ISP Customer DNS on Edge Compute

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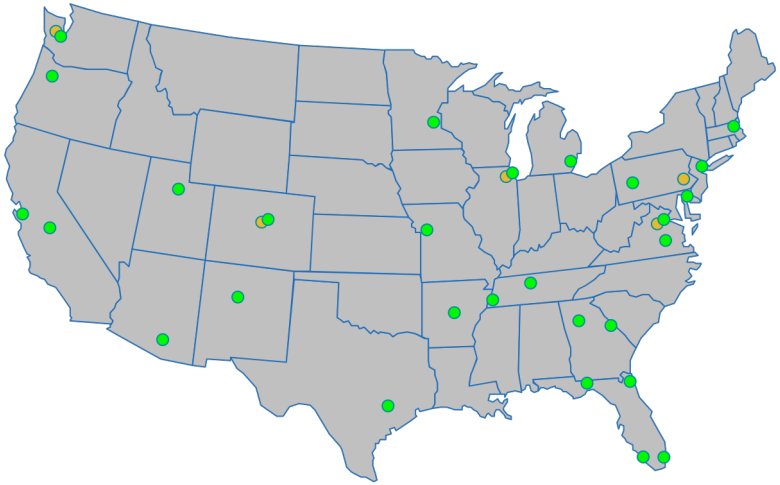
Thomas Modayil Jacob

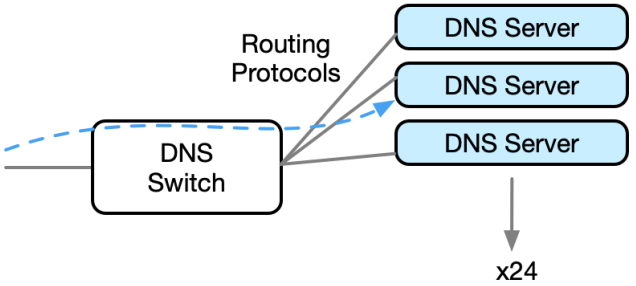
Sambi Mandala

Kalicharan Vuppala

Comcast Customer DNS

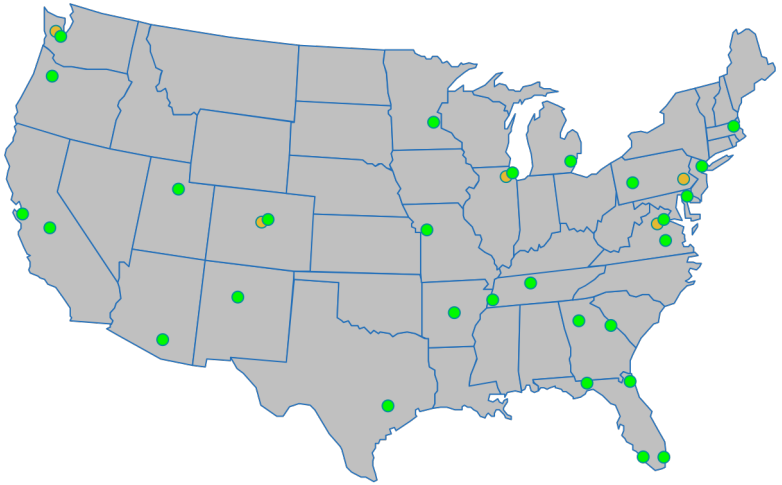
- Serves ~1.5 trillion queries/day
- Business and Residential Customers
- Anycast Delivery
  - 75.75.75.75 / 2001:558:feed::1 (primary)
  - 75.75.76.76 / 2001:558:feed::2 (secondary)
- Dedicated Infra in Regional NA sites
- Resilient across local and site issues
- On-Network Access Only
- DNSSEC Validation
- Encrypted DNS (DoH)

