

Demo of EDIV: Building and managing distributed virtualization scenarios in federated testbed infrastructures

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Abstract—The purpose of this demonstration is to show the functionality of EDIV tool to manage distributed virtualization scenarios that are deployed on PASITO, a federated experimentation infrastructure created and coordinated by RedIRIS (the Spanish Research and Education Network). The demo presents the different phases a researcher would follow to create and deploy a virtual network scenario to experiment with new protocols or services using the EDIV deployment controller, involving design, deployment and interaction steps.

Index Terms—Virtualization, distributed management, federated testbeds, VNUML

I. INTRODUCTION

Large and federated multi-user platforms, such as GENI [1] or FEDERICA [2], are being created to provide researchers with real testbeds where they can deploy network and service scenarios to experiment with the new services and protocols that will shape the Future Internet.

Virtualization [3] is one the key technologies used for such purpose, as it decouples physical and logical resources in these infrastructures, allowing to dynamically and concurrently build several testbeds scenarios over a common infrastructure in an inexpensive way, avoiding physical devices reconfiguration.

EDIV (Spanish acronym for *Distributed Scenarios with VNUML*) project [4], a partnership between Telefónica I+D and UPM, has developed an open source tool to manage distributed virtualization scenarios. The goal of the proposed demonstration is to show the functionality and advantages of the EDIV tool to easily provision large and complex testbed scenarios over the distributed infrastructure of virtualization

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servers of PASITO project [5] (a federated experimentation facility created by RedIRIS).

II. EDIV

The EDIV project has developed a wrapper to VNUML [6] (a framework to create virtual network scenarios which uses UML [7] as virtualization technology) to allow the transparent management of distributed scenarios. The EDIV architecture is depicted in Figure 1. It is based on a set of *deployment hosts* and a *deployment controller*. This controller processes the VNUML scenario specifications and it is in charge of invoking a *segmentation module*, which allocates each virtual machine to one of the specific deployment hosts. It uses a modular approach so that the allocation algorithm can be developed independently [4].

Based on the result of the segmentation process, the controller coordinates the required operations to implement and manage the scenario in a distributed mode. Specifically, it is responsible for splitting the global specification into several sub-specifications for each host, which contain a “fragment” that is processed by each local VNUML instance. The controller also prepares the interconnection of VMs in different hosts and conveniently configures 802.1Q virtual networks (VLAN) in the network switches. OpenVPN tunnels [8] are used when deployment hosts are not locally connected.

The controller interacts with deployment hosts and other network equipment (e.g., switches, routers) over a dedicated network (named *management network*) which can be associated to a preconfigured VLAN/VPN (as shown in Figure 1). It is assumed that IP connectivity in the management network is preconfigured in all hosts and deployment controller before starting operation.

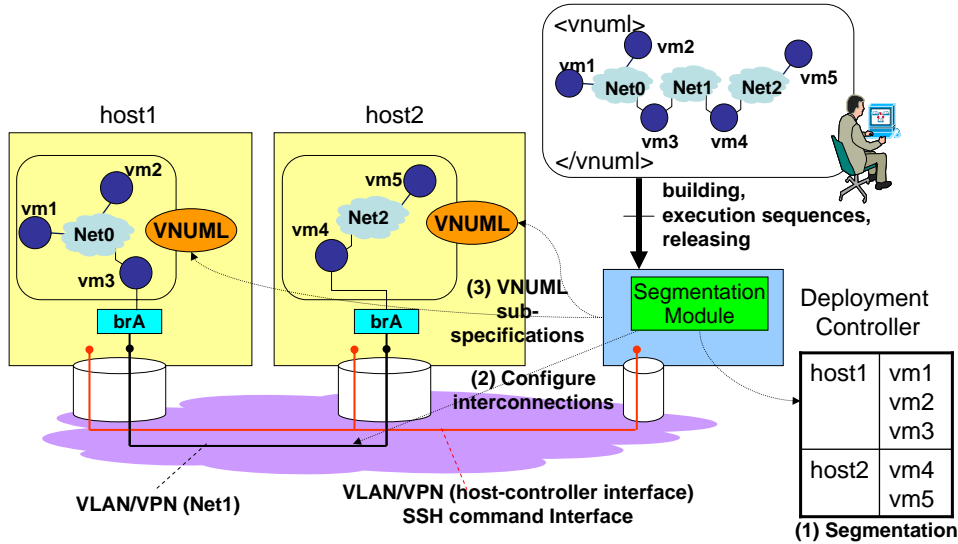


Fig. 1. EDIV architecture

III. PASITO

The main objective of PASITO [5] project is to provide a physical network platform to test next generation telecommunication services. It has been created and coordinated by RedIRIS, the Spanish NREN (National Research and Education Network), with the cooperation of several Spanish specialized research groups hosting the platform physical infrastructure (e.g., servers). Additionally, RedIRIS provides the interconnecting network backbone, part of the infrastructure and the supporting services (based on middleware which eases the use of the platform), whereas the research groups provide the rest of the test infrastructure, composed of servers and network equipment. Its high level topology is shown in Figure 2.

In summary, PASITO consists on a wide-area network, composed of different interconnected nodes deployed in several administrative domains. Each node is connected to a layer-2 backbone network through a router or switch interface. Internally, each node involves several subnets (maybe implemented using 802.1Q VLANs) and one or more physical servers connected to such subnets.

