IPv6 Address Distribution Mechanisms

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The IPv6 Vision

Communications as a commodity service:

anywhere, anyhow, anytime

present-and-play auto-configuration

every device with an IP protocol stack

appliances, automobiles, buildings, cameras, control units, embedded systems, home networks, medical devices, mobile devices, monitors, offices, output devices, phones, robots, sensors, switches, tags, vans ....

And every device will need an address...

What do we want from addresses?

- Assured Uniqueness
- Verifiable Authenticity
- Routeability
- Simplicity
- Stability
- Assured availability
- Low cost

What do we want from IPv6 addresses?

- Servicing Ubiquity
  - Global populations of people, places, activities, devices,...
- Simplicity
  - Easy to obtain, easy to deploy, easy to route
- Longevity
  - 70 - 100 year technology lifespan
- Commodity
  - Low cost per address
- Scaleability
  - Global end-site populations of the order of hundreds of billions of sites

Distribution Mechanisms - Objectives

- Preserve valued attributes
  - Ensures that distributed addresses are assuredly unique, have clear lines of authenticity, and support routeability
- Maximize current utility
  - Readily available to meet network demand with low marginal cost of deployment
- Maximise future utility
  - Readily available to meet various future demand scenarios
- Minimize distribution overheads
  - Low cost of access

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Distribution Mechanisms - Risks and Threats

- Any distribution system can fail – the forms of possible failure include:
  - Exhaustion
  - Induced scarcity
  - Hoarding
  - Fragmentation
  - Instability of supply
  - Pricing distortions
  - Forced renumbering
  - Speculative acquisition and disposal
  - Erosion of assured uniqueness and/or authenticity
  - Theft and Seizure

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Potential Mechanisms – Characteristics

- Distribution
  - Allocations / Auctions / Markets
- Title
  - Freehold / Leasehold
- Circulation
  - Tradeable Asset / Restricted Use
- Structure
  - Uniform / Various
- Nature
  - Global / Regional / National / Industry
- Pricing
  - Asset-based pricing / Service-based pricing

Distribution Frameworks

- Allocation Scope

  - Global / Regional / National ?

  - Public / Private / Hybrid ?

  - Coordinated function / Multi-source competitive framework ?

- Supporting Authenticity

  - Trust points

  - Accuracy of information

  - Currency of information

- Supporting Routeability

  - Supporting an allocation framework that supports hierarchies of aggregation within the routing system

  - Service provider alignment

Some Lessons from IPv4

- Address distribution characteristics
  - simple, uniform and generic
  - consistent and stable
  - relevant
  - routeable
  - accurate and trustable

- Some useful considerations:
  - Be liberal in supply (but not prolifigate!)
  - Avoid "once and forever" allocations
  - Avoid creating future scarcity
  - Plan (well) ahead to avoid making changes on the fly

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National Distribution Channels?

- To what extent would national regimes impose particular constraints or variations on address use conditions?
  - How would you put these constraints into your routers?
  - What additional overheads would ensure?
- What is the underlying network model?
  - National service operations interlinked by bilateral arrangements?
  - Heterogenous service industry based on private sector investments at the local, regional and global levels
- Are there end-user visible IP address semantics?
  - Toll or international address prefixes?
- Is there the risk of scarcity in IPv6 addresses?
  - At last count we appear to have provision for 225,179,981,368,525 useable end site address prefixes. This appears to be adequate for the most optimistic forecasts of IPv6 lifetime address consumption.

Competitive Distribution Channels?

- What would be the basis of competition?
  - Pricing, Policies, Use Restrictions, Local regulation?
    - It appears likely that competition would be based predominately on policy dilution in the distribution function.

- Would this enhance or erode address attributes?
  - Availability, Uniqueness, Stability, Routeability, Confidence?
    - A regime of progressive policy dilution would expose consequent risks of increased routing overheads address fragmentation and restricted address policies, dilution of authenticity and integrity, the potential for gains derived from hoarding and speculative pricing ,and erosion of confidence in the address distribution system

- Would this enhance or erode IPv6 viability?
  - Scaleability, Stability, technology lifecycle

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What form of distribution is most appropriate for the future IPv6 commodity network?

– Accommodates multi-sector needs and interests

– Preserves strong address integrity

– Stays within technology bounds

– Highly stable

– Very simple

– Very cheap

Today's IP Address Distribution System

- Industry self-regulatory framework
  - Consensus-based, open and transparent policy development processes
  - Balancing of interests

- Reflective of global trend to deregulation and multi-sector involvement
  - Policy development process open and accessible to all interested parties

- Separation of Policy and Operation
  - Non-profit, neutral and independent operational unit
  - Consistent application of the adopted policy framework

- Structured as a stable service function
  - Self funded as an industry service function
  - Preserve address integrity

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What are we really trying to achieve here?

The distribution of network addresses is an enabling function, and not an enduring value proposition in its own right. The enduring value proposition here lies in the exploitation of networked services to create value.

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Thank You

Questions?