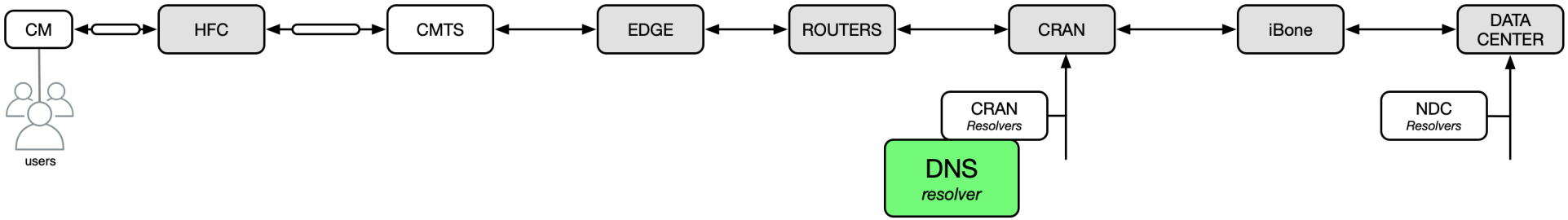




Subscriber Do53 Service

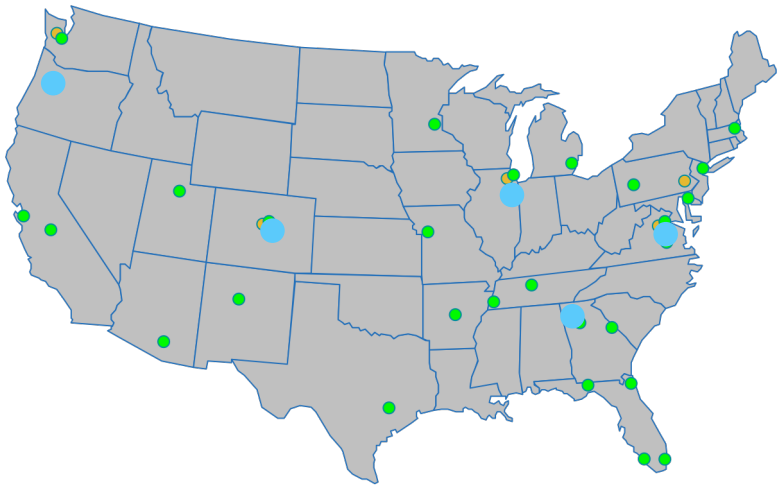
- DHCP Provisioned Anycast Service
- Fixed Primary Secondary Sequence
- Customers can set any Alternate DNS
- Cached in the Comcast Network
- Resolved Regionally without ECS

