Carrier Use Case: Connecting Users to Functions

Today: Fragmented
Bound to Routers, Topologically segmented

Goal: Clouded
Dynamically linked, Logically segmented
Approach: SDN .. but!

- Problem: push, hop by hop, SDN model, doesn't scale
- Solution: federated-overlay, Map & Encap pull SDN model
LISP SDN Connects Users to Functions (NFV)

ContexMapping
  Configuration Mapping
  Analytics Mapping
  Control Mapping

Orchestration
  Rest APIs

ContexView
  Performance Analysis

OPEN DAYLIGHT
  Federated Control
  Distributed Mapping
  Programmable Network

PXTR
  Network Functions

Network Functions

RTR

IPv6

Underlay

XTR

OpenFlow

ConteXtream Confidential
SDN-NFV Barriers Addressed by LISP

- Multi vendor and legacy interoperability
  - Outerlay multi functions, ALGs
  - IP Legacy Underlay

- Lack of standardization / Technology maturity
  - OpenFlow S, LISP E-W
  - North Mapping Schemas

- NFV May slow traffic / Cost Benefit
  - Lower performance × higher utilization, fast global rollout defragmentation
Federates FlowHandlers by Application-Location

Mapping: ID-RLOC, Sub-Service, Class-Instance

cdn
epc-gi
ims-sbc

dino, fabio, vina... lispmob

ietf

flowhandlers

open

daylight

contextream confidential
SDN-NFV Form Carrier Solutions

- NFV unbundles functions per feature & capacity
- SDN flow-mapping assembles & links components
SDN-NFV Chaining and Balancing

- Chaining assembles a service from component classes
- Balancing ensures instances are pooled-defragmented
Example: The virtual EPC Problem
vEPC using LISP SDN-NFV
ConteXt LISP SDN Federation in Open Daylight

First Code Release "Hydrogen"
### LISP-SDN Backhaul Map-Retag-Encap

#### XTR EID-RLOC Mapping

<table>
<thead>
<tr>
<th>EID-RLOC</th>
<th>RTR Segment (optimal)</th>
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<tbody>
<tr>
<td>121.1:2:7</td>
<td>141.2.6:3</td>
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<tr>
<td>141.2.6:3</td>
<td>121.1:2:7</td>
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#### Diagram

- **L3 Switch 121.1**
  - MPLS port 1
  - MPLS port 2
  - IP port

- **L3 Switch 141.2**
  - MPLS port 1
  - MPLS port 6
  - IP port

- **Any Routing**
  - IP port
  - IP port
  - IP port

- **Re-routing Tags**
  - Tag 7
  - Tag 3

- **RSVP**
  - RSVP ingress
  - RSVP egress
Thank You
LISP Based Software Defined Network

- Software Defined Overlay Network, connects resources over carrier IP LAN-WAN backbones.
- Uses underlay IP for both transport and mapping-DB: north to orchestration, east-west ID-IP.
- OpenFlows to (and from) Access and Internet are chained through carrier network functions.
- Functions include: subscriber / m2m mobility, content caching, optimizations, and monetization.
- Functions are flow-mapped locally-globally, form flat, non (location) fragmented, resource pool.
- Flows steered per context: subscriber-function-application, context is kept in mapping database.
- Flows recorded in an information export format (FIX), and bridged (TCP-O) across overlay mediums.
- Flows cross locations using a mesh of overlay tunnels, the federated Overlay is Underlay aware:
  - Underlay multi-path options measured for queue-buildup, ensuring drop-less flow-tunnel delivery
  - Overlay traffic is steered through stateless-core landmark segments using re-tunneling headers
Summary: Top 10 Carrier SDN Traits

- Mapping: global-lookup, Sub-Service, EID-RLOC, App-VM
- Affinity: maintained under topology changes and VM motion
- Overlay: underlay measurements & landmark-segments aware
- Chaining: dynamically "linking" function classes to form services
- Balancing: flows mapped to pooled-defragmented functional instance
- Flow Bridging: 5 tuple TCP/UDP per flow jitter-buffers and window scaling
- Flow Recording: 5 tuple TCP/UDP per flow metadata IPFIX writes to mapping
- Flow Separation: ACL, tenancy, blacklists and white lists resilient to movement
- Flow Tapping: any flow at any point can be replicated and forked to .. elsewhere
- Flow Proxy: ALGs close mapping gaps between legacy (3GPP) and NFV scaling