

IPv6, Perspective from small to medium ISP

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Overview

- Some myths and facts about IPv6
- Implementation Strategy – Before you begin
- Case study: IPv6 Implementation in D-NET
 - About D-NET
 - IPv6 implementation strategies at D-NET
 - Plan for transition phases
 - Post deployment stage
- Conclusions

Myth of IPv6 implementation

- No customer demand
- Only few vendors support IPv6
- Only few people use IPv6 in real world
- We can still use NAT
- IPv6 is still has a long way to go
- Migrate to IPv6 is not feasible in business terms.

Facts

- IPv4 projected to be exhausted in 2012.
- Support for both IPv4 and IPv6 will be (very near) future requirement from customers.
- Large ISP's are getting ready with IPv6 service
- IPv6 has been supported by major brands like cisco, juniper, microsoft, google, etc.
- NAT has it's own problem
- IPv6 is about our business continuity

Before you begin

- Status of Hardwares and Applications
- Customer Types → different approach
- What IPv6 Services you want to deliver
- Transition methods
- IPv6 Addressing Plans
- Security aspects

Customer Types

- Retail customers
 - Home Users : ADSL, Cable, 3G, Dial up
 - Don't have their own infrastructure
 - Don't care about IPv4 or IPv6
 - Access from modems, mobile phones
 - IPv6 migration should be transparent
 - Have to think about the strategy of replacing those modems.

Customer Types

- Corporate Customers/Organizations
 - have their own network infrastructure
 - Probably have their own domain name, website and email server
 - Many may have their own IT department
 - Concern about their business continuity
 - Help them aware about IPv4 exhaustion
 - Be ready when our customer need IPv6 connectivity.

Layers of IPv6 adoption

- Core Network
 - Routers, Layer 3 Switches, Firewall, BGP.
- Distribution
 - Gateways, CPEs, routing protocols.
- Services
 - Web, Email, FTP, Managed Services, Radius, Streaming, CRM, bandwidth managements.
- End Users
 - Operating systems, user education, communication strg.

Transition Methods

- IPv6 Tunneling
 - Requires more complex configuration
 - More security concerns : encapsulated IPv6 traffic is not detected by IPv4 Firewalls
 - Not a long term solution
- Dual Stack
 - Maintain current IPv4 compatibility
 - Not much change in hardware and topology is required
 - Smoother IPv4 to IPv6 transition
- NAT PT
 - A bridge between IPv4 and IPv6 clouds.

IPv6 Addressing Plan

- IPv4 is 32 bits, IPv6 is 128 bits → abundant compared to IPv4
- Total number of IPv4 is 4,294,967,296 ip addresses → equals to “only” a /96 of IPv6
- Minimum allocation for ISP is /32 → 18×10^{18} /96s
- RFC3177 which suggested /48 for most customers is obsolete.
- A new way of ip addressing plan is needed to keep our IPv6 structured and organized.
- Join various NOG mailing list to gain most up to date BCP.

About D-NET

- One of the first ISPs in Indonesia
- Focused on corporate customers
 - Major services are providing connectivity via wireless networks and fibre optic networks
- Services includes:
 - Dedicated Internet Connection
 - DNS, mail and web hosting
 - Data Center with some Managed Services.
- D-NET is allocated with:
 - IPv4 : /17 + /19 + /20
 - IPv6 : /32

IPv6 implementation strategies at D-NET

1. Request for IPv6 allocation
 - We got our IPv6 allocation on Oct 11, 2006
2. Engineer Staff Training
 - Ask our upstream provider for an introduction of IPv6,
 - attend IPv6 Trainings held by APNIC, APRICOT, APJII.
 - Involve in our National IPv6 Task Force
3. Device and application assements.

IPv6 implementation strategies at D-NET

4. D-NET IPv6 Addressing Plan:

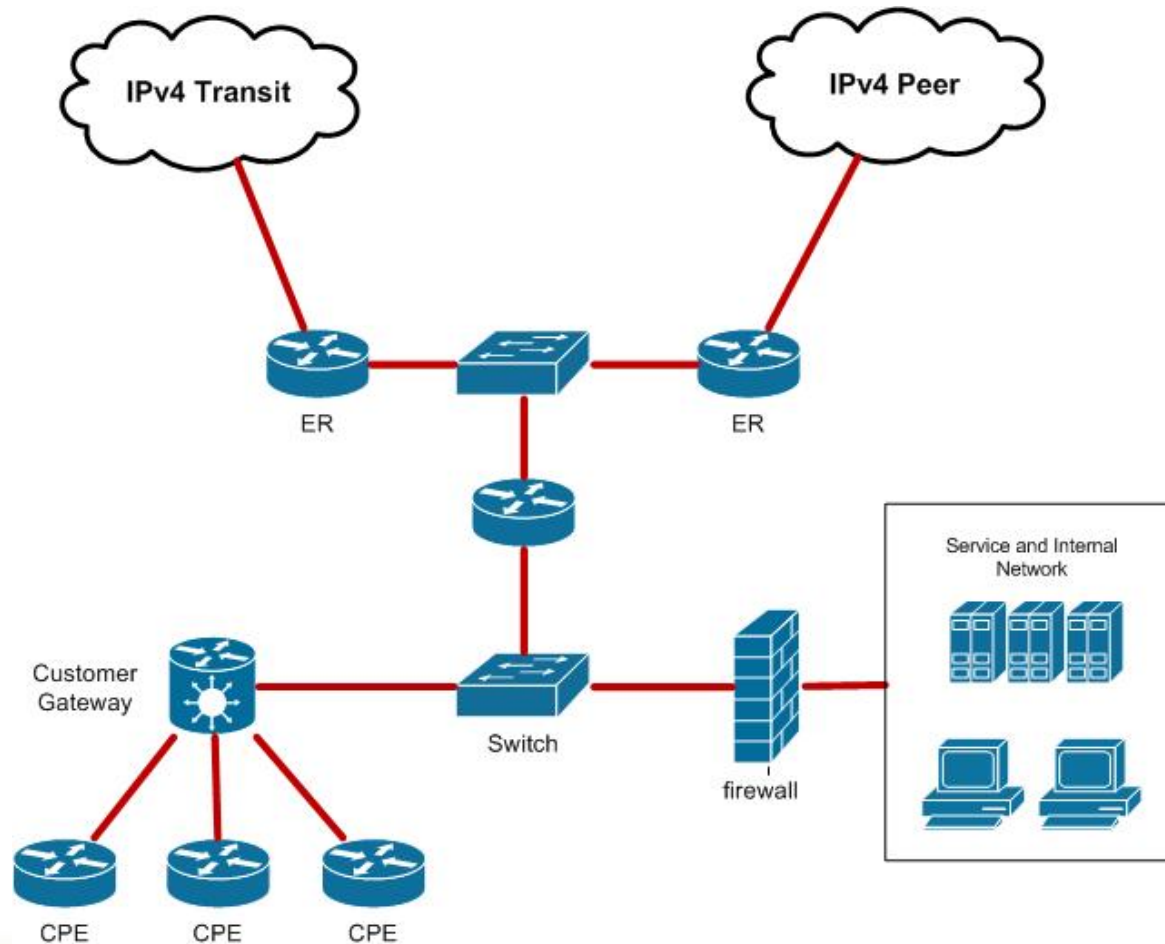
- /126 for ptp's, /64 for subnets.
- /40's to each area (geographically)/POP → 256 POPs.
- First /48 in each /40 for Router loopbacks.
- Second /48 in each /40 for Infrastructure (Servers).
- Third /48 in each /40 reserved for ptp links
- Forth /48 and so on are for end customers.
- IPv6 Autoconfiguration for workstations.

Note: This is just an example of how D-NET apply it's IPv6 plan. Other network might have different assignments.

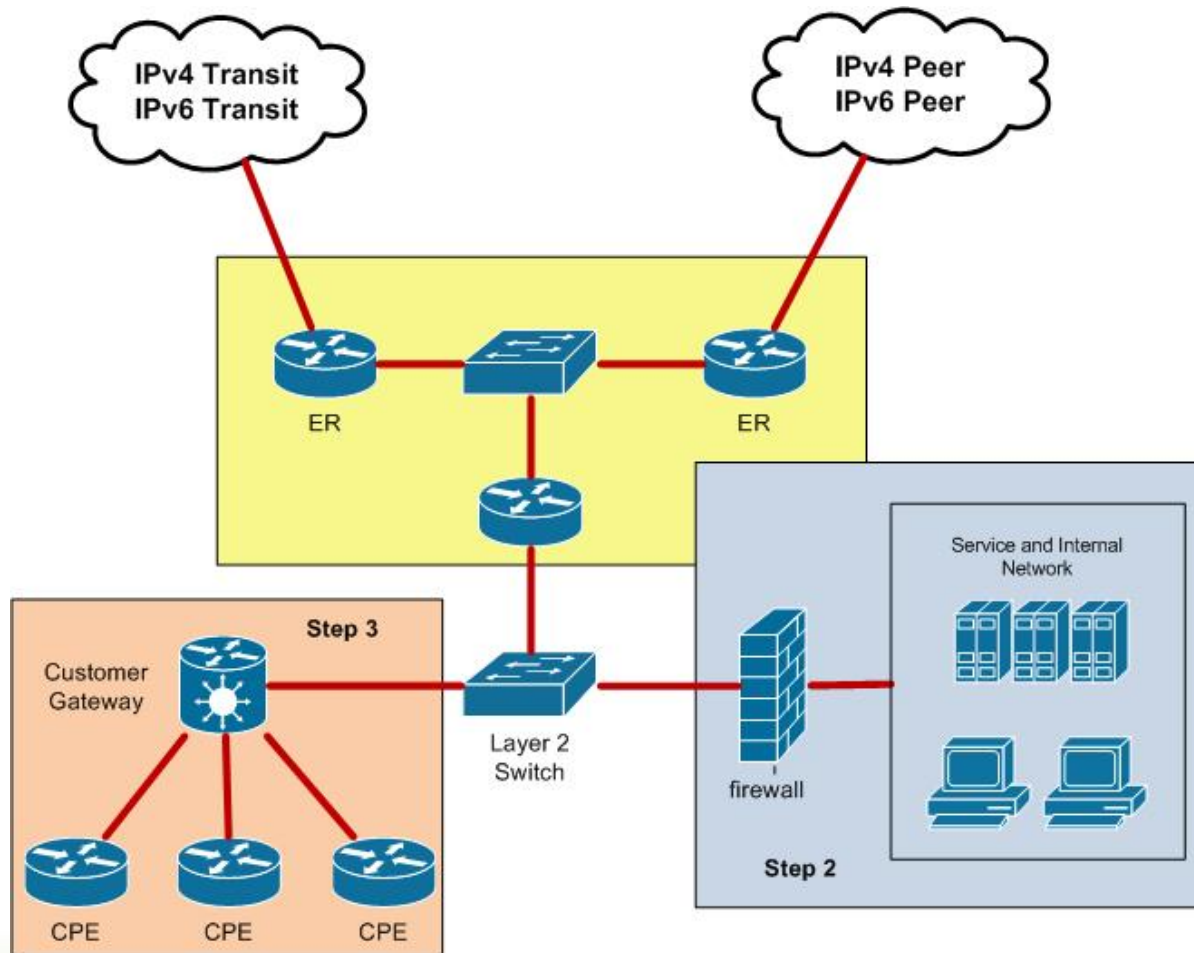
IPv6 implementation strategies at D-NET

5. Choosing Transition Method : Dual Stack.
6. Planning on transition steps :
 1. Core Networks
 2. Internal Networks
 3. CPE Distribution and IPv6 Services (gradually)
7. Add IPv6 enabled featured as future procurement criteria

D-NET's basic topology



Transition steps



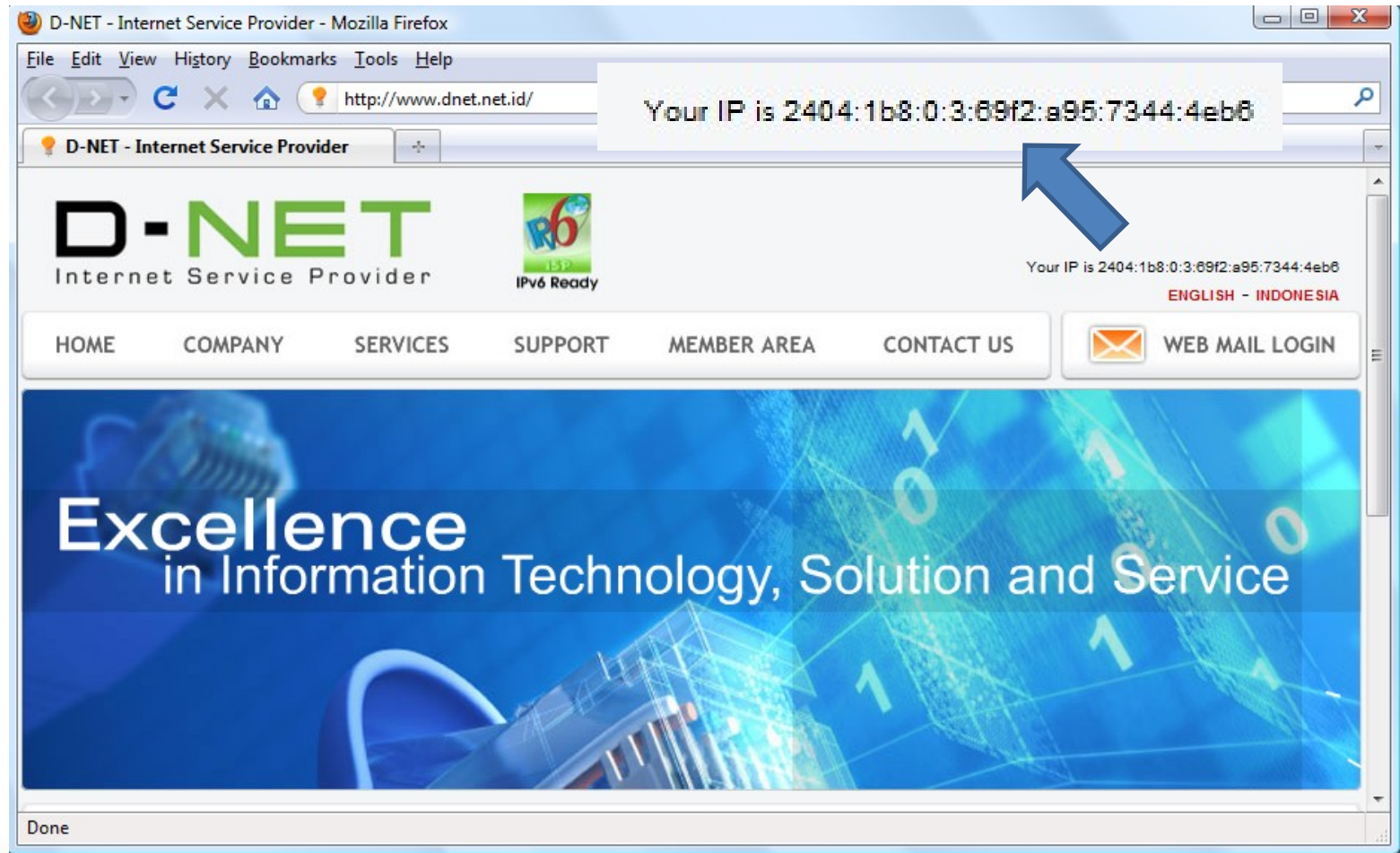
Security

- In 2006, our version of Firewall was only partially support IPv6
 - Caution was required during experimenting IPv6
- Newer version came in 2008 with updates on IPv6 capabilities.
- Configure basic ACL's in our routers, and ip6tables in our servers
- With dual stack, we applied every security rules twice to provide same security level as our IPv4 Network

IPv6 Services

- DNS
 - Dual stack on the DNS Server
 - Configure bind to listen to IPv6 (in named.conf)
 - listen-on-v6 {any;};
 - Make AAAA records for your domain
- Webservers
 - Dual stack on the servers
 - Configure httpd.conf to listen to IPv6
 - Configure the Virtual Hosts of an IPv6 Website.
 - NameVirtualHost [2001:db8::a00:20ff:fea7:ccea]:8080

IPv6 ready website



Challenges

- There're no Bandwidth Management that support IPv6
 - We can use rate limit on customer interfaces.
 - But complex customer bandwidth scheme or plan will need a bandwidth management that support IPv6 → must raise voice to developers.
- In dual stack, disruption in IPv6 network will cause delay in user's Internet activity.
- Future IPv6 BGP Routing table size (IPv6 DFZ issue?)
- IPv6 Multihoming is not yet standardized.

Post deploying stage 1

- Marketing
 - Obtain IPv6 Enabled ISP Logo from www.ipv6forum.com
 - You will be instructed to insert a script in your web site to check IPv6 reachability from global IPv6 network.
 - If you pass the test, then you will receive a Logo ID with a unique serial number
 - Benefit of obtaining this logo
 - Exhibit growth of IPv6 enabled ISPs to the world
 - Increase awareness of IPv6 to site visitors
 - Increase awareness among D-NET staff about D-NET's forward-thinking vision
 - Increase staff confidence toward D-NET's future growth

Post deploying stage 1

- Get your IPv6 website listed
 - Let other people know you are ready with IPv6
 - Encourage other ISPs
 - Sample of ipv6 enabled website lists:
 - <http://www.ipv6.org/v6-www.html>
 - http://www.sixxs.net/wiki/IPv6_Enabled_Websites
 - <http://sixy.ch/>
 - http://www.ipv6forum.com/ipv6_enabled/isp/approval_list.php
- Educate our sales staff about IPv6
 - Help them to share IPv6 knowledge with our customers
 - Help them to increase their future vision about our business in the expanding Internet business model

Future Plans

- Improve Security over IPv6 networks.
- Peer with as many IPv6 peering available.
- Dual stack on Mail Systems
 - Spam filters, Anti Virus, RBLs
- Dual stack as default service to end customers
 - Automatically assign IPv4 and IPv6 to end customer.

Conclusions

- Smaller ISP can adopt IPv6 faster.
 - An advantage compared to bigger ISPs
- Faster IPv6 adoption will give both marketing and technological advantages to ISPs.
- Dual Stack is currently the best option to start migrating to IPv6
- IPv6 is not the same as Y2K. You don't have to upgrade everything at a time!

Conclusions

- Don't forget about security! Applying ipv6 in your network without proper security could result in your entire already secured system vulnerable!
- Educate your staff in a planned manner
 - IPv6 knowledge and skills can not be gained overnight
- Network with other network engineers
 - Share your experience and learn from their experience
- Deploying IPv6 is not about customer demands, but about readiness of your network to secure future growth of your business

Thank you!