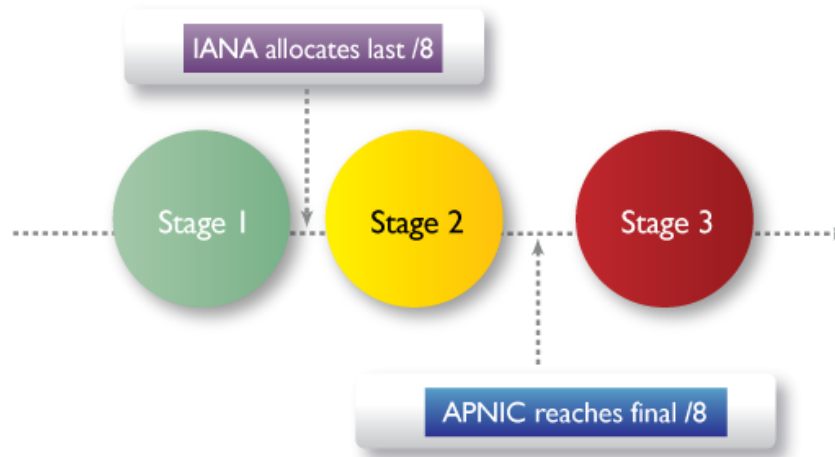


## Final Stages of IPv4 Distribution

During the next few years, we will move into the final stages of IPv4 address distribution. This document is a starting point to examine the issues that may arise from the implementation of policies related to IPv4 exhaustion. It also includes some suggestions on how APNIC could manage IPv4 address distribution during this time.

This document identifies three stages of IPv4 distribution within the APNIC region:



**Diagram 1: The three stages of IPv4 distribution**

### **Stage 1. IANA Unallocated Pool still available (now)**

IPv4 address space is still available from IANA for delegation to RIRs. Stage 1 represents the period before the final /8s are allocated by the IANA to the RIRs.

### **Stage 2. After the IANA Unallocated Pool (2011)**

The exhaustion of IANA's Unallocated Pool will be triggered by the allocation of the last 5 /8s to the RIRs under the [Global Policy for the Allocation of the Remaining IPv4 Address Space](#).

### **Stage 3. APNIC Final /8 (2011-2012)**

APNIC reaches its final /8 and begins distributing space according to section 9. 10, "Distribution of the final /8 worth of space in the unallocated APNIC IPv4 address pool", of [Policies for IPv4 address space management in the Asia Pacific region](#).

