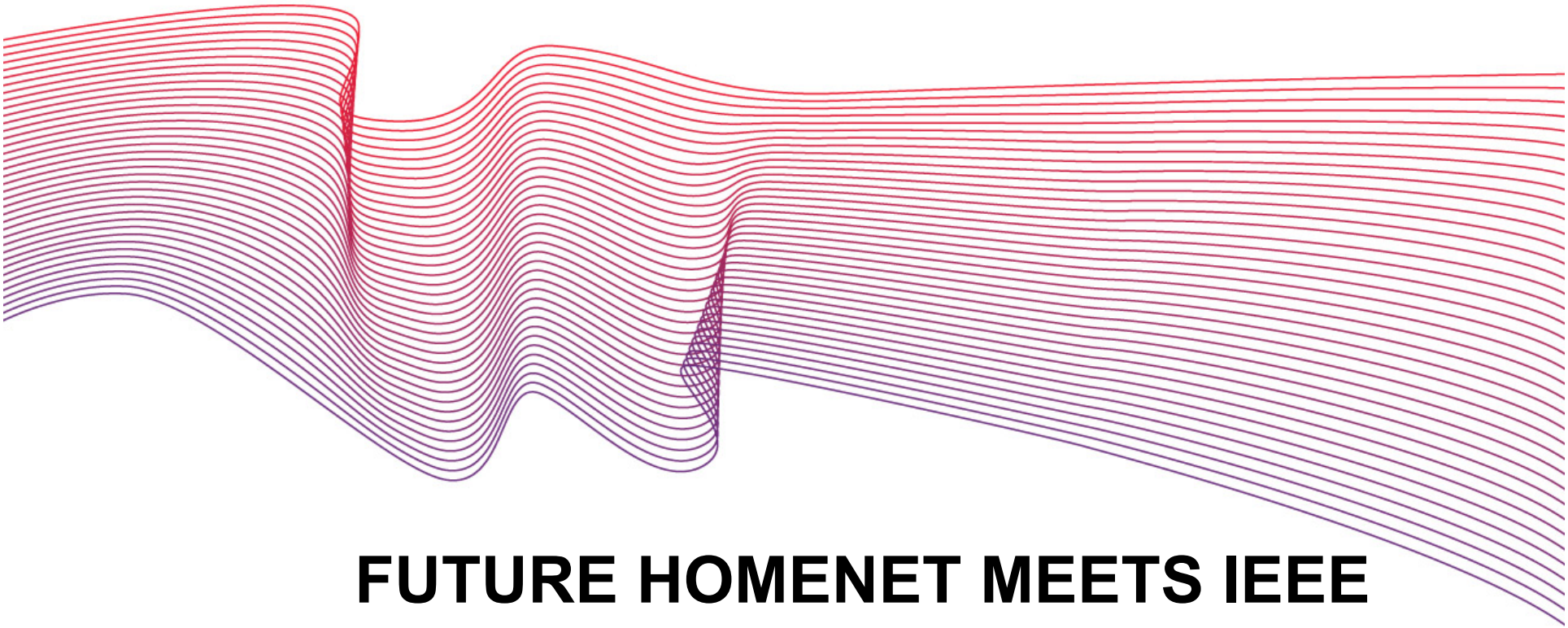

FUTURE HOMENET MEETS IEEE DRAFT 5

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FUTURE HOMENET ACTIVITIES - IETF

- **IETF Homenet WG works an a set of solutions to enable "next generation" IPv6 homenetworking environment, where multiple routers and devices can be plugged together in an adhoc manner by hopelessly non-technical people.**

- **Entirely a Layer 3 only, IP centric, solution – it is assumed Layer 2 just works.. (*)**

- **Homenet must support:**
  - Routing, Prefix configuration for routers, Name resolution, Service discovery, and Network security.