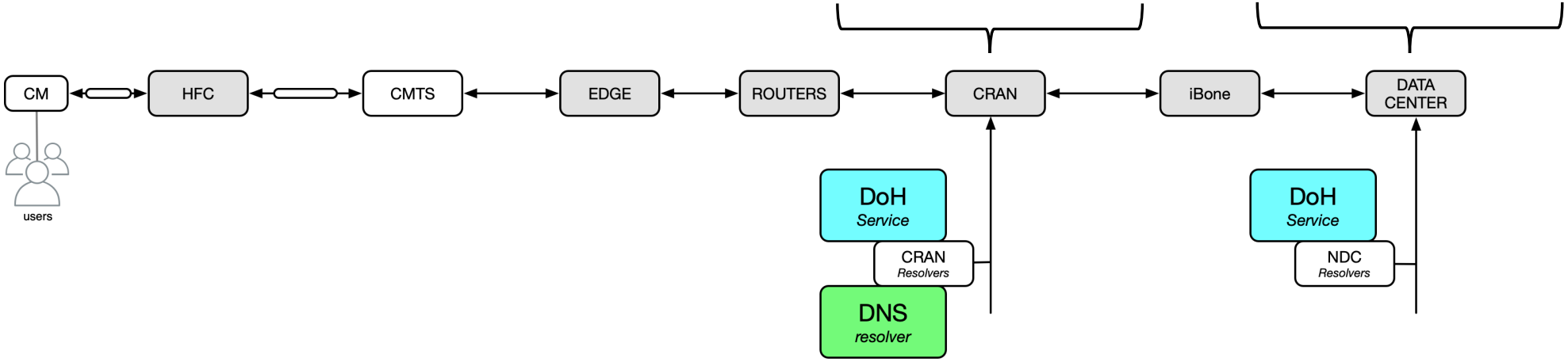




Subscriber DoH Service

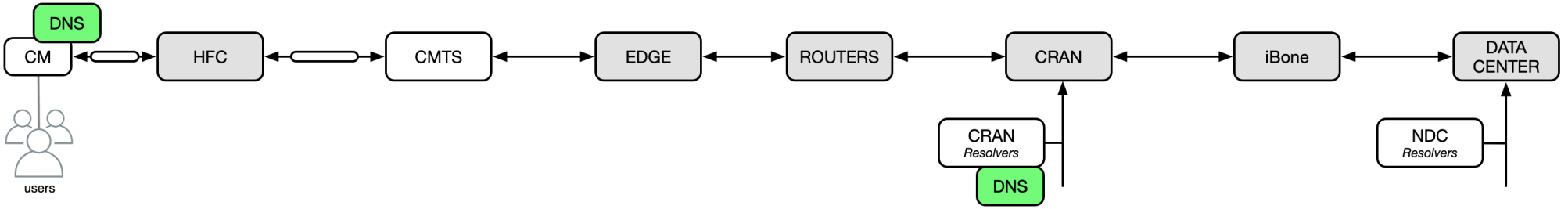
- DoH Service on doh.xfinity.com
- Serves ~150B queries/day
- Customers can set any Alternate DoH
- Cached in the Comcast Network
- Same Resolution Sites as Do53 without ECS





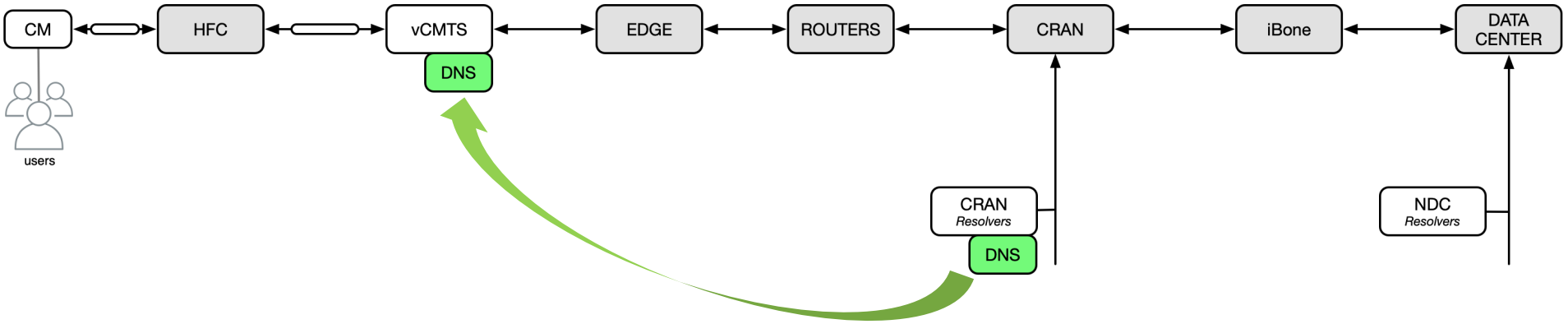
DNS Service Location

- Network Latency
- Smaller Blast Radius
- **Cache Hit Ratio**
- Closer to Subscriber the Smaller the Shared Cache
  - CPE Caching has very low CHR - <10%
  - Low Latency to an Empty Cache
- Network Caching Shares Cache
  - Network Caching has high CHR - 90%
  - Higher Latency to a Full Cache



