



# Load Balancing as a Service in CERN Cloud & Container Networking

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IT-CM-RPS



**CERN**openlab

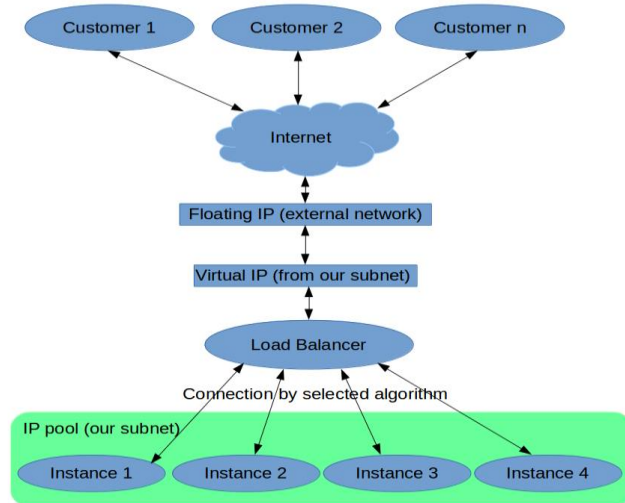
# Introduction

- › **In openstack environment load balancing can take place either by agent or octavia.**
- › **LBaaS has two implementations available: v1 and v2.**
- › **LBaaS v1 has a limitation of one port per load balancer. Whereas LBaaS v2 allows multiple ports (called listeners) per load balancer.**
- › **LBaaS v1 was deprecated during the Liberty release.**

