NFV ISG PoC Proposal

A.1 NFV ISG PoC Proposal Template

A.1.1 PoC Team Members

- Include additional manufacturers, operators or labs should additional roles apply.
- **PoC Project Name: E2E vEPC Orchestration in an multi-vendor open NFVI environment**
- Network Operators/ Service Providers: **Telefonica** (Gerardo García de Blas (ggdb@tid.es)
  Sprint (Farid Feisullin, Farid.Feisullin@sprint.com)
- Manufacturer A: **Intel** (Shivani A Sud - Shivani.a.sud@intel.com)
- Manufacturer B: **Cyan** (Nirav J. Modi – Nirav.Modi@cyaninc.com)
- Manufacturer C: **Red Hat** (Nicolas Lemieux - nlemieux@redhat.com),
  Glenn Rudolph (grudolph@redhat.com)
- Manufacturer D: **Dell** (Franklin Flint - Franklin_Flint@Dell.com)
- Manufacturer E: **Connectem** (Barry Hill – barry@connectem.net)

A.1.2 PoC Project Goals

This PoC, demonstrates an open NFVI ecosystem comprised of multiple vendors with a single orchestrator to provision, deploy and manage a mobile network-service comprised of a vEPC deployed on COTS hardware infrastructure and a Layer2 mobile backhaul network. This PoC will help identify the core requirements and information model structures that are required to support this open and flexible approach.

This PoC will be extended to include further phases. The scope of this proposal is limited to the first phase.

POC Phase 1 Goals

- PoC Project Goal #1: Validate the ETSI NFV ISG architecture framework, as described in ETSI GS NFV 002 v1.1.1 (2013-10)
- PoC Project Goal #2: Demonsrate the integration of a multi-vendor open NFVI:

a) Intel x86 Xeon servers with advanced virtualization features, Intel 10G Niantic NICs

b) Dell servers

c) Red Hat Enterprise Linux and Red Hat KVM as a hypervisor

- PoC Project Goal #3: Industry standard Virtual Infrastructure Manager

a) Red Hat OpenStack (VIM)

- PoC Project Goal #4: Demonstrate a vendor and network function-neutral orchestrator, showcasing a real-world deployable virtual service:

a) Cyan Blue Planet NFV Orchestrator and VNF Manager

- PoC Project Goal #5: Connectem VCM (Evolved Packet Core) VNF deployed on Intel Architecture based COTS hardware;
- PoC Project Goal #6: Demonstrate network service configuration between a VNF and embedded network functions (PNFs). In the scope of this PoC, we will demonstrate a MEF CE2.0 service that is configured from

eNodeB across a metro-Ethernet backhaul network, to the Connectem vEPC residing in a DC comprised of Intel/Dell/Red Hat solutions

- PoC Project Goal #7: Demonstrate OpenStack Heat template-driven orchestration of VNFs, supporting parameterization and customization. The information models associated with the templates will be included in the results.

POC Phase 2 Goals

This PoC may be extended into a phase 2 where we will demonstrate the following additional capabilities:

1) Work with best practices approved by PER EG to achieve NFVI performance and predictability requirements
2) Identify OpenStack gaps and investigate enhancements proposed by the PER EG towards extracting higher vEPC performance in an OpenStack environment.
3) Enhanced Data Plane performance for the vEPC with Intel DPDK integration for both VM-to-VM and VM to NIC port communications .
4) Orchestration of vEPC scale-out
5) Orchestration of vEPC EMS (within a VM) as part of overall EPC instantiation
6) Orchestration of additional VNFs, etc. vIMS + vEPC with VoLTE service demonstration

A.1.3 PoC Demonstration

- Venue for the demonstration of the PoC: Mobile World Congress, 24-28 Feb, 2014, Barcelona, Spain

A.1.4 (optional) Publication

- What would be the publication channel(s) for the PoC
  - A detailed PoC guide will be published at: http://networkbuilders.intel.com
    - Publication date: 24th February, 2014
  - A final PoC Report with results and findings for the ETSI NFV ISG will also be published
    - Publication date: 01 May, 2014

A.1.5 PoC Project Timeline

• What is the PoC start date?	This project has already been started.
• (First) Demonstration target date	24-28 Feb, 2014
• PoC Report target date	01 May, 2014
• When is the PoC considered completed?	This PoC will be completed in several stages. Phase 1 will be completed once the report has been published to the ETSI NFV ISG.

