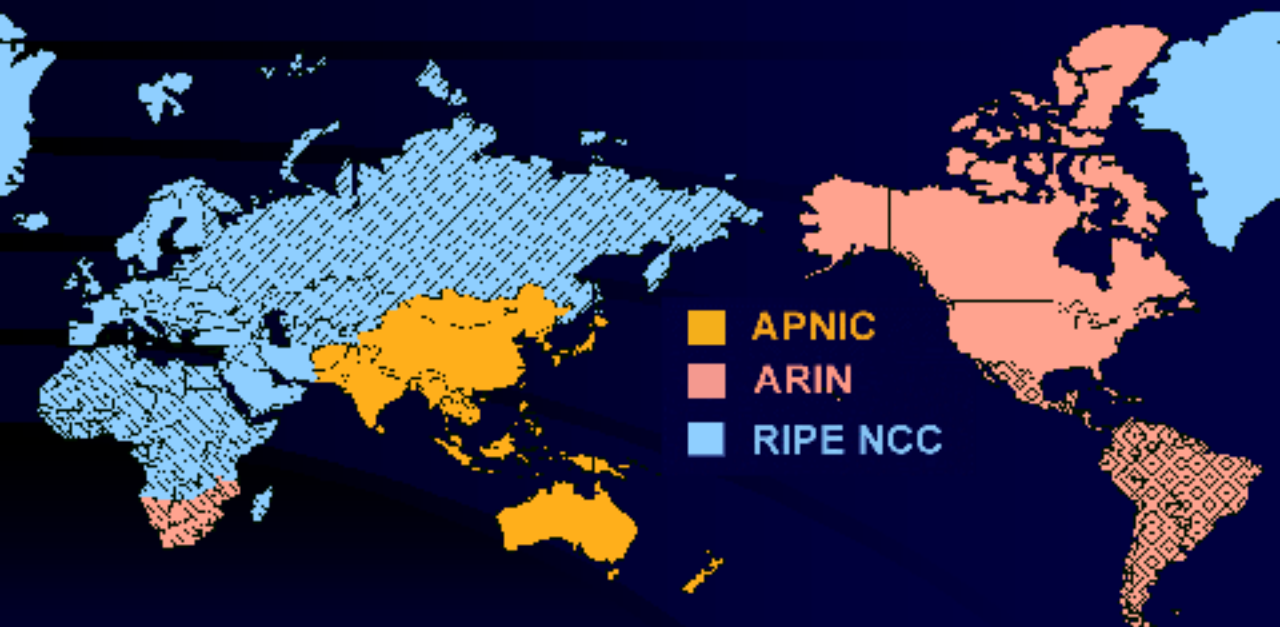# What is APNIC?

- Regional Internet Registry for the Asia Pacific
  - one of three RIRs
- Not-for-profit, membership based
- Provides allocation and registration services