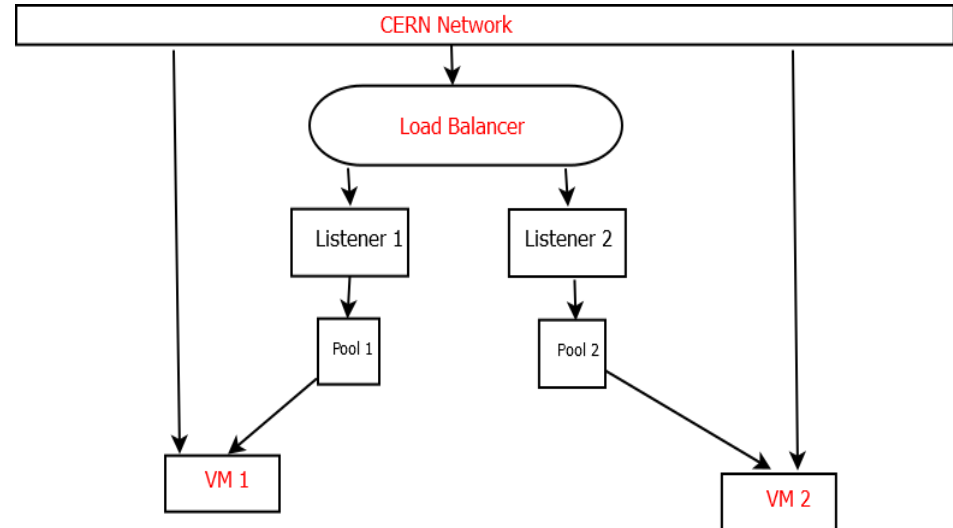
# The Project Challenge

> **No Floating IPs in Neutron @ CERN**

> **LBaaS in OpenStack**



**LBaaS in CERN**

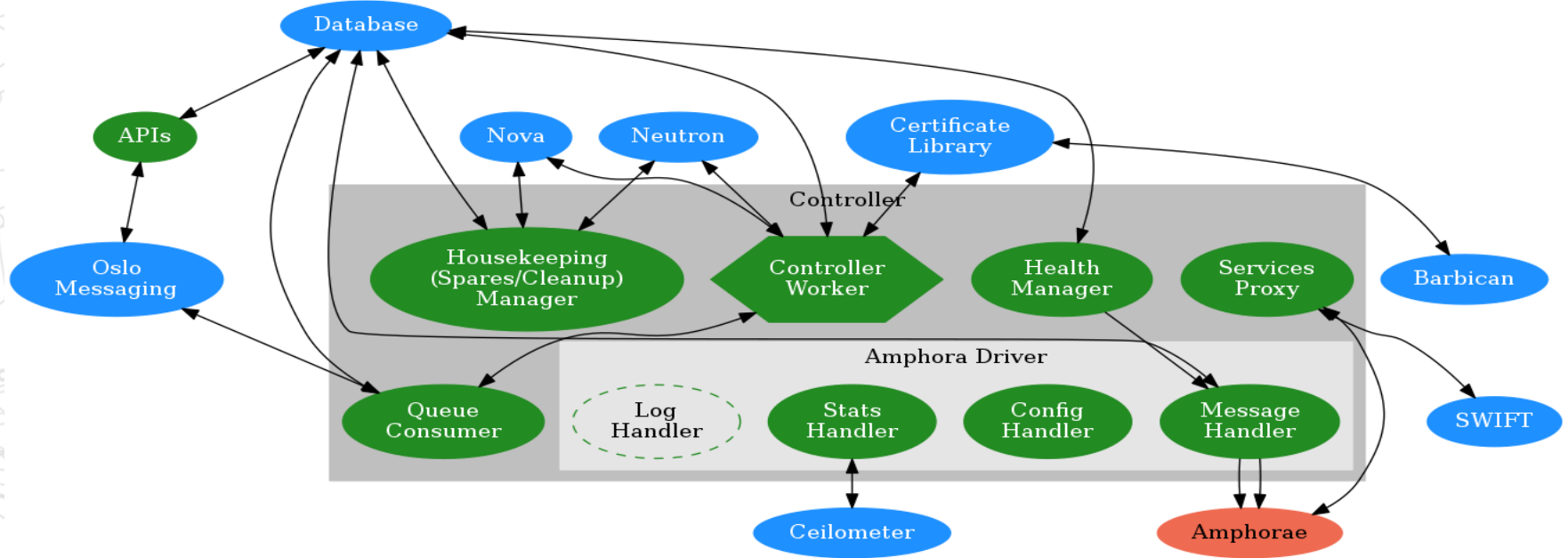


# The Project Challenge

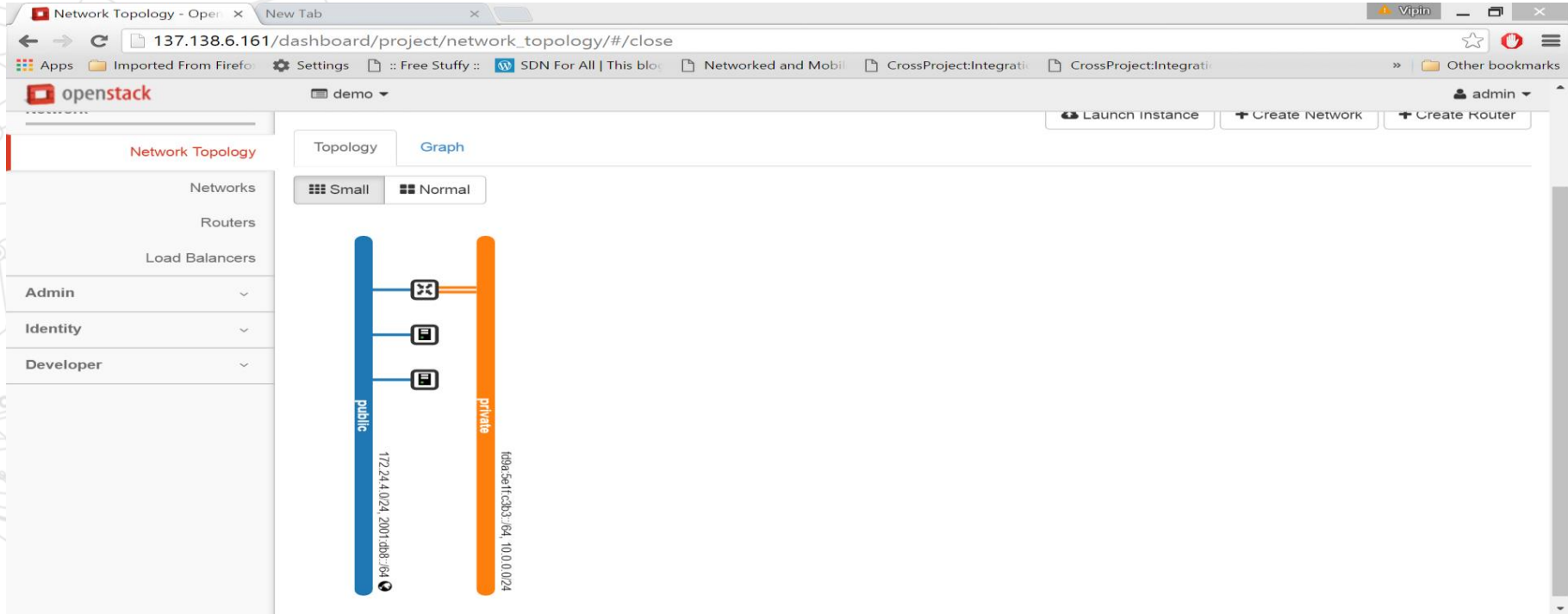
- › **Ease the deployment of Load Balancer services**, offering a web dashboard and a set of well defined APIs.

- › **Octavia is a service-vm based LBaaS implementation which uses haproxy on Nova.**
- › **Deploy Load balancer in virtual Machine.**
- › **The component of octavia that does load balancing is known as Amphora.**
- › **The component of octavia that provides command and control of the Amphora is the octavia controller.**