A.2 NFV PoC Technical Details

A.2.1 PoC Overview

The following diagram and table specifies the vendors involved in the PoC and the functional components that comprise the NFVI, VNF and NFV orchestration layer.

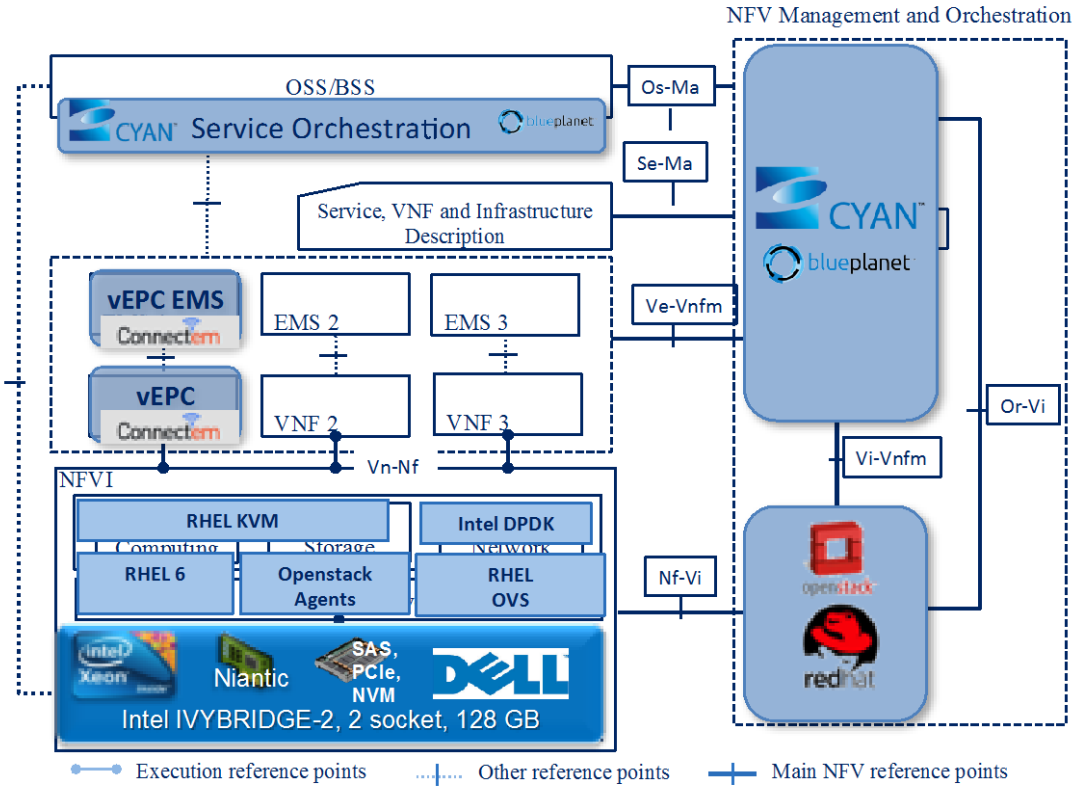

Figure 1: PoC Phase 1 Components

NFV Component	Vendor	Component Description
NFVI	Intel	Intel Ivybridge-2, 2 socket 128 GB Intel 10 G Niantic Intel DPDK
NFVI	Red Hat	RHEL Linux OS RHEL KVM RHEL OpenStack
NFVI	Dell	Dell PowerEdge C6220
VNF1	Connectem	Evolved Packet Core
EMS1	Connectem	EPC Manager
VIM	Red Hat	Red Hat OpenStack
VNF Manager(s)	Cyan	Cyan Blue Planet Suite
NFV Orchestrator	Cyan	Cyan Blue Planet Suite
Service Orchestration	Cyan	Cyan Blue Planet Suite
Solution Integrators	Cyan	-

A.2.2 PoC Scenarios

- **Scenario 1: Integration and interopability of a multi-vendor, high-performance NFVI**

The PoC demonstrates use of one orchestration solution that can manage resources as diverse as latest industry open source based Cloud Management System, Openstack to new virtual Network Functions developed specifically to address NFV architecture and executing on Intel architecture based COTS hardware to legacy optical mobile back haul products – by embracing interoperability across legacy telco industry and evolving cloud technologies.

- **Scenario 2: VNF Instantiation in an open NFVI environment**

Showcase the OpenStack Heat AWS CloudFormation template-based orchestration of the Connectem vEPC, exposing key parameters for customization and deployment. The vEPC in this case is a composite VNF and has a complex placement topology, showing high availability configuration.

