Annex A (normative):
NFV ISG PoC Proposal Template

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: Demonstration of multi-location, scalable, stateful Virtual Network Function
- Network Operators/ Service Providers: NTT Contact: Eriko Iwasa(iwasa.eriko@lab.ntt.co.jp), Shigeki Toshima (toshima.shigeki@lab.ntt.co.jp)
- Manufacturer A:FUJITSU Contact: Hideki Iwamura (iwamura.hideki@jp.fujitsu.com) , Yasuhiro Seta (seta.yasuhiro@jp.fujitsu.com)
- Manufacturer B:Alcatel-Lucent Contact: Tetsuya Niki(tetsuya.niki@alcatel-lucent.com), Norimasa Asai(norimasa.asai@alcatel-lucent.com)

A.1.2 PoC Project Goals

- PoC Project Goal #1: This multi-stage PoC will demonstrate and verify geo-redundancy and multi-location distribution of sample VNF (SIP) on top of NFVI.
- PoC Project Goal #2: Demonstrate “New sophisticated NW node” development framework on top of NFVI using sample VNF (SIP).

A.1.3 PoC Demonstration

- Venue for the demonstration of the PoC: Bankoku Shinryokan Resort MICE Facility VIP room (Okinawa, Japan)

A.1.4 (optional) Publication

Currently not planned.

A.1.5 PoC Project Timeline

- What is the PoC start date? February 7, 2014
- (First) Demonstration target date May 14,2014
- PoC Report target date Mid June,2014
- When is the PoC considered completed? End of December,2014

A.2 NFV PoC Technical Details (optional)

A.2.1 PoC Overview

In this PoC, we demonstrate reliability and scaling out/in mechanism of stateful VNF that consists of several VNFCs running on top of multi-location NFVI, utilizing purpose build middleware to synchronize state across all VNFC. As an example, we chose SIP proxy server as a VNF, which consists of a load balancer and distributed SIP servers with high-availability middleware as VNFCs.

Figure 2.1 depicts the configuration of this PoC. A SIP proxy server system (VNF) is composed of several SIP servers (VNFC(SIP)s) and a couple of load balancers configured in redundant way (VNFC(LB)s.) VNFC(SIP) are running on top of specialised middleware, used to provide state replication and synchronization services between VNFC(SIP) instances.

We demonstrate the near-linearly-scalable system with regard to the network load by allocating/removing virtual machines (VMs) flexibly on NFVI, and by installing/terminating SIP server application. Additionally, we will demonstrate policy based placement of VNFC in multi-location NFVI to cater for data and processing redundancy needs. We also demonstrate the system can autonomously maintain its redundancy even if there is a change in the number of VNFC(SIP)s either because of the failure of single VNFC(SIP), failure of multiple VNFC(SIP) due to failure of NFVI in one location, or because of the addition or removal of VNFC(SIP)s.

In this POC, Alcatel-Lucent is providing its product CloudBand, which assumes the roles of Orchestrator and VIM, partial role of VNFM and full role of NFVI. Additionally, Alcatel-Lucent is providing VNFC(LB) as part of the CloudBand product. FUJITSU is providing middleware composed of distributed processing technologies, which are collaborative technologies of NTT R&D and FUJITSU, and operation and maintenance technologies that realize reliability and scaling out/in mechanism of stateful VNF.