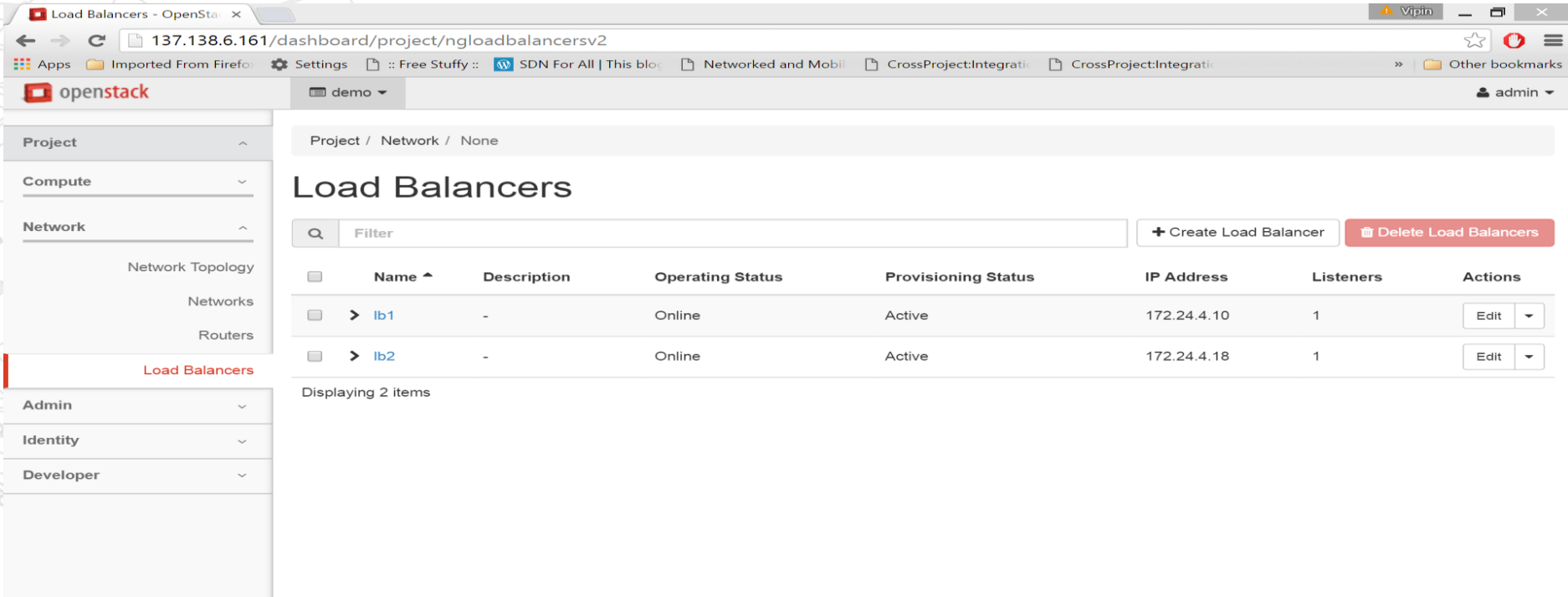
# Octavia Controller



# Results



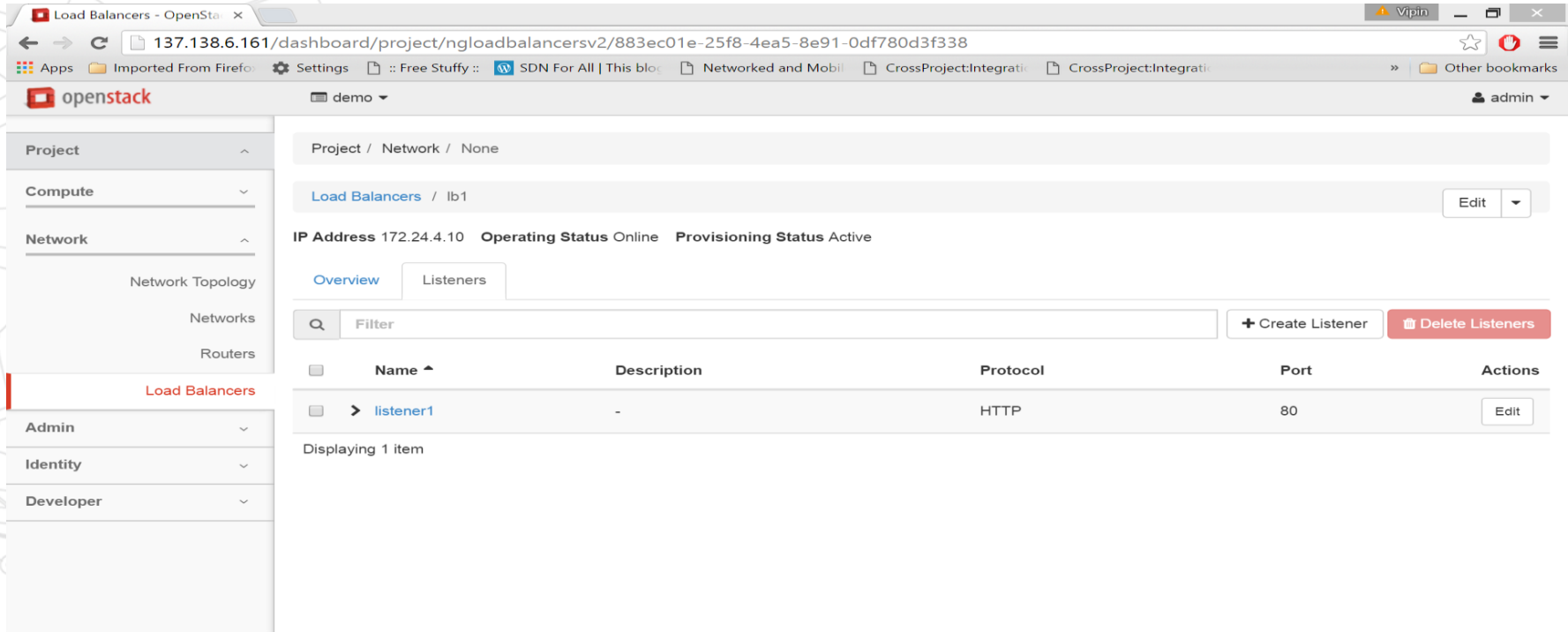
The screenshot shows a web browser window displaying the OpenStack dashboard. The address bar shows the URL `137.138.6.161/dashboard/project/network_topology/#/close`. The page title is "Network Topology - OpenStack". The dashboard includes a navigation menu on the left with options like "Networks", "Routers", "Load Balancers", "Admin", "Identity", and "Developer". The main content area shows a network topology diagram with two vertical bars representing networks: a blue bar labeled "public" with IP address `172.24.4.0/24, 2001:db8::/64` and an orange bar labeled "private" with IP address `198.51.100.0/24, 10.0.0/24`. Three routers are shown connecting the two networks. The interface also includes tabs for "Topology" and "Graph", and buttons for "Launch Instance", "Create Network", and "Create Router".