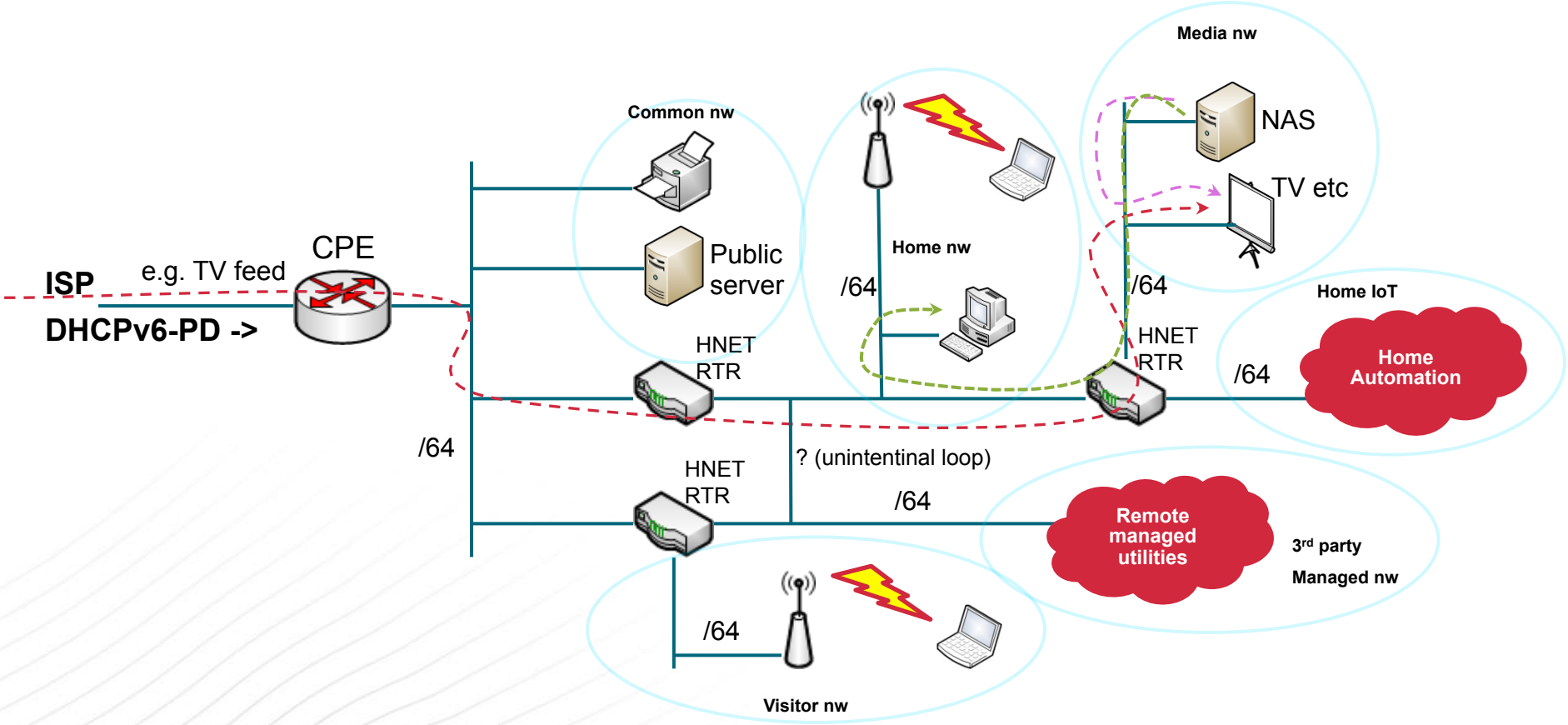
- **Architecture and requirements are documented:**
  - draft-ietf-homenet-arch-13 (in IESG already..)

(*) not quite right in reality.. This is where TSN & IWK can give a hand and cooperation needed across layers.