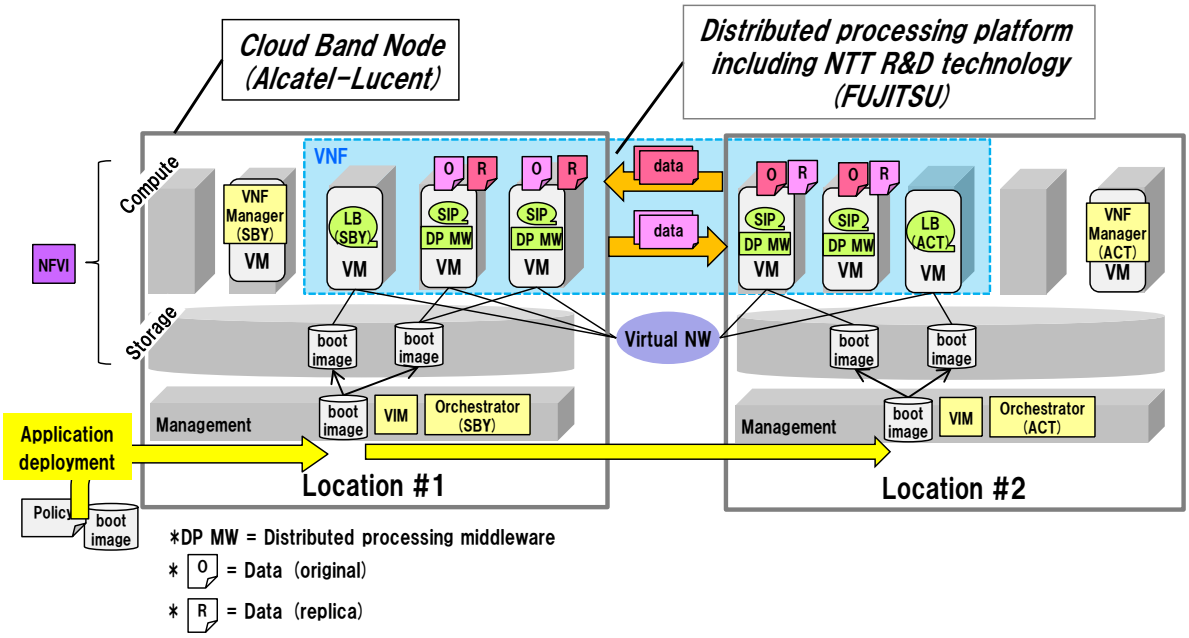

Figure 2.1 PoC configuration

A.2.2 PoC Scenarios

- Scenario 1 – Automatic policy based deployment of VNF

  System is configured to provision VNF in HA mode, equally spread across all instances of NFVI. We will demonstrate ability of the system to automatically deploy full VNF as group of VNFC(LB) and VNFC(SIP) across all available instances of NFVI in automatic mode, taking policy, usage and affinity rules in consideration(figure2.2). Once VNFC are placed, middleware platform will ensure proper data synchronization across all instances.

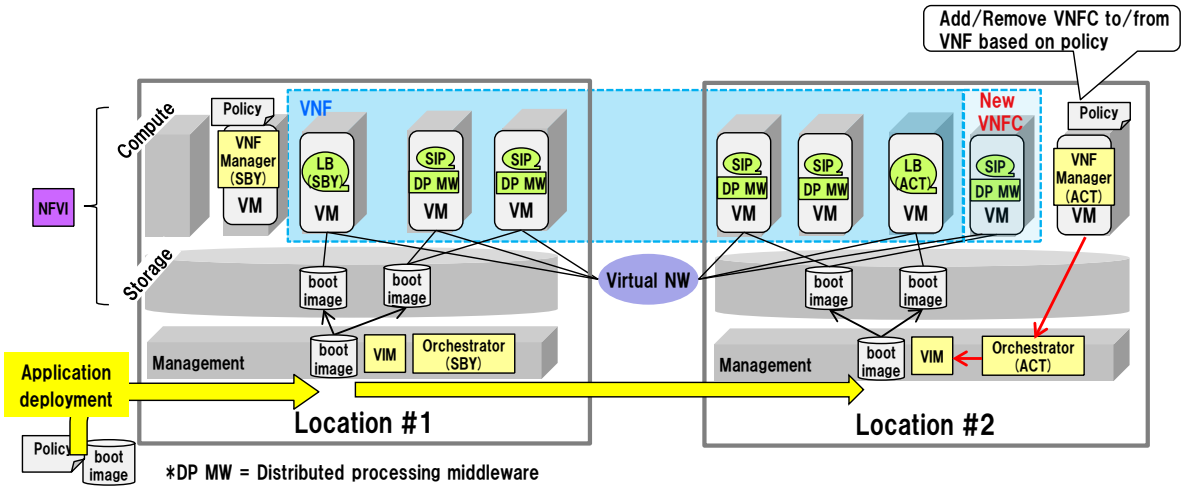

Figure 2.2: Policy based deployment

- Scenario 2 – Autonomous maintenance of redundancy configuration during the failure of VNFC(SIP)

  Each VNFC is configured to have correspondent VNFCs that store its backup data including state information of the dialogues in normal condition on a remote location. VNFCs are monitored from both MANO as well as EMS perspective, to ensure VNFC-level operation as well as application and data consistency.

