

Application of the HD ratio to IPv4 [prop-020-v001]

Policy SIG

1 Sept 2004

APNIC18, Nadi, Fiji

Document history

- APNIC16 ‘informational’ presentation
 - Idea favourably supported
- Presentation ‘world tour’
 - Considered at RIPE, ARIN and LACNIC meetings (more later)
- Submitted as a ‘proposal’
 - Posted to *sig-policy* mailing list on 4 Aug
 - <http://www.apnic.net/mailling-lists/sig-policy/archive>

What is the proposal?

- Defining the threshold for requesting subsequent allocations
- Replace fixed 80% measure of utilisation with a variable % measure
- Motivation
 - To apply a fairer and more just measure of utilisation

Current situation

- IPv4 policy
 - Fixed 80% utilisation requirement
 - Once 80% is sub-allocated or assigned, LIR can request additional block
 - Same 80% threshold for all address allocations
 - Regardless of size
- IPv6 policy
 - Variable % utilisation requirement
 - Different % threshold for different sized address allocations
 - Recognises utilisation efficiency is related to size of block
 - Larger address allocation, lower utilisation threshold

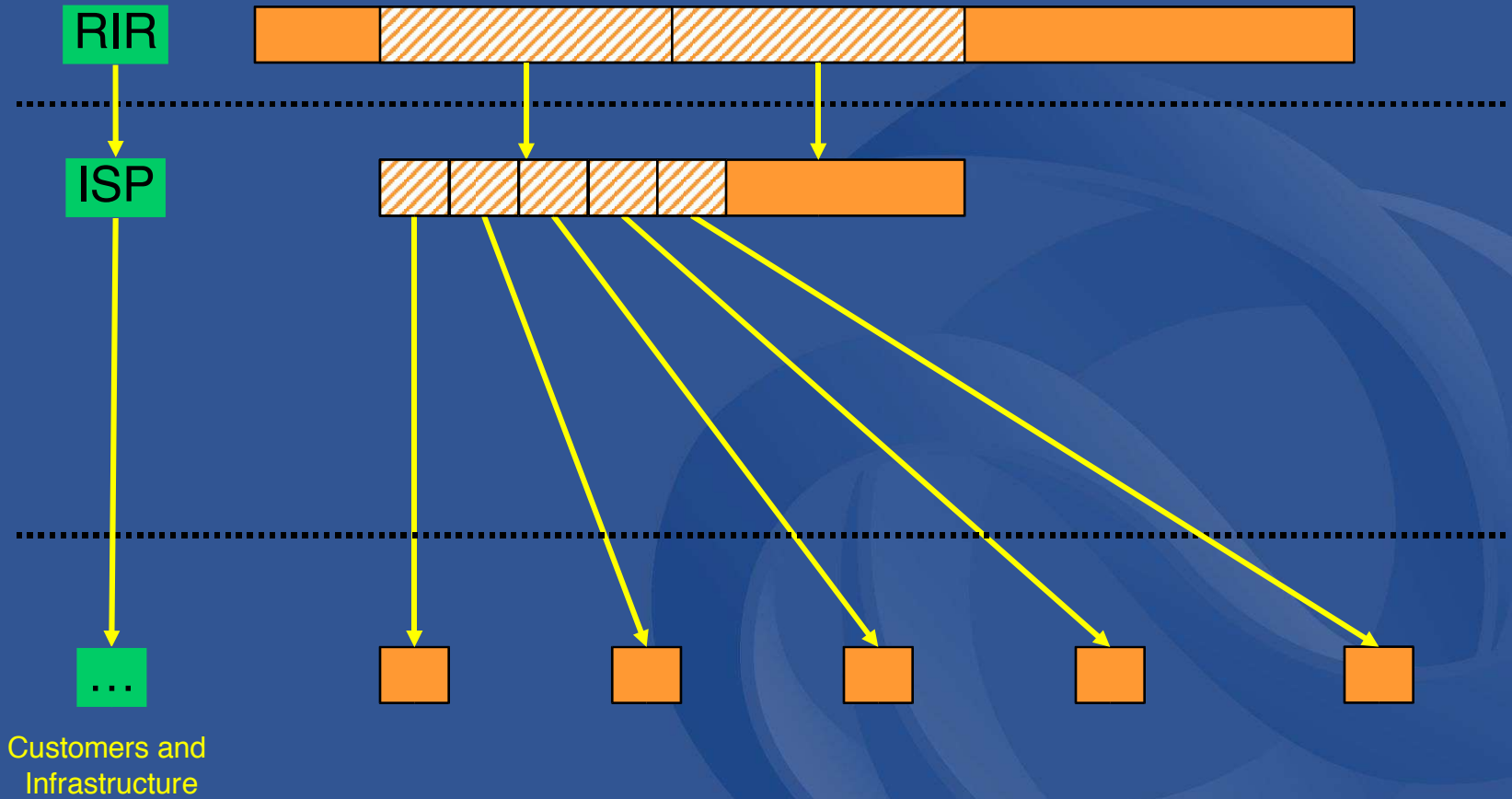
Problem statement

- Feedback to Secretariat
 - Larger LIRs have difficulty in meeting 80%
 - Unlike IPv6, no allowance for hierarchy in managing network addresses
 - “One size fits all” approach is unfair

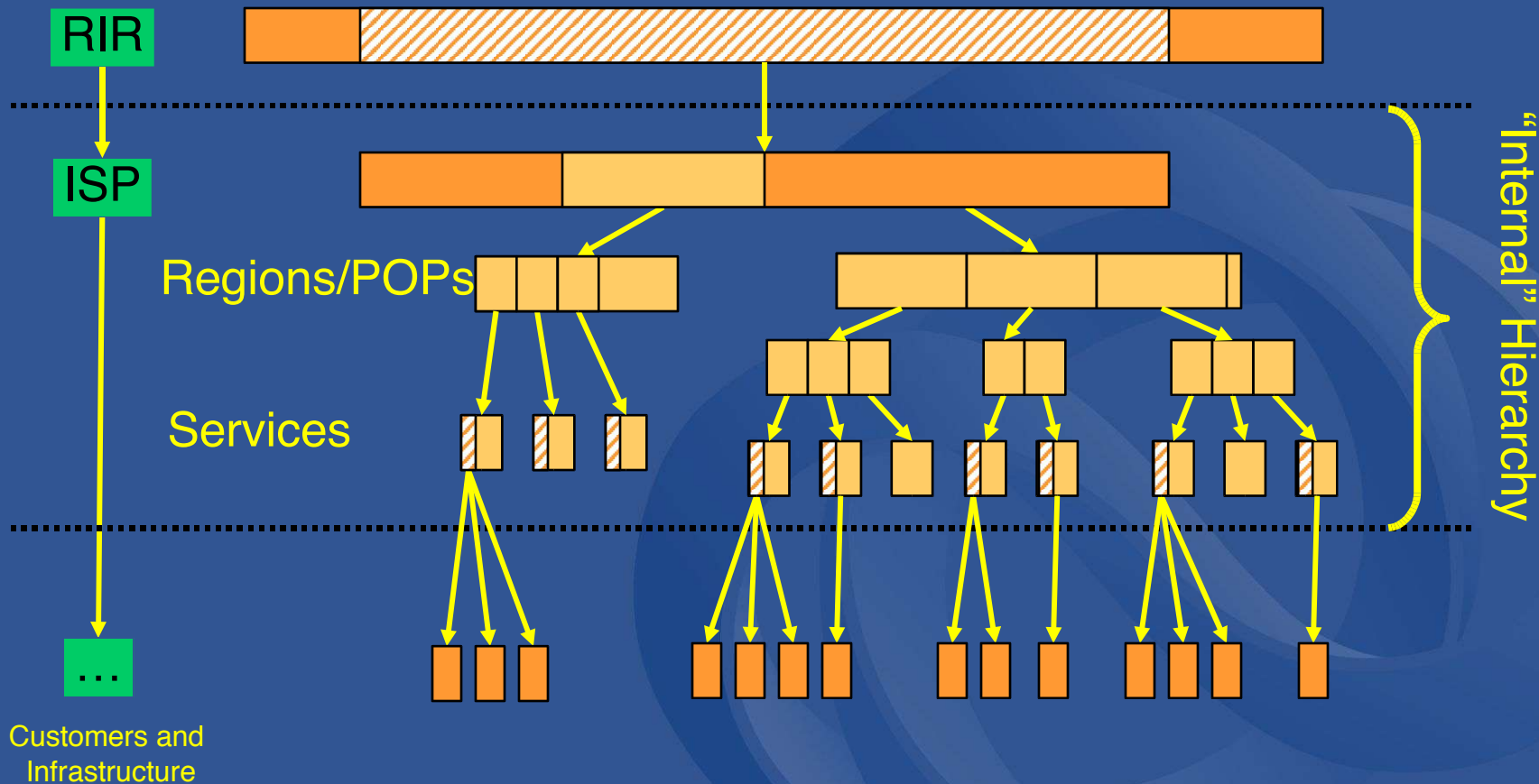
Basis of proposal

- There is a relationship between the size of a network and the administrative complexity of managing address space of the network
- As a network grows the diversity and complexity in service types and product offerings increases

More 'efficient' with less hierarchy



'Efficiency' loss through hierarchy



Deeper hierarchy = lower efficiency

Utilisation ‘efficiency’

- Address management “efficiency” decreases as network becomes more hierarchical
 - 80% at 3 levels of hierarchy is 51.2% overall
 - With a fixed utilisation we assume 100% efficiency at lower levels
 - Proportion of address “padding” increases with more hierarchy
 - Tends to occur in larger networks
 - Greater diversity of services and infrastructure

Proposes use of Host-Density ratio

- Measures utilisation in hierarchically managed address space

$$HD = \frac{\log(\text{utilised host addresses})}{\log(\text{total addresses})}$$



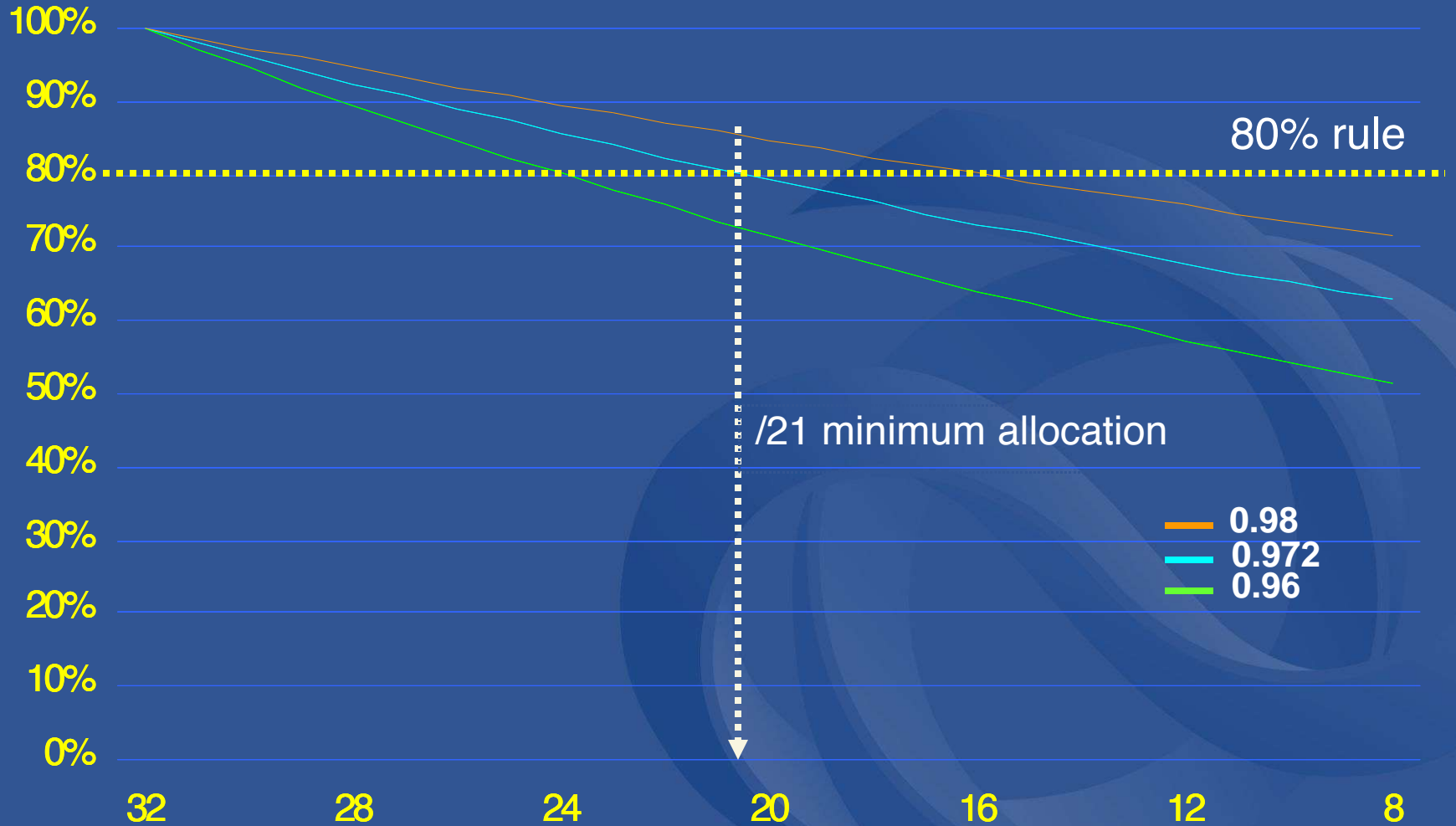
- An HD-ratio value corresponds to a % utilisation
 - % utilisation decreases as the size of the address space grows
- The HD-ratio has been adopted for IPv6

Selection of the HD ratio value

Size range (prefix)	Depth (n)	Utilisation (0.80*n)	HD ratio (calculated)
/24 to /20	1	80%	.960 to .973
/20 to /16	1.5	72%	.961 to .970
/16 to /12	2	64%	.960 to .968
/12 to /8	2.5	57.2%	.960 to .966
/8 to /4	3	51.20%	.960 to .966



Proposed flexible utilisation





Proposal summary

- Proposes a realistic measure of ‘utilisation’
 - Recognises larger networks have greater diversity and network hierarchy
 - Uses a simple lookup table
 - No need to do calculations
 - APNIC secretariat will develop tools
- Benefit
 - Fairer system
 - Amends current penalty applied to larger networks

Feedback received on ML

- Why not lower the utilisation threshold instead – say 70%
 - Unnecessarily lenient with smaller network and still may not accommodate need for larger networks
- HD ratio is the wrong measure
 - What is the “best fit” to gradual decrease in “efficiency”?
 - Linear ‘fit’ does not accept argument of overhead in hierarchy
- Concern about impact to utilisation
 - Use more conservative HD ratio value
- Smaller networks also have difficulty?

Impact on NIRs

- NIRs expected to conduct an OPM with a view to a consistent policy
 - The time-frame for implementation at discretion of the NIR



Status in other regions

- ARIN XII
 - Similar proposal raised and discussed
 - Proposal abandoned as “too complex”
- LACNIC VI
 - Presented by APNIC staff as informational only
- RIPE 48
 - Presented by APNIC staff as informational only

Thank you!

- Questions?



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