Stub Networks

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Stub Networks

- Stub networks are leaf nodes: no thru traffic
- Minimal required functionality:
  - connectivity to adjacent network
  - discoverability on adjacent network
- Additional desirable functionality:
  - Reachability to the cloud
  - Full routing
  - DNS update

How we got here

- Homenet tried to do everything:
  - Full mesh topology discovery
  - Full mesh routing
  - Full mesh naming

- It was a struggle
  - Naming architecture never got consensus
  - HNCP was published, but never deployed
  - Babel has potential, but also isn't deployed

- Top-down approach: the enemy of good enough?

A different approach

- Solve the problems we actually have
- How to deploy an IoT network in an existing infrastructure
- Doesn't have to do everything
  - We need devices on the IoT network to be equivalently usable as devices on the home network
  - Need to support existing use patterns

Existing practice

- Two stub networks implementations to date:
  - HomePod Mini
  - OpenThread

- These are independent implementations

- These do not solve every problem

- But they deliver the functionality we need: accessories on the stub network are discoverable and controllable from the home network

Building from the bottom up

- We have now solved one Homenet problem

- But does it scale up?

- Yes:
  - Add Babel, and we have routing
  - Add SRP on the edge router and we have naming
  - Add DHCPv6 /64 prefix delegation on the CE router and we have a two-level fully-routed network topology

Motivating implementation

- CE router vendors have no incentive to implement HNCP

- Mesh or wired backbone + access points give better UX

- But if you add SRP, Babel and DHCPv6 to the CE router, a home with stub routers gets *better*

Building Blocks

- Service Registration protocol: draft-ietf-dnssd-srp

- Advertising Proxy: draft-sctl-advertising-proxy

- SRP Replication: draft TBD

- mDNS discovery of DNS-SD browsing zones: draft TBD

- Stub Networks: draft-lemon-stub-networks

mDNS Discovery
of Browsing Zones

- With lots of devices behind a stub router that are advertising the same service type, answer sets can get big

- This isn't scalable

- Solution: discover a DNS server for the stub router's zone

- Only zones under home.arpa are supported, so no way to spoof real DNS domains

- One implementation at present:
  - mDNSResponder project

- We have a draft of a draft, but haven't published yet

- Would like to work on this in DNSSD wg

Service Registration Protocol

- Two Open Source independent implementations
  - OpenThread
  - Apple's mDNSResponder project
- Has had lots of review
- Server is deployed in HomePod Mini
- Clients in various HomeKit accessories, e.g. Eve and NanoLeaf
- DNSSD Ready for WGLC, please?

Advertising Proxy

- Stateless server for SRP registration database
- Service Discovery over mDNS or DNSSD
- One or possibly two implementations
  - mDNSResponder
  - OpenThread?
- Spec is not yet mature enough for WGLC
- Please read the spec
- DNSSD Working group adoption?

SRP Replication

- Allows multiple SRP Servers that are advertising proxies to back each other up

- Provides conflict avoidance, but not a zero-conflict guarantee

- With multiple servers, can maintain a stable registration zone even when stub routers are rebooted, as long as they aren't all rebooted at once

- Better reliability, better UX

- One implementation, soon to be open source:
  - mDNSResponder project

- Draft is being worked on, not ready to read

- Would like to work on this in DNSSD wg

Stub Networks

- Two documents:
  - Connecting Stub Networks to Existing Infrastructure
    - draft-lemon-stub-networks
  - Self-configuring Stub Networks: Problem Statement
    - draft-lemon-stub-networks-ps
- draft-lemon-stub-networks is implemented:
  - mDNSResponder project
  - OpenThread
  - Running on HomePod Mini
- Draft is not sufficiently specific to implement yet
- Would like to work on this in Homenet
- Homenet Working group adoption?

Other Homenet Work

- How to delegate prefixes?
  - HNCP? If so, how do we make this work
  - DHCPv6? How do we make it work

- How to register stub network discovery browsing zones with a capable CE router?

- How to eliminate the use of multicast in service discovery without requiring new clients

- Etc.

Drafts:

- https://datatracker.ietf.org/doc/draft-lemon-stub-networks-ps/

- https://datatracker.ietf.org/doc/draft-lemon-stub-networks/
- https://tools.ietf.org/html/draft-sctl-advertising-proxy-00
- https://tools.ietf.org/html/draft-ietf-dnssd-srp

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