

# Hierarchical Prefix Delegation in Basic Home Networks

draft-chakrabarti-homenet-prefix-alloc-01.txt

Erik Nordmark

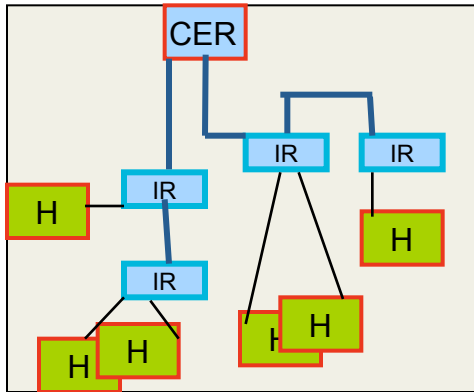
Samita Chakrabarti

Suresh Krishnan

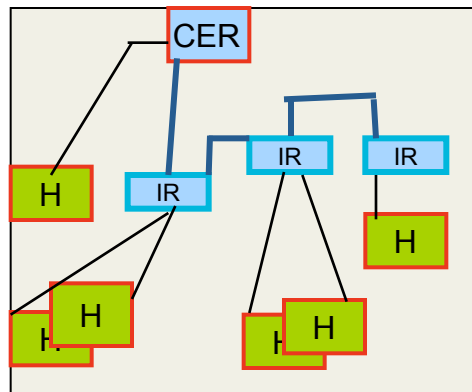
Wassim Haddad

# Goals

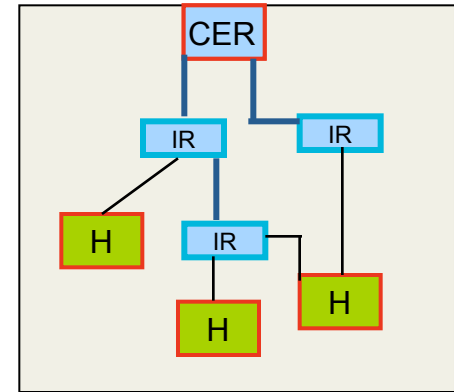
- Look at existing IPv4 home networks with multiple NATs
- How can we add IPv6 to those without any IPv6 NATs?



A. Tree of routers



B. Daisy chain of Routers



C. Internal host multi-homing

# Why multiple Customer Routers today?

- ISP provides a box, perhaps with a single Ethernet port and no WiFi
  - That box does NAT
  - Customer wants multiple Ethernet ports, WiFi
- Dedicated VoIP box is also a NAT; should be closest to the ISP for QoS reasons
- Backup box can also be a NAT
- Result is a daisy-chain or shallow tree of NATs

# State of current IPv4 home routers

- Have a dedicated uplink port with DHCP client
- Have zero or more downlink ports
  - Might be bridged together
  - WiFi might be bridged together with Ethernet
- Might support a separate guest network
  - Unclear whether this is a separate IPv4 subnet or just ACLs
- Model as one or more downlink L3 interface
  - With optional bridges below those interfaces

# Core of proposal

- Just use DHCPv6 Prefix Delegation
  - Run a PD client on the uplink interface
  - Run a PD server for the set of downlink interfaces
- Start PD server once a prefix is available from the uplink/client
  - ULA discussion on subsequent slide
- Carve up the delegated /N prefix to provide
  - Some /64 prefixes to assign to the routers downlink interfaces
  - Some /(N+k) prefixes to sub-delegate to downlink routers

# Recommend default $k=3$

- Allows for 7 downlink routers
- Allows for 3 levels of hierarchy from a /56
  - Customer edge router sub-delegates 7 different /59 prefixes
  - A interior router one step down can sub-delegate 7 / 62 prefixes
  - Two steps down a router can have four interfaces, or sub-delegate two /64 plus have two interfaces
- In general and approximately,  
 $k = \log_2(\text{expected number of downlink routers} + 1)$

# Prefix Stability

- Each router calculates its fixed sub-delegation prefix length
- Recommend that routers (their PD server) remember delegated prefixes in stable storage
  - Even after the lease has expired
  - Do FIFO allocation so that a previously used prefix will be re-used last
- Or recommend that requesting router (PD client) remember the prefix it had before