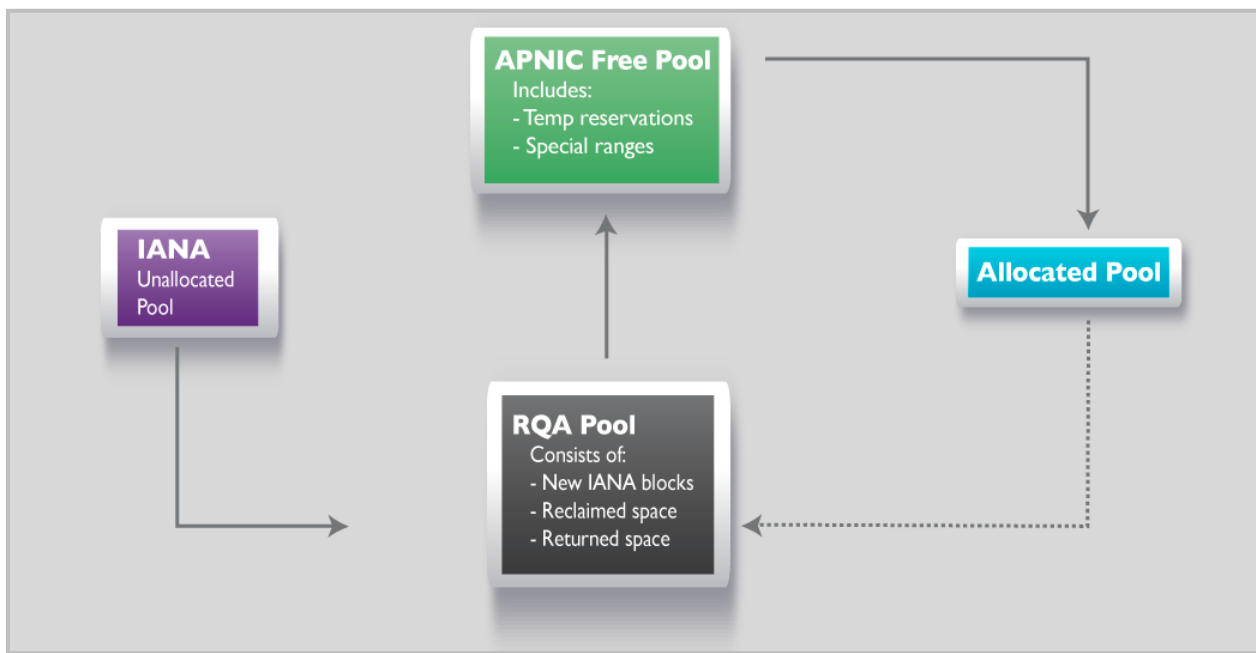


Join the community to discuss the issues raised in this document and more at APNIC 30 at the APNIC 30 Plenary:

**IPv4 Tomorrow? Community consultation on the finer details of the IPv4 run-out policy**  
09:00-10:30, Thursday, 26 August 2010

Remote participation options are available for those who can't attend onsite. For more information see: <http://meetings.apnic.net/30/program/plenary>

## Stage 1: IANA Unallocated Pool

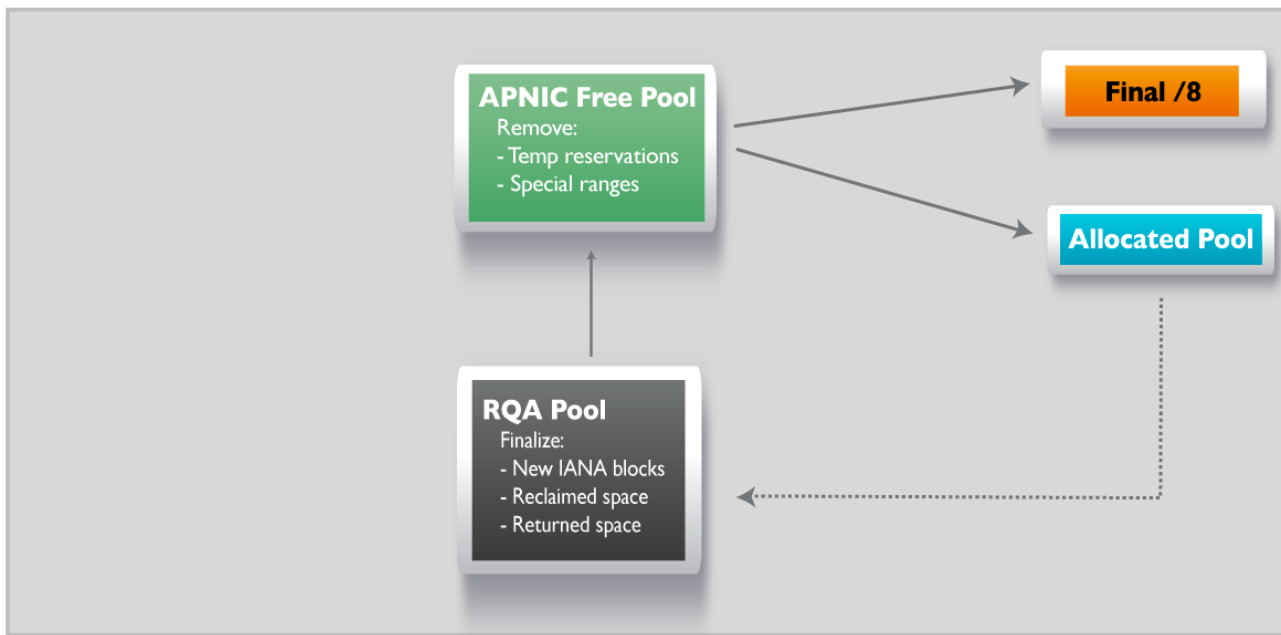


**Diagram 2: Address pool and distribution model under Stage 1**

As of 18 August 2010, there are 14 /8 blocks in the IANA unallocated pool. In Stage 1, APNIC distributes IPv4 according to the current IPv4 address policy and recognizes the following pools of address space:

<b>IANA Unallocated Pool</b>	Unallocated addresses in IANA's care.
<b>APNIC Free Pool</b>	Unallocated addresses in APNIC's care. This pool includes: <ul style="list-style-type: none"> <li>• <b>Temporary reservations</b> Operationally, in some cases, APNIC reserves a contiguous block next to an LIR's latest allocation for a certain time. This allows APNIC to make a contiguous allocation to the LIR if it requests more addresses within a reasonable period of time.</li> <li>• <b>Special ranges</b> APNIC designates ranges of addresses from which it makes delegations for Internet Exchange Points, Critical Infrastructure, experimental allocations, and temporary assignments, conferences, and exhibitions. For more information, see <a href="#">Resource ranges allocated by APNIC</a>.</li> </ul>
<b>Allocated Pool</b>	The pool of addresses allocated and assigned to APNIC account holders. It also includes historical allocations made to networks in the Asia Pacific region.
<b>RQA Pool</b>	When APNIC first receives resources, they are placed in a "quarantine" pool until any potential routability problems associated with the addresses are minimized. After these resources have been through <a href="#">Resource Quality Assurance</a> (RQA) processes, they are moved into the APNIC free pool for distribution to Members. Resources that are placed in this RQA pool include: <ul style="list-style-type: none"> <li>• <b>New /8 blocks from IANA</b></li> <li>• <b>Reclaimed addresses</b> obtained via the <a href="#">Recovery of unused address space</a> policy or when Members' accounts are closed</li> <li>• <b>Returned resources</b> received voluntarily from Members</li> </ul>

## Stage 2: Post IANA Unallocated Pool



**Diagram 3: Address pool and distribution model under Stage 2**

In 2011, when the IANA Unallocated Pool is predicted to run out, the RIRs will receive their last /8 block from IANA according to [Global Policy for the Allocation of the Remaining IPv4 Address Space](#). When APNIC receives its final /8 from IANA, APNIC currently plans to do the following:

### 1. Reserve the final /8

Reserve the last /8 from IANA. When APNIC reaches Stage 3, it will use this /8 to make allocations under section 9. 10, "Distribution of the final /8 worth of space in the unallocated APNIC IPv4 address pool", of [Policies for IPv4 address space management in the Asia Pacific region](#).

The advantages of reserving this contiguous /8 block are:

1. It will be a clean block as IANA has reserved five clean blocks for the RIRs.
2. It is easy for APNIC to manage the final /8 allocations and records.
3. It is also easy to identify other recyclable or transferable ranges.

The disadvantage of reserving this /8 block is:

1. It will create some fragmentation when there is a large request and we only have small prefixes to make up the allocation size without using the reserved final /8 block.

### 2. Continue to make allocations and assignments from the APNIC free pool

Towards the end of Stage 2, the reservation of the final /8 block may result in allocation requests being delegated to recipients as multiple noncontiguous prefixes to make up the required allocation size.

### 3. Continue to assess requests to transfer of IPv4 according to demonstrated need

As we approach the end of Stage 2, Members may begin to use the policy described in section 3, "Transfers of IPv4 addresses" of [APNIC transfer, merger, acquisition, and takeover policy](#). During Stage 2, such transfers are still subject to APNIC Hostmasters' evaluation.