GOALS AND PRINCIPLES

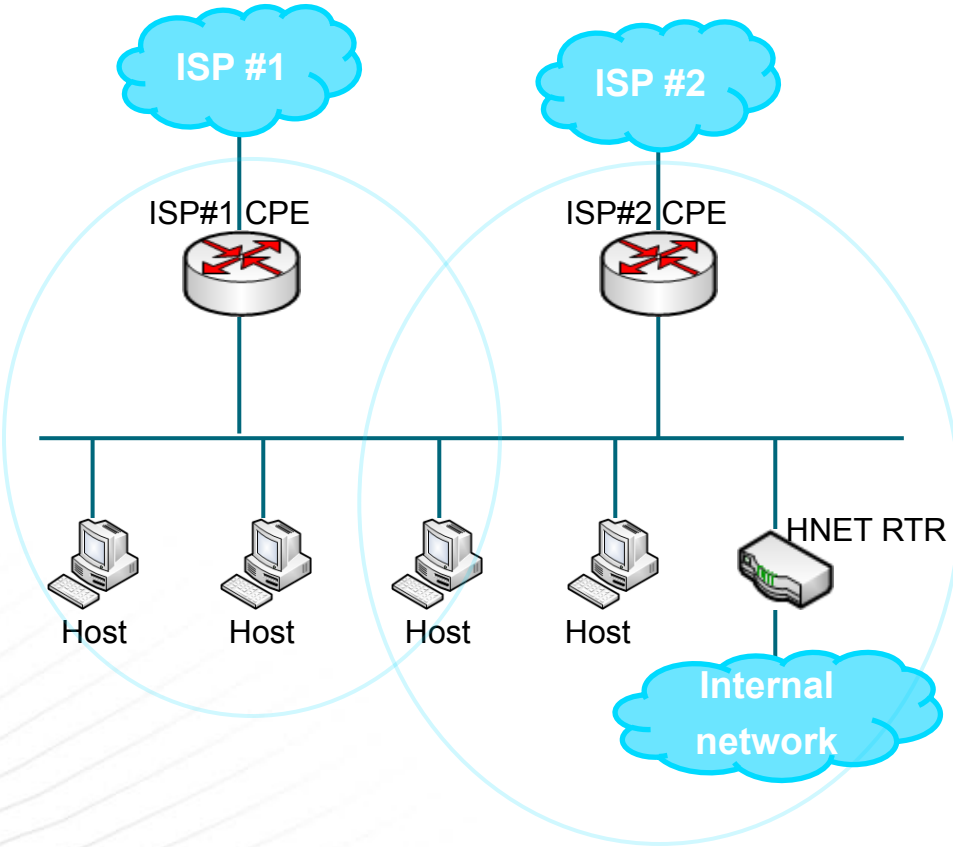
- **Solutions MUST work with IPv6, and IPv4 support is a bonus..**
- **Must support multiple routers and arbitrary topologies with any number of subnets/prefixes/links.**
- **Support for multiple ISPs and/or multiple CPEs.**
- **Plug'n'play auto/zeroconf; e.g. loops must not confuse the system.**
- **Adequate default security; from outside the network and within the network.**
- **Possibility to isolate parts of the network e.g. for own, visitor, utility, IoT and 3rd party managed network segments.**

ARCHITECTURE EXAMPLE..



