IP numbers to such organizations at minimal cost as long as possible, and providing IP numbers to such organizations at low cost thereafter.

Excluding speculators—Assuring that addresses are provided only to actual network operators with actual current need for those resources, and not to speculators or to those seeking addresses for future sale or possible future need.

Robustness against gaming—Enforcing policy rules and achieving policy objectives even in the face of networks or speculators attempting to evade those rules.

Routability—Managing IP number resources in such a manner that Internet routing is scalable and reliable (although routability is not guaranteed by any transfer policy approach or any ARIN policy).

Encouraging IPv6 transition—Motivating networks to take genuine and timely steps towards IPv6, rather than continuing to rely on IPv4 for an extended period.

Facilitating accuracy of registration data—Causing or encouraging registration records and WHOIS to correctly reflect networks’ actual users and contacts.

Accommodates new entrants—Allowing new networks to obtain IPv4 resources.

Administrative simplicity—Imposing limited and reasonable record-keeping requirements and evaluation processes for networks and for ARIN staff. Keeping such requirements consistent with capabilities that are well-established or otherwise feasible.

In principle a transfer policy might attempt to distinguish between varying types of uses of IP numbers, such as granting some form of preference to public-interest, educational, or governmental use; preference to use for transition technologies; or preference for uses that are less amenable to transition to IPv6. For lack of a consensus as to favored uses, this document does not attempt to evaluate the extent to which particular policies advance particular favored uses. This also matches ARIN policy to date: Favored uses (transition technologies) have benefited not from special transfer policies, but from holdbacks that make certain IPv4 resources available only to these favored uses. The question of how much space to reserve, and for what favored purposes, is largely orthogonal to the question of what restrictions should apply to routine transfers. This document therefore does not attempt to evaluate favored uses.

The ARIN Recommended Draft Policy [RIR Principles](#) also calls for considering “stewardship”, i.e. the responsible overseeing and protecting of IP number resources. Rather than evaluate that principle as a whole, this document considers stewardship via the evaluation criteria listed above.

“Network operators only”: restrictions on who may obtain addresses

Under this policy approach, an organization would no longer be required to demonstrate need in order to receive addresses. However, each requester would nonetheless be required to show that it is in fact a network operator (i.e. either an ISP or an end-user), and that it otherwise complies with applicable requirements (e.g. as to size, multi-homing, etc.). Once a requester established its status as a network operator, there would be no constraints on the amount of address space the requester could acquire, presumably through market transactions.

Key benefits: A network-operators-only requirements would prevent “raw speculation” in which an entity buys addresses with no intent to use them and no capability to use them. Implementing a network-operators-only rule draws on existing ARIN capabilities required under existing registration processes, and this verification generally need only be performed once per organization. After the initial verification, no further needs assessment is required, reducing workload on both RIR and network staff.

Key weaknesses: A speculator can control IP resources through a partnership with a network. Wealthy networks can buy their way out of IPv6 transition.

Conservation: Nothing in the policy would prevent a network from claiming a large amount of IP numbers, limiting availability to other networks and raising prices from other networks. As discussed below, a speculator might also be able to claim IP numbers by partnering with an operator. Pricing

would discourage networks from claiming unneeded resources, but pricing might not influence the decisions of wealthy networks.

Excluding speculators: Low. Imposes a one-time burden on a would-be speculator, which must find a network operator partner or style itself as a network operator.

Robustness against gaming: A speculator could acquire, partner with, or otherwise direct an operator. Some small operators would likely be willing to partner with a speculator in exchange for modest payments. (Large operators would more likely be concerned about reputational impact.) Historically, the need requirement prevented organizations from claiming or buying more addresses than they needed, but without such a requirement and with the network-operators-only requirement, even a small organization could nonetheless claim an unlimited number of addresses.

Routability: Networks would have no special incentive to buy addresses in large blocks that facilitate efficient routing, or to keep large blocks intact.

Encouraging transition to IPv6: Low. A wealthy organization can buy its way out of transition without any impediment. Specifically, a wealthy organization can purchase a large amount of IPv4 resource, sufficient to satisfy long-term needs, thereby freeing the organization from any need to move to IPv6.

Facilitating accuracy of registration data: Medium. If a speculator partners with an operator, the addresses would probably list details of the operator rather than the speculator. That said, if the addresses are not actually in use, their records may be of lesser importance.

Accommodates new entrants: Requires special provisions to allow a prospective network operator to obtain resources.