  When one VNFC fails, the correspondent VNFCs utilizes their backup information and continues services (figure 2.3). At the same time, the VNFCs taking over the failed VNFC, copy their backup data to other VNFCs, which are assigned as new backup VNFCs. The VNF autonomously reconfigures system in this way, and maintains its redundancy.

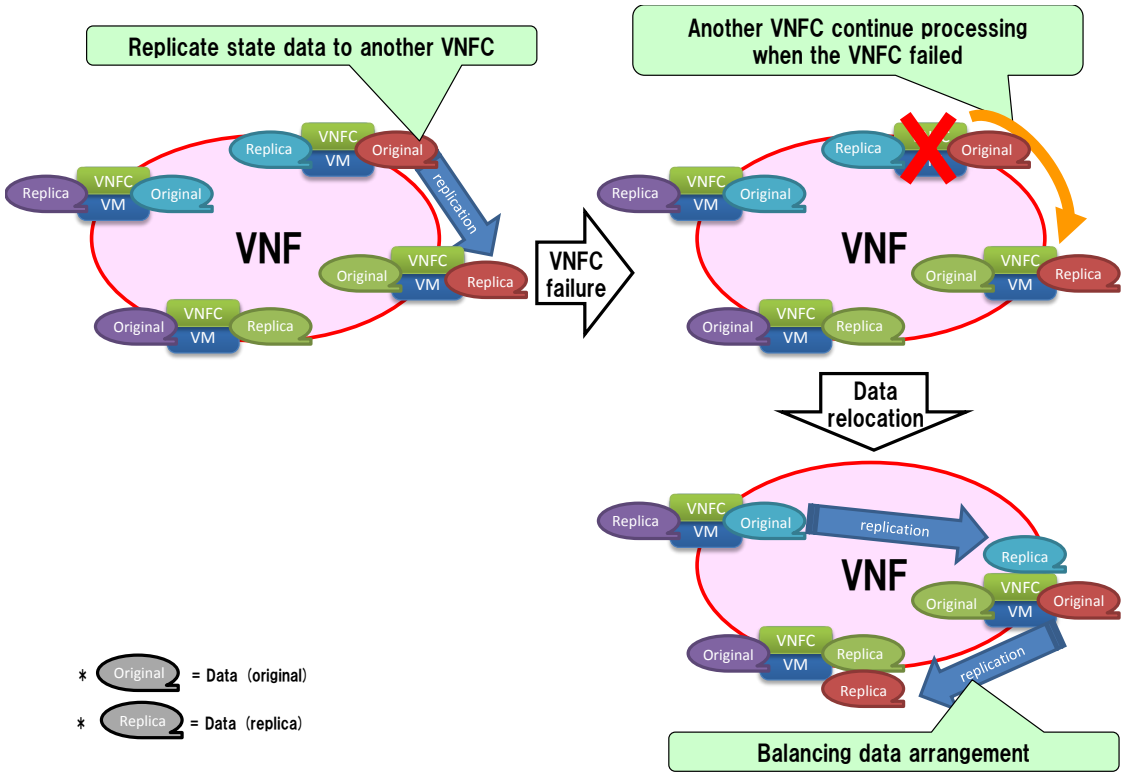

Figure 2.3: Autonomous maintenance of redundancy configuration at the failure of VNFC.

Similarly, when one NFVI location fails, VNFM and middleware EMS will trigger failover to remote location, rebuilding missing VNFC instances for capacity purposes.

- Scenario 3 – Auto-scaling out/in of VNF

  In this scenario, we demonstrate auto-scaling of the VNF system by increasing/decreasing the number of VNFC(SIP)s autonomously according to the load added on the VNF system.

  The figure 2.4 shows the example that VNFC(SIP) is added to the system when the load of the system increases. During the increase of the system load, the load added to each VNFC also increases. When the measured traffic at each VNFC(SIP) exceeds the pre-defined threshold, the EMS manager will trigger the scaling function of VNFM, that in turn will add VM and VNFC to the system (VNF). Once added, new VNFC will also be logically added to VNF pool by EMS, data replicated and traffic load balancing will be adjusted among the VNFC(SIP)s to include new member.