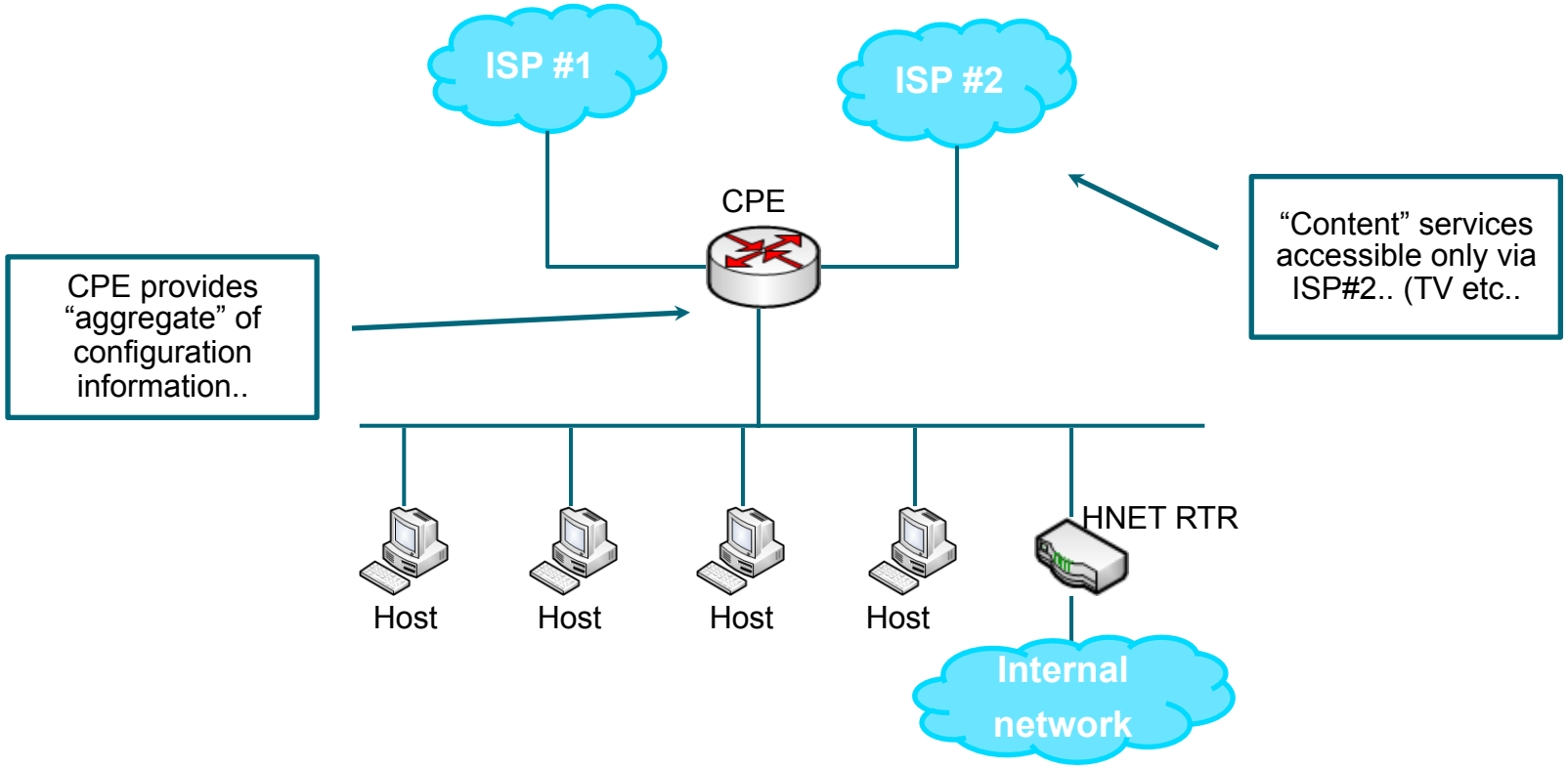
- **Network segmented for different uses**
  - Using L3 addressing
  - Each segment _may_ have further switched L2
- **L3 routing essential to make the homenet topology to work..**

ARCHITECTURE EXAMPLE – TWO ISP



- **Source address selection becomes essential**
  - IP packets with ISP#1 configured source address are not routable via ISP#2 CPE (ingress filtering is common).
- **It is possible that a host configures addresses from both ISPs**
  - Would be “normal” with IPv6 when SLAAC is used..

ARCHITECTURE EXAMPLE – TWO ISP ONE CPE



- **Source address selection "complexity" in a different form**
  - IP packets with ISP#1 configured source address are not routable via ISP#2 CPE (ingress filtering is common).
  - End hosts see only one CPE and source for addressing.. However.. only certain range of source addresses can be used to reach e.g. ISP#2 services..

THE SOLUTION SPACE

- **No changes to end hosts -> existing host configuration protocols remains unchanged (SLAAC, DHCPv6, DNS(SD), etc).**

- **Minimal changes to existing management/infra protocols:**
  - New protocols or extensions may be introduced if seen necessary.
  - On the table: **Source Address Dependent Routing**, **Prefix Coloring & Assignment** and **Boundary Detection** etc**.**