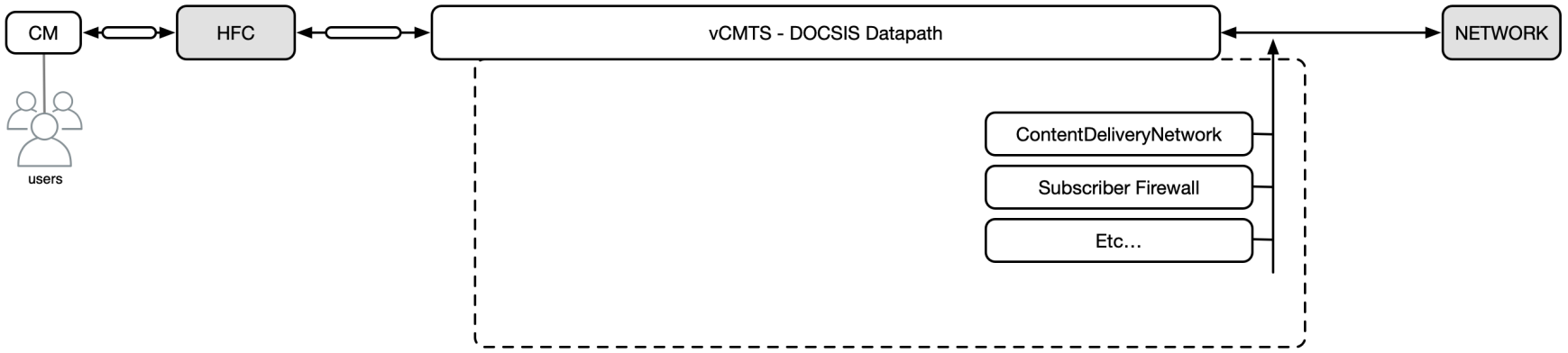
Lowering DNS Latency

- Move Do53 and DoH Service Closer to Subscriber and Maintain Cache Hit Ratio
- Leverage Comcast Edge Compute
- Closest App Service Location to Comcast Customers
- Integrated into Existing Do53 and DoH Service



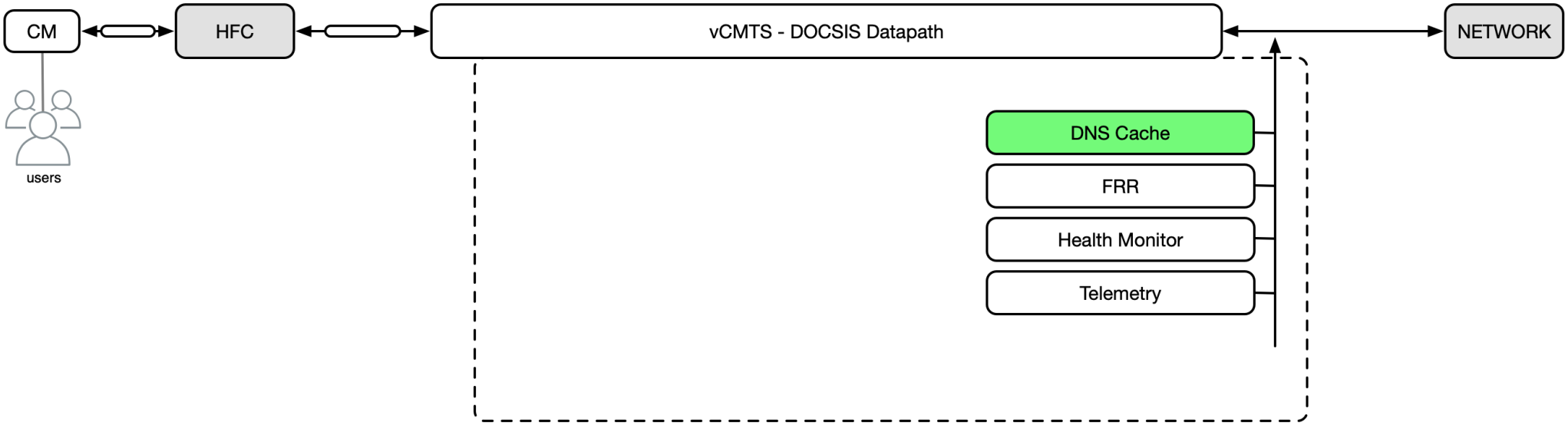
Comcast Edge Compute on vCMTS

- Comcast Hosts Internal and 3rd Party Apps on vCMTS Edge Compute Platform
- Co-located with DOCSIS Datapath
- Kubernetes Environment
- Deployed to Local Headend Sites Across Comcast Footprint
- Very Low Latency to Comcast Subscribers



