Technical Activities

StratusLab Kick-off Meeting, 14 – 15 June 2010

What?

- **Technical**
  - Track progress of development and infrastructure activities
  - Prioritize features, keep sprints and product backlogs
  - Coherent technical view across WPs
  - Make technical decisions
- **Administrative**
  - Homogeneous technical vision across deliverables
  - Track progress of technical deliverables
    - D4.1+4 (architecture), D4.3+6 (Integration),
    - D5.1, D5.2 (Infrastrcuture Specification & Policies)
    - D6.1 (design of Cloud-like interfaces)
    - D3s (interaction with other projects)

Who?

• Activity Leader(Cal,David,Meb,Vangelis,Juan) + Person nominated by PC (Ruben)

When?

• Regular meetings, every 3-4 weeks

• May **alternate** administrative/technical meetings

• On-demand if urgent issues arises

Technical and Scientific Coordination Group (TSCG)

Development Sprint

- WP4 Integration & Distribution
- WP6 New features
- WP5 Image Appliances
- **Input**
  - Sprint Backlog
- **Output:**
  - Working increment of the StratusLab Distribution

Integration Sprint

- WP5 Infrastructure Operation
- **Input**
  - StratusLab Distro
- **Output:**
  - Devel testbed
  - Operational infrastructure*
  - Image repository
  - Feedback & issues

TSCG Meetings

- **Input**
  - PMB strategic vision
  - WP2 deliverables
  - WP5 feedback
- **Output:**
  - Updated Product Backlog
  - Sprint Backlog
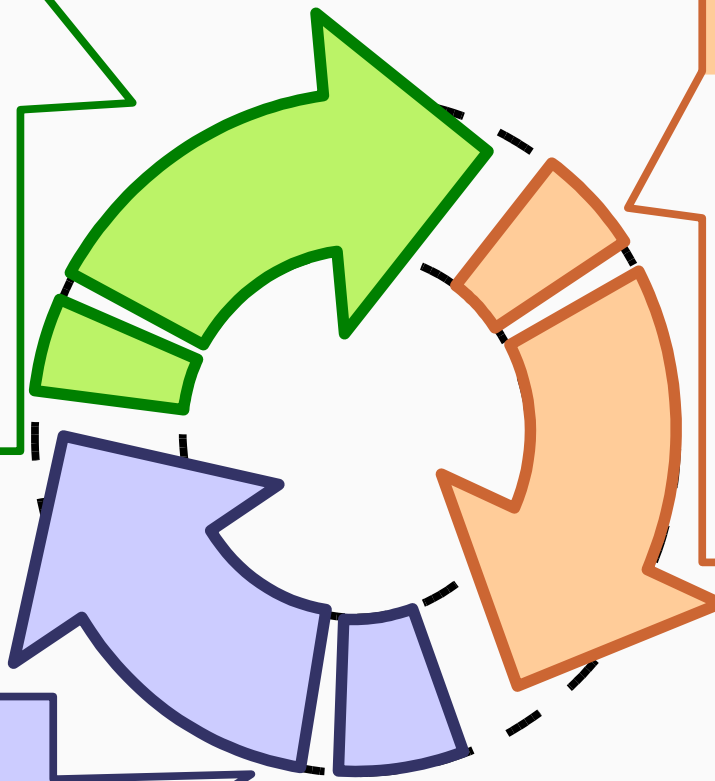
Roadmap for the Group (short-term)