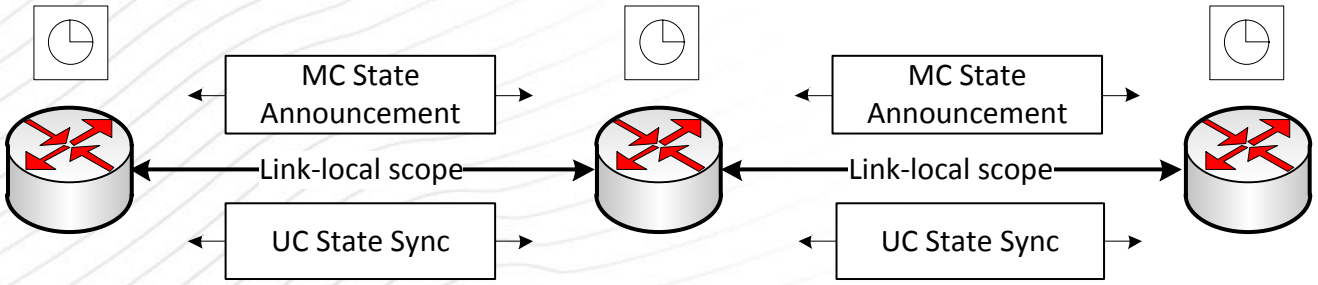
- **No requirement for a "homenet wide" routing protocol:**
  - Plug-ins for OSPFv3 do exist already to assist zeroconf..

- **Routers synchronize state across home network using the using the Homenetworking Control Protocol (HNCP) in order to facilitate automated configuration and use of routing protocols without homenet specific extension:**
  - Automated configuration requires support for host configuring & serving "daemons" to be HNCP aware.
  - Must allow mixing "legacy" CPEs a'la RFC7084.

THE HOMENETWORKING CONTROL PROTOCOL

- **A Trickle-driven [RFC6206] multicast state flooding + unicast state synchronization protocol on top of UDP.**
  - Link scope and IPv6 link-local addressing.
  - Trickle (per each link) makes sure the flooding is not too babbling and not everybody floods at the same time.. Rapid propagation, low maintenance.
  - Protocol documented in [draft-ietf-homenet-hncp-00].
  - Download implementation: https://github.com/sbyx/hnetd

- **Configuration information (e.g. originally received by the CPE facing ISP network via DHCPv6-PD etc) distributed to homenet aware routers..**



MC=Multicast
UC=Unicast

HNCP FEATURES – MORE DETAILED RUNDOWN

- **State synchronization between routers**
  - link-local multicast transmission
  - unicast fallback for bulk synchronization
  - collision and conflict detection and resolving
- **Prefix distribution and allocation**
  - IPv6 prefix delegation
  - IPv4 prefix allocation
- **Routing setup**
  - Selection of a shared routing protocol
  - Fallback mechanism to setup routes autonomously
- **Dynamic border-detection for IPv4 and IPv6**
  - On-demand firewall reconfiguration
  - On-demand RA/DHCP/DHCPv6 server configuration
  - Integration of fixed external connections (e.g. PPP, 6rd, ...)
- **Sharing of DNS and Service Discovery configuration**
  - Local DNS configuration
  - mDNS / DNS-SD hybrid proxy configuration