Administrative ease: Eliminating needs justification implies a reduction in ARIN workload. Determining whether an applicant is a network operator is easier than performing a full evaluation of need. ARIN staff and processes already determine whether an applicant for an allocation or assignment is in fact a network operator.

“Growth limit”: growth cap or multiplier on current holdings

Under this policy approach, an organization would be permitted to purchase or otherwise acquire IP addresses until reaching a certain size, perhaps relative to its prior size. No demonstration of need would be required. The specific structure of the growth limit would require significant community development, and myriad possibilities are available. Growth could be limited to a specific total size (“can grow until reaching a /16”), to a specific amount of growth (“can grow by up to a /16 over holdings as of January 1, 2013”), or to a multiplier (“can grow up to 4x the organization’s size as of January 1, 2013”). These rules could also be combined into various hybrids (“can grow up to a /16 over baseline, or up to 2x over baseline, whichever is greater”). Growth rights would be nontransferable.

In principle, special provisions could be established for new entrants. For example, new entrants could be exempted from growth caps, hence permitted unlimited growth, but subject to ARIN's needs justification system (probably capped at some predetermined maximum).

Key benefits: A growth limit caps each organization's growth at a predetermined factor. Impedes speculation by requiring a speculator to partner with slow-growing organizations. Easy to administer in that permissible IPv4 growth is reduced to a mathematical formula, eliminating further needs assessment.

Key weaknesses: Restricts genuine growth. A speculator can control IP resources through a partnership with a slow-growing network.

Conservation: A low growth cap would reduce the amount of IP numbers that any individual network could claim, implying more IP numbers preserved for others. That said, a low growth cap also limits a network's ability to grow quickly when technical and business needs genuinely call for growth.

Excluding speculators: Depending on the structure of the growth limit, a growth limit would impose an intermediate impediment to a would-be speculator. Under a low growth limit, a speculator might need to identify multiple organizations that do not wish to use their growth allowance. That said, if organizations are permitted to grow to significantly larger than their size as of some baseline date, stable-sized organizations could provide speculators with ample capacity to claim resources.

Robustness against gaming: If a large organization is not growing, it would have unneeded growth rights that might be sought by an organization wanting to grow more than permitted or to speculate on address prices. The former organization could seek addresses to meet its growth limit, then provide those addresses to the latter organization. Separately, allowances for new entrants could be gamed by organizations falsely claiming to be new entrants (via subsidiaries, shell companies, or similar). By claiming to be a new entrant, an organization could grow more than would otherwise be permitted—providing an incentive for an existing organization to claim to be a new entrant.

Routability: Networks would have no special incentive to buy addresses in large blocks that facilitate efficient routing, or to keep large blocks intact. Indeed, a low growth cap might exacerbate the move towards smaller blocks by requiring that a growing network obtain a series of small blocks which are likely to be discontinuous and hence require separate routing entries.

Encouraging transition: If its growth does not exceed the permissible growth limit, a wealthy organization can buy its way out of transition without impediment.

Facilitating accuracy of registration data: If a speculator partners with an organization that holds IPv4 resources, the addresses would probably list details of the organization rather than the speculator. That said, if the associated addresses are not actually in use, their records may be of lesser importance. Meanwhile, if an organization resorts to licensing others' addresses in light of growth limits prohibiting the organization from obtaining addresses of its own, records will likely be inaccurate as to the true user of those addresses.

Accommodates new entrants: Requires special provisions to allow a prospective network operator to obtain some baseline amount of resources.

Administrative ease: Eliminating needs justification implies a reduction in ARIN workload. However, additional workload could result from the need to determine what organizations are bona fide new entrants. This task could be significant if rules create a large incentive for creating new organizations. (EURid faced a similar problem when opening .EU with a sunrise policy that gave each registrar an equal chance at desirable new domains: Aggressive registrars created numerous shell companies in order to obtain disproportionate opportunities to claim the most valuable domains.) Additional workload could also result from evaluating claims that organizations had impermissibly transferred their growth rights.

“Small transfers exempted from demonstrated need requirement”

Each organization would be permitted to receive a certain quantity of transferred addresses without demonstrating need (say, a /22 per year). The current needs justification system would be retained for total transfers larger than that amount.

Key benefits: Reduces administrative workload for small transfers. Provides some deference to networks’ willingness to pay for addresses.

Key weaknesses: Gameable by creating new, duplicative, and/or small organizations.

Conservation: By transferring some IP numbers without a showing of need, this approach likely shifts some addresses to uses where they are not immediately needed, limiting supply and increasing costs for those who seek addresses with a showing of need. The extent of these changes depends on the amount of transfer permitted without demonstrating need.