- **Defining process**
  - Implementation of the development cycle (All)
  - Packging & Deployment process (WP5,WP4)
  - Development process (WP4,WP6)
- First version of **StratusLab Architecture** (All)
- **Product Backlog** (All)
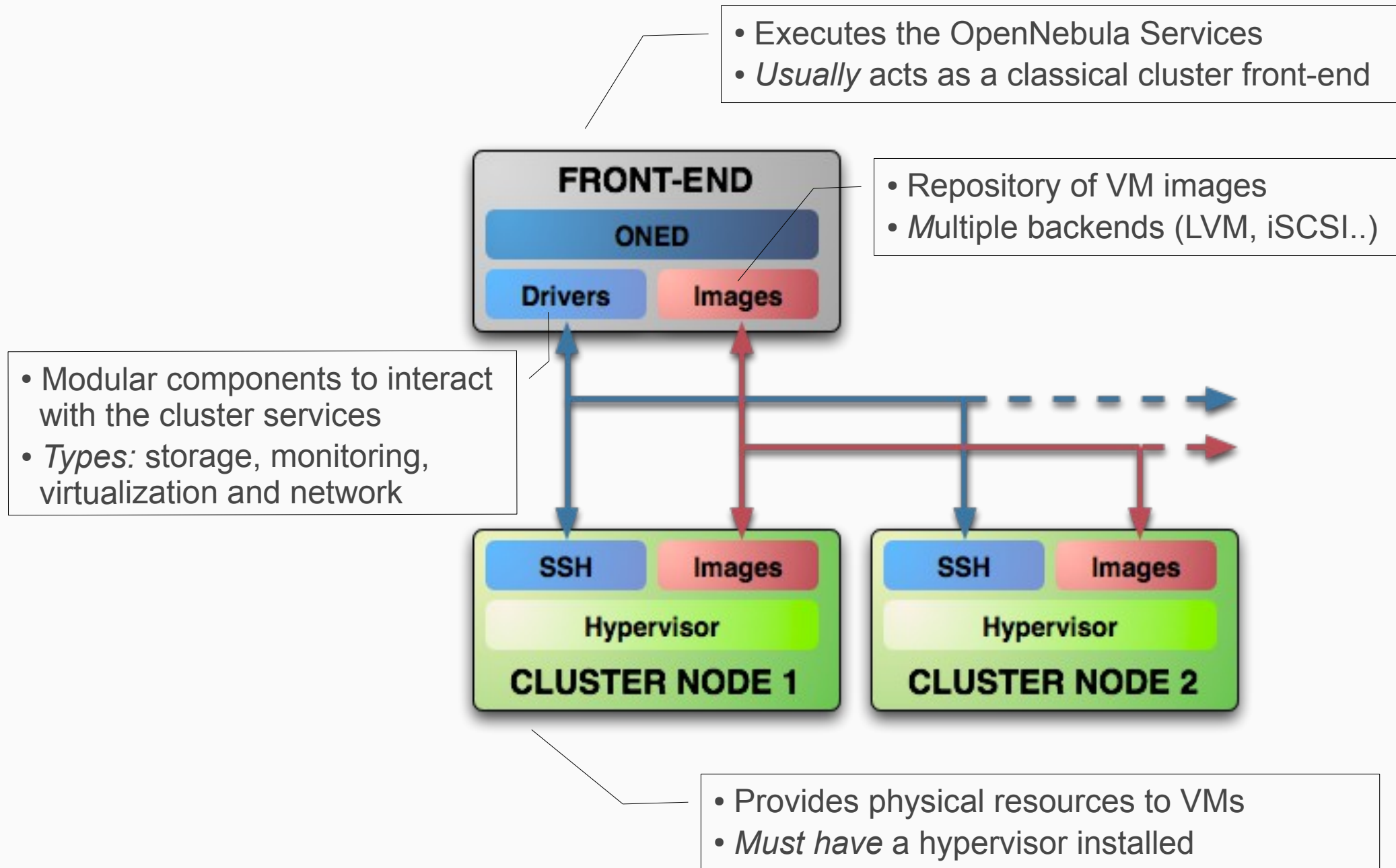- **Data model & policies** for StratusLab appliances (WP5)

Brief Overview of OpenNebula

StratusLab Kick-off Meeting, 14 – 15 June 2010

StratusLab

- Executes the OpenNebula Services
- *Usually* acts as a classical cluster front-end

FRONT-END

ONED

Drivers   **Images**

- Repository of VM images
- *Multiple* backends (LVM, iSCSI..)

- Modular components to interact with the cluster services
- *Types:* storage, monitoring, virtualization and network

SSH   **Images**

Hypervisor

CLUSTER NODE 1

SSH   **Images**

Hypervisor

CLUSTER NODE 2

- Provides physical resources to VMs
- *Must have* a hypervisor installed

- OpenNebula uses bridge networking
- NAT, firewalling and other services are configured with hooks

