

Microsoft

IPv6-only in an Enterprise Network

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Agenda

- Network Overview
- Why IPv6-only
- IPv6-only status and plans
- Current Issues
- A major challenge – and some solutions

Network Overview

- Main Redmond campus - 100+ Buildings
- Three regions with smaller campuses and tail sites
 - EMEA, Asia and North America
- 4 On-premise data centres (down from 11)
- Most tail-site WAN is carrier MPLS
- 775+ locations in total
- ~1.2m devices accessing the network
- IPv6 dual-stack enabled on most of corporate network

IPv6-Only – why?

- Exhaustion of IPv4 space – including RFC1918 space
- Overlapping RFC1918 space
 - Azure
 - Acquisitions
- Operational complexity of dual-stack
 - This is a compelling incentive
 - Managing two protocols is hard
 - IGP
 - ACLs
 - Firewall Policies
 - Feature parity on network platforms
 - Support (NOC, Helpdesk, etc.)
- New IoT demands

IPv6-only – status and plans

- **Current**

- Test bed in IT buildings in Seattle
 - Wireless Guest
 - Wired and wireless network on the corporate network
- Test IPv6-only segments for Product Groups
 - Europe
 - Redmond Campus and North America

- **Plans**

- Deploy new test networks for Product Groups
- Enabling infrastructure for guest and corporate networks in the regions
 - Redundant NAT64/DNS64
- Piloting dual-stack and IPv6-only VPN

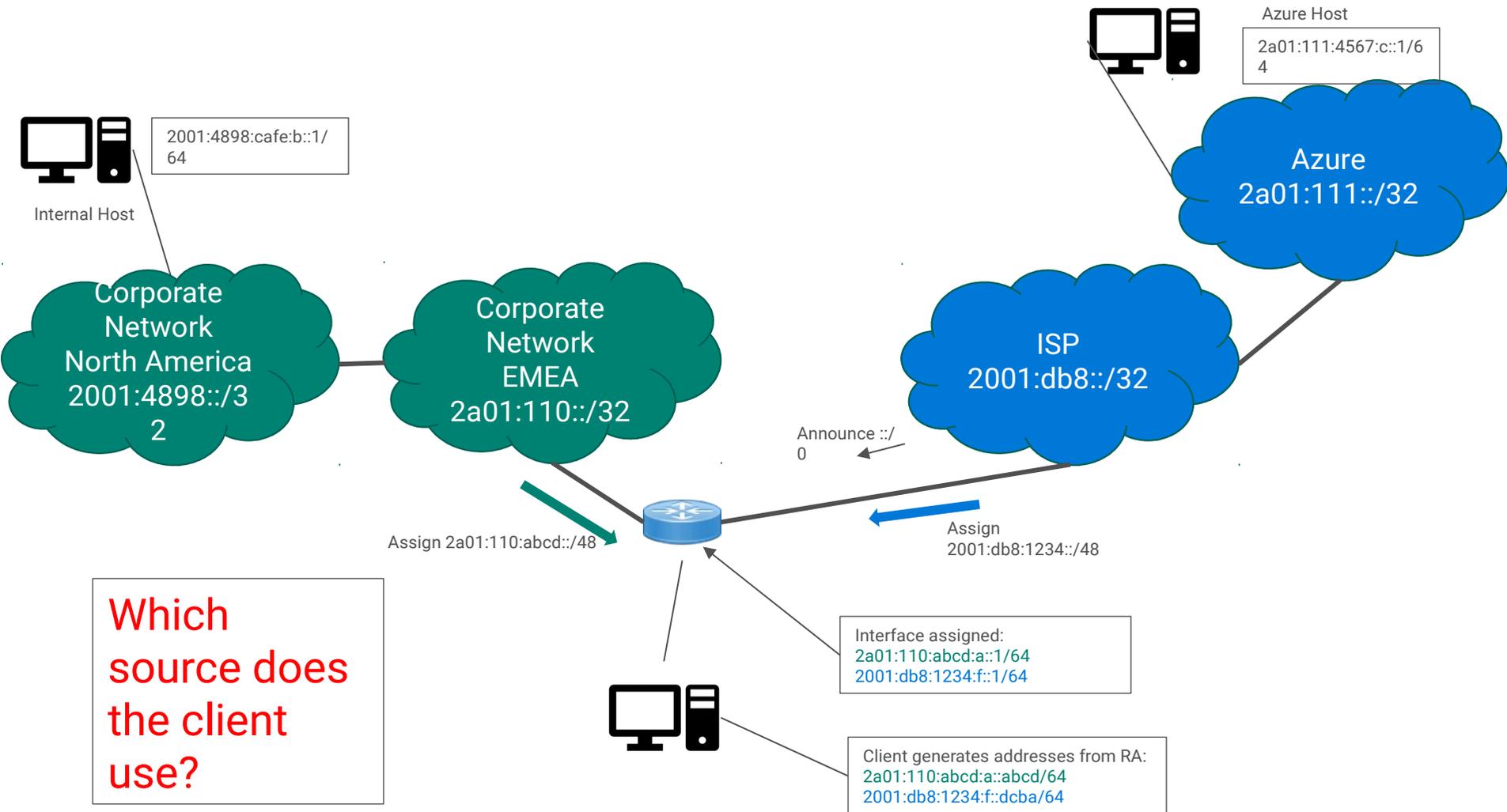
Anything slowing us down?