HNCP DATA MODEL

- **Flexible TLV-only message structure.**

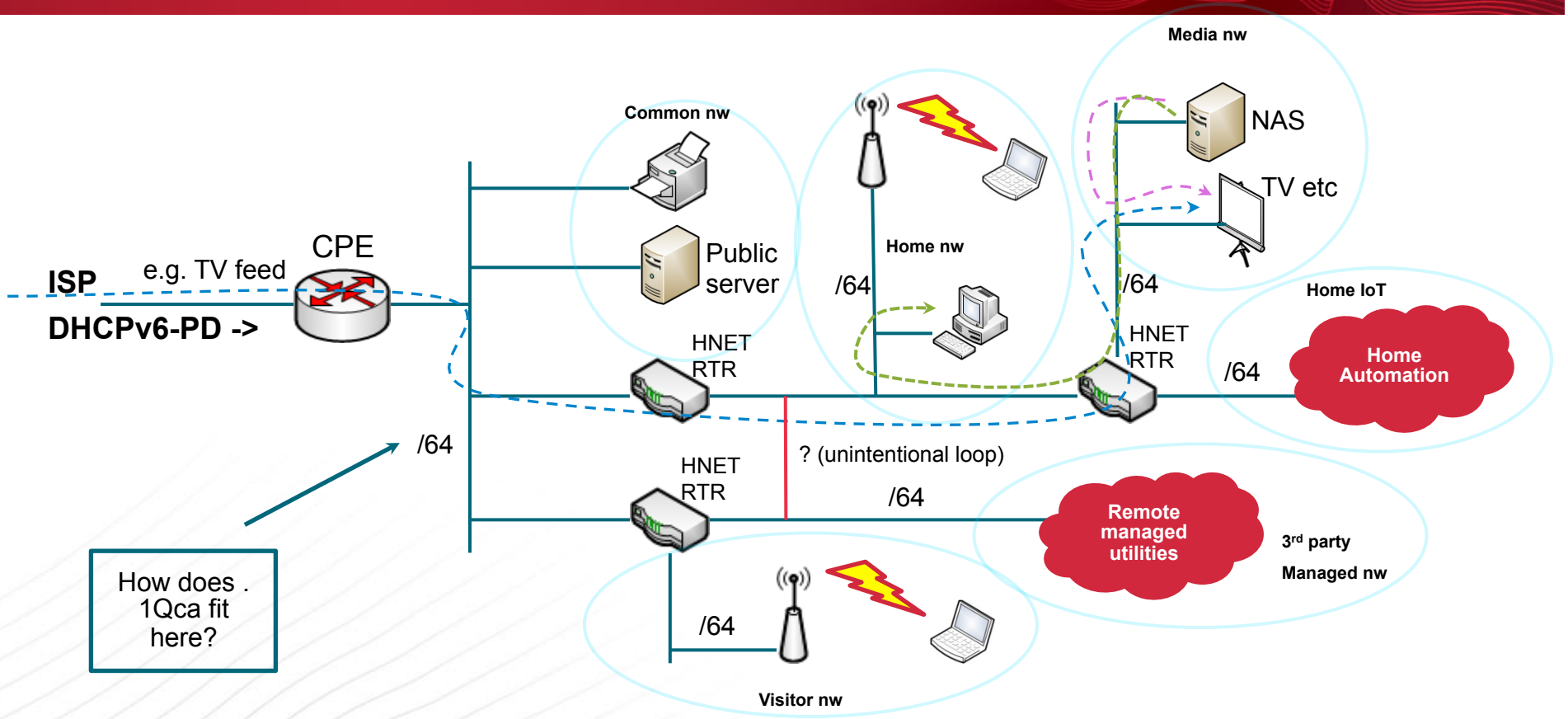
- **Each router has:**
  - An unique identity, for example, it may be a public key, unique hardware ID, or some other unique blob of binary data.
  - A synchronized configuration data set (ordered set of TLVs), with:
    - Latest update sequence number.
    - Relative time, in milliseconds, since last publishing of the current TLV data set.
    - Hash over the set for fast comparison.
  - A public/private key-pair for authentication.

- **Change in state / data noticed when the hash calculated (and advertised) over the data changes..**

AND HOW THIS RELATES TO 802.1QCA ET AL..?

