Network Monitoring and Management

Where and How to get IP Addresses

Quick recap and some terminologies

NAT – Network Address Translation

- process of modifying IP address information in IP packet headers while in transit across a traffic routing device

IP Address– Internet Protocol Address

- numerical label assigned to each device (e.g., computer, printer) participating in a computer network

ASN – Autonomous System Number

- an identifier (number) for a collection of IP networks and routers under the control of one entity

RIR – Regional Internet Registry

- is an organization that manages the allocation and registration of Internet number resources within a particular region of the world

LIR – Local Internet Registry

- is an organization that has been allocated a block of IP addresses by a regional Internet registry (RIR), and that assigns most parts of this block to its own customers

Why get IPs in the first place?

- Independence and mobility – you are free to choose your own upstream (ISP) and can change when and if necessary

- Identity – you can manage your own IPs and everyone will know that they are yours (with whois). Can get an ASN as well

- Redundancy and uptime – with your own IPs, its easier to get and control multiple upstreams (multi-homing), you can have redundancy between two links and hence improved uptime

What about NAT?

- Many types of NAT – one to one, one to many, port address translation, etc

- Mostly used when public IPs are at a minimum

- Also useful if you want to do port forwarding but:

  - Breaks some protocols (FTP, SIP)

  - Could get tricky to scale up

  - No end to end connectivity

  - Complicates configs - port forwarding, bi-nat, FTP passive and active

  - No control of DNS records (the IPs probably belong to someone else)

IP and DNS?

Yes they go together!

- A record – Address record
- AAAA – Quad A record (IPv6)
- PTR – aka reverse record
- MX – Mail Exchanger
- CNAME – Canonical Name aka alias record
- NS – Name Server record
- TXT – for Sender Policy Framework (SPF record)
- Many others (SOA, SRV, TKEY, TSIG, etc)

GARNET assigned or Individually/per University acquired IPs?

Both models will work :)