Note that the Connectem vEPC has an EMS that can be deployed and used for configuration and management. In the scope of this PoC, the Cyan Service Orchestrator performs all required configuration of the vEPC and the EMS is not used.

Two different VNF taxonomies will be orchestrated. Each of these configurations will be user-selectable and demonstrate the flexibility of the Connectem vEPC, as well as the agility and tunability enabled by orchestrator.

vEPC Components:

CLP – Control Plane/Processing Engine
DPE – Data Processing Engine
RIF – RAN Interface
SC – System Controller
SDB – System Database
SWREPO – SW Repository

a) Minimal deployment composite VNF

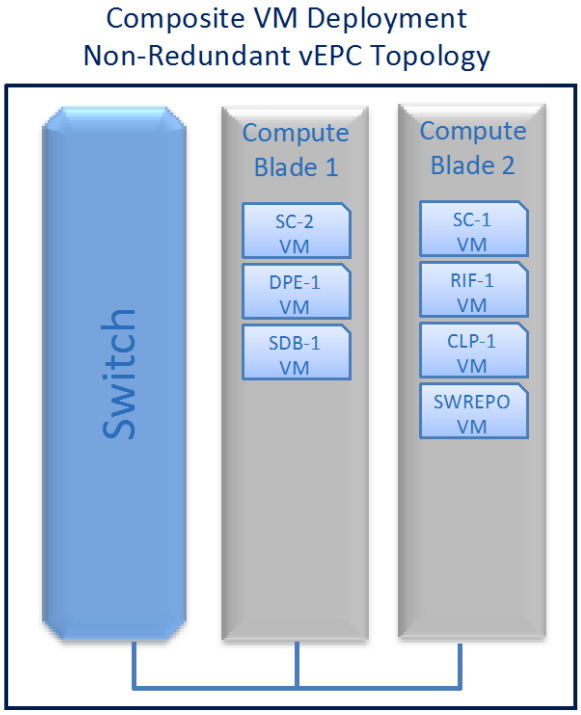

Figure 2: Minimal vEPC Deployment Topology

b) High-availability VNF configuration

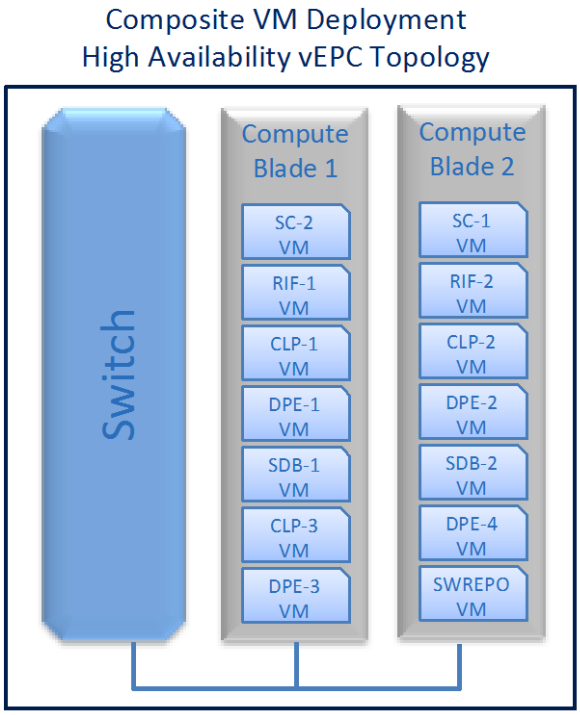

Figure 3: High-availability vEPC Deployment Topology

- **Scenario 3: Network Service E2E service orchestration**

Showcase the end-to-end orchestration of a mobility service from handset through an eNodeB, over a metro Ethernet backhaul network, and through the virtual EPC. This scenario combines E2E service orchestration of both NFV and traditional embedded network functions (Physical eNodeB, metro Ethernet devices) and shows a real-world deployable NFV use-case.