Physical Network

Bridge

VM

VM

Bridge

Bridge

VM

VM

Bridge

Internet
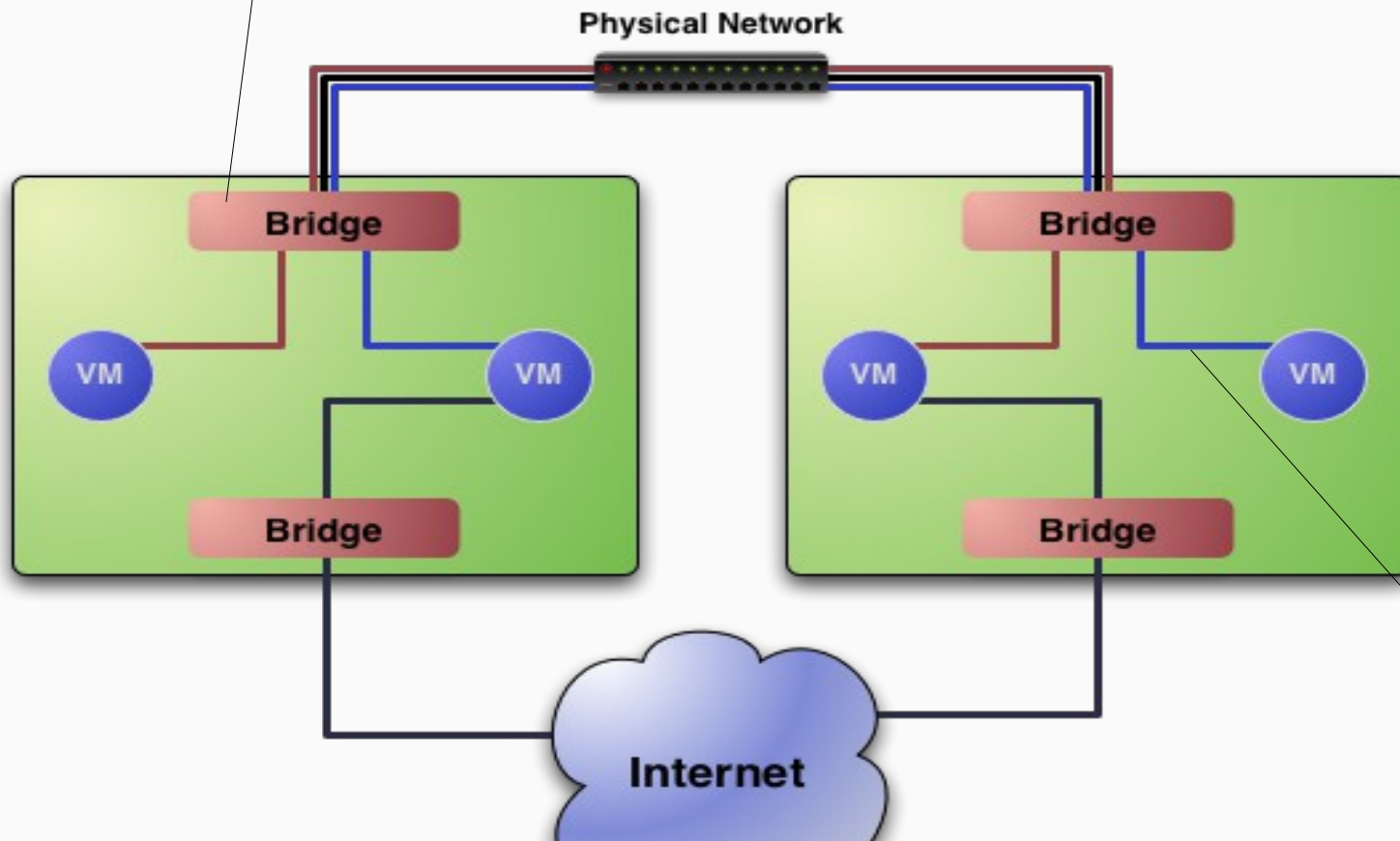
- Virtual Network: MAC/IP address space + bridge binding
- Networks are isolated at layer 2 (IEEE 802.1Q, ebtables)
- You can put any TCP/IP service (e.g. DHCP, nagios...)

Using Virtual Networks with VMs

- Define VM NICs attached to a given virtual network. The VM will get a NIC with a free MAC in the network

```
#A VM with two interfaces each one in a different vlan
NIC=[NETWORK="Blue LAN"]
NIC=[NETWORK="Red LAN"]

#Ask for a specific IP/MAC of the Red vlan
NIC=[NETWORK="Red LAN", IP=192.168.0.3]
```

- Prepare the VM to use the IP. Sample scripts to set the IP based on the MAC are provided for several Linux distributions.