The screenshot shows the OpenStack dashboard interface. The browser address bar displays the URL `137.138.6.161/dashboard/project/ngloadbalancersv2`. The page title is "Load Balancers - OpenStack". The left sidebar contains navigation menus for "Project", "Compute", "Network", "Admin", "Identity", and "Developer". The "Network" menu is expanded, showing "Network Topology", "Networks", "Routers", and "Load Balancers" (which is highlighted in red). The main content area shows the "Load Balancers" page with a breadcrumb "Project / Network / None". Below the breadcrumb is a search bar with the text "Filter" and two buttons: "+ Create Load Balancer" and "Delete Load Balancers". A table lists the load balancers with columns for Name, Description, Operating Status, Provisioning Status, IP Address, Listeners, and Actions. Two load balancers are listed: "lb1" and "lb2", both with "Online" status and "Active" provisioning status. Below the table, it says "Displaying 2 items".

<input type="checkbox"/>	Name ^	Description	Operating Status	Provisioning Status	IP Address	Listeners	Actions
<input type="checkbox"/>	> lb1	-	Online	Active	172.24.4.10	1	Edit ▾
<input type="checkbox"/>	> lb2	-	Online	Active	172.24.4.18	1	Edit ▾





Load Balancers - OpenStack

137.138.6.161/dashboard/project/ngloadbalancersv2/883ec01e-25f8-4ea5-8e91-0df780d3f338