This scenario will further showcase:

- Service aware resource allocation
- Virtualization transparency: Management functions are unaware that the network function has been virtualized
- Service availability: A combination of high-performance NFVI and orchestration supports the high-availability of the VNF

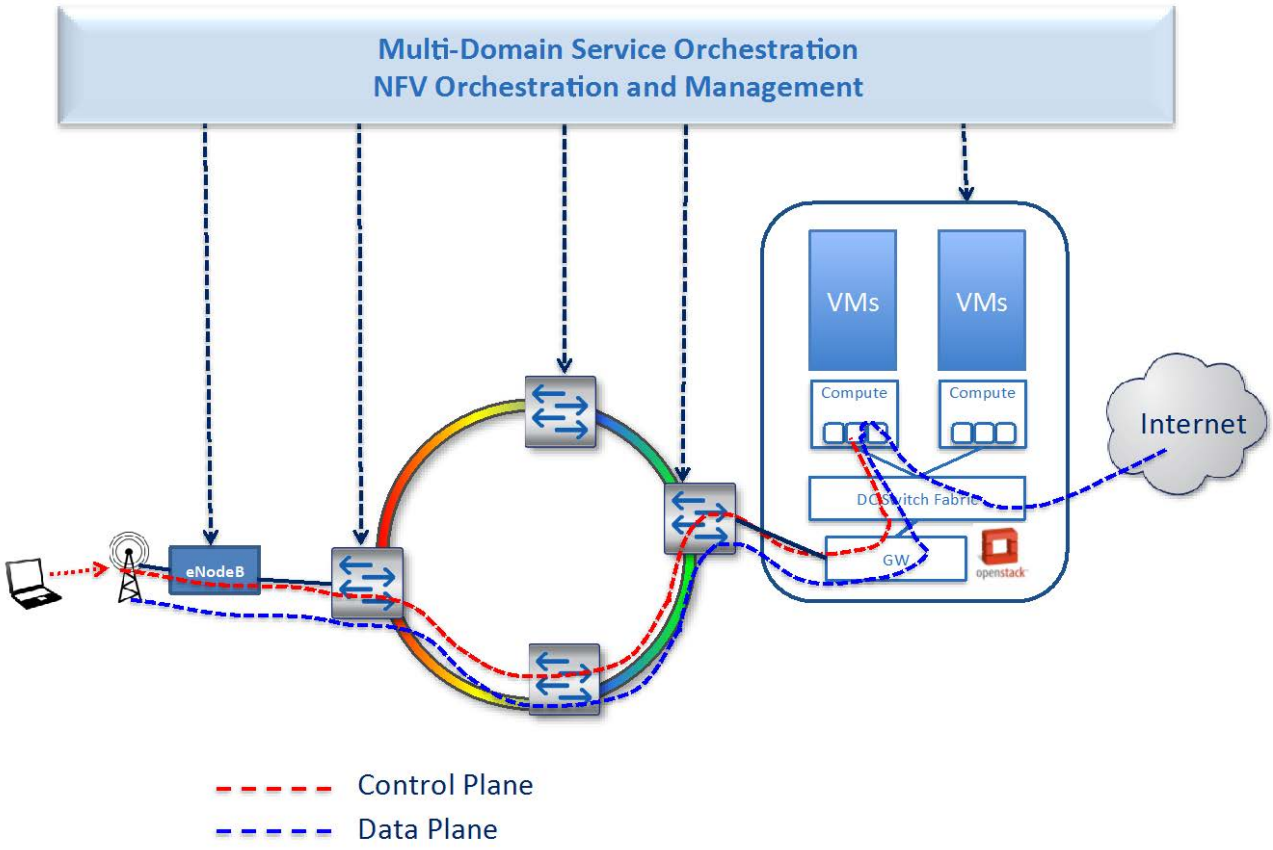

Figure 4: End-to-End vEPC service orchestration – network topology with PNFs and VNF

