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Solution Architecture Definition for "Mirroring of Virtual-labs at IITD"

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1 Basic Architecture

1.1 Overview

Below is an overview of the overall system describing all the actors, entities and their interfaces: ./overview.jpg

1.2 Actors

1.2.1 Lab Developer

An person who has agreed to use the services of VLEAD as per the **terms of association** and follows certain standard processes to maintain his/her lab during its development life-cycle. In specific, the roles are as follows:

- Checkin the lab contents (sources,dependencies, scripts and other files) into a lab-depository.
- Keep updating the lab-depository with newer revisons of lab contents.
- Instantiate a test lab-instance for testing and debugging issues.
- Instantiate a live lab-instance.
- View live lab-instance statistics.

1.2.2 Lab Administrator

An actor who is responsible for administering all the hosted labs. In specific, the roles are as follows:

- Allocate a unique labid and a depository(collection of repositories) to a lab
- Allocation of resources(physical machines,ip address pools, vmid pools) to the lab-manager and vmmanager

1.2.3 Lab User

These are end-users who use the virtual-labs and its experiments

1.3 Entities

1.3.1 LabDepository

All labs are allocated a unique-id and a lab-depository by the labs administrator. A lab-depository represents a collection of various repositories associated with a lab.

lab-depository - An **Object** describing the property of all repositories of a particular lab

labid - Unique identifier of the lab

labinfo - Object describing basic properties of a lab

labinst - One of the defined **enumerations** (IITB, IITK, IIITH ,,,)

labdisc - One of the defined **enumerations** (chemical, mechanical .....)

labos - Object describing a particular operating-system version

osname - Name of the operating system

osversion - Specific version of the operating system

labmetadata - A structured **object** representation of depository contents describing the number of repos present, actual repos present, their type . This is regenerated everytime the lab-developer makes a commit to a repository.

numrepos - Sum of all repositories present in the repository

repo - A repository **object** which refers to a svn, git or bzr repository

repoid - Identification text that can be used to checkout the repository. (Eg: cse01, mech09)

reponame - Display text (Eg: Frontend, Backend, UI etc)

repotype - One of the supported **enumerated** types - (git, svn, bzr)

revsnum - Number of revisions of the repository (Eg: 20)

rev - Object defining a particular repository revision

revno - Unique revision number generated by the repository tool. (Eg: 10)

date - Date/Time the revision was checked into the repository. (Eg: 2013-11-10 16:30)

user - Text representing user who checked the revision. (Eg: ramakrishna)

diskspace - Approximate disk-space required. (Eg: 30G)

ram - Approximate memory required. (Eg: 256M)

staticdeps - An **object** describing a list of packages the lab depends on. (Eg: apache2, opencv)

dep1

dep2 . .

depn

runtimedeps - An **object** describing a list of services to be enabled/started. Services may mean standard packages (eg. apache2) or other custom made scripts (Eg: backup) to be configured during installation of the lab.

dep1

dep2 . . .

depn

size - Number representing the size of the particular repository revision (**Optional**)

1.3.2 Lab

An instance of a lab (inactive) which refers to a complete set of properties that can be used to instantiate a particular lab revision. All these properties can be loaded directly from the lab-depository by using its unique labid, unique repoid and a unique revision no.

lab - **Object** describing an lab

labid - Unique id to identify the lab from others

labinfo - **Object** describing basic properties of a lab

repo - **Object** describing a particular repository of a lab

rev - **Object** describing a particular revision of a particular repository of a lab

1.3.3 LabManager

An entity that monitors a set of hosts, accepts requests for creation, modification and deletion of labinstances and sends request to appropriate vm-manager for life-cycle management of labinstances

labmanager - An entity responsible for managing the various vm-managers

labmanagerid - Unique id to describe a labmanager

hosts - **Object** representation of a list of physical-hosts

host1 - **Object** representation of a physical host (described later) . . .

host2 - . . .

host3 -

runtime runtime characterstics of the labmanager

start$_{\text{time}}$ **-** timestamp the labmanager was instantiated

1.3.4 Host

A physical host entity managed by a lab-manager and hosting a single vm-manager

Host - Entity representing a physical host

hostname - Common name of the host

vmmgr - **Object** representation of the vm-manager (described later) managing the host

hostid - Unique-id representation of the host

hostip - IPaddress of the physical host

resource - **Object** representation of resources of the physical host

diskspace - (Eg. 2000GB)
mem - (Eg. 64GB)
cpu - (Eg. 2)

runtime - Runtime properties of the host

status - one of running, stopped, shutoff
start$_{time}$ **-** timestamp the host was started
useddiskspace - (Eg. 100GB)
usedmem - (Eg. 20GB)
usedcpu - (Eg. 1)

1.3.5 VMManager

An entity that is responsible for managing virtual machines(vms) on a particular host

vmmgr - Entity describing an instance of a vm-manager residing on a physical machine

vmmgrid - Unique id to represent the vm-manager
vms - List of vm objects

vm1 - Object representation of a vm (described later)
vm2 -

vmn -

resources - Object representation of resources

vmids - List of available vmids

vmid1 -
vmid2 - .
vmidn -

ips - List of available ips

ip1 -
ip2 - . .
ipn -

runtime - Runtime properties

status - up, down, stopped
start$_{time}$ **-** start timestamp

1.3.6 VM

A VM is a running instance of a lab.

vm - An active instance of a lab that runs on a specified host

guid - Global Universal id of the vm generated to identify the

vmid - Unique identification of a vm amoung its current running VMs. This is allocated from a defined pool of ids when the vm is created and re-sent to the pool when the vm gets destructed.

vmname - Common name to identify the VM instance.

vmos - Operating system **object** of the running vm.

osname - Name of the operating system

osversion - Particular version of the operating system

lab - A particular instance of a lab associated with a vm

runtime - Object describing run-time properties of the vm

state - running, stopped, suspended, archived

createddate - Creation time-stamp of the VM

modifieddate - Modification time-stamp of the VM

lastbackedup - Timestamp when the vm was last backedup

stats - Object describing stats of a vm

userstats - User-level statistics of the vm

userinfo -

perfstats - cpuinfo -

meminfo -

netinfo -

2 Relationships Model

2.1 LabDepository - repository - revision

[Lab-Depository] 1 ————— *[repo] 1 ———- * [rev]

2.2 Lab - repository - revision

[Lab] 1 ——— 1 [repo] 1 —— 1 [rev]

2.3 LabManager - host - vmmgr - vm - lab

[Labmanager] * ——- * [host] 1 —— 1 [vmmgr] 1 ——- * [vm] 1——-1 [lab]

3 Workflows

3.1 Lab Developer Workflows

3.1.1 Create a Lab

3.1.2 Update a Lab

3.1.3 Test a Lab

3.1.4 Release a Lab

3.1.5 Delete a Lab

3.1.6 Fetch Lab-Statistics

3.2 Lab Administrator Workflows

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3.2.2 Delete a Lab Repository

3.2.3 Update Resource Information

- Physical Machine Resources
- Network Parameters
- VM Manager Information