GARNET assigned

If GARNET gets the IPs and allocates them to the Universities it will make routing easier for all
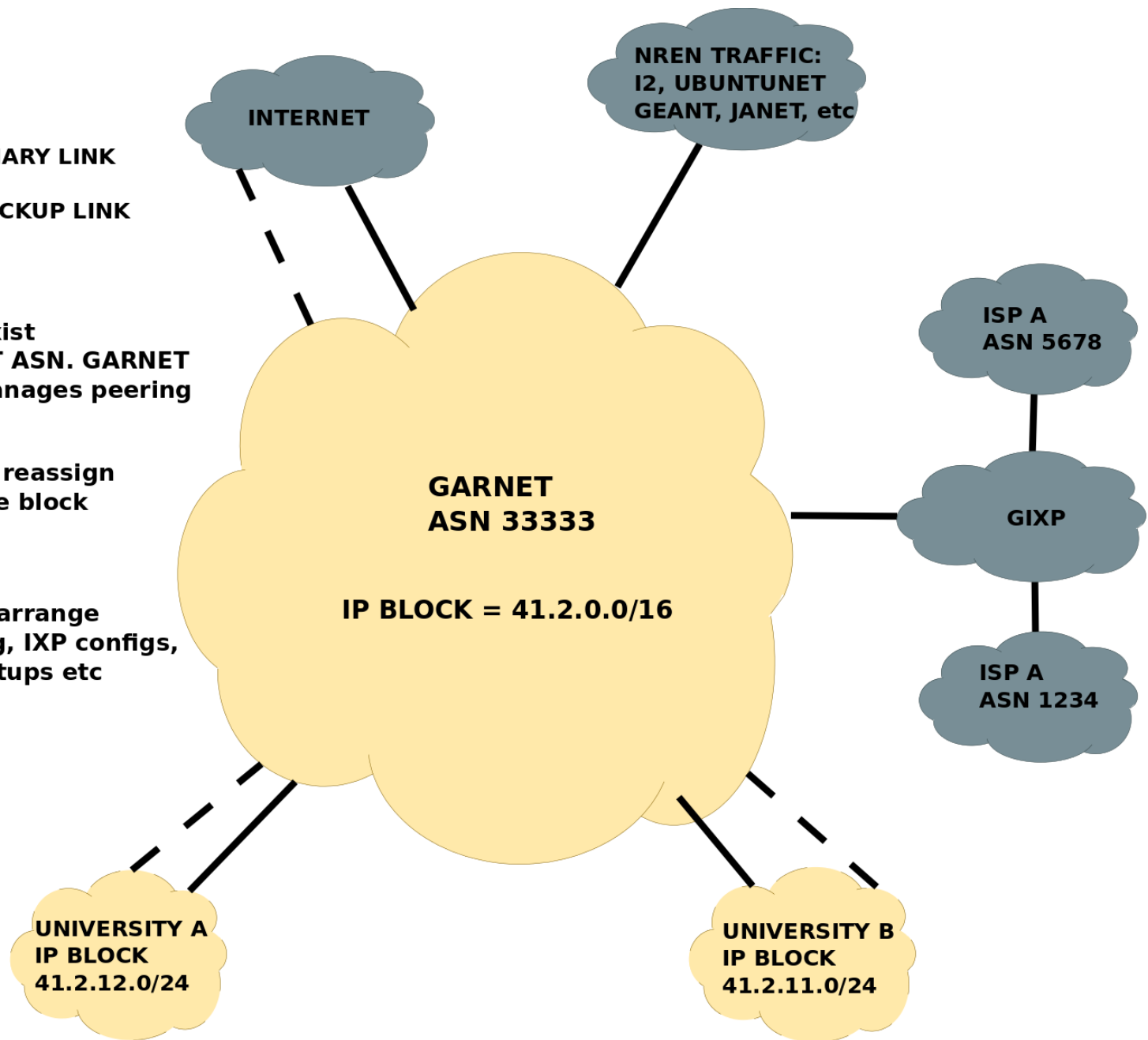
- GARNET would select & manage upstreams, multi-homing
- GARNET would be a one stop shop
- Focus would be on in-country links – two redundant paths to the Universities from GARNET pops
- GARNET would manage peerings and exchange point configs
- GARNET would be the BGP experts
- GARNET would be the IP + DNS experts

PRIMARY LINK

BACKUP LINK

INTERNET

NREN TRAFFIC:
I2, UBUNTUNET
GEANT, JANET, etc

ISP A
ASN 5678

Universities exist
within GARNET ASN. GARNET
selects and manages peering

GARNET would reassign
IPs from a large block

GARNET
ASN 33333

IP BLOCK = 41.2.0.0/16

GIXP

GARNET would arrange
for multihoming, IXP configs,
reverse DNS setups etc

ISP A
ASN 1234

UNIVERSITY A
IP BLOCK
41.2.12.0/24

UNIVERSITY B
IP BLOCK
41.2.11.0/24

Individually/per University acquired IPs?

If Individually acquired, each University would acquire its own IP block and maybe separate ASNs

- Universities would be able to connect to another upstream as redundancy to GARNET if necessary

- Configs slightly more complicated

- Each University would have to register and manage their own IPs, would have to understand BGP fully