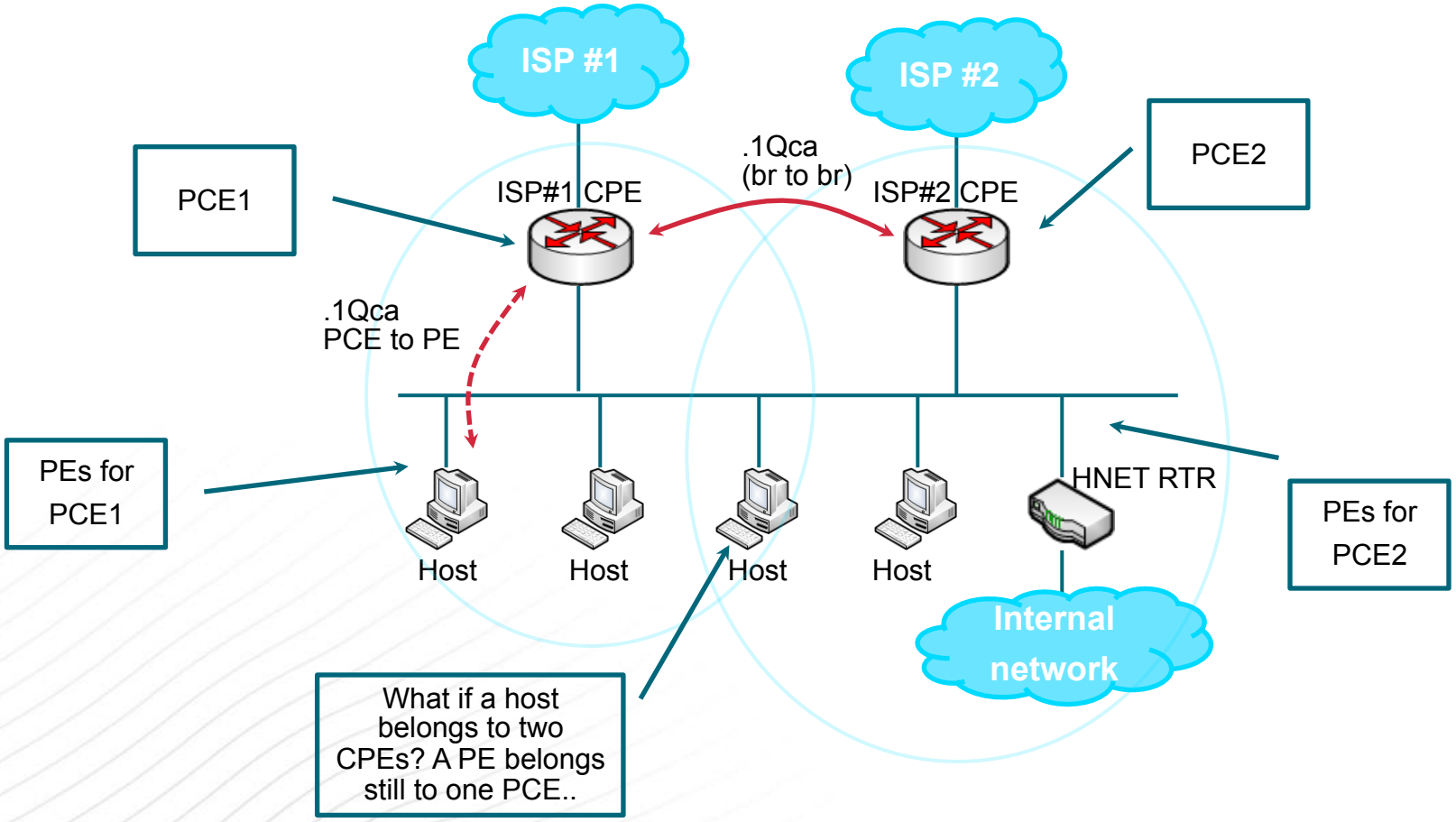
- **In certain deployment, like, homenetworking environment:**
  - L3 and L2 are developing their own.
- **There should be a standard way to make these two layers to communicate for example:**
  - When doing path computation and reservation over multiple L3 segments.
  - When segmenting the network for different purposes so that both layers have the same view of the topology.
- **The list goes on.. Basically ensuring alignment.**