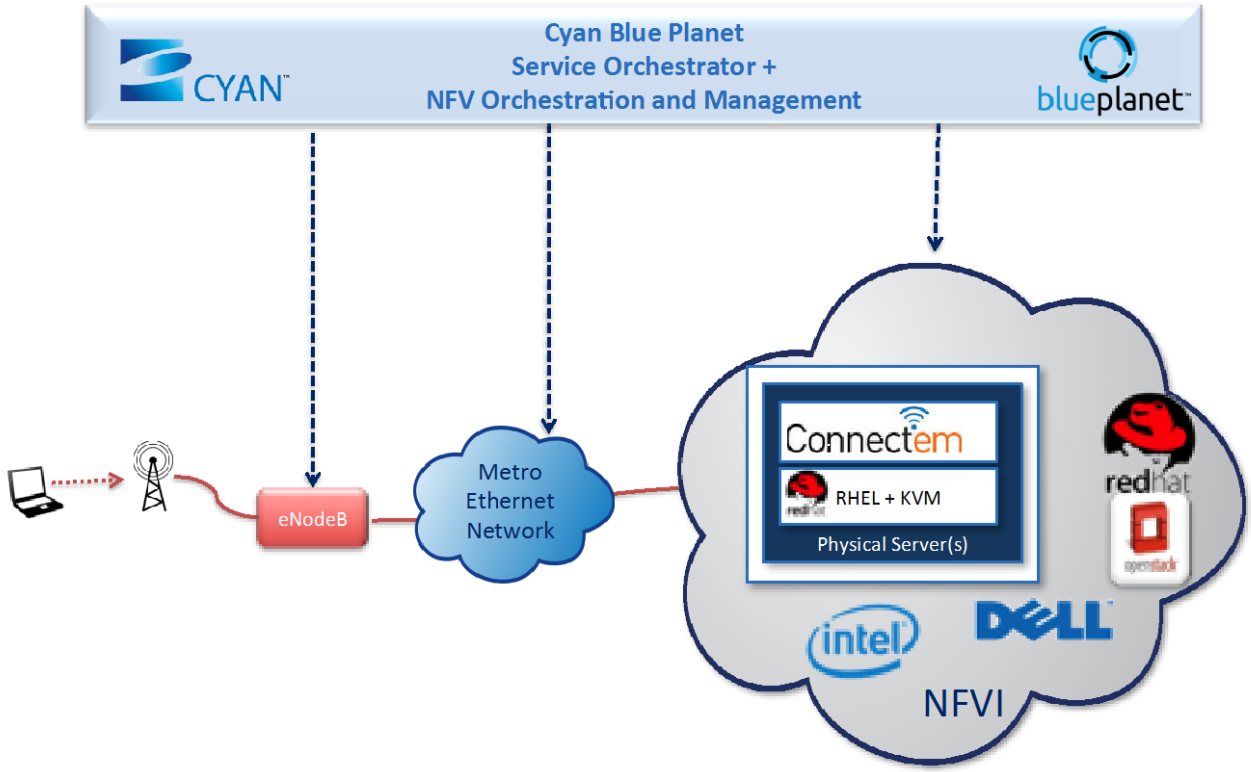

Figure 5: PoC Participant Placement in Network Topology

A.2.3 Mapping to NFV ISG Work

Describe how this PoC relates to the NFV ISG work:

1) Specify below the most relevant NFV ISG end-to-end concept from the NFV Use Cases [2], Requirements [3], and Architectural Framework functional blocks or reference points [4] addressed by the different PoC scenarios:

	Use Case	Requirement	E2E Arch	Comments
Scenario 1	*Use Case 1 NFVIaaS*		*Sec 5.1, Sec 5.2 Sec 7.2.4 NFVI*	*The NFVI is built as a resource pool available to the NFV orchestrator for flexible deployment of VNFs.*
Scenario 2	*Use Case 5 Virtualized EPC*		*Sec 7.2.2 VNF*	*Validates the feasibility and deployment complexity and requirements around vEPC*
Scenario 3	*All use cases*		*Sec 7.2.5, 7.2.6 Virtualized Infrastructure Manager, NFV Orchestrator*	*End-to-end deployment orchestration of NFVI, Co-existence of virtual and non-virtual network functions, VNF Manager and, vEPC VNF*

A.2.4 PoC Success Criteria

This proof-of-concept will be considered successful when all scenarios have been successfully implemented, integrated and demonstrated and findings published in the PoC report.

A.2.5 Expected PoC Contribution

One of the intended goals of the NFV PoC activity is to support the various groups within the NFV ISG. The PoC Team is therefore expected to submit contributions relevant to the NFV ISG work as a result of their PoC Project.

List of contributions towards specific NFV ISG Groups expected to result from the PoC Project:

- PoC Project Contribution #1: Feedback on VNF-D information model NFV Group: MAN
- PoC Project Contribution #2: Orchestrator & VNF manager functionality & interface requirements NFV Group: MAN
- PoC Project Contribution #3: Feedback on constructing VNFD interfaces NFV Group: SWA
- PoC Project Contribution #4: NFVI Performance requirements NFV Group: PER
- PoC Project Contribution #5: NFVI Performance Predictability NFV Group:PER
- PoC Project Contribution #6: AWS Template requirements NFV Group: PER/MAN
- PoC Project Contribution #7: Multi-tenancy and security NFV Group: SEC