IP-MAC address correspondence

I P: 10. 0. 1. 2

MAC: 02: 01: 0A: 00: 01: 02

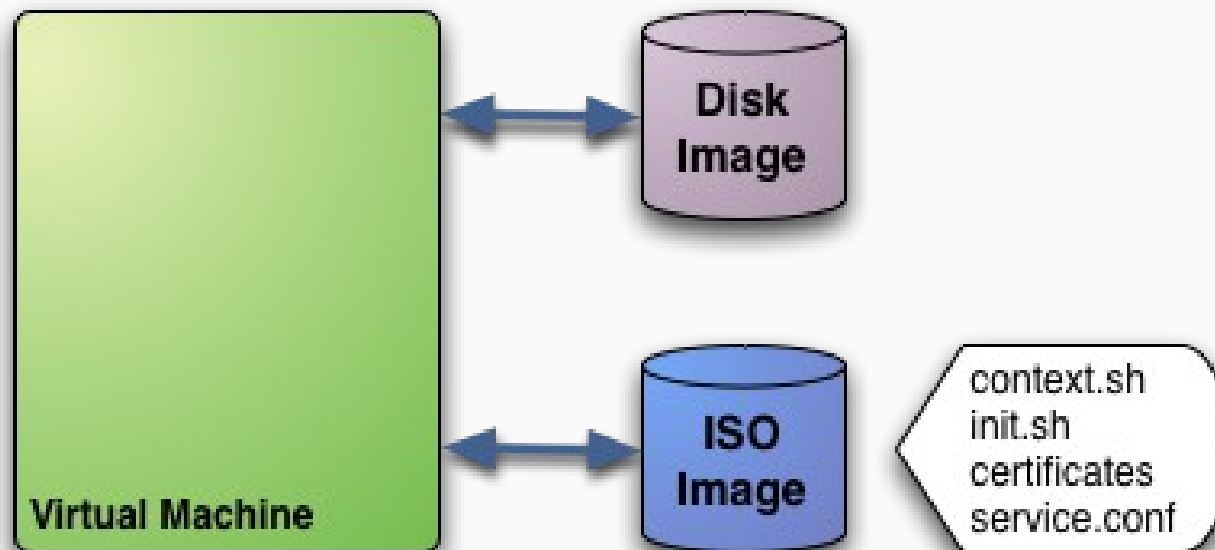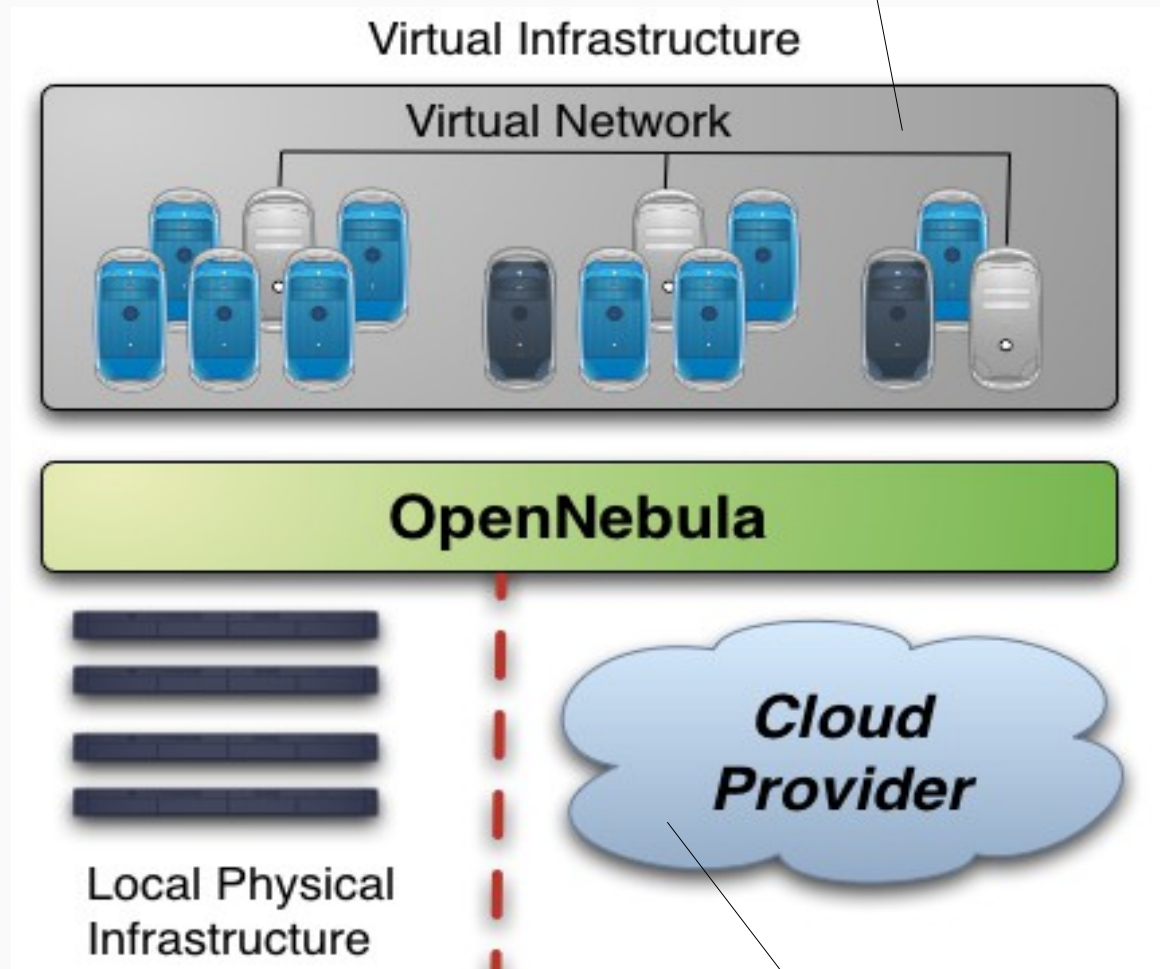   oned.conf   IP Address