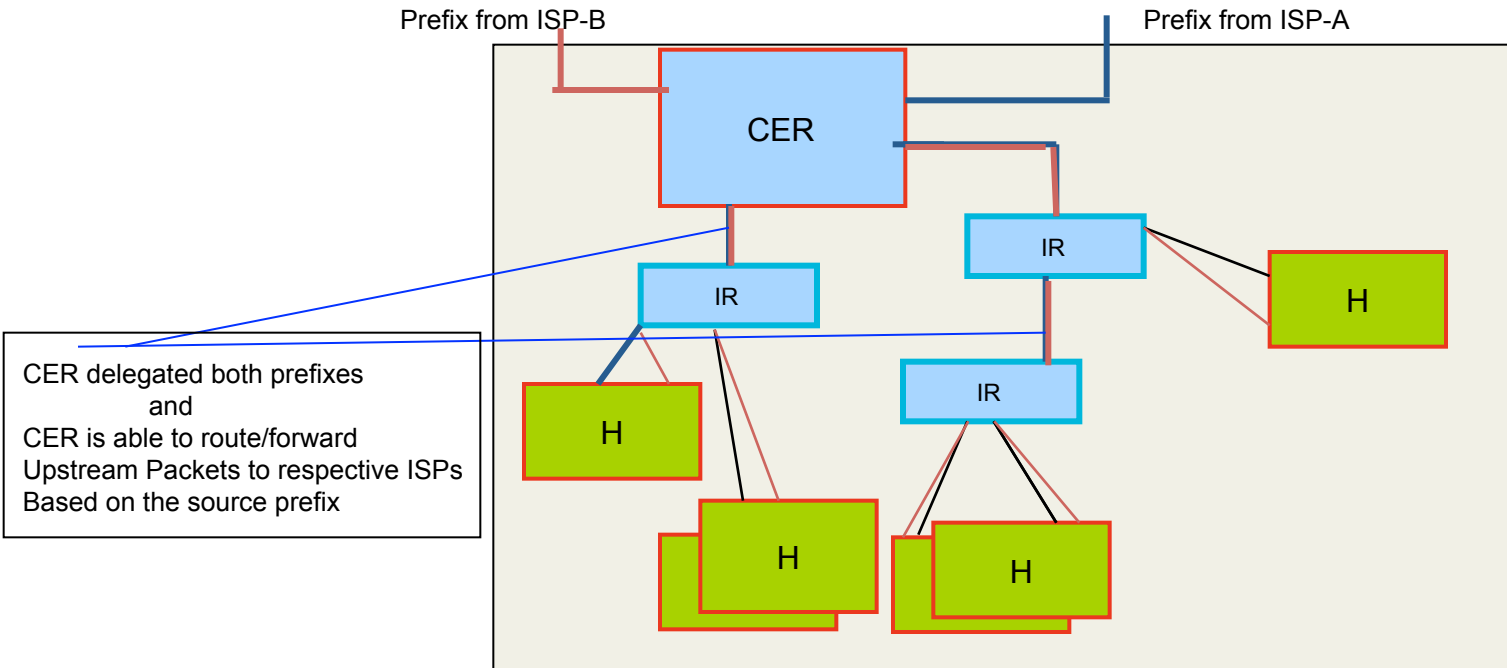
# ULA

- Manually configure the CER to generate a ULA prefix for the home
- Sub-delegate ULA by itself (if home has never been connected)
- Sub-delegate ULA together with global prefix
- Possible with further automation
  - If PD client receives global prefix but no ULA from delegating router, then assume it is the Customer Edge Router; enable ULA generation and sub-delegation
  - Is this automation desirable? Security concerns?



# Site Multi-homing

- With IPv4 NAT two separate home routers connecting to different ISPs (and wiring together their downlink ports) doesn't work well – dueling DHCP servers on the same link
- A single IPv4 NAT connected to two ISPs work – Ditto for this proposal



# Next Steps?

## NAT

- Complementary to the larger desire to have

arbitrary topology home networks, redundant paths, etc

- Should the WG work on this?

- Should the WG document this?