Regarding the virtualization capabilities, each node in PASITO provides one or more virtualization servers running virtualization solutions like Xen [9] or VMware ESX [10]. In this way, the servers can be easily shared among researchers without having to reinstall them for each experiment. In order to make experiments, researchers will have to create their own virtual machines and deploy them to the servers.

Virtualization servers also provide the capabilities to deploy virtual network scenarios based on the EDIV/VNUML tool [6] (composed of bridges, routers and virtual machines interconnected following a user-defined topology). A EDIV controller allows users located in any node (or even located outside PASITO) to deploy and interact with these virtual network

scenarios, either including servers in their node or in other nodes.

IV. DESCRIPTION OF THE DEMO

The proposed demonstration shows how the EDIV tool can be used to build and manage several simultaneous virtual network scenarios over the PASITO distributed infrastructure. It will be performed using one laptop in the TridentCom venue (Washington DC, USA) with the EDIV deployment controller installed. This laptop will access to the PASITO platform using a VPN tunnel (acting as management network) through the public Internet in order to carry out the different management operations proposed for the demo (as shown in Figure 2).

Basically the demo will present the different steps a researcher would follow to create and deploy a virtual network scenario to experiment with new protocols or services (Figure 3). In particular:

- *Scenario Design.* The first step consists on designing the experimentation scenarios using a high level descriptive specification based on XML (i.e., the VNUML language [6] used by EDIV tool). In the demo we will use preconfigured scenarios involving an important number of nodes (more than 50 virtual machines).
- *Scenario Deployment.* Second, EDIV controller will be used to deploy the scenarios over the PASITO virtualization hosts. The EDIV controller transparently splits and distributes all the virtual machines that made the scenarios among the different physical nodes using custom algorithms (e.g. round robin, etc). It also automatically configures all the required interconnections among the virtual networks to ensure connectivity in the scenario.
- *Interaction with scenario.* Once the scenario is deployed, the user can interact with it through centralized management operations (e.g., automated execution of commands

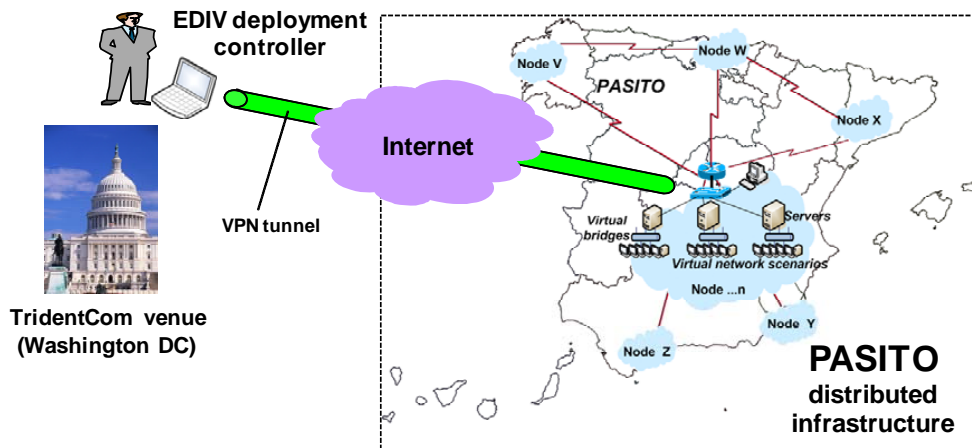


Fig. 2. PASITO high level architecture and demo setup

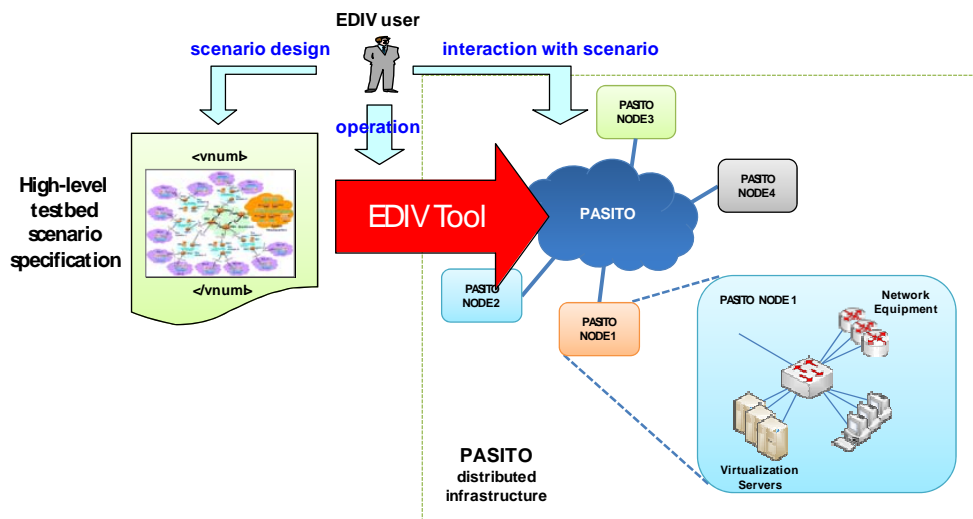


Fig. 3. Using EDIV to build and manage distributed virtualization scenarios in PASITO

in the scenarios nodes) using the EDIV controller or direct access to virtual machines using the EDIV console management capabilities. Both possibilities are shown in the demonstration.

In the demo, several scenarios will be deployed and managed simultaneously, showing how EDIV users in PASITO can use the platform concurrently without interference.

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