Defining a Virtual Machine...

- A **capacity** in terms memory and CPU

- A set of **NICs** attached to one or more virtual networks

- A set of **disk images,** to be "*transfered*" to/from the execution host.

- A **state file** (optional) or recovery file, with the memory image of a running VM plus some hypervisor specific information.

- Virutal Machines are defined in a VM template

- Each VM has an unique ID in OpenNebula the VM_ID

- All the files (logs, images, state files...) are stored in
  `$ONE_LOCATION/var/<VM_ID>`

The Virtual Machine Context

- Custom data to be passed to the VM at boot time

- Boot Process

  - Mount an iso image with context data

  - Source context.sh to look for variables

  - Access any file to setup VM services (e.g. ssh keys...)

- VMs can be local or remote
- VM connectivity has to be configured, usually VPNs

Virtual Infrastructure

Virtual Network

OpenNebula

Local Physical Infrastructure

Cloud Provider

- External Clouds are like any other host
- Placement constraints

Using the EC2 Cloud

- Several accounts or zones can be configured

- The capacity allocated in EC2 can be limited

- VMs must be prepared to be instantiated locally or in the EC2

  - The template must provide a description for both instantiation methods.

  - The EC2 counterpart of your VM (`AMI_ID`) must be available for the driver account

```
EC2 = [
  AMI                = "ami_id for this VM",
  KEYPAIR            = "the keypair to use the instance",
  AUTHORIZED_PORTS = "ports to access the instance",
  INSTANCETYPE      = "m1.small...",
  ELASTICIP         = "the elastic ip for this instance",
  CLOUD             = "EC2 cloud to use"
]
```

