Exploring the Service/Orchestrator interaction
Secure and dynamic deployment of services based on identity
Partner Introduction

**UPV/EHU**
- I2T Research Group from the University of the Basque Country (Spain)
- Efficient Network Virtualization, Authentication, Flow Based Services
- Contributions: L2PNV / FlowNAC / Service Graph

**BISDN**
- Berlin-based SDN company, in operation since 2013, ONF startup member.
- SDN/NFV Solutions for Carrier networks.
- Contributions: CPE / xDPd
NFV-driven service delivery orchestration in carrier networks

- **Novel network architecture**
  - Address assignment and routing are pushed into Layer 2.
  - IP address range used per service, avoiding NAT (and helpers).

- **Service Orchestration in a carrier network (including CPE)**
  - A graph-based service description opens the infrastructure to multi-provider (and multi-service) scenarios.
Network Architecture

Layer 2 Prefix-based Network Virtualization

Network Resources
L2PNV (slices isolated by MAC prefixes)

Compute Resources
XEN VMs, Docker containers, DPDK processes

http://dx.doi.org/10.1016/j.bjp.2013.11.013
1. FlowNAC Service is deployed
2/3. User requests access to a Service
4. FlowNAC authenticates User
5. New Service deployment is requested to Orchestrator
6/7. Service request is decomposed in path and NF instantiation requests

http://dx.doi.org/10.1109/NETSOFT.2015.7116168
Demo workflow at the ONS2015

0. "HomeLAN" service is enabled with local resources on the CPE.

1. Multiple service providers (SP) offer different services to end users.
   - Service Providers isolated by MAC prefixes (at Layer 2).

2. Connection to a new SP generates a new port (using the MAC prefix assigned to the SP).
   - L2PNV guarantees traffic isolation per SP (prefix) so there is no collision on IP ranges.

3. “FlowNAC” is the first service deployed by the SP.
   - Allows the SP to individually control the access to each service.

4. “Internet access” service is requested and deployed by the SP (e.g. DHCP and GW/NAT).
   - The SP will be able to assign an IP address (from the SP’s pool) to the new port (e.g. via DHCP).

5. An additional service is requested: “Video” service deployed on the CPE.
   - Local compute resources on the CPE could enable access to HDMI.
Exploring the Service/Orchestrator interaction

Secure and dynamic deployment of services based on identity

Universidad del País Vasco
Euskal Herriko Unibertsitatea

i2t Research Group

i2t.ehu.eus
eduardo.jacob@ehu.eus

BISDN
Berlin Institute for Software Defined Networks

bisdn.de
hagen.woesner@bisdn.de
Rigid network control and infrastructure limit the flexibility of cloud and network services. The UNIFY project envisions full network and service virtualization to enable rich and flexible services and operational efficiency.

Universal Node combines high throughput packet processing on commodity hardware with flexibility of deployment.
FlowNAC

SDN-agnostic NFV / SDN-aware NFV

FlowNAC VNF
Slow Path Access Control
- All traffic pass through the VM

SDN-enabled NFV

VM
AA block
- State of AuthN/AuthZ (Stateful)
Access Control enforcing block
- Stateless AC rules
- All the traffic pass through the SDN switch

http://dx.doi.org/10.1109/MCOM.2015.7081093
Demo setup at the ONS2015

Detailed view of a Service Chain: FlowNAC
## Demo setup at the ONS2015

### Service Chains

<table>
<thead>
<tr>
<th>Owner</th>
<th>Chain</th>
<th>CPE</th>
<th>SWITCH</th>
<th>LUN</th>
<th>RUN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infrastructure Provider</strong></td>
<td>Home LAN (with access to multiple SP)</td>
<td>V</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>FlowNAC</td>
<td>V</td>
<td>P</td>
<td>V</td>
<td>X</td>
</tr>
<tr>
<td><strong>Service Provider</strong></td>
<td>Internet access</td>
<td>P</td>
<td>P</td>
<td>V</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Video Service</td>
<td>V</td>
<td>P</td>
<td>P</td>
<td>V</td>
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- **V** resources deployed
- **P** connectivity provided (path)
- **X** resources not deployed
Demo setup at the ONS2015

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<tr>
<th>Tenant</th>
<th>Prefix</th>
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<th>Slice</th>
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<tbody>
<tr>
<td>Service Provider 1</td>
<td>02:00:30</td>
<td>131120</td>
<td>ServProv1</td>
</tr>
<tr>
<td>Service Provider 2</td>
<td>02:00:34</td>
<td>131124</td>
<td>ServProv2</td>
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0. HomeLAN
1/2. Serv. Prov Offering

Management Plane (Connections with the Orch Framework)
Data Plane (All Connections internal to the Service Chain)

Remote Universal Node (RUN)

ELwUD Orch. Framework

User

Network Controller

MACP

HomeLAN

CPE

SDN Switch

Local Universal Node (LUN)

INTERNET

OpenVPN EHU

EHU-OEF (Data plane)
Demo setup at the ONS2015

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Management Plane (Connections with the Orch Framework)
Data Plane (All Connections internal to the Service Chain)

Remote Universal Node (RUN)

I2T (Mgmt plane)

Network Controller

EHU-OEF (Data plane)

User

Network Controller

FlowNAC AC Enforcing

FlowNAC Control App

ELwUD Orch. Framework

OpenVPN EHU

Local Universal Node (LUN)

INTERNET
Demo setup at the ONS2015

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4. Internet Access

- Management Plane (Connections with the Orch Framework)
- Data Plane (All Connections internal to the Service Chain)

Remote Universal Node (RUN)

I2T (Mgmt plane)

Network Controller

EHU-OEF (Data plane)

OpenVPN EHU

Internet Access

ELwUD Orch. Framework

FlowNAC AC Enforcing

User

CPE

SDN Switch

Local Universal Node (LUN)

I2T
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Management Plane (Connections with the Orch Framework)
Data Plane (All Connections internal to the Service Chain)

Infrastrucure

5. Video Service

- Video Player
- FlowNAC AC Enforcing
- Network Controller
- Orch. Framework
- ELwUD

Remote Universal

Video Server

I2T (Mgmt plane)

Network Controller

EHU-OEF (Data plane)

SDN Switch

Local Universal Node (LUN)

OpenVPN EHU

CPE

Internet
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