- **Guest network deployment**
 - VPN on IPv6-only continues to be an issue industry-wide
 - Further investigation ongoing
- **Network Platform features**
 - Currently include:
 - RDNSS
 - Wireless controller security features
- **New building configuration**
 - Heterogenous segments
 - Better telemetry needed
- **Multihoming complexity**
 - Mostly at tail-sites
 - More on this

Internet First Strategy

- **One of our strategic initiatives**
 - Sites maintain routed connectivity to corporate network
 - Internet traffic offloaded to local egress
- **Routing straightforward (in theory)**
 - Policy-based Routing. Operationally difficult
 - Source-destination routing eventually
- **Source-selection becomes challenging**
 - The source address the client selects may not be what you want

Multihoming problem illustrated



Client source address selection

- Existing Options might be:
 - You could (in principle) use NAT66 to overcome the issue
 - Local firewall device must now support this
 - Otherwise ISP must support this – not guaranteed
 - You could just use ISP IP space exclusively – which you now need to import...
 - Use your own IP space exclusively – implies direct EBGP (with public AS) with ISP
 - Using your own IP space and the ISP space seems the right thing

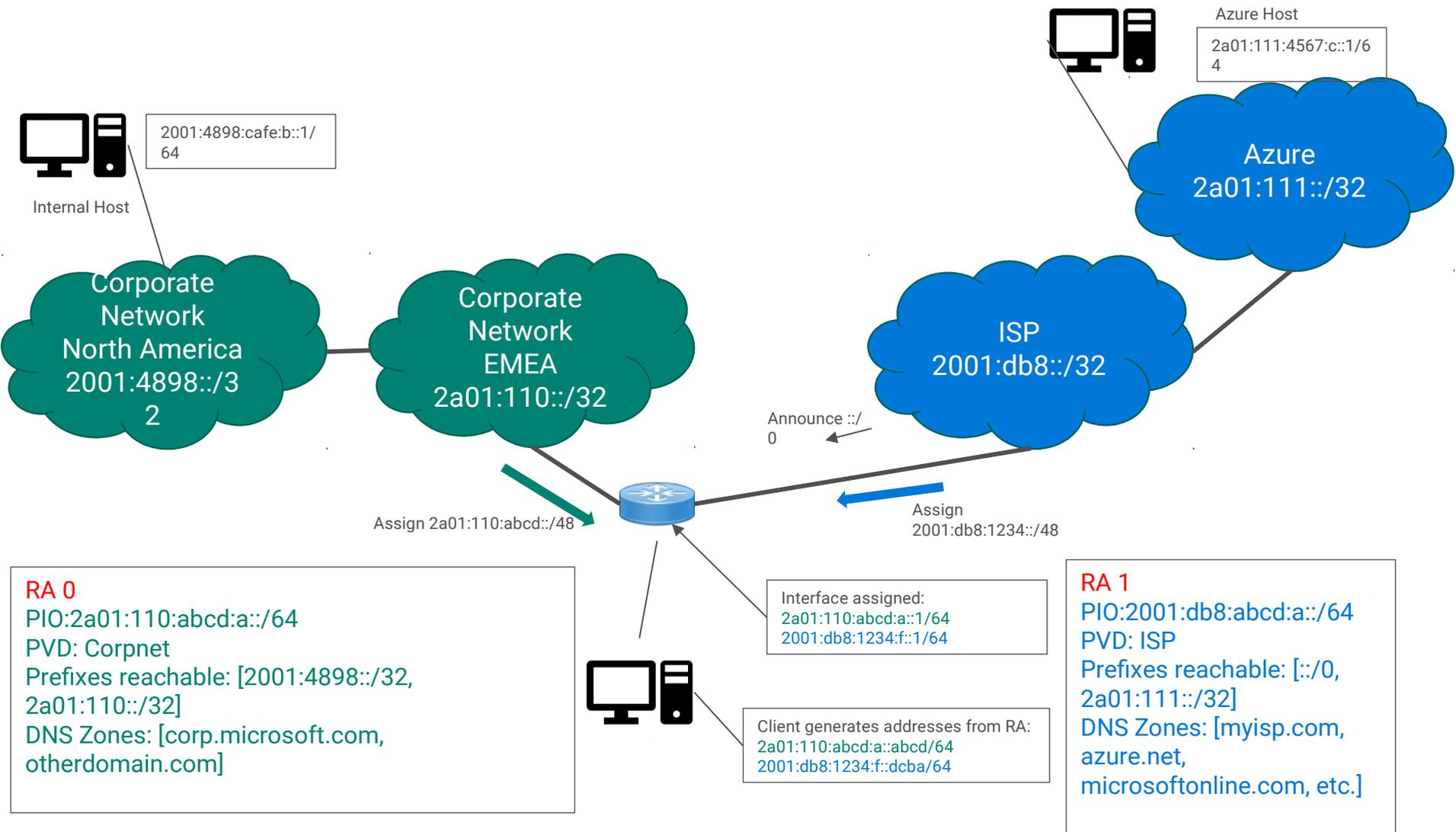
Multi-prefix – potential solutions

- The kernel of the problem is the intersection of two or more routing domains at the edge
- Must link destination prefixes with source prefixes