Excluding speculators: Speculators could partner with myriad small networks that are not growing and do not need to exercise their need-exempted transfers.

Robustness against gaming: By claiming to be multiple organizations (via subsidiaries, shell corporations, divisions, or the like), an organization could obtain a larger quantity of transferred addresses without demonstrating need. If incentives were sufficiently strong, a genuine network operator could probably structure itself to increase its supposed number of organizations. For example, an organization could treat each state or county of operation as a separate organization, seeking resources from ARIN through multiple such organizations. These concerns are more than speculative: Domain name registrars have used similar schemes to maximize their access to desired domain resources.

Routability: Networks would have no special incentive to buy addresses in large blocks that facilitate efficient routing, or to keep large blocks intact. Indeed, by exempting small transfers from demonstrated need, this policy approach would invite organizations to obtain periodic small blocks without demonstrating need, and the resulting small blocks are likely to be discontinuous and hence require separate routing entries.

Encouraging transition: If its growth does not exceed the permissible growth limit, a wealthy organization can buy its way out of transition without impediment.

Facilitating accuracy of registration records: If speculators partner with myriad small networks to claim additional addresses, records would likely be inaccurate as to those blocks.

Accommodates new entrants: Automatically allows a new entrant to obtain the permissible small amount of resource. A large new entrant can invoke needs review.

Administrative ease: Reduced workload for ARIN to process the small transfers, but greater effort probably required to screen organizations in light of the incentive to create multiple suborganizations with separate relationships with ARIN. If an organization later seeks to pass a needs review, after previously claiming need-exempted transfers, there may be a greater workload, both on ARIN and on the organization, to determine how those addresses were used and to confirm whether need exists for further addresses.

“Limits on flipping”

An organization would be prohibited from selling newly-acquired addresses for some predetermined period (perhaps, 24 months). In a stronger version of the rule, an organization would be disallowed from selling addresses if it purchased any addresses within a specified time period, or from buying addresses if it sold any addresses within that period.

A restriction on flipping would require each organization to determine whether it is on net a buyer or a seller, and to retain that position for an extended period. This restriction would reinforce the norm that IP addresses should be used for network operations and not as the subject of speculation: Anyone wanting to speculate in IP addresses would find such speculation more difficult and less profitable with limits on flipping in place.

Key benefits: Helps to establish norms against speculation. Reduces the profitability of speculation, reducing the likelihood that would-be speculators will choose to hold IPv4 addresses.

Key weaknesses: Can compel resources to remain unused even when a seller seeks to sell them and a buyer seeks to buy them.

Conservation: By discouraging speculation, this policy approach helps to assure that IP numbers are claimed only by networks that genuinely need them. On the other hand, if a network is genuinely constrained by this policy, perhaps because it bought IP numbers but genuinely no longer needs them, the network is compelled to hold the IP numbers for the period proscribed by this policy – withholding those IP numbers from use by a network that needs them more.

Excluding speculators: Reduces the feasibility of short-term speculation and reduces profits. Reinforces to speculators that they are unwelcome in IP address markets, which would probably deter some speculators from participating.

Robustness against gaming: Depends on structure of the rules. More restrictive rules are probably harder to game, but at the cost of providing reduced flexibility for organizations whose needs genuinely change. Flexibility might be desirable: An organization's needs could change relatively quickly: For example, once an organization resolves all compatibility problems impeding transition to IPv6, the organization might be ready to move to IPv6 relatively rapidly. Any delay to the organization's sale of IPv4 addresses would reduce the financial incentive to move to IPv6 and would also withhold addresses from those who need the addresses more urgently.

Routability: This policy approach envisions transfer of large address blocks on a near-permanent basis. Such transfers are more likely to facilitate hierarchical routing and efficient reduction in required routing entries.

Encouraging transition: None. This policy allows a wealthy organization to buy its way out of transition without any impediment whatsoever.

Facilitating accuracy of registration data: If a seller wants to sell resources quickly, but is not permitted to do so as a result of a prohibition on short-term sales, the seller might enter into a contract for future sale at the time permitted by ARIN rules. In that case, records would be inaccurate in the interim.

Accommodates new entrants: Allows new entrants to obtain addresses from any permissible seller on the same terms as any other buyer (subject to the limits on flipping).

Administrative ease: Eliminating needs justification implies a reduction in ARIN workload.