openstack demo admin

Project / Network / None

Load Balancers / lb1 Edit

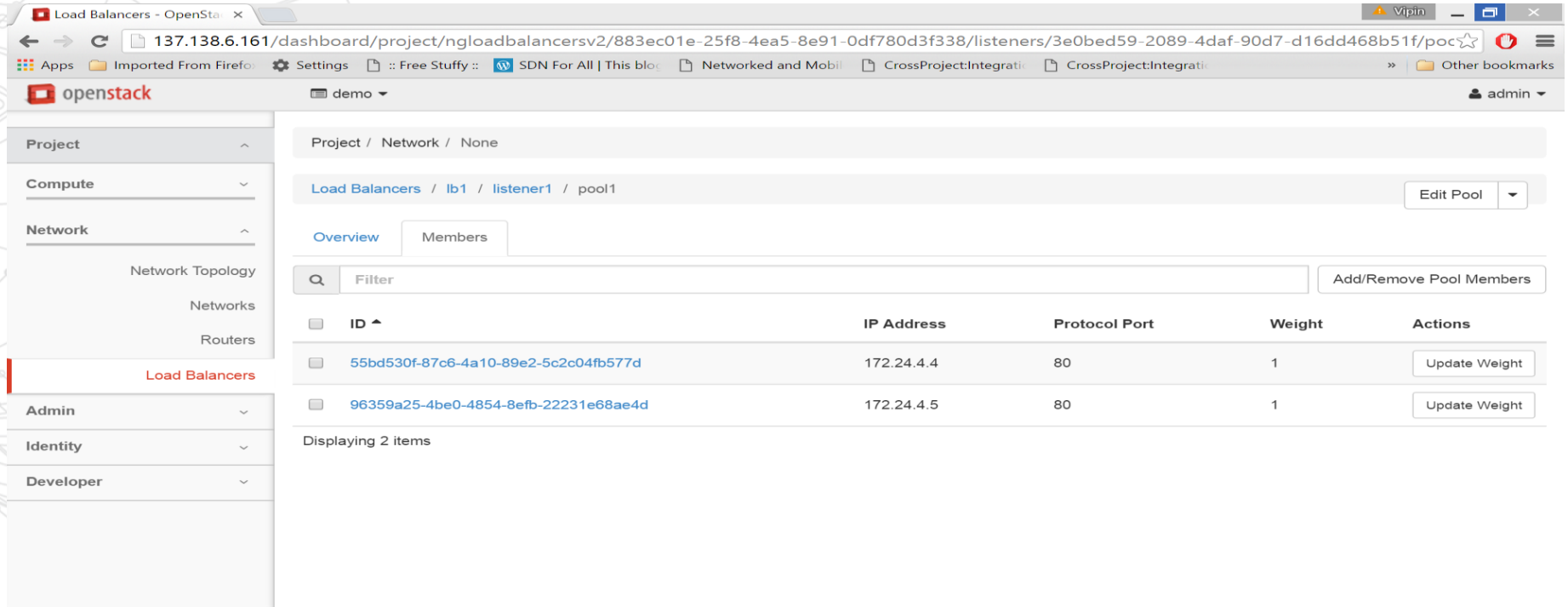
IP Address 172.24.4.10 Operating Status Online Provisioning Status Active

Overview Listeners

Filter + Create Listener Delete Listeners

Name	Description	Protocol	Port	Actions
listener1	-	HTTP	80	Edit

Displaying 1 item



The screenshot shows the OpenStack dashboard interface for configuring load balancers. The breadcrumb trail is: Project / Network / None / Load Balancers / lb1 / listener1 / pool1. There are tabs for 'Overview' and 'Members'. A search filter is present above a table of pool members. The table has columns for ID, IP Address, Protocol Port, Weight, and Actions. Two members are listed, both with a weight of 1. The 'Admin' menu is visible on the left sidebar.

ID	IP Address	Protocol Port	Weight	Actions
55bd530f-87c6-4a10-89e2-5c2c04fb577d	172.24.4.4	80	1	Update Weight
96359a25-4be0-4854-8efb-22231e68ae4d	172.24.4.5	80	1	Update Weight

# Proposed Solution Advantages

- › **Improved scalability** and ease of use of the Load Balancer solution at CERN.
- › **Cost saving** by reducing the total number of HAProxy instances (shared between projects).
- › **Improved usability** as the load balancers can be managed via the OpenStack Horizon dashboard or via APIs.