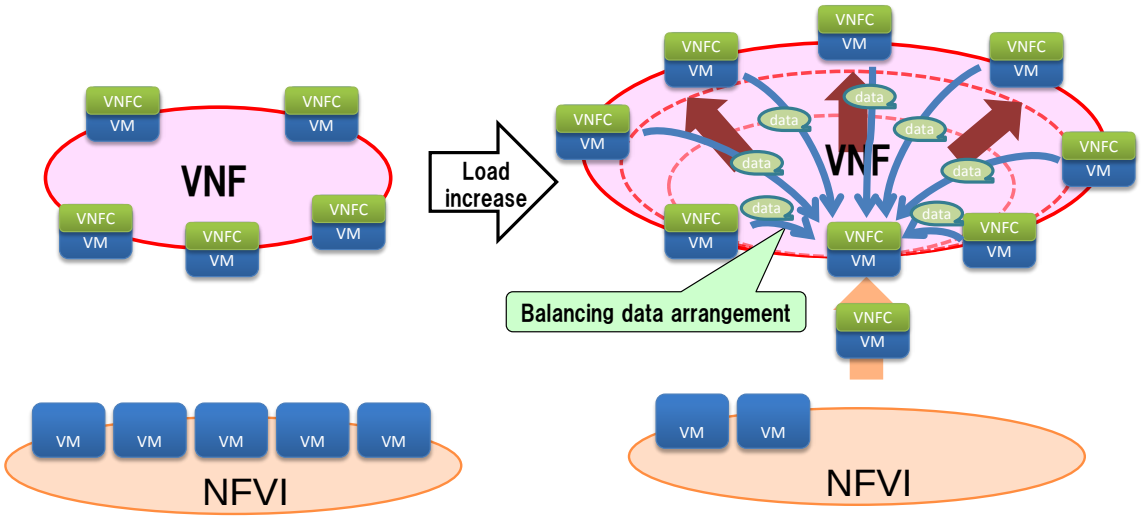

Figure 2.4: Auto-scaling out/in of VNF.

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, Requirements, and Architectural Framework functional blocks or reference points addressed by the different PoC scenarios:

	Use Case	Requirement	E2E Arch	Comments
Scenario 1	Use Case#1 (GS NFV 001 v1.1.1; use case NFVIaaS)	GS NFV 004 v1.1.1: Virtualisation requirements: Section 5.9 (OaM.1, OaM.7, OaM.12)	GS NFV 002 v1.1.1: NFV Architecture Framework: Distribution of functionality between EMS, VNF, VIM, VNFM/MANO and NFVI. Policy management (muti-location resource distribution and placement).	Implementation of best foundation provided in multi-location.
Scenario 2	Use Case#3 (GS NFV 001 v1.1.1; use case VNPaaS)	GS NFV 004 v1.1.1: Virtualisation requirements: Section 5.5 (Res.1) Section 5.7 (Cont.2,Cont.3, Cont.4) –	GS NFV 002 v1.1.1: NFV Architecture Framework: Distribution of functionality between EMS, VNF, VIM, VNFM/MANO and NFVI: role of EMS vs. NFV-MANO.	Realize the continuity of service even in disaster; use of LBaaS and distributed processing platform.
Scenario 3	Scalability is applicable to	GS NFV 004 v1.1.1:	GS NFV 002 v1.1.1 : NFV	Realize automated scaling out/in of VNFCs.

	multiple GS NFV 001 use cases	Virtualisation requirements: Section 5.4 (Elas.2, Elas.5)	Architecture Framework: Distribution of functionality between EMS, VNF, VIM, VNFM/MANO and NFVI:role of EMS vs. NFV-MANO.	

A.2.4 PoC Success Criteria

Automatic deployment of full VFN across all available NFVI instances will be considered a successful end of scenario 1 of this POC.

Automatic failover and reinstallation of failed VNFC will be considered a successful end of scenario 2 of this POC.(Failover of individual VM case is currently implemented. Disaster Recovery (Taking an entire location down) is targeted for end of December.)

Proper scaling triggered by increase of the load will be considered successful end of scenario 3 of this POC.

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: Geo-redundant failover NFV Group REL
- PoC Project Contribution #2: Policy based, multi-location distribution NFV Group MAN
- PoC Project Contribution #3: Realize redundancy, near-linear scalability by the middleware NFV Group SWA