Microsoft IT

IPv6-only at Microsoft

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Agenda

- Network Overview
- IPv6 Dual-Stack Status
- The move to IPv6-only
- Problems encountered
- Future directions

Network Overview

- Main Redmond campus - 100+ Buildings
- Three regions with smaller campuses and tail sites
  - EMEA, Asia and North America
- 10+ On-premise data centres
- Most tail-site WAN is carrier MPLS
- 775+ locations in total
- ~1.2m devices hitting the network

IPv6 Dual-Stack Status

- First configured on network in 1993
- More broadly deployed in 2006 using mixture of ISATAP and native
- Internet peering enabled in US and regions
  - Mostly with AS8075
- All new networks deployed with IPv6
- Recent retrofit pushed native to all corporate networks
- Labs and co-managed networks now in scope

IPv6-Only – why?

- Exhaustion of IPv4 space – including RFC1918 space
- Overlapping RFC1918 space
  - Azure
  - Acquisitions
- Operational complexity of dual-stack
- Strategic Goal

IPv6-only – part 1

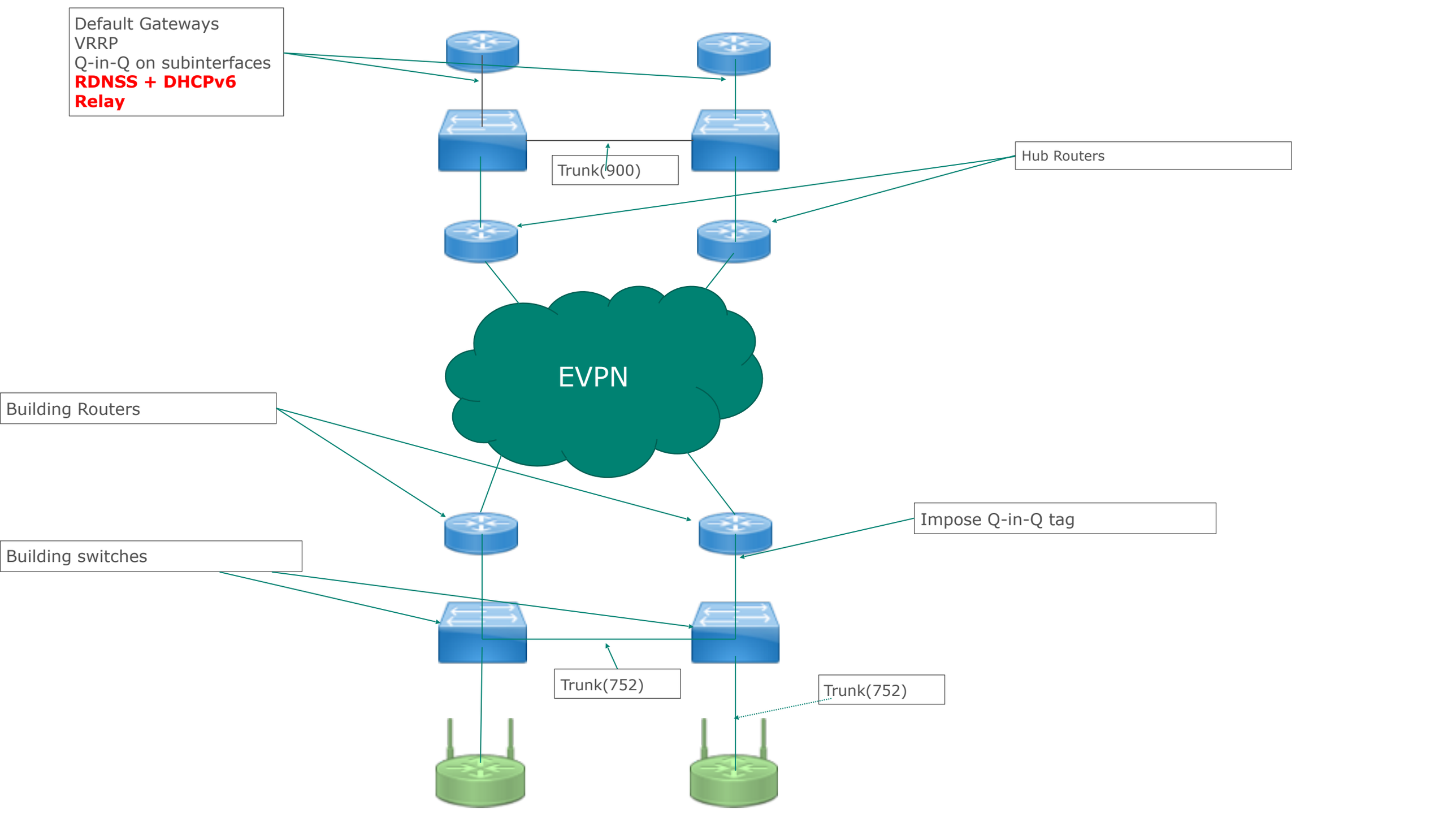
- Two test networks in Seattle
  - Wireless Guest
  - Wired and wireless network on the corporate network
- Both networks opt-in
- Non-redundant NAT64/DNS64
- Tested different address acquisition schemes
  - SLAAC on wireless guest
  - DHCPv6 stateful and SLAAC for the corporate network
- For guest network - DHCPv6 stateless + RDNSS

IPv6-only – part 2

- Target production networks
- Initial focus on wireless guest
- Rebuilt network to current redundancy standards
  - VRRP
  - Redundant NAT64/DNS64
- Extended network to other buildings on campus

Problems – DNS resolver

- DNS name resolution
  - Windows only supports DHCPv6
  - Android only supports RDNSS
- Need to support both
- Parallel DHCPv6 infrastructure
- Not all routers support RDNSS
  - Platform support coming
- Solution – centralised default gateway
  - L2VPN(EVPN) overlay
  - Run RDNSS and DHCPv6 relay on central router pair


Default Gateways
VRRP
Q-in-Q on subinterfaces
RDNSS + DHCPv6 Relay
Trunk(900)
Hub Routers
EVPN
Building Routers
Impose Q-in-Q tag
Building switches
Trunk(752)
Trunk(752)

Some issues remain…

- Most WAN connectivity is carrier L3VPN
  - MPLS EVPN not possible
  - VXLAN a possibility in sites with supporting hardware
- Some LAN routers will never support RDNSS
  - We can use centralised DG model but…
  - These devices don’t support EVPN either.
  - A solution with pseudowires is a possibility.
  - Redundancy is tricky

Existing status

- Redmond test equipment being replaced by production equipment
- NAT64/DNS64 being deployed in Europe
- Single centralised DG deployed for RDNSS support
  - Redmond
  - Europe

Future Plans

- Deploy redundant NAT64/DNS64 to other regions
- Expand centralised DG solution to the other regions
- Start piloting IPv6-only on corporate networks
  - Redmond and Europe probably first targets
- Start thinking about our Internet First strategy
  - This will require a rethink of NAT64/DNS64.

Questions?