# The Project Impact

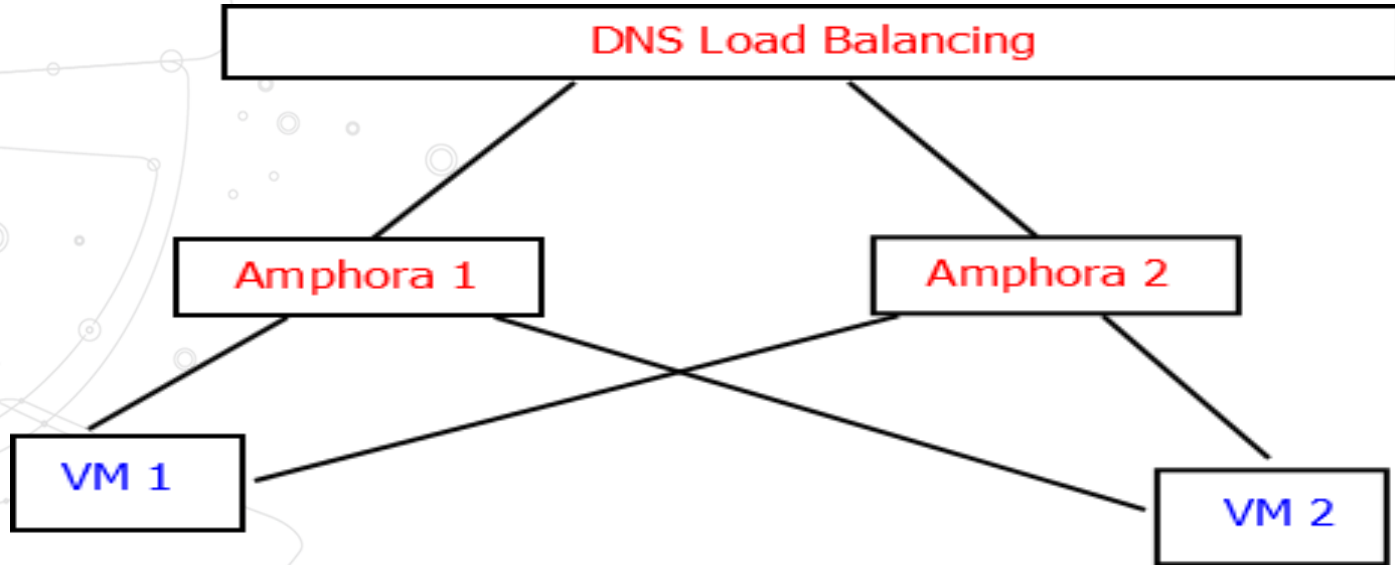
- › Additional option to the existing DNS based load balancing at CERN, reusing existing authentication, authorization and the rest of the infrastructure.
- › Reduction of the number of resources to provide High Availability as the existing haproxy services used by several projects get replaced with a centralized solution.