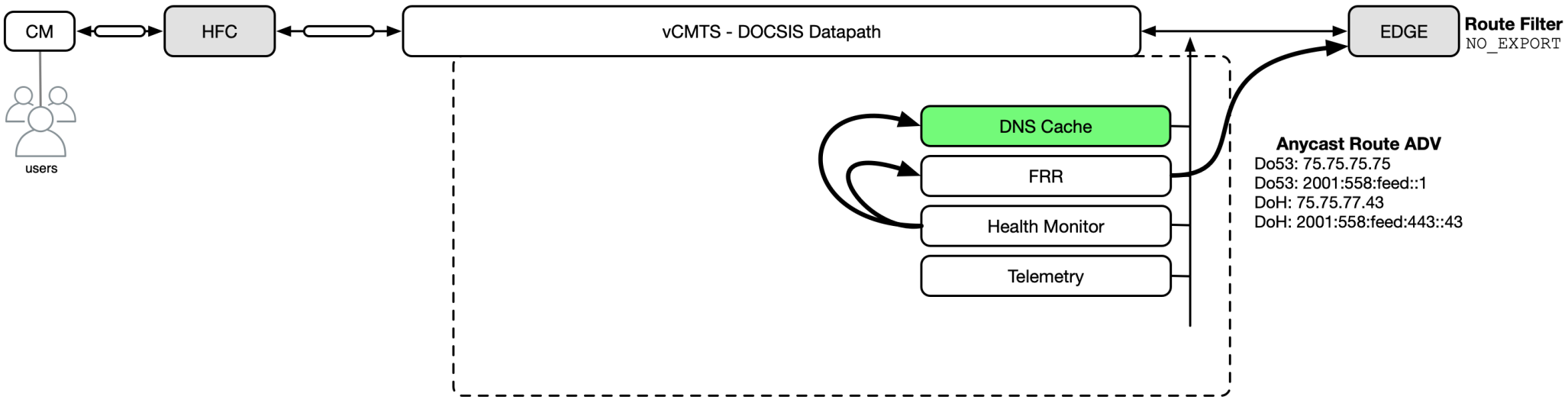
Customer DNS Cache on Edge Compute

- DNS Shared Cache for both Do53 and DoH
- DNS Resolution Remains in same Regional Sites without ECS