"Extended need period"

Needs assessment would continue as in the status quo, except with a significantly enlarged future period for which need would be evaluated ("needs window"). For example, an organization might be permitted to buy as many addresses as the organization can demonstrate need for, within the next five or ten years. ARIN has already changed the need window from six months to two years, and this approach would be a further such expansion.

Over longer periods, need becomes particularly difficult to project. For example, it is difficult to project how many customers a given network will serve in five years: future needs depends on marketing, competition, economic conditions, etc., and projections become more difficult over a longer period.

Key benefits: Allows organizations to buy addresses in advance in order to be confident that they will have enough addresses to satisfy long-run needs. Increases the deference to organizations' purchasing decisions. Could facilitate transfers of large blocks, improving routing efficiency.

Key weaknesses: Difficulty of assessing need over an extended period, implying increased workload for organizations and ARIN, greater deference to organizations' claims (even when overstated), or both. Could open the door to speculation by anyone who cares to submit inflated projections. Could discourage transition by inviting organizations to build long-run plans for IPv4 and by letting wealthy organizations buy sufficient IPv4 resources to implement those plans.

Conservation: If organizations inflate long-run growth, there will be more supposed need and greater pressure by networks seeking IP numbers – factors likely to cause relative shortages and price increases. The longer the needs window, the less effective the focus on organizations with immediate needs.

Excluding speculators: By inflating long-run growth projections, organizations can increase their claimed need and buy more addresses than their requirements genuinely call for. By partnering with one or more organizations willing to inflate its need in this way, a speculator can obtain permission to buy as many addresses as it seeks.

Robustness against gaming: Organizations can inflate long-run growth projections more easily than they can inflate short-run growth projections. Extending the need period facilitates gaming for both an organization's own needs and for any affiliated speculator.

Routability: On the most optimistic view, this policy approach would facilitate transfer of large address blocks on a near-permanent basis. Such transfers are more likely to facilitate hierarchical routing and efficient reduction in required routing entries. On the other hand, networks could also respond to this policy through a series of small transfers, requiring multiple routing entries.

Encouraging transition: Limited. By overstating its needs, a wealthy organization can buy its way out of transition without significant impediment.

Facilitating accuracy of registration data: Good. Little likelihood of deterring submission of accurate information.

Accommodates new entrants: Allows new entrants to obtain resources via a showing of need.

Administrative ease: Rigorous enforcement of a longer needs window implies a greater ARIN workload—reviewing more speculative growth projections and engaging in greater discussion with applicants as to their projections and expectations. Furthermore, the more speculative submissions might require additional back-and-forth with applicants, further increasing the time required to evaluate a request. If ARIN staff began to accept a lower standard of evidence, workload would be reduced, but at the cost of correct implementation of the policy. A possible countervailing benefit is that a longer needs window might prompt organizations to reapply less often, reducing application volume.

"Use it or lose it"

An organization would be required to demonstrate actual current or immediate use of all IPv4 resources, on pain of being required to return those resources to ARIN for use by others.

Key benefits: Assures that scarce resources are put to use. Reinforces the vision of IPv4 as a shared resource for inter-network communication, not for hoarding or speculation.

Key weaknesses: Difficulty of robustly determining what resources are in use. Difficulty of reclaiming resources. Likely disputes. Low likelihood of successfully reclaiming significant space.

Conservation: To the extent that this policy successfully reclaims IPv4 resources, those resources would be provided to those who can demonstrate need – reducing the amount of resources held by speculators or hoarders, and increasing the amount in use by bona fide networks.

Excluding speculators: Speculators would need to conceal their space as being in use. One natural way to do so is to put it in use, e.g. via short-term leases, which might indeed be useful in facilitating liquidity for those who can easily change addresses.

Robustness against gaming: Organizations can design schemes to make addresses appear to be in use, e.g. via announcing routes and even responding to network probes. Significant engineering and investigation would be required to uncover such gaming, and even then sophisticated perpetrators could probably escape most automated probes.

Routability: This policy approach takes no special steps to keep large blocks intact.

Encouraging transition: A wealthy organization can buy its way out of transition without any impediment.

Facilitating accuracy of registration data: Very good. Organizations have no obvious reason to submit inaccurate registration data.

Accommodates new entrants: Allows new entrants to obtain resources on the same terms as other buyers, so long as the resources are promptly put to use.

Administrative ease: Significant challenges both in determining what resources are in use and in reclaiming resources. ARIN has not had reason to build large-scale capabilities in either of these areas, and both are likely to be challenging, especially with significant value at stake and with capable adversaries.

