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Agenda Item: **7. Release'99 and Release 4**

Source: **Cingular Wireless and BT Cellnet**

Title: **IPv4 Address Allocation Guidelines for (Rel-4 and earlier) GPRS Network Infrastructure & Mobile Terminals**

Document for: **Discussion and information**

This contribution was previously submitted at SA2 Meeting #22 to inform delegates about work already completed by the GSM Association (GSMA) in conjunction with the *regional internet registries (RIRs)* regarding IPv4 address allocation guidelines for Rel-4 and earlier version GPRS network infrastructure and mobile terminals.

This information is being re-submitted at the TSG #15 Plenary meetings (TSGs CN, RAN, SA and T) now for the benefits of other 3GPP work groups, who might also require this information in their work.

Highlights of GSMA IPv4 addressing guidelines, status of work on this subject and the specific reference to the full guidelines document published by the GSMA are presented in this paper. IPv6 addressing policy is for further study.

CONTACTS:
Kim Fullbrook, BT Cellnet, UK kim.fullbrook@btcellnet.net +44 1753 564106
Kennie Kwong, Cingular Wireless, USA kennie.kwong@cingular.com +1 404 236 6882

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(Minor editorial revisions included)

Source: **BT Cellnet and Cingular Wireless**

Title: **IPv4 Address Allocation Guidelines for GPRS Network Infrastructure & Mobile Terminals**

Agenda item: **Rel-4 and earlier GPRS implementations**

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1 Introduction

In SA2 Meeting #21 in Cancun, discussions on S2-013587 from Ericsson (3GPP SA2 feedback to IETF IPng on draft-wasserman-3pp-advise-00.txt entitled "Recommendation for IPv6 in 3GPP Standards, Nov. 2001") indicated that "…how to allocate the block of address to the operators is not an IETF IPv6 WG issue".

This contribution aims to inform SA2 delegates about work already completed by the GSM Association (GSMA) in conjunction with the *regional internet registries (RIRs)* regarding IPv4 address allocation guidelines for Rel-4 and earlier version GPRS network infrastructure and mobile terminals. Given the view generally held by the IP communities that IPv4 and IPv6 systems may co-exist for a prolonged period (perhaps in years), these guidelines will remain important for some time to come. IP address allocation policy based on IPv6 requires resolution of IPv4-to-IPv6 migration strategies and interworking issues both within and between PLMNs; these issues are for further study.

Highlights of GSMA IPv4 addressing guidelines, status of work on this subject and the specific reference to the full guidelines document published by the GSMA are presented herein.

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2 Discussion

The GSMA has worked closely with major RIR communities (RIPE NCC, ARIN and APNIC) to develop and produce IP address allocation guidelines as contained in the GSMA Permanent Reference Document (PRD) IR.40 version 3.1.0 entitled "Guidelines for IPv4 Addressing and AS Numbering for GPRS Network Infrastructure and Mobile Terminals" dated 21st September, 2001 [1]. This document has been assigned an "Unrestricted" classification and is available on the public GSM World web site http://www.gsmworld.com/about/index.html .

Given the global nature of IP addressing, co-ordination with the RIRs responsible for assignment of globally unique public IP addresses was recognised as essential. This was done to ensure that the proposed guidelines for PLMN operators requesting and implementing Public IP addresses are aligned with existing policies and procedures of the RIR community. To this end, significant progress has been made with all three major RIRs (Table 1).

Table 1 - RIRs and their served areas

RIR	Areas served
1. RIPE NCC Réseaux IP Européens Network Co-ordination Centre	• Europe • The Middle East • Central Asia • African countries located north of the Equator
2. ARIN American Registry for Internet Numbers	• North America • South America • Caribbean • African countries located south of the Equator
3. APNIC Asia Pacific Network Information Centre	Entire Asia Pacific region, including 62 economies/countries/regions in South and Central Asia, South-East Asia, Indochina and Oceania

To date, the GSMA and the RIR communities have agreed on the following IPv4 address allocation guidelines in relation to PLMN operators as per IR.40:

1) **IPv4 addressing guidelines for GPRS network infrastructure**
   - Applicable to SSGN, GGSN, DNS server, Border Gateway etc.
   - The RIR community has agreed that Public addresses can be requested for this purpose using their existing request policies and procedures.
2) **Autonomous System Number (ASN) guidelines**
   - Applicable to a PLMN operator's overall IP network.
   - The RIR community has agreed that Public (registered) ASNs can be requested for use in the GPRS network infrastructure using their existing request policies and procedures.
   - Private (unregistered) AS Numbers can be requested from the GSMA via the following email address: *"as_number@gsm.org"*.
3) **IPv4 addressing guidelines for GPRS mobile terminals**
   - The GSMA is currently still working with the RIR communities to gain approval of the guidelines associated with Public address space for GPRS mobile terminals. IR.40 was presented to the RIR membership at their Open Policy meetings as follows: -

     APNIC: 28-31 August 2001
     RIPE: 1-4 October 2001
     ARIN: 28 October – 1 November 2001

3 Proposal

Highlights of IPv4 addressing allocation guidelines contained in IR.40 are as follows:

3.1 General Guidelines:

1) Existing request policies and procedures operated by the RIRs must be adhered to.

- Each PLMN operator must individually submit a request for Public IP address space and Public ASN in accordance with RIR policies and procedures.
- Private addresses must be used *wherever possible* for MT addressing where IPv4 addressing is needed.
- Public addresses for MT addressing are used only for services where it can be demonstrated that use of Private addresses is not feasible or practical.
- Public addresses will not be issued for purposes that IR.40 has shown can be supported using Private addresses, unless the requestor can demonstrate otherwise.

2) Public address space must be used conservatively and efficiently.

- Private addressing must be used wherever possible. Public addressing must only be considered where it is not possible or practical to support Private addressing.
- Dynamic IP addressing should be deployed wherever possible to conserve both the Public and Private address space available.
- Wherever possible, utilise any previously assigned spare Public address space for use with the GPRS network before requesting new Public addresses.

3.2 Specific Guidelines for GPRS Network Infrastructure

- **Public** IPv4 address space will be used for the GPRS network infrastructure:
  - for all network elements involved in the GPRS roaming process via the inter-PLMN backbone network.
- **Private** address space can and should be used wherever possible within the PLMN operator's intra-PLMN:
  - for non-GPRS network elements that are not involved with the GPRS roaming process, e.g. internal network routers.

Utilising existing assigned public address space

- GPRS PLMN operators may already have Public address space which has previously been assigned to them. To help conserve the public address space, wherever possible, PLMN operators should utilise any such existing address space for addressing their GPRS network infrastructure before requesting new Public addresses for this purpose.

Requesting new Public address space

- New Public address space shall be requested by the operator from the appropriate LIR/NIR/DR (Local, National or Delegated Registries) using existing procedures supported by its respective serving RIR.
- IR.40 can be used as a reference as part of the request submitted by the PLMN operator.

Notification of address assignment to GSMA

- It will be the PLMN operator's responsibility to notify the GSMA of the Public address range assigned to its GPRS network infrastructure for roaming.

3.3 Specific Guidelines for ASN

The total IP network that hosts the GPRS infrastructure under control of each PLMN is considered an Autonomous System (AS).

ASN range

The ASN is defined as a 16 bit integer, hence limited to 65535 unique values.

The Internet Registry System has divided the ASN space for Public and Private uses as follows: -

- **Public ASN range:** **0 to 64511**
- **Private ASN range:** **64512 to 65535 (i.e. 1,024 values)**

ASN Guideline Highlights

1. PLMN operators shall assign an ASN that is unique within the GPRS inter-PLMN backbone infrastructure to represent their respective GPRS IP network.
2. An operator can elect to use either a Public ASN or a Private/Reserved ASN for their GPRS network. The following should be noted:
   - **Private** ASNs must *not* be advertised on the global Internet.
   - A PLMN operator can decide to change their assigned **Private** ASN to a **Public** ASN (or vice-a-versa) at a later stage if so desired.
   - There is no dependency for an Operator to use a **Public** ASN if Public IP addressing scheme has been deployed in its network, i.e. a Private ASN can be assigned to a PLMN operator's network even though its network elements have been assigned Public addresses.
3. The GSMA will administer the assignment of **Private** ASNs to its members.
4. A PLMN operator can request a **Private** ASN from the GSMA via the following email address:

   as_number@gsm.org
5. The PLMN operator can request a **Public** ASN from their respective RIR. Details of the ASN request process can be obtained from the home web site of the RIR. Some additional useful links are provided below.

Table 2. Useful web links to request Public ASN

RIR	AS Number links
RIPE NCC	http://www.ripe.net/ripe/docs/ripe-147.html
ARIN	http://www.arin.net/regserv/asnguide.htm
APNIC	http://www.apnic.net/db/aut-num.html

6. IR.40 can be used as a reference as part of the request submitted by the PLMN operator.
7. It will be the PLMN operator's responsibility to notify the GSMA of the ASN assigned to its GPRS network infrastructure.

3.4 Specific Guidelines for Mobile Terminals (MTs)

All GPRS Mobile Terminals (MTs) require an IP address in order to connect to the desired packet data network, e.g. Internet or corporate LAN. If a MT can support more than one simultaneous active connection, then one IP address will be required for each of these connections. The IP address(es) will be assigned to the MT for at least the duration the connection is maintained.

Either a Public or Private IP address can be assigned to the MT to establish the data connection. The type of address assigned will depend upon how the service has been designed and how it is configured and implemented in the PLMN operator's network.

The GSMA recommends that PLMN operators adopt the following general policy:

- **Private** IPv4 addresses are used *wherever possible* for MT addressing where IPv4 addressing is needed.
- **Public** IPv4 addresses are only used for MT addressing for services where it can be demonstrated that the use of Private IPv4 addresses is not feasible or practical.

Design examples are provided in the Annex of IR.40 showing how **Private** IPv4 addressing can be used for MTs in conjunction with some of the currently known GPRS services:

- Internet Web Server Access Service
- 'Standard' Internet WAP Service
- WAP 'Push' Service
- Web/POP Email services

Other services may require **Public** addresses (e.g. IPSec VPNs).

Summary of Services

The table below summarises the main types of GPRS service and the corresponding recommended IPv4 addressing type. More detailed descriptions for the services are provided in IR.40.

Table 3. Summary of GPRS Services and their IP Addressing

No	Service	Address Type	Notes
1	Direct Corporate LAN access	Company	Use company address scheme. In practice, most companies today use Private addressing.
2	Internet access– WAP only	Private	No justification for Public addressing
3	Internet access– WAP with other NAT-compatible applications	Private	e.g. Web, POP3 email, ftp
4	'Open' Internet access	Public	Service is defined as open access
5	"Internet" service APN	Public	Used only by roamers, i.e. customers outside their home PLMN

Note that PLMN operators may have services that do not fit into these categories. Any such service that requires Public addressing will need to demonstrate its justification as per the normal request policies and procedures of the Internet Registry from which IP addresses are requested.

PLMN Operator guidelines

The following guidance is provided for note and consideration by the PLMN operator when requesting Public address space from the appropriate Internet Registry:

- The request must demonstrate and justify the requirement for Public addresses
- Identify any efforts the PLMN operator is making to contribute towards the conservation of Public address space, e.g.:
  - Identify the quantity of Private addresses being used or planned for services in relation to the quantity of Public addresses being requested.
  - Identify any use of dynamic addressing to demonstrate efficient usage of addresses.

- Requests for Public addresses for use with GPRS services shown to be supportable using Private addressing may be rejected, unless the PLMN operator can justify otherwise.
  - E.g. Public addresses cannot be justified for WAP-only services.
- IR.40 can be used as a reference as part of the request submitted by the PLMN operator.

Internet Registry guidelines

To assist the Internet Registries with this activity, the GSMA also proposes the following additional guidelines for their consideration:

1. Main GPRS services requiring Public address
   - "Open Internet Access"
   - "Internet" Service APN (for roamers)
2. Other services that require Public addresses
   - Internet Registry to apply their normal rules for assessment

4 References

[1] GSMA PRD IR.40 "Guidelines for IPv4 Addressing and AS Numbering for GPRS Network Infrastructure and Mobile Terminals" (See attached Table of Contents.)

(Excerpt from GSMA Permanent Reference Document IR.40)
http://www.gsmworld.com/technology/gprs.html

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