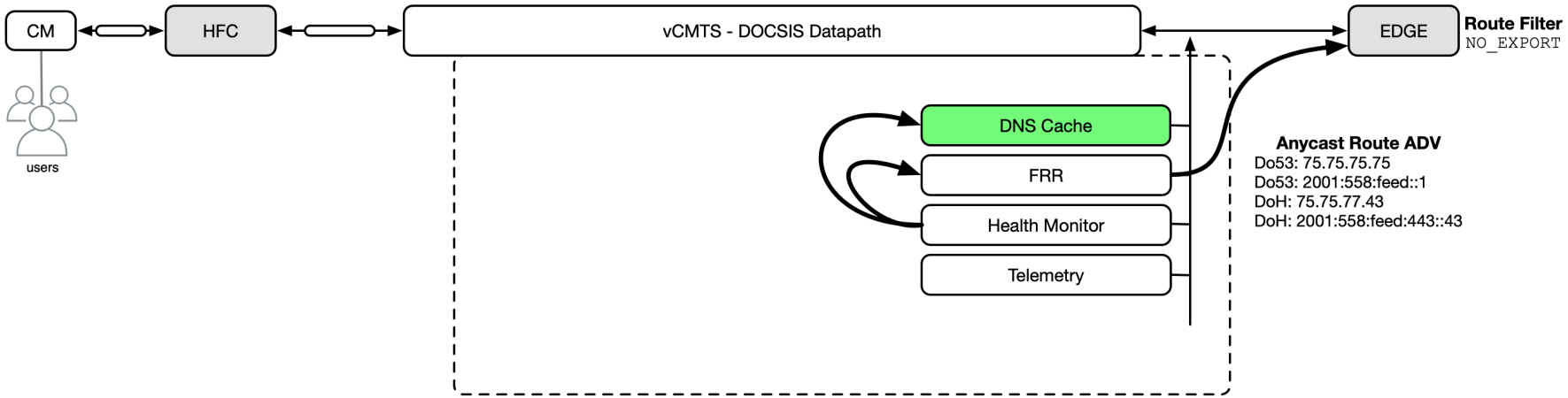
Customer DNS Cache Integrated Routing

- Do53 Anycast Addressing Unchanged
- DoH Static Local Response

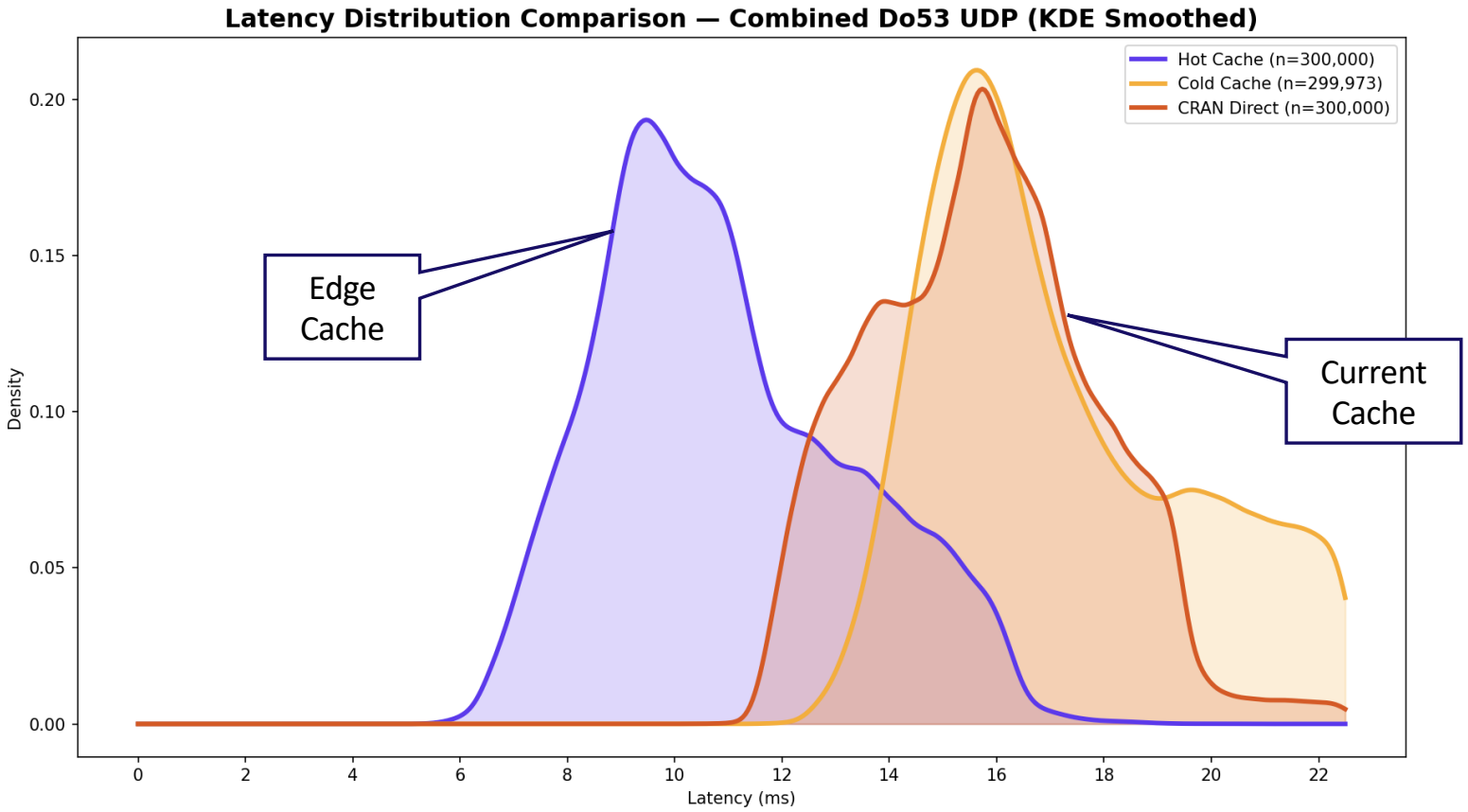


DNS Cache Operation Model

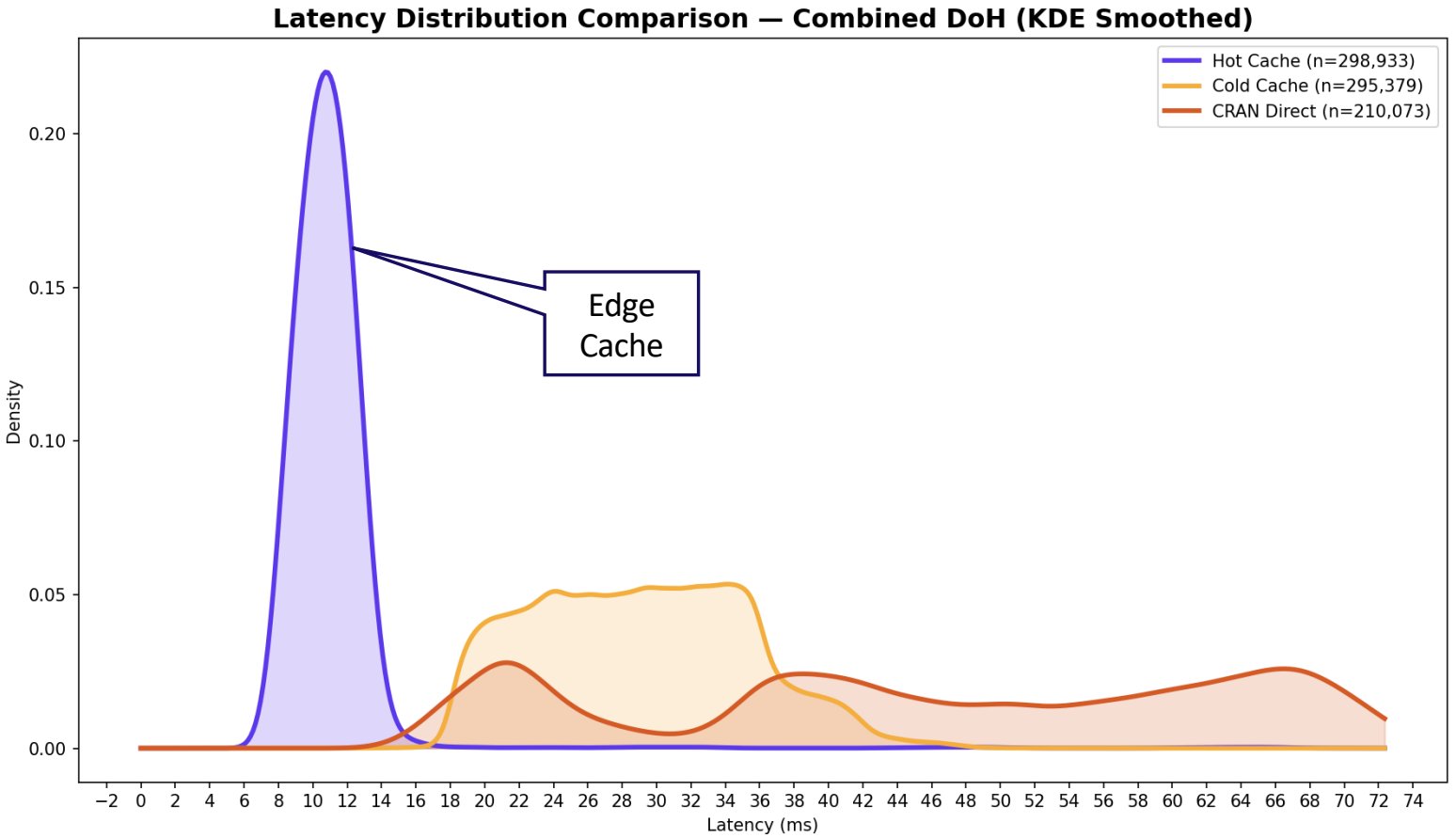
- Do53 and DoH Service and Cache Backed by Existing Services
- Cache Route Insertion and Removal is Non-Service-Impacting
- Do53 and DoH Cache Services are Coupled
- DNS Service Coupled with Datapath



Latency Results Distribution – Do53 UDP



Latency Results Distribution – DoH



Latency Results Distribution – Do53 TCP