# Current Status

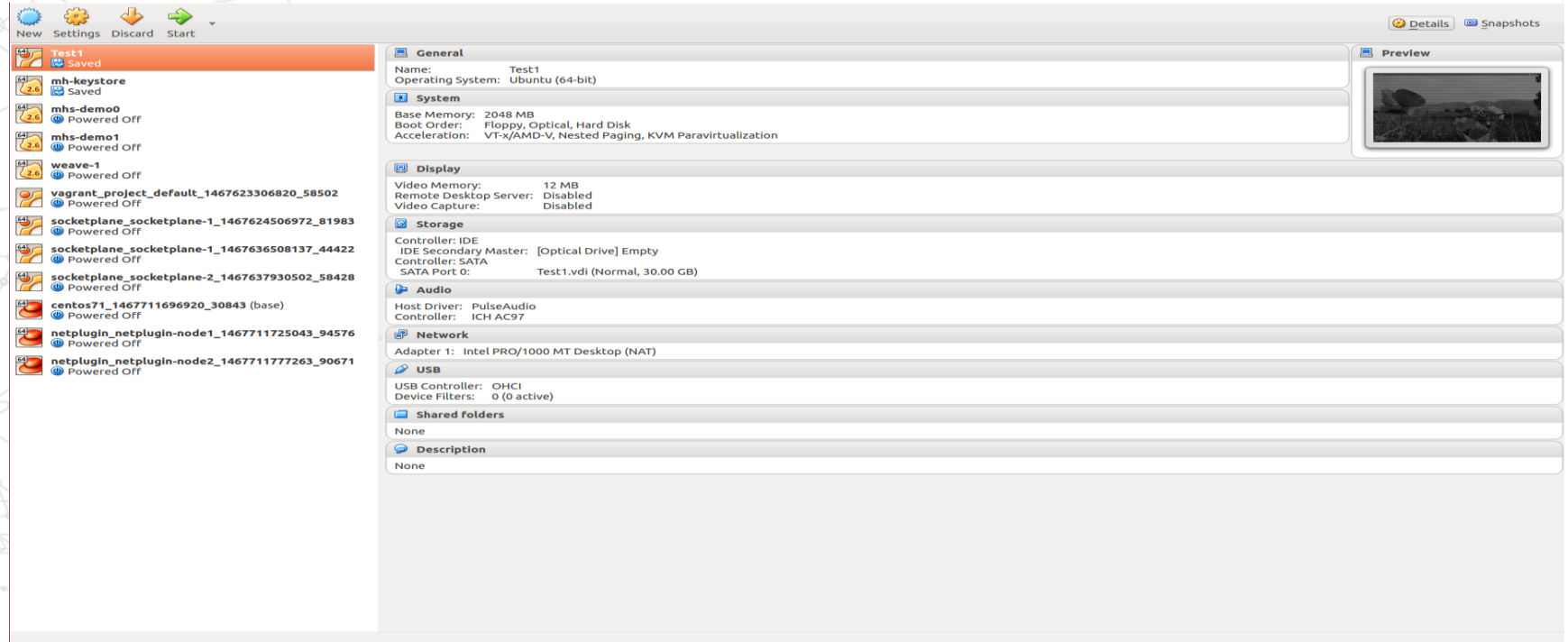
- › The service has been initially tested in a development environment mimicking the CERN infrastructure, and is now deployed along the rest of the CERN OpenStack cloud, **ready to be tested in a beta phase.**

# Suggestions & Future Work

- › Further integration with the existing DNS load balancing solution.



# Container Network Overlay VM's



The screenshot displays the Oracle VM VirtualBox interface. On the left, a list of VMs is shown, with 'Test1' selected. The main panel shows the configuration for 'Test1', which is an Ubuntu (64-bit) VM. The settings are as follows:

- General:** Name: Test1, Operating System: Ubuntu (64-bit)
- System:** Base Memory: 2048 MB, Boot Order: Floppy, Optical, Hard Disk, Acceleration: VT-x/AMD-V, Nested Paging, KVM Paravirtualization
- Display:** Video Memory: 12 MB, Remote Desktop Server: Disabled, Video Capture: Disabled
- Storage:** Controller: IDE, IDE Secondary Master: [Optical Drive] Empty, Controller: SATA, SATA Port 0: Test1.vdi (Normal, 30.00 GB)
- Audio:** Host Driver: PulseAudio, Controller: ICH AC97
- Network:** Adapter 1: Intel PRO/1000 MT Desktop (NAT)
- USB:** USB Controller: OHCI, Device Filters: 0 (0 active)
- Shared folders:** None
- Description:** None

At the top right of the settings panel, there are buttons for 'Details' and 'Snapshots'. A 'Preview' window on the right shows a dark, abstract image.

# Container Networking Results

## In Magnum

Driver	Kubernetes	Swarm	Mesos
Flannel	supported	supported	unsupported
Docker Overlay Network	unsupported	supported	supported

## In General

Features	Flannel	Weave	Docker Overlay Network	Calico
Network Model	VxLAN or UDP Channel	VxLAN or UDP Channel	VxLAN	Pure Layer-3 Solution
Name Service	No	Yes	Yes	No
Distributed Storage Requirements	Yes	No	No	Yes
Encryption Channel	TLS	NaCl Library	Yes	No
Container Subnet Restriction	No	Yes, configurable after start	Yes, not configurable after start	No
Multicast	No	Yes	No	No



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