ARCHITECTURE CONSIDERATIONS FOR .1QCA



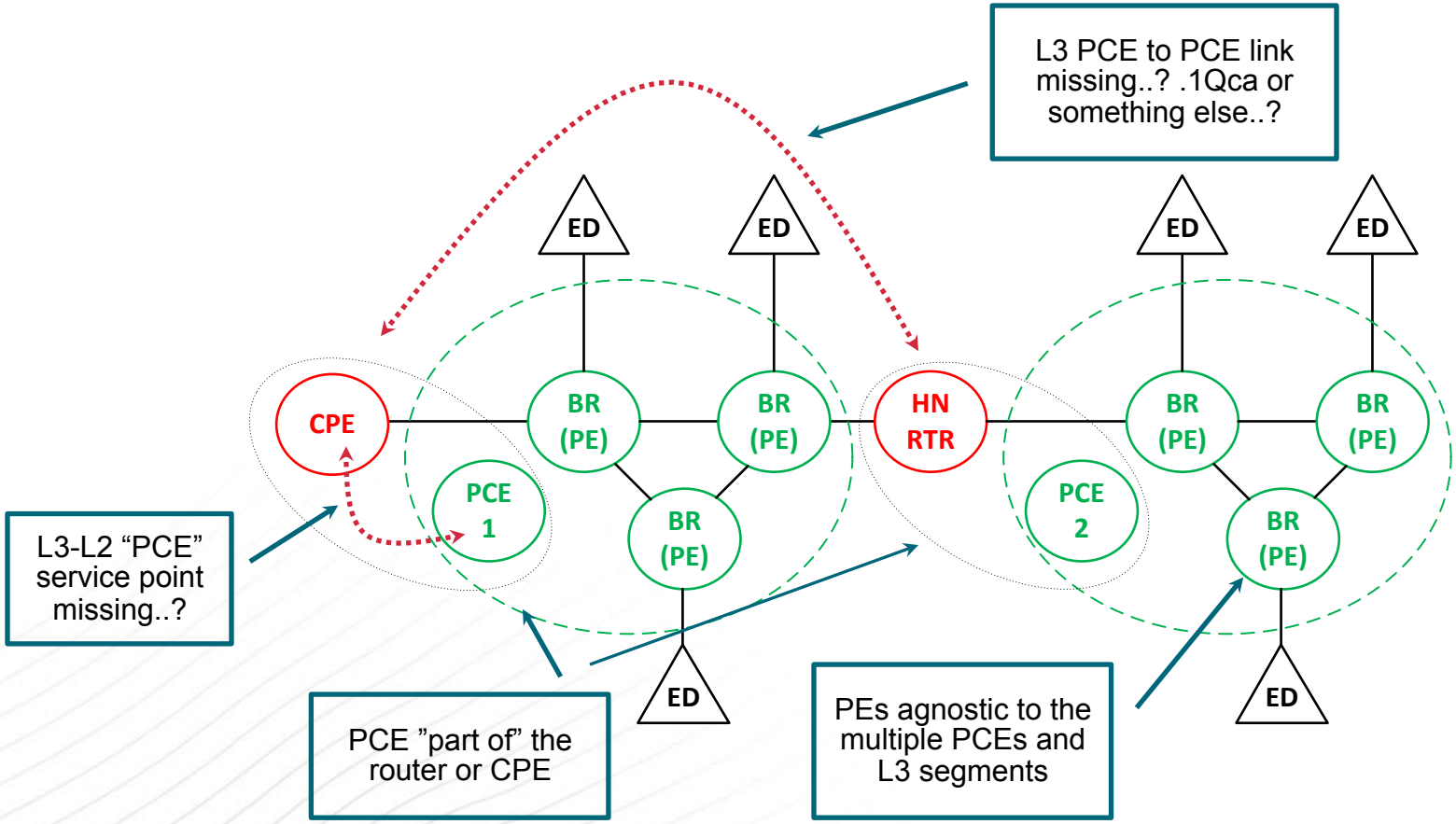
- **Path reservation over multiple L3 segments:**
  - L2 may still have arbitrary non-loop-free cabling..
  - L2 area in a L3 segment may contain arbitrary switched topology..
- **L2 using IS-IS SPB, whereas L3 can be e.g. IS-IS, OSPFv3 or nothing..**
- **Need for a L3 to L2 communication for path reservation and coordinated network segmentation?**

ARCHITECTURE CONSIDERATIONS FOR .1QCA



- **How would 802.1Qca with PCE – PE architecture fit here..**
  - Multiple PCEs and Pes. Also PCE to PCE communication..
  - See ca-farkas-small-nets-0514-v02.pdf

ARCHITECTURE PROPOSAL FORMING..



- **L2 protocols exports service points to the L3 protocols to allow these protocols to be deterministic while network agnostic.**
- **Ok.. The architecture applies to a largee or smaller scale networks than a home network; it is just serves a good starting point..**

CONCLUSIONS

- **Need for alignment with L2 and L3 efforts:**
  - For example in homenetworking.
- **Solution for L2 and L3 cooperation for e.g. path reservations:**
  - Expose required service points.
  - Agree on minimum set of required information elements passed between functions and layers.
- **Fitting the (.1Qca) PCE – PE model with L3 developments.**
- **The same architecture principles should work for:**
  - Large networks (with added bells and whistles); and
  - Smaller networks (with way reduced “dynamic” parts).