



ROUTING IN NEXT GENERATION

RiNG: Routing in Next Generation Workshop

Enterprise Routing Requirements

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Enterprise Requirements

- Considering the end-user site/enterprise requirements for inter-domain routing
 - Site scenarios
 - General requirements
 - Evaluation against requirements?
- As we go: is everything mentioned relevant?
 - What's missing?
 - Priorities – 'nice to have', 'must have', ...?
 - Do the requirements allow is to differentiate sufficiently between solutions?
- Consider this in our workshop discussions

Site Scenarios

- Four broad classes
 - SOHO Networks
 - Unmanaged, single subnet
 - Enterprises
 - Managed, multiple networks
 - Distributed Enterprises
 - Multiple sites, possible dedicated interconnects
 - Mobile Networks (emerging)
 - Changes point of attachment over time
- Others in scope?
 - Content provider networks?

General Requirements

- End-user/Enterprise sites have networking requirements
 - An ISP maps the requirements to services
 - A site just wants cheap, simple, robust solutions
 - Not concerned about the global network impact
 - But ‘local’ solutions can generate global problems
 - e.g. by use of PI address space
 - See projections at <http://www.vaf.net/~vaf/iepg.pdf>
- Need to recognise that there is a kind of ‘global routing warming’ problem
 - Some good documentation of this trend:
 - e.g. see BGP reports at <http://bgp.potaroo.net/>

The challenge

- The challenge is to evolve the existing routing architecture to meet Internet growth
 - Be scalable
 - Reduce the ‘pain’ for ISPs
 - While meeting the end-user site needs
- No shortage of previous work, e.g.
 - ‘Requirements for Inter-Domain Routing’
 - draft-irtf-routing-reqs-08
 - ‘Design Goals for Scalable Internet Routing’
 - draft-irtf-rrg-design-goals-01
 - More focused on protocols than an end-site’s view

The requirements?

- These may vary with the scenario
- We'll briefly look at:
 - Provider independence
 - Multi-homing
 - Traffic engineering
 - Mobile network support
 - Minimising change
 - Exposure (or not) of internals
 - Specific service support
 - Scalability (...not explicitly an end-site issue!)

Provider Independence

- It should be easy to change network provider
 - Avoid dependence on any given ISP
 - Avoid network renumbering when changing ISP
 - Still problematic with IPv6
- Currently facilitated in various ways, e.g.
 - Using PI (as opposed to PA) address space
 - Using NAT (with associated baggage)
 - Using ‘ye olde’ Class B address blocks
 - Enterprise sites that gained IP space prior to CIDR
- Extra routes => Pain for ISPs that carry them
 - PI for all IPv6 /48’s would be a *lot* of routes...

Multi-homing

- Using multiple providers
 - Multiple points of attachment and/or ISPs
- Various reasons to multi-home, e.g.
 - Resilience
 - Load-balancing
- May lead to many more network prefixes being advertised
 - Either 'PI' or sometimes more-specifics from one ISP towards another ISP's network
 - Also leads to consumption of the ASN space
- The 'pain' is again pushed to the core
 - Increased de-aggregation

Traffic Engineering

- May wish to exercise control over which paths certain traffic uses
- Various reasons, e.g.
 - Specific applications/services may require specific paths (with different characteristics)
 - Enforcing policy in a multi-site enterprise
- Implies more-specific routes advertised for different paths
 - Yet more pain, depending where routes seen
 - May see a lack of stability in more-specific routes
- A recent study claimed 70K of 200K observed routes were intentional de-aggregates

Mobile Networks

- An emerging area
 - A site network, or some part of it, may be mobile
- The network changes point of attachment
 - Ideally with session survivability
- Could be handled various ways
 - Use home prefix (and tunnel to the home network)
 - Renumber to use a prefix from the new point of attachment
 - Use 'PI' and advertise that from current point of attachment
- Mobile networks might also multi-home?

Minimising change

- The end-user site is unlikely to accept extra complexity or change being introduced
 - No extra more-specific routes internally
 - No unnecessary tunnelling
 - No requirement to upgrade hardware
 - No changes to applications
 - Retain existing security models (e.g. firewalls)
- End-site would expect to see a ‘normal view’ of the global network
 - For troubleshooting, monitoring, etc

Exposure of Internals

- Different views on this topic
 - The view depends on the scenario
- Some will seek global visibility, and ‘end to end’ transparency of communicating nodes
 - An apparent goal of general IPv6 deployment
- Some will want topology and host obfuscation
 - Avoid disclosure of internal configurations
 - Offer network-level ‘privacy’ for nodes/users
- Thus support for both is desirable

Specific Service Support

- Various (well-defined) network services may be required by an end-user site, e.g.
 - QoS
 - VPNs
 - Multicast
- These provide desirable solutions for many end sites today
 - End site networks will want to continue to use these functions
- New protocols should support such services, or their equivalents
 - Loss of function would not be acceptable to sites

Scalability

- From a design perspective, perhaps the most important aspect
 - But the end-user/enterprise site doesn't care
 - Especially if not 'paying the cost'
 - Why use PA if PI is available and 'cheap'?
- To facilitate a deployable solution, any new proposal must be incrementally deployable
 - The end-site is very likely to want this change to be transparent to them
 - Though any new benefit or capability for the end site would be an incentive to deploy early

Evaluating Solutions

- A goal of documenting requirements is to be able to judge or evaluate solutions against the requirements
 - Do we have sufficient detail in the requirements to differentiate between the emerging proposals?
 - Does this matter, if they are met?
 - Is there more to add?
- To what extent does considering site scenarios help?
 - Or are our requirements generic to all scenarios?
- Plenty of solutions are being proposed...

Conclusions

- We can probably draw up a core set of agreed end-site requirements
 - Provider independence, multi-homing, etc
 - But new requirements are also emerging, e.g. support for mobile networks
- The current situation is placing the ‘pain’ in the core of the network
 - End sites don’t really care about this
 - Each individual ISP may not (to an extent)
- A solution is needed that is scalable while being attractive to end sites
 - Sites are unlikely to accept change
 - Adding new value for sites would be a bonus