Architecture Discussion
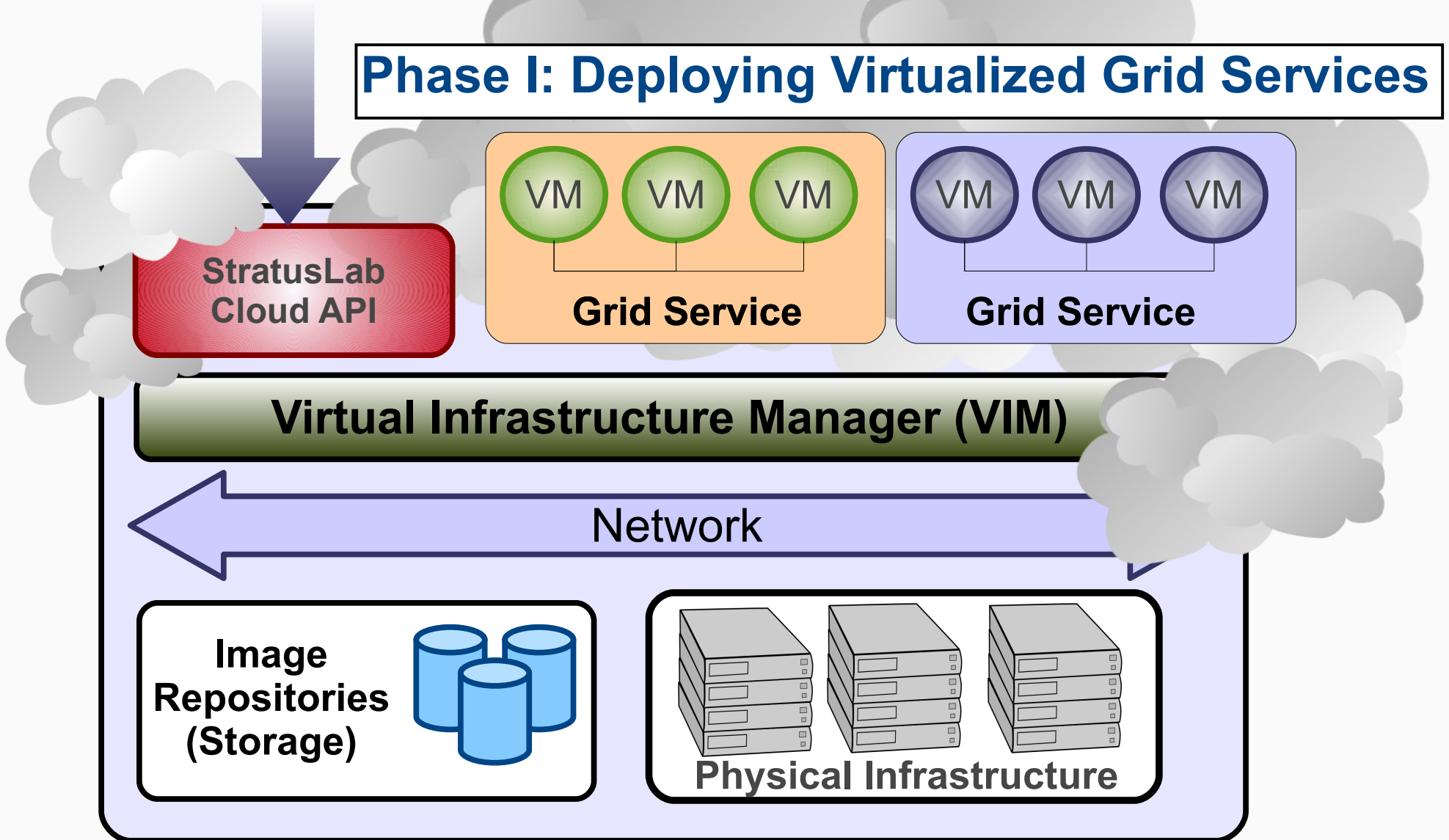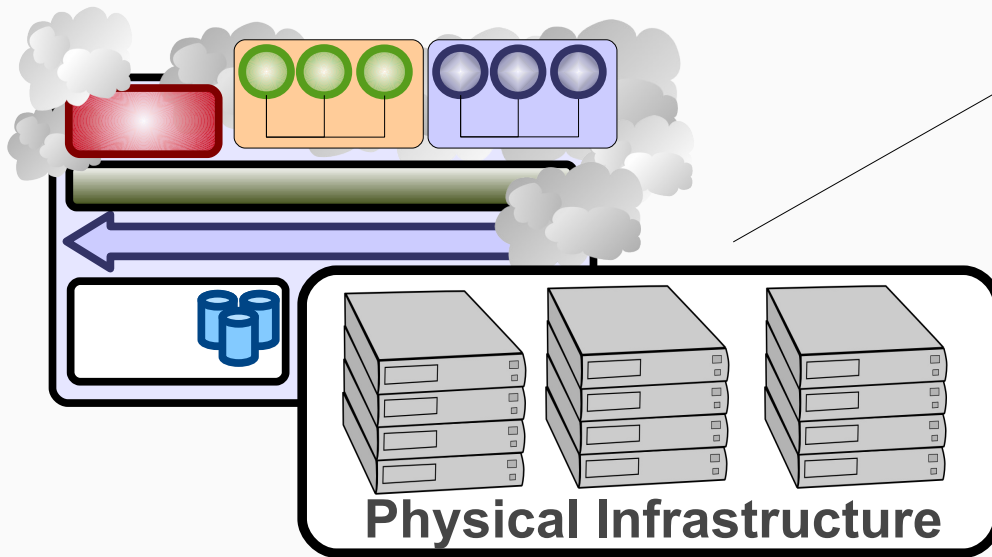
StratusLab Kick-off Meeting, 14 – 15 June 2010