“Maintain needs assessment as is”

Current ARIN policy calls for a two-year needs window for addresses obtained via transfer. The ARIN community previously determined this two-year window to be an appropriate balance between conservation and deference to organizations’ purchase decisions, bearing in mind constraints including the difficulty of long-term forecasts.

Key benefits: Status quo, consistent with prior community determination. Balances conservation, deference to organizations’ purchasing decisions, and the difficulty of long-term forecasts.

Key weaknesses: Limited deference to organizations’ purchasing decisions. Administrative burden of needs assessment for both organizations and ARIN.

Conservation: Comprehensive needs assessment assures that networks claim only the IP numbers they need for the short run. This keeps addresses available for others. Wealth alone is not sufficient to claim addresses.

Excluding speculators: Speculators can partner with any organization that has plausible growth scenarios sufficient to buy addresses. As in all approaches evaluated in this document, speculators can enter into forward contracts in order to capture the economic substance of a transaction without formal recognition by ARIN.

Robustness against gaming: Organizations can somewhat overstate their growth over the coming two-year period.

Routability: Networks have no special incentive to buy addresses in large blocks that facilitate efficient routing, or to keep large blocks intact.

Encouraging transition: A shorter needs window prevents organizations from preacquiring the IPv4 addresses they anticipate needing in the future—thereby helping to preserve IPv6 transition incentives and to coordinate IPv6 transition. While an organization could contract for future address delivery (with address transfer not yet recorded by ARIN), future contracts present inevitable risks and provide less than full certainty of future performance, and ARIN’s inability to recognize such contracts in advance helps to establish a norm that such transactions are disfavored.

Facilitating accuracy of registration data: Medium. To the extent that parties seek transactions that they cannot justify based on two-year need, the transactions may proceed with the transactions anyway and decline to update registration records. To date, there no direct evidence of such transactions occurring, although an emerging “leasing” model may pose similar risks to accuracy and is not clearly prohibited by current policy.

Accommodates new entrants: Allows new entrants to obtain resources on the same terms as other buyers.

Administrative ease: Continues the needs review process with which ARIN staff and organizations are familiar. Maintains a needs window consistent with prior ARIN practice. Networks seeking to obtain resources in anticipation of future need have a strong incentive to inflate their supposed short-term need.

“Unrestricted transfers”

In principle an RIR could allow networks and other interested parties to buy and sell IP number resources as they see fit, without restriction from ARIN. Prior APNIC and RIPE transfer policies implemented this approach, albeit later adding restrictions to require a demonstration of need.

Key benefits: No needs assessment is required, reducing workload on RIR and network staff. No impediment whatsoever to submitting accurate registration data.

Key weaknesses: Speculators may seek to control IP number resources, preventing or delaying their use by network operators. Wealthy networks can buy their way out of IPv6 transition.

Conservation: Nothing in the policy would prevent a network from claiming a large amount of IP numbers, limiting availability to other networks and raising prices from other networks. Pricing would discourage networks from claiming unneeded resources, but pricing might not influence the decisions of wealthy networks. Speculators would have a *de facto* green light to participate in the IP numbers market if they so choose. The lack of any prohibition would likely embolden them to do so and ease their efforts to obtain outside capital with which to do so.

Excluding speculators: This policy makes no effort to exclude speculators.

Robustness against gaming: This policy imposes no rules that networks, speculators, or others would want or need to “game.” The policy by its terms allows transfers without restriction.

Routability: Networks have no special incentive to buy addresses in large blocks that facilitate efficient routing, or to keep large blocks intact.

Encouraging transition: Low. A wealthy organization can buy its way out of transition without any impediment. Specifically, a wealthy organization can purchase a large amount of IPv4 resource, sufficient to satisfy long-term needs, thereby freeing the organization from any need to move to IPv6.

Facilitating accuracy of registration data: High. No aspect of this transfer policy would present any barrier whatever to submission of accurate registration data.

Accommodates new entrants: Requires that new entrants purchase IP numbers on the open market, at prices that could pose a practical barrier to entry.

Administrative ease: Eliminating needs justification implies a reduction in ARIN workload.

Tabular summary of Restrictions & Administrative Burden

		restrictions on who can claim resources & how much			
		no recipient restrictions	limited recipient restrictions	intermediate recipient restrictions	significant recipient restrictions
registry administrative burden	small burden	unrestricted transfers	limits on flipping	small transfers exempted	
	medium burden		network operators only	extended needs period growth limit	use it or lose it
	large burden				needs assessment