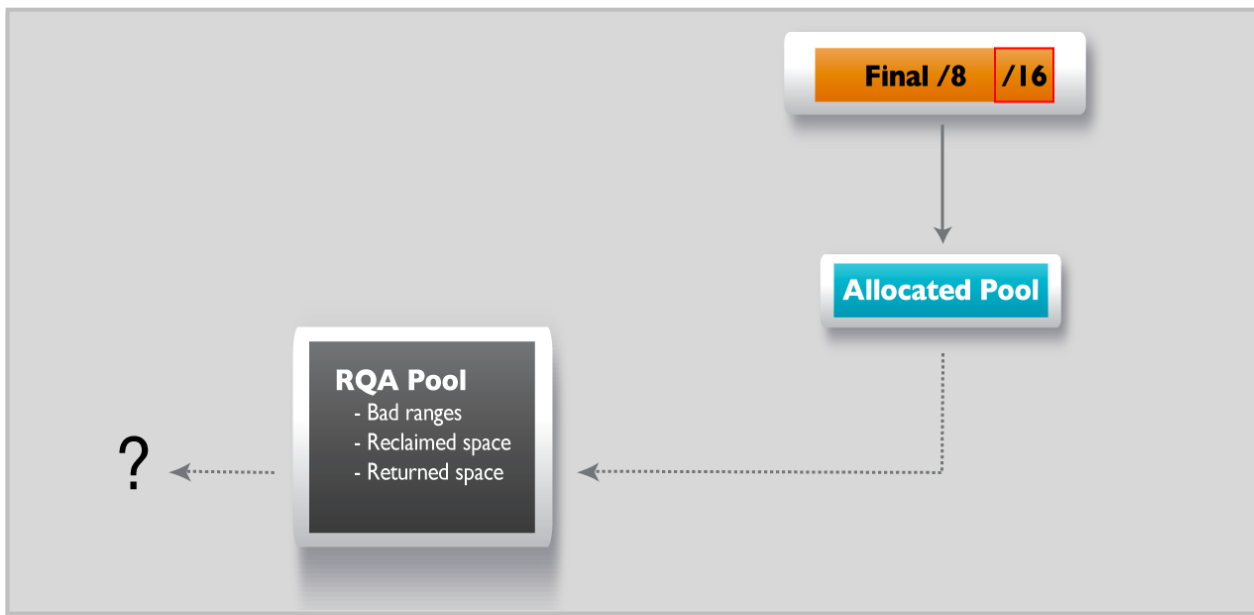
## Implications of Stage 2 on the address pools held by APNIC:

1. A new contiguous pool, the final /8, will be created.
2. A question emerges about how to handle addresses in the RQA Pool:

Should addresses in the RQA Pool that have not successfully met the criteria of [RQA processes](#) be counted as “free space”? If so, the entire contents of the RQA Pool would need to be distributed before the final /8 policies can be triggered, regardless of routability problems.

For example, there is a small range of blocks from the 1.0.0.0/8 that may never be suitable for allocation. Additionally, there will be terminated ranges in the RQA Pool that have not spent their usual year in quarantine, and may be problematic to use. In the absence of any specific policy otherwise, APNIC would need to consider these pools as part of the available free pool and distribute them before the final /8 is reached.

### Stage 3: APNIC Final /8



**Diagram 4: Address pool and distribution model under Stage 3**

After the IANA Unallocated pool has run out (Stage 2), the remaining IPv4 addresses in each RIR pool will last for anywhere from a few months to a few years, depending on the size of their free pool and the consumption rate in their region. This exhaustion timeframe does not include any special blocks with allocation criteria aimed at making a portion of IPv4 addresses available in small blocks for a long time to come (for example, APNIC's final /8). As APNIC currently has the highest IPv4 consumption rate compared to the other RIRs, it is likely that APNIC will run out of its own IPv4 Free Pool earlier than any other RIR, triggering Stage 3. When APNIC reaches Stage 3, APNIC currently plans to do the following:

#### **1. Reserve a /16 from the final /8**

According to section 9.10.2, "Allocations for future uses", of [Policies for IPv4 address space management in the Asia Pacific region](#), one /16 must be reserved for future uses, as yet unforeseen. As stated in the policy, if the reserved /16 remains unused by the time the rest of the remaining /8 worth of space has been allocated, the /16 will be returned to the APNIC pool for distribution under the policy described in Section 9.10.1, "Allocations to LIRs".