Anatomy of a StratusLab Site

Phase II: Cloud-like Interfaces

Phase I: Deploying Virtualized Grid Services

StratusLab Cloud API

VM VM VM
Grid Service

VM VM VM
Grid Service

Virtual Infrastructure Manager (VIM)

Network

Image Repositories (Storage)

Physical Infrastructure

Physical Infrastructure

Operating System

- Linux distribution
  - CentOS
  - Ubuntu
  - Scientific Linux
- Requirements
  - sudo
  - sshd
  - oneadmin account
  - FS related (e.g. NFS)

Hypervisor

- KVM + libvirt
- Xen
- Requirements
  - HW virtualization
  - special drivers (virtio...)

Connectivity

- No public IP needed
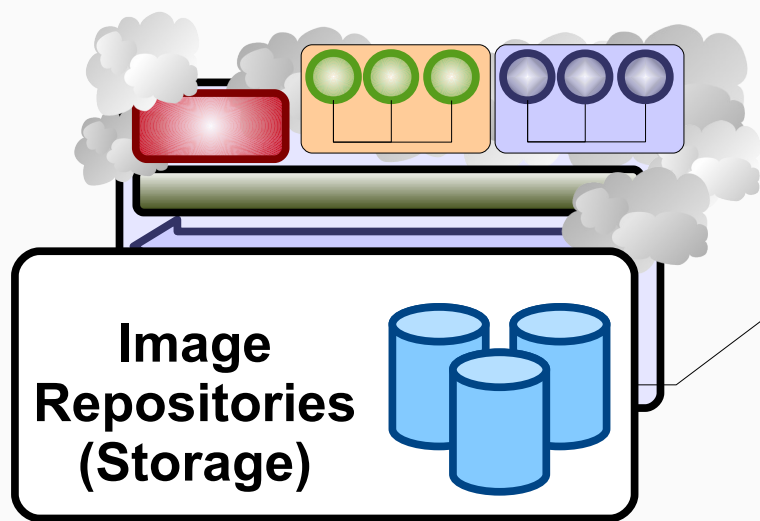- Internet attached
- Bridged networking

StratusLab

Image Distribution

- Dedicated VO Repositories (off-site)
- On-site Repository (caches VO images)
- Transfer of images to workernodes
  - Shared/Distributed FS
  - LVM-based
  - scp

Image Repositories (Storage)

Image Creation

- Format (raw, qow...)
- FS conventions (e.g. partitions, swap)
- Persistent DataBlocks (ala EBS)

Image Contextualization

- Data model:
  - pre-defined & user variables (e.g. IPs)
  - specific files (e.g. ssh keys)
  - software packages
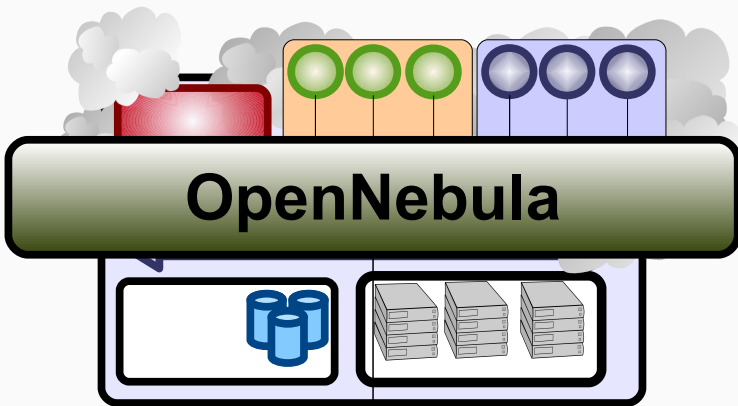- Access conventions (e.g. context dev)