- <u>Not</u> operations forum
- <u>Not</u> standards development
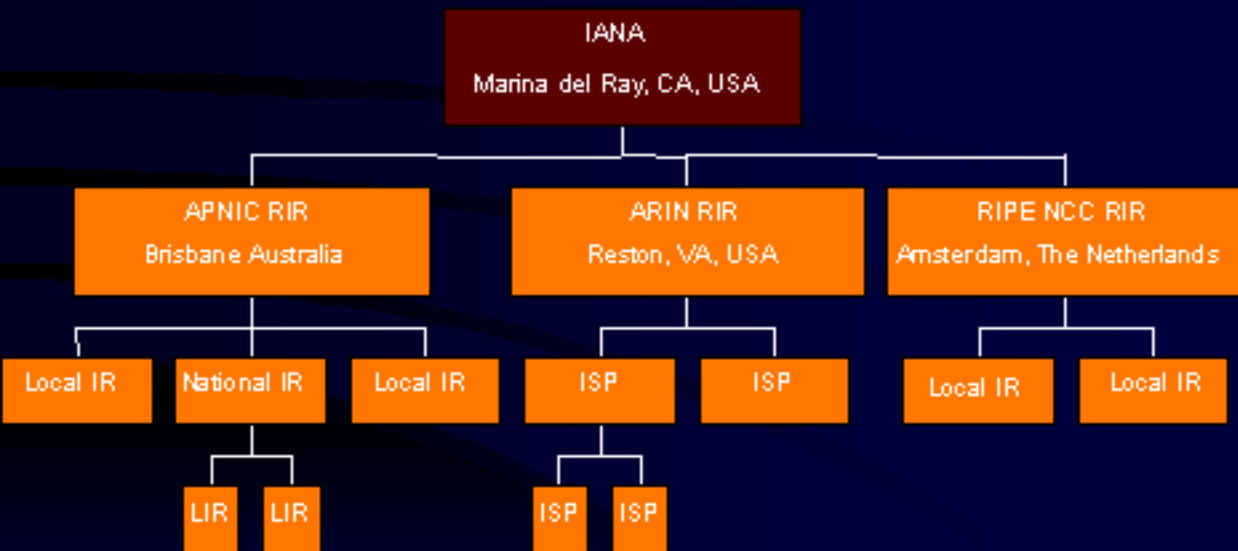
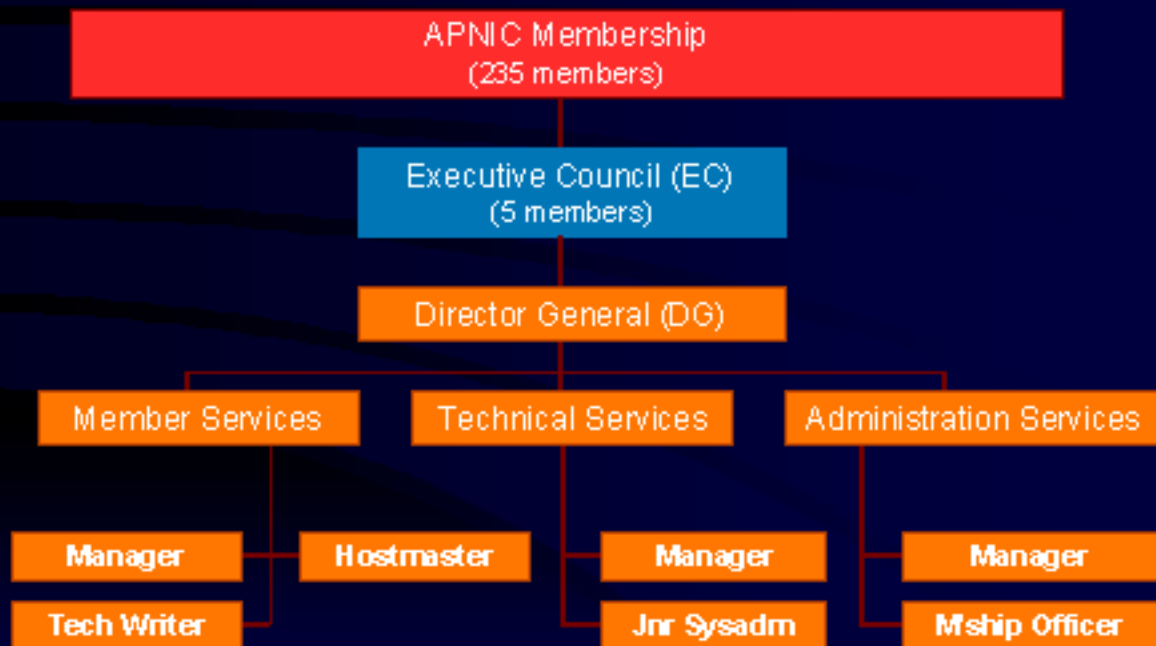# Registry hierarchy

IANA
Marina del Ray, CA, USA

APNIC RIR
Brisbane Australia

ARIN RIR
Reston, VA, USA

RIPE NCC RIR
Amsterdam, The Netherlands

Local IR — National IR — Local IR — ISP — ISP — Local IR — Local IR

LIR — LIR — ISP — ISP

APNIC organisation

```
┌─────────────────────────────────────────────┐
│            APNIC Membership                    │
│             (235 members)                      │
└───────────────────────┬───────────────────────┘
                        │
        ┌───────────────┴───────────────┐
        │   Executive Council (EC)        │
        │        (5 members)              │
        └───────────────┬───────────────┘
                        │
        ┌───────────────┴───────────────┐
        │    Director General (DG)        │
        └───────────────┬───────────────┘
```

Member Services	Technical Services	Administration Services

Manager	Hostmaster		Manager		Manager
Tech Writer			Jnr Sysadm		Mship Officer

Membership

- Membership is open
- Benefits of membership
  - use of resource registration services
  - use of resource allocation services
  - free attendance and voting at meetings
  - free attendance at training courses
  - participation in policy development

- <u>But</u> membership does not mean automatic or easier allocations of resources

APNIC core services

- **Resource allocation**
  - IP allocations
  - approval of IP assignments
  - AS number assignments
- **Resource registration**
  - APNIC database objects
    - person, inetnum, AS number, domains etc
- **DNS management**
  - in-addr.arpa domains

APNIC support services

- **DNS management**
  - secondary for ccTLDs
- **Representation**
  - regional representation at Internet meetings
- **Coordination**
  - ARIN, RIPE NCC, IANA
- **Information dissemination**
  - APNIC meetings
  - web and ftp site
- **Training courses (from 1999)**

Policy documentation

Policies for Address Space Management in the Asia Pacific Region

- http://www.apnic.net/policydraft.html

RFC 2050: Internet Registry Allocation Guidelines

- http://ftp.apnic.net/ietf/rfc/rfc2000/rfc2050.txt

Goals of public address space management

- **Uniqueness**
  - public hosts must be uniquely identifiable by IP address

- **Registration**
  - ensures uniqueness of address space
  - ensures users of resources can be found
    - public registry provided

- **Aggregation**
  - hierarchical and topological distribution
    - limits growth of routable prefixes

Goals of public address space management (cont'd)

- **Conservation**
  - addresses to be distributed on the basis of demonstrated need

- **Fairness**
  - addresses to be distributed fairly
  - policies to be applied equitably to all

- **Conflict of goals acknowledged**
  - aggregation vs conservation
  - needs of individuals to be balanced with needs of Internet community

Documentation

ISP Address Request Form (apnic-065)

- ftp://ftp.apnic.net/
 apnic/docs/isp-address-request

Addressing plan

- **components of the network**
  - dial up
    - analogue dialup modems (initially)
    - 2 PRI dial up pools x2 (later)
    - 8 PRI dial up pools x2 (even later)
  - servers & PCs
    - mail, DNS, web
    - secondary servers redundancy (later)
    - operations management servers, helpdesk PCs
  - routers
    - loopback router interfaces
    - WAN ports
    - customer connections
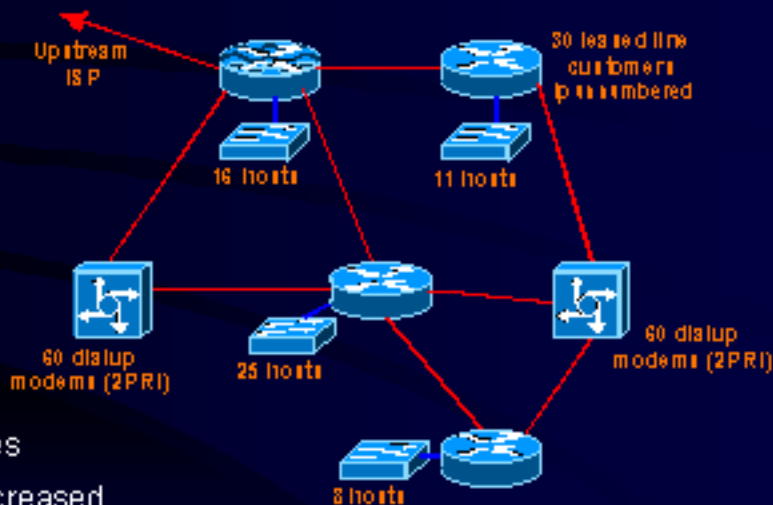
Network plan example

- Starting off
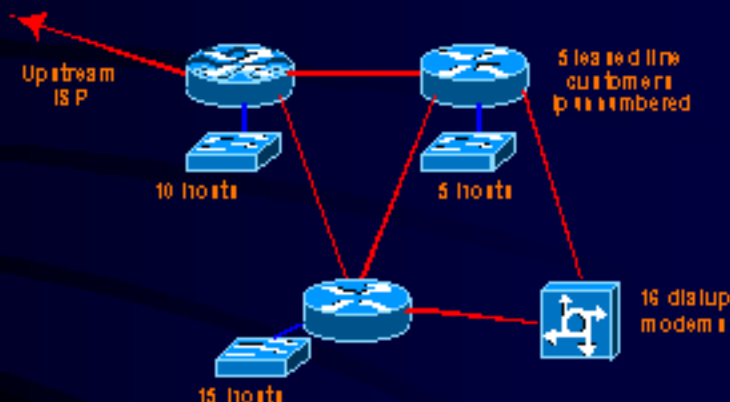
- Key elements
  - one loopback interface per assigned router /32
  - WAN point to point /30
  - LANs can have address space they require
  - 'ip unnumbered' to upstream ISP

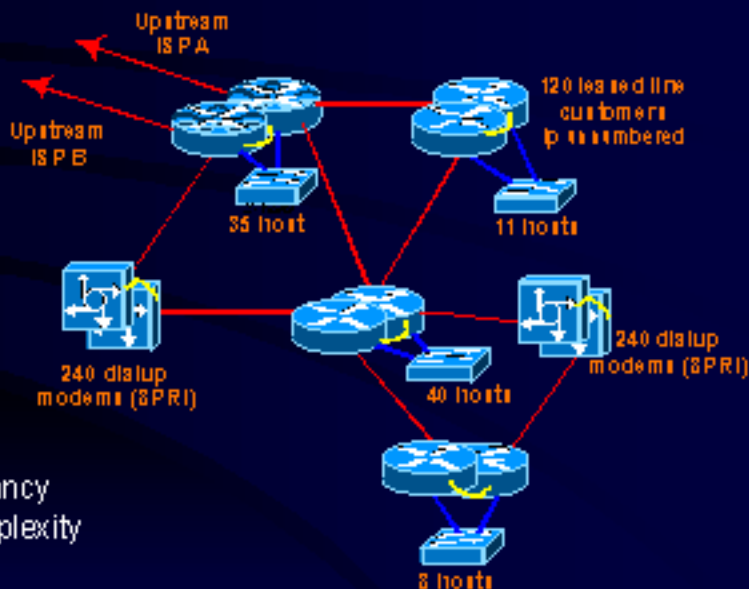# Network plan example

- 6 months later

Upstream
ISP

30 leased line
customers
[p unnumbered]

16 hosts

11 hosts

60 dialup
modems (2PRI)

25 hosts

60 dialup
modems (2PRI)

3 hosts

- Key features
  - scale increased

Network plan

- 12 months total

Upstream
IS P A

Upstream
IS P B

120 leased line
customers
ip unnumbered

35 hosts

11 hosts

240 dialup
modems (SPRI)

40 hosts

240 dialup
modems (SPRI)

8 hosts

- Key features
  - site redundancy
  - greater complexity
  - *efficiency*

Addressing plan

- Addressing plan for network-plan

network-plan:	0.0.0.0	**255.255.255.0**	256	16/60/240	8 PRI dial up modems
network-plan:	0.0.1.0	**255.255.255.0**	256	0/60/240	8 PRI dial up modems
network-plan:	0.0.2.0	**255.255.255.192**	64	10/16/35	ops management servers
network-plan:	0.0.2.64	**255.255.255.192**	64	15/25/40	customer support PCs
network-plan:	0.0.2.128	**255.255.255.240**	16	5/11/11	mail, DNS, web servers
network-plan:	0.0.2.142	**255.255.255.240**	16	0/8/8	secondary DNS & Mail servers
network-plan:	0.0.2.158	**255.255.255.240**	16	4/6/12	loopback router interfaces
network-plan:	0.0.2.174	**255.255.255.252**	4	2/2/2	router WAN ports (x 8)

Additional information

- **Deployment plan**
  - to support large network growth
    - describe type of equipment, planned operational date, location, communication circuits, and bandwith
- **Network topology map**
    - shows network structure
    - can also show POP design
- **Hardware details**
    - equipment specification, number of ports, etc
- **Service details**
    - details of how implement services (eg, web hosting)
    - dial up services

Evaluation

- Consistency with policy goals
    - uniqueness
    - registration
    - aggregation
    - conservation
    - fairness

Evaluation (cont'd)

- **Technical information**

  - contributing APNIC member?
  - variable length subnet masks used?
  - address space non-portable?

  - private address space considered ?

- **Addressing plans - general**
  - is all address space declared?
    - use 'whois' to research previous allocations
  - is 80% used up?
  - are subnet masks real?
  - are assignments classless?
    - non-CIDR boundary assignments can be repeated on form
  - is it efficient?
    - can addresses be conserved with different subnet mask?
  - what are the usage rates
    - how much was used in what time frame?

Evaluation (cont'd)

- **Customer-network fields**
  - what is the prefix distribution?
  - are customer assignments recorded accurately in database?
  - are the cust-network name & the network name the same?

- **Infrastructure fields**
  - are efficient technologies used?
    - research archived history
  - has 80% of address space been used?
    - sum of infrastructure and cust-network fields is equal to the total of used address space

- **Network-plan fields**
  - is plan detailed enough?
  - is plan efficient?
  - are dynamic technologies planned?
  - do customer projections match infrastructure plans?

- **Additional information supplied**
  - does deployment plan match information in network-plan fields?
  - does network topology description correlate with addressing plan?
    - *larger requests require additional documentation*

- **Other considerations**
  - is the customer renumbering?
  - what are the timeframes?

Considerations

Assignment

Allocation

'Assignment window' 0

'Slow start' /19

- determines maximum amount of address space a LIR can assign without approval from APNIC

- increases when procedures & criteria are understood

- determines an initial allocation size that is consistent and fairly applied to all

- increases when usage rate increases

Considerations

- **Motivation**
  - support the LIR during start up
  - familiarise the LIR with APNIC procedures
  - standardise criteria for request evaluation
  - treat everyone fairly

Assignment Window

Assignment window	LIR Assignment limit (host addresses)
AW=0 $\longrightarrow$	Limit is zero
AW=/25 $\longrightarrow$	requests <= 128
AW=/24 $\longrightarrow$	requests <= 256
AW=/23 $\longrightarrow$	requests <= 512
AW=/22 $\longrightarrow$	requests <= 1024
AW=/21	etc
AW=/20	
AW=/19 $\longrightarrow$	Maximum is<=/19

Increasing responsibilty of LIR

- Most impact during start-up phase
  - start at minimum

- Not raised automatically

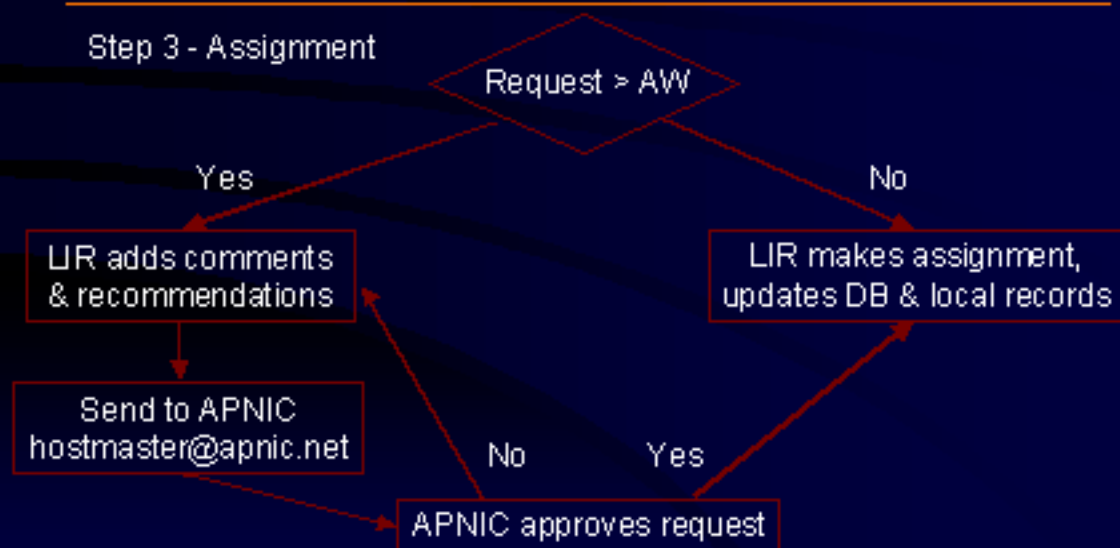# Assignment window

Step 1 - Complete the documentation
Step 2 - Evaluation OK

Step 3 - Assignment

Request > AW

Yes

No

LIR adds comments
& recommendations

LIR makes assignment,
updates DB & local records

Send to APNIC
hostmaster@apnic.net

No   Yes

APNIC approves request

Assignment and allocations

- LIR can only make <u>assignments</u> not allocations

- Update local records
  - archive original documents

- Clarify status of address space
  - 'Provider Aggregatable' or 'Provider Independent'
    - more explanation next slide...

PA and PI assignments

- *Provider Aggregatable (PA)*
  - customer uses addresses out of registry's allocation
  - good for minimising size of routing tables
  - but customer has to renumber if changing ISP
- *Provider Independent (PI)*
  - customer gets separate range of addresses
  - customer keeps addresses when changing ISP
  - customer may experience routing problems
  - bad for routing tables

- APNIC requires 'Provider Aggregatable'

Issues

- **Current operational problems**
  - growing number of routes
  - many prefixes announced
  - the 'swamp'
  - routing instabililty
- **What can ISPs do?**
  - aggregate & filter
  - dampen flapping routes
  - renumber
  - NAT