A change of paradigm for business or just stuff for techies?

Session Border Controller virtualization towards “service-defined” networks based on NFV and SDN

Giuseppe Monteleone and Pietro Paglierani, Senior Member, IEEE

11 November 2013 EIT ICT Labs, Trento, Italy
Virtualization of the SBC towards NFV and SDN

- The Session Border Controller use case
- Why the SBC?
- How the SBC is virtualized
- NFV as new paradigm
- VNF lifecycle management
- The HA problem
- Joining NFV and SDN
- A SDN use case
- The T-NOVA NFaaS concept
Moving from Proprietary HW to SW Defined Environments

Proprietary HW
Proprietary RT OS

ATCA Platform
Control/User Plane
CG Linux OS

COTS HW &
Virtualization

NFV & SDN

From 2000:
Availability of
Softswitch for
Voice over IP

From 2005:
Availability of
Network Functions on
ATCA platform

From 2010:
Availability of
Network Functions on
Virtualized platform and
COTS HW

From 2013:
Software Defined
environment via NFV & SDN
A core network and an access network; in this case we have a UNI (User to Network Interconnection).
Two core networks belonging to two different administrations; in this case we have a NNI (Network to Network Interconnection).

Border control functions between two core networks subsystem.

- Pinholing: i.e. opening gates and allowing the media streams to be exchanged;
- IPv4-IPv6 interworking:
- NA(P)T-PT functionality;
- media adaptation (transcoding/transrating), adjusting in real time the coding format of the media transmitted between end users.

- QoS marking (for outgoing traffic)
- Resource allocation and bandwidth reservation (traffic policing)
- Traffic usage metering
- Multi VLAN support
- Other: DTMF detection and/or generation; FAX/T.38 interworking
HW-based SBC

- I-BGF based on specialized HW:
  - High performance achieved through specialized HW components
    - High throughput, low latency, low power consumption can be easily achieved....
  - Long development time, complex deployment, specialized maintenance, ....
    - Scalability and flexibility cannot be provided

![Diagram of I-BGF Control with CPU, NPU, and DSP FARM]
How is implemented

Virtual Infrastructure

- SCALABILITY (more VMs)
- HA middleware
- Carrier grade Linux

VM SW

vCPU: virtual CPU (virtual machine’s virtual processor)

pCPU: physical CPU (physical core)

Computing modules
Memory modules
Network interfaces
Storage modules
SBC virtualization: the first step. Border Control Function, Border Gateway Function, Operation and Maintenance are implemented are independent Virtual Machines

<table>
<thead>
<tr>
<th>Unit</th>
<th>vCPUs</th>
<th>HA</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBF+BCF</td>
<td>2</td>
<td>Active-standby model</td>
</tr>
<tr>
<td>BGF</td>
<td>4</td>
<td>Active-standby model</td>
</tr>
<tr>
<td>OAM</td>
<td>4</td>
<td>Active-Active model</td>
</tr>
</tbody>
</table>
A new paradigm

Virtualization first steps emulating pre-existing physical network functions.

From a technology ... to a new framework

Customized HW for some functions
Assigned HW (w/ hypervisor)
Limited innovation

COTS HW
Shared HW resources
Automation of lifecycle management
Choose the VNF w/ associated capacity.

VMs instantiated according to the VNF descriptor.
Solution#1 (PoC Lifecycle management): VNF scaling

Performances and load indicators used for scaling decisions

OSS
EMS
EMS
VNF
VNF
VNF

Orchestrator
VNF Manager
VI Manager
Management and Orchestration

Virtualized Network Functions

Scale-up
Scale-out

NFV Infrastructure

On boarding
Instantiation
Operation
Termination

Monitoring – Healing – Scaling
Upgrade - Migrate
SW implemented HA, independently from HW and hypervisor.

Load is distributed to the two VMs

Load is attributed to surviving VM

Carried grade availability achieved by using an High Availability Middleware (HA) handling:
- application redundancy;
- overload control;
- fault detection and automatic switchover.
Solution#3 (work in progress): SDN control

Based on ETSI NFV ISG architectural framework
NOTE: The SDN controller might as well be a VNF.

(*) at present, partial implementation/integration
Solution#4 (work in progress): Service-defined networking

- Network topology
- Link measurements
- Policy mapping

Forwarding rules

SDN controller

Control protocol

Service-defined network
T-NOVA
FP7 ICT Call 11 - Objective ICT-2013.1.1.: Future Networks
Duration: 36 Months
Starting Date: 1.1.2014
Consortium composed by 18 partners
Research: i-NEXT project

Italian project on Smart Cities
- Starting Date: nov 2012 (30 months)
- M2M Italtel platform

- Horizontal M2M platform
- Different applications sharing a common network infrastructure
- NFV based w/ SDN controller
Thank You

Convergent Solutions by

ITALTEL
Roots to the future

giuseppe.monteleone@italtel.com
pietro.paglierani@italtel.com