StratusLab
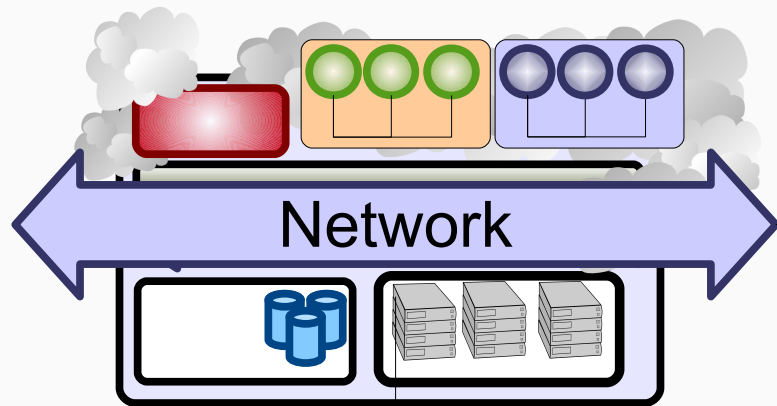
Network

Firewalling & Security

- Site needs to open VM services
- VM access controlled "from the outside"
- Layer 2 isolation (Phase II)

IP Addresses & Networks

- Private network for Grid Services VMs
- Public network with a pool of public IPs
- Getting the IP & hostname
  - MAC2IP (preferred)
  - DHCP using dedicated network VMs
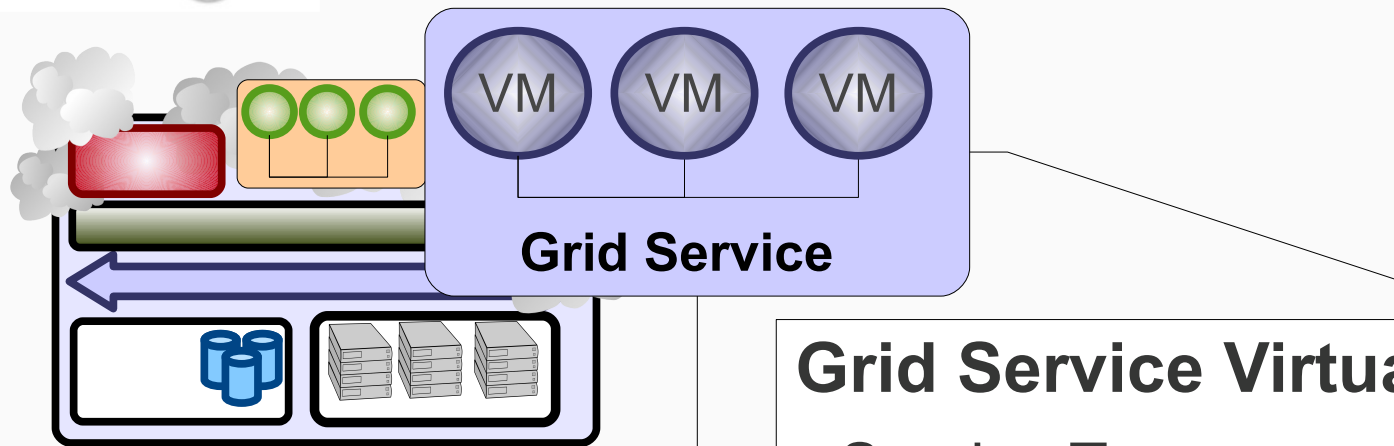- IPv4

OpenNebula Configuration

- Deployment (dedicated machine, VM)
- SW requirements (mysql, sqlite)
- Tunning (monitor intervals, threads...)
- Simplified configuration process
- Management Interface

Scheduling

- VM placement policies:
  - Packing
  - Stripping
  - Requirements

Commision Requirements

- Keep an eye on other cloud solutions

StratusLab

Grid Service

Grid Service Virtualization

- Service Type:
  - Computing Element
  - Workernode
  - Storage Resource Manager
  - …
- Certificate Management

Cluster Virtualization

- LRMS management (WN registration)
- Queue management
- Elasticity Management