
OpenNebula.org

OpenNebula 4.8 Release Notes

Release 4.8

OpenNebula Project

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RELEASE NOTES 4.8

1.1 What's New in 4.8

OpenNebula 4.8 Lemon Slice brings significant improvements in different aspects. Sticking with our vision of bringing simplicity to cloud management, this release comes with improvements in the recently added Cloud View portal, designed for end users. One significant advantage of the new portal is the ability to control flows, groups of interconnected Virtual Machines that conform a service. Based on this Cloud View, a Virtual Datacenter administrators view has been included (VDCAdmin View), which enables VDC admins to easily manage the VDC users and resources.

The screenshot displays the OpenNebula VDCAdmin View interface. At the top, the 'one' logo is on the left, and navigation icons for VDC Info, Users, VMs, Templates, Flows, myvdc-admin, and OpenNebula are on the right. The main content area is titled 'Flows Hadoop small size' and includes a green wrench icon, a red trash icon, and a 'RUNNING' status indicator. Below this, there are two summary cards: 'Hadoop master' (1 / 1 VMs) and 'Hadoop slave' (2 / 2 VMs), each with 'Show VMs' and 'Change Cardinality' buttons. A 'Hadoop slave VMs' section follows, featuring a search bar and two VM detail cards. The first card, 'Hadoop slave_1_(service_15)', is 'OFF' and has details: x0.2 - 256MB, ttylinux, 192.168.56.134, myvdc-admin, 5 Jun. The second card, 'Hadoop slave_0_(service_15)', is 'RUNNING' and has details: x0.2 - 256MB, ttylinux, 192.168.56.133, myvdc-admin, 5 Jun. A pagination control at the bottom right shows '1' of 6 items.

An important highlight in this release is a vast improvement to the hybrid model. Support for two new public cloud providers have been added, widening the range of possibilities to offload VMs in case the local infrastructure is

saturated. The hybrid model in OpenNebula enables a centralized management of both local and remote resources for the cloud administrator, and a transparent consumption of these resources for the end user. With these two new additions, namely support for Microsoft Azure and IBM SoftLayer, OpenNebula is increasing the possibilities to build powerful, robust, cost and performance efficient cloud infrastructures across administrative domains and public cloud providers.

The OneFlow component also has been improved, specially OneGate, making sharing service information among VMs possible. Flows are now easier than ever to build and consume, since details like the virtual network the flow is going to use are defined later by the user, so the administrator doesn't have to deal with all the possible combinations. We are proud of OneFlow, we believe it is powerful and it can suit most of the services needs, so check it out!

Moreover, Virtual Networks underwent a thorough redesign. Definition of virtual networks are no longer restricted to the fixed and ranged model, but rather they can include any combination of ranges to accommodate any address distribution. Moreover, end users can now reserve a range or IP addresses for their own use at a later time. This was done as usual trying to maintain as much compatibility with older versions of OpenNebula as possible, so the migration path stays smooth.

Finally, several improvements are scattered across every other OpenNebula component: improvements in quotas management, multi boot available through Sunstone, availability of Windows contextualization packages, new raw device mapping datastore, better Ceph drivers, possibility to clone images across datastores ladies and gentlemen, you are in for a treat.

As usual OpenNebula releases are named after a Nebula. The [Lemon Slice nebula \(IC 3568\)](#) is a planetary nebula that is 1.3 kiloparsecs (4500 ly) away from Earth in the constellation of Camelopardalis. It is a relatively young nebula and has a core diameter of only about 0.4 light years.

Want to take OpenNebula 4.8 for a test drive? Use one of the *SandBoxes* <<http://opennebula.org/tryout/>>__ to try out OpenNebula in no time, or proceed to the [Quick Start](#) guides.

In the following list you can check the highlights of OpenNebula 4.8. ([a detailed list of changes can be found here](#)):

1.1.1 OpenNebula Core :: Virtual Networks

Virtual Networks have undergone an important upgrade in 4.8. The network definition is not longer tied to the traditional FIXED/RANGED model anymore:

- **New virtual network model**, virtual networks can now include any combination of ranges to accommodate any address distribution. The *new network model* has been implemented through the address range (AR) abstraction, that decouples the physical implementation of the network (vlan id, bridges or driver), from the logical address map, its map and the associated context variables. The new VNETs preserve the original interface in terms of contextualization, address hold, addition and removal of addresses from the network or usage.
- **New Address Range concept**, the *new ARs* define the address type being it IPv4, IPv6, dual stack IPv4 - IPv6, or just MAC addresses; this allow you to control the type of address of the network you want to generate and makes it representation more accurate in OpenNebula when an external DHCP service is providing the IP addresses. Address ranges can even overwrite some of the network configuration or context attributes to implement complex use cases that logically groups multiple networks under the same VNET.
- **Address Reservation**, a powerful reservation mechanism has been developed on top of the new VNET and ARs. Users can *reserve a subset of the address space*; this reservation is placed in a new VNET owned by the user so it can be consumed in the same way of a regular VNET.
- **Network defaults**, you can now define a *NIC_DEFAULT attribute* with values that will be copied to each new NIC. This is specially useful for an administrator to define configuration parameters, such as `MODEL = "virtio"`.
- **Securing your cloud**, ARP Cache poisoning prevention can be globally disabled in Open vSwitch: *arp_cache_poisoning*.

- **Specify default gateway for multiple NICs**, now the network gateway can be *defined separately for each NIC*.

1.1.2 OpenNebula Core :: Usage Quotas

Quotas are easier to set than ever:

- **Limiting quotas**, now you can set a quota of '0' to completely disallow resource usage. Read the *Quota Management documentation* for more information.

1.1.3 OpenNebula Core :: Federation

Different instances of OpenNebula 4.8 can be easily federated:

- **Better management**, to ease federation management admins usually adopts a centralized syslog service. Each *log entry is now labeled with its Zone ID* to identify the originating Zone of the log message.

1.1.4 OpenNebula Drivers :: Images and Storage

The storage drivers in OpenNebula are always evolving:

- **Raw device mapping datastore**, OpenNebula 4.8 includes a *new datastore type to support raw device mapping*. The new datastore allows your VMs to access raw physical storage devices exposed to the hosts. Together with the datastore a new set of transfer manager drivers has been developed to map the devices to the VM disk files.
- **Cloning to a different datastore**, images can now be *cloned to a different Datastore*. The only restriction is that the new Datastore must be compatible with the current one, i.e. have the same DS_MAD drivers.
- **Better Ceph drivers**, *these drivers have been also improved* in this release, support for RBD format 2 has been included and the use of qemu-img user land tools has been removed to relay only in the rbd tool set. Also CRDOM management in Ceph pools has been added.
- **Better IO control**, disk IO bandwidth can be *controlled in KVM using the parameters TOTAL_BYTES_SEC, READ_BYTES_SEC, WRITE_BYTES_SEC, TOTAL_IOPS_SEC, READ_IOPS_SEC and WRITE_IOPS_SEC*. These parameters can be set to a default value in the KVM driver configