Telia Company

PRACTICAL IPV6 DEPLOYMENT FOR THE MASS MARKET

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THE HISTORY OF MASS MARKET IPV6 WITHIN TELIA COMPANY

- Telia Company launched an Opt-in IPv6 service back in 2011 for the “World IPv6 Day”
  - Based on 6RD (Rapid Deployment) and anycast to border relays
  - Allowing customers to enable IPv6 in the residential gateway configuration
  - Using newly deployed IPv6 DNS resolvers
- Between ”World IPv6 Day” and ”World IPv6 Launch” we participated in Google's IPv6 DNS activation to attract traffic
- Statistics show that very few customers actually enable IPv6

REDESIGN MOTIVATION

- Old service design
  - Based on multiple PVCs/VLANs per Customer
  - Dragged along since the early days of DSLAM's for ATM QoS
  - Developed before Smartphones and Wi-Fi home routers became a commodity
  - Initially used with a multiport bridge with dedicated service ports
  - Multiple IPv4 addresses per customer
    - Internet
    - IPTV
    - Management
    - VoIP
- Access node types/models have increased over the years
  - Service development time has increased simultaneously
- Desire to Enable Native IPv6
  - Even on older not IPv6 capable access platforms

NEW DESIGN

- Each customer uses only one IPv4 address for all services
- Extensive use of 802.1q QinQ
  - Each customer has their own VLAN towards the BNG
- Moves most intelligence/features to a BNG
  - By disabling most of the security features in the access node
  - The access node will still do IGMP snooping with MVR (Multicast VLAN registration), meaning only multicast via IPv4

ADDRESS ASSIGNMENTS

- Based on DHCPv6 for both WAN link and prefix delegation
- Each access gets
  - /56 via DHCPv6 prefix delegation
  - /64 via DHCPv6 for WAN link
- Each BNG provides addresses from pools
  - /40 for prefix delegation
  - /48 for WAN links
- Leases are kept for 30 days after the last renew
  - Giving more or less a static prefix for the customer

SECURITY CONSIDERATIONS

- Most customers rely on their internal LAN not being accessible from the outside world
- CPE does provide a IPv6 statefull firewall
- Unicast Reverse Path Forwarding native to the BNG
- Update Abuse logging to support IPv6
- DDOS platform updated to support IPv6

RESIDENTIAL GATEWAY (RGW)

- Most of our RGW models have software based on OpenWRT and have fairly good IPv6 support
- IPv6 sessions are forwarded in the hardware
- Incoming connection requests
  - Currently blocked by default, as recommended in RFC6092
  - No option to open in current software versions, later software versions will allow static firewall entries
  - Considering Port Control Protocol (PCP)

Remote management enabled via IPv6 but not used

QOS

- CPE can prioritize upstream for neighbour discovery and DHCPv6
- On older access platforms there is no way to classify upstream IPv6 traffic
  - A problem might arise where a heavy loaded upstream interface between the access node and the BNG breaks DHCPv6 or neighbour discovery (ND), we see this as a small risk
  - No IPv6 for TV or VoIP
- Downstream traffic is marked in the BNG and follows MPLS CoS or 802.1p

BNG SCALING

- Be careful when doing calculations on how many subscribers a BNG can terminate
- Different vendors calculate subscribers differently
  - Some count each ipv4 and ipv6 session as a subscriber session
  - Some can share resources between ipv4 and ipv6 sessions and count them as one

CUSTOMER MIGRATION

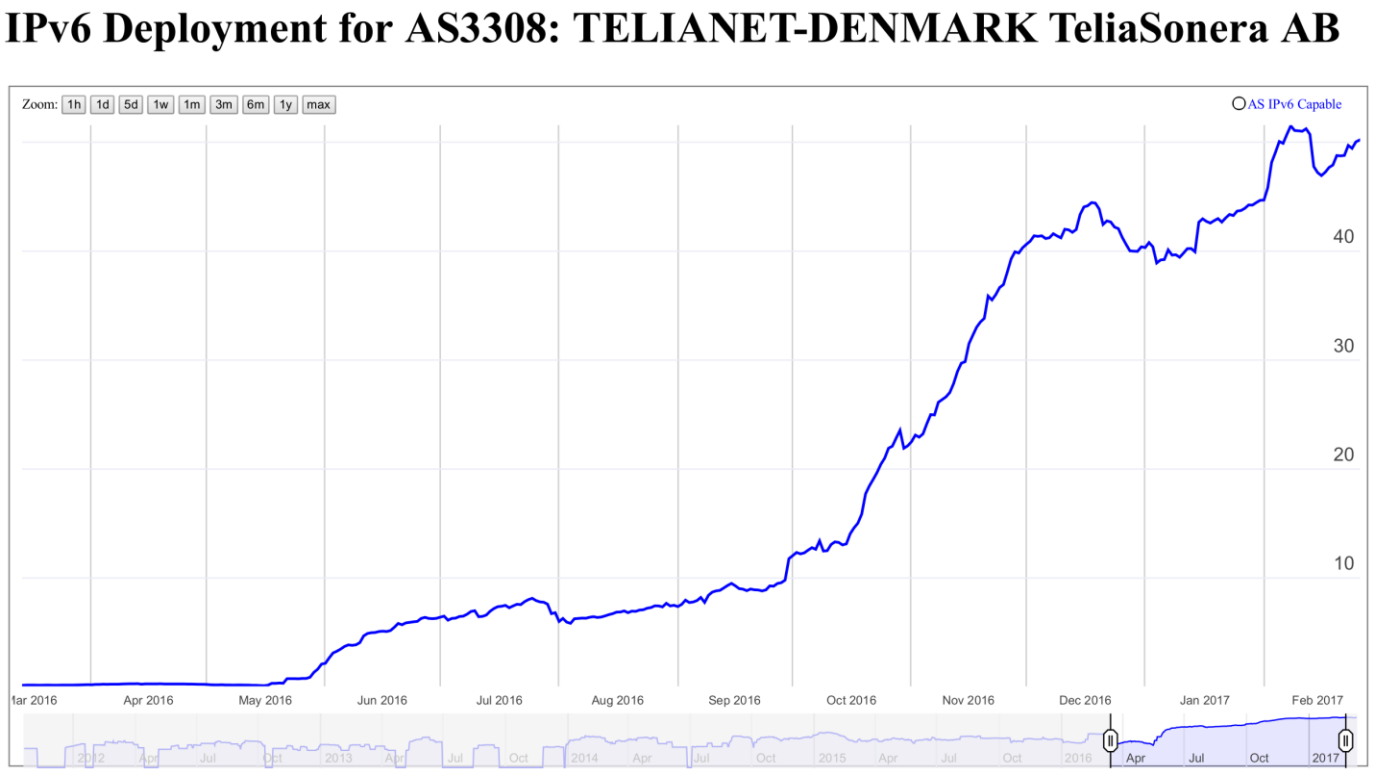
- During a service window, customers are moved to a new BNG
- The RGW calls home via TR-069
- The TR-069 server notices that The RGW needs a new configuration
- A new configuration is pushed
  - Disabling 6RD
  - Enabling native IPv6
  - Enabling IPv6 on the LAN side

PROBLEMS FROM PILOT IN AS3308

- Overall we have had only a few minor issues
- We did not have any customer complaints after several months of a pilot with 25k customers
- But after reaching around to 50k we discovered an error in the Akamai DNS implementation that directed our customers to a remote cache a few ASes away.
- Google might not send you to the same cache for IPv6 and IPv4
  - Some customers complain about some YouTube videos working only on IPv4 or only onIPv6
- Some connections from subcontractors block IPv6 multicast which hinders neighbour discovery (ND)

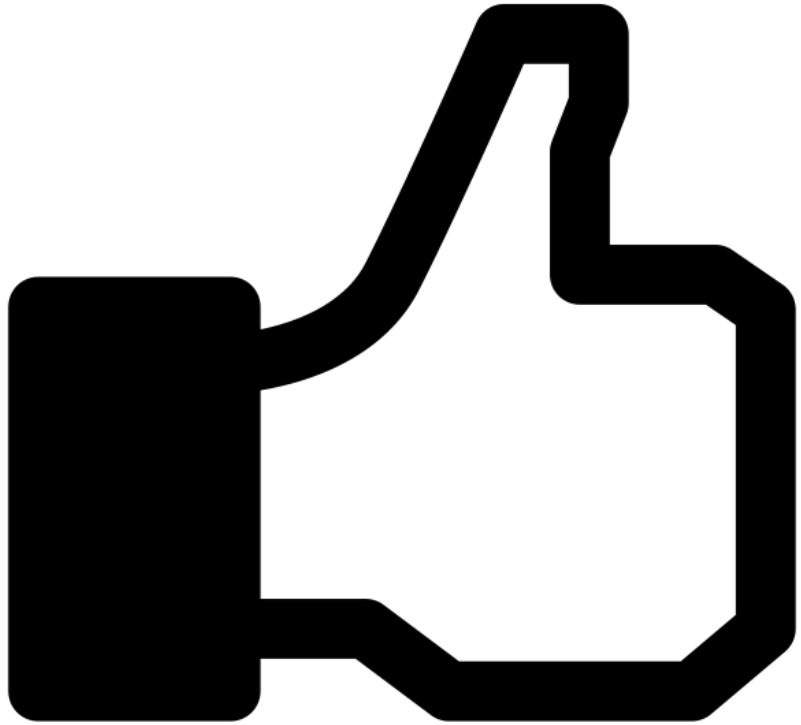
ACHIEVEMENTS FROM AS3308 PILOT

- APNIC Claims for AS3308
  - 80% of IPv6 customers in Denmark
  - Close to 50% of users is IPv6 activated
  - Questionable numbers, APNIC cant tell how many users are behind NATed IPv4 solutions
- Downstream traffic of IPv6 enabled customers show a 29,5% IPv6 share



CONCLUSION

- Just do it
- Telia Company will continue in Finland and Sweden



QUESTIONS