- **Basic solution would require:**
 - Multiple RAs with disjoint PIOs and RIOs
 - Described in [draft-ietf-rtgwg-enterprise-pa-multihoming](#)
 - Rule 5.5 of RFC6724. How widely implemented?
 - Coordination between routing and ND modules in routers
 - Described in [draft-linkova-v6ops-conditional-ras](#)
- **More sophisticated solution requires:**
 - Communication of parameters to clients that understand them
 - Provisioning Domains fit the bill

Provisioning Domains

- Formalises the notion of different administrative network domains reachable on the same segment
- Allows the client to determine configuration parameters specific to each domain
- Perhaps the most useful bits for an enterprise might be:
 - What prefixes are reachable through this domain
 - Importantly, what source(s) to use to access this domain
 - What DNS zones are reachable through the domain
- Described in detail in:
 - [draft-bruneau-intarea-provisioning-domains](#)
- Requires much of functionality described in pa-multihoming draft:
 - Multiple RAs, Rule 5.5, etc.

Provisioning Domains



Final thoughts

- Dual-stack is hard
- IPv6-only might be easier
- We still need to solve the multiple prefix issue
- Solutions such as Provisioning Domains will make using multiple prefixes much easier
 - More flexibility
 - More potential for innovation
- Please see IPv6 stack updates in Windows 10 Creators Edition:
 - <https://blogs.technet.microsoft.com/networking/2017/07/13/core-network-stack-features-in-the-creators-update-for-windows-10/>

Questions?