#### **2. Make allocations according to the final /8 policy**

Under section 9.10.1, "Allocations to LIRs", APNIC can only make one allocation to each LIR from this final /8 block. Each allocation can be no larger than the minimum allocation size in effect at the time the final /8 policy is invoked.

#### **3. Remove the requirement to justify the need for transferred resources**

The activation of the final /8 policy triggers the removal of the requirement to demonstrate a need for transferred resources. It is anticipated that IPv4 address transfers will become popular in Stage 3, and MyAPNIC will provide a streamlined process for direct transfers between Members.

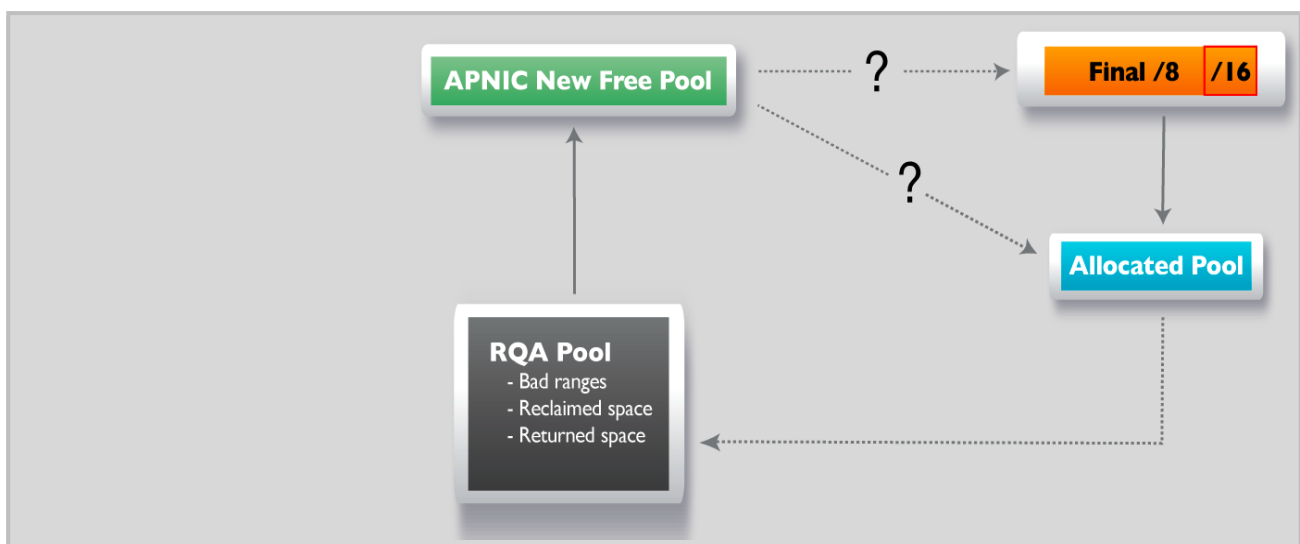
If there is a demand for market facilitation services, the APNIC community may consider APNIC taking on that role. In this case, market facilitation models should be studied, presented, and evaluated in advance.

## Implications of Stage 3 on the address pools held by APNIC

1. The APNIC Free Pool no longer exists.
2. The final /8 pool has a reserved /16 within its boundaries.
3. Questions emerge about how to handle addresses in the RQA Pool:

Depending on the decision of the community about how to handle quarantined resources in Stage 2, there may still be RQA Pool resources carried over from Stage 2. In addition, APNIC is likely to reclaim addresses or receive returned addresses from time to time. However, there is no policy for APNIC to reallocate returned IPv4 address space at Stage 3. This raises questions:

- How should resources be handled after RQA processes have been completed?
- Should returned addresses be returned to IANA or form an APNIC New Free Pool?
- How should APNIC redistribute returned space? Should it be subject to the same allocation policy as the final /8 block? Or should it be subject to a different policy?



**Diagram 5: Questions and possible solutions for managing returned addresses**