- Each University would have to understand DNS properly

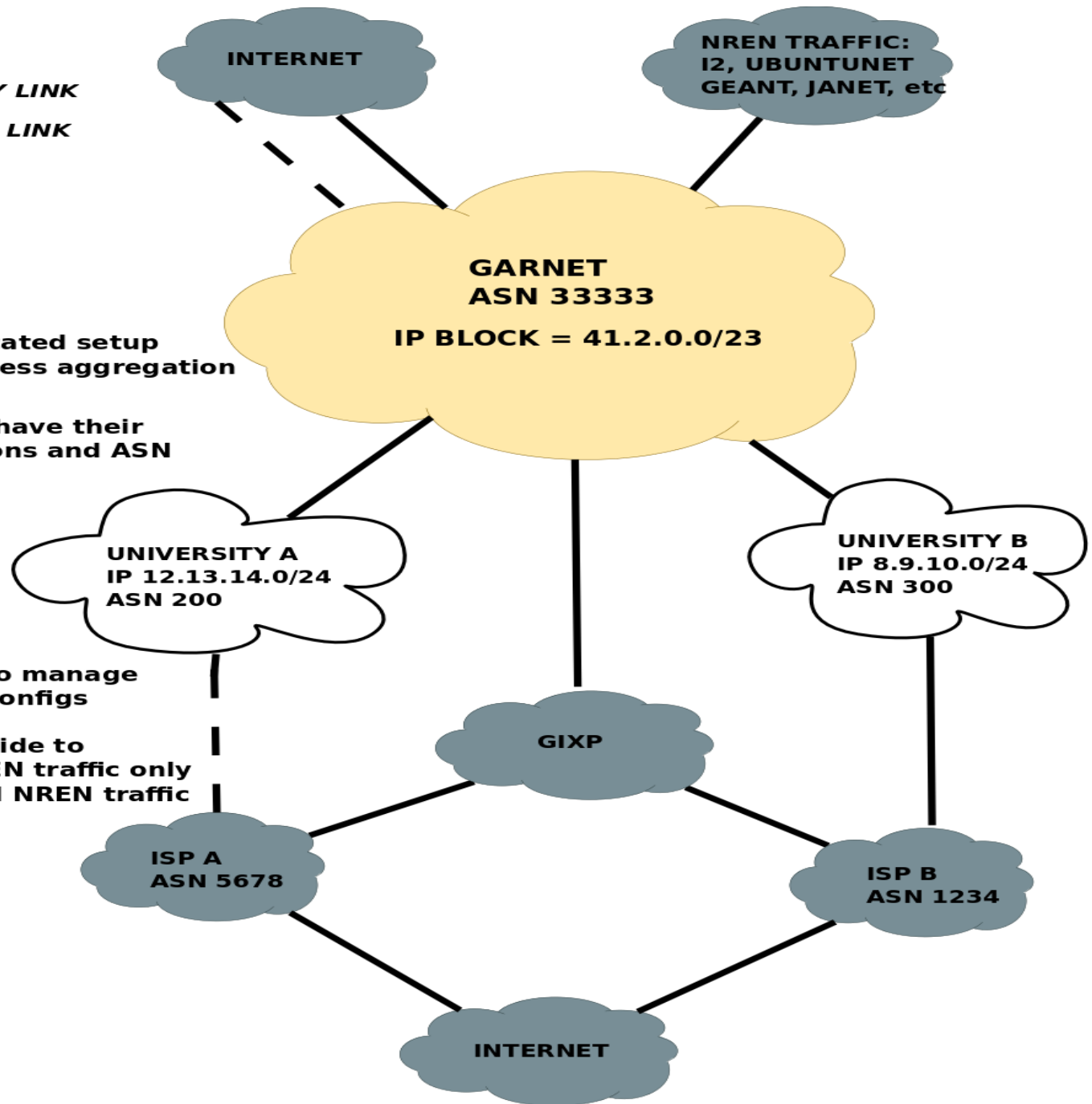- More work for GARNET in terms of configs

How many IPs should I get?

- Depends on your infrastructure, your needs and policy
  - Public IP for every desktop? Good but beware: botnets, spam, viruses
  - How many public machines do you have and how fast is your network growing?
- A /24 allocation means 254 use-able public IPs
- For GARNET, a large allocation at least a /16 to distribute to the others
- Some upstreams only do BGP with you if you have a minimum /24
- IPv6 - GARNET as a LIR could get a /32 = 2^96 (many IPs!)
  - Universities could get /48 = 2^80 (still very many)

Where do I get IPs from?

- Africa's RIR is Afrinic (http://afrinic.net). Its mission
    - *"To serve the African community by providing professional and efficient management of Internet Number Resources, supporting Internet technology usage and development, and promoting a participative and multi-stakeholder approach to Internet self governance."* (http://afrinic.net/about.htm)
- Head offices are in Mauritius
- Everything is on-line based
    - Membership registration
    - IP Address management – Reverse records, allocation requests
    - Many other functions – billing, voting etc

How do I get the IPs?

- You first must be an Afrinic member and sign up. You can choose from two types of members:
    - LIR – Local Internet Registry ie ISP (GARNET in this case) can re-assign IPs to others
    - End User – the Universities (not re-assigning IPs to another entity)
- http://my.afrinic.net/registration
- Members benefit by:
    - Can get IPs and ASNs
    - Can get training on IPv4, whois, IPv6 and DNSSEC
- Once registered, you will be creating objects in the database which reflect various types of information:
    - Domain – forward or reverse DNS
    - Role – administrative or technical
    - Many others (auto-num, as-set etc)

Registration at Afrinic

- You will need a "nic-handle" which is a unique identifier. Also known as a person object or "nic-hnl"

- Used to identify the contact person responsible for a specific object

- Can be created by sending an email to auto-dbm@afrinic.net in the following format:

person:	*[mandatory]*	*[single]*	*[lookup key]*
address:	*[mandatory]*	*[multiple]*	*[ ]*
phone:	*[mandatory]*	*[multiple]*	*[ ]*
fax-no:	*[optional]*	*[multiple]*	*[ ]*
e-mail:	*[mandatory]*	*[multiple]*	*[lookup key]*
nic-hdl:	*[mandatory]*	*[single]*	*[primary/lookup key]*
remarks:	*[optional]*	*[multiple]*	*[ ]*
notify:	*[optional]*	*[multiple]*	*[inverse key]*
mnt-by:	*[optional]*	*[multiple]*	*[inverse key]*
changed:	*[mandatory]*	*[multiple]*	*[ ]*
source:	*[mandatory]*	*[single]*	*[ ]*

Sample Nic Handle

```
$ whois  kc1-afrinic
```
% This is the AfriNIC Whois server.

% Note: this output has been filtered.

% Information related to 'KC1-AFRINIC'

person: Kevin Chege

address: P.O. Box 30244 00100, Nairobi, Kenya

phone: +254206750435

e-mail: noc@kenet.or.ke

nic-hdl: KC1-AFRINIC

remarks: Kenya Education Network

source: AFRINIC # Filtered

Sample inetnum object

```
$ whois 41.204.160.22
```
% This is the AfriNIC Whois server.

% Note: this output has been filtered.

% Information related to '41.204.160.0 - 41.204.160.255'

inetnum:	41.204.160.0 - 41.204.160.255
netname:	KENET-NBI-POP
descr:	KENET-NBI-POP
country:	KE
admin-c:	KC1-AFRINIC
tech-c:	KNT1-AFRINIC
status:	ASSIGNED PA
mnt-by:	KENET
source:	AFRINIC # Filtered
parent:	41.204.160.0 - 41.204.163.255

Sample domain object

```
$ whois 164.204.41.in-addr.arpa
```
% This is the AfriNIC Whois server.

% Note: this output has been filtered.

% Information related to '164.204.41.in-addr.arpa'

domain: 164.204.41.in-addr.arpa

descr: Kenya Education Network

admin-c: KC1-AFRINIC

zone-c: KC1-AFRINIC

tech-c: KC1-AFRINIC

nserver: ns1.kenet.or.ke

nserver: ns2.kenet.or.ke

nserver: ns3.kenet.or.ke

source: AFRINIC # Filtered

mnt-by: kenet-mnt

References and where to get more info

- http://www.afrinic.net/faq.htm
- http://www.afrinic.net/about.htm
- http://www.afrinic.net/docs/db/afsup-obj200502.htm
- http://www.afrinic.net/rs/eligibility.htm
- Google and WikiPedia are your friends!

Thanks!

And now a live demo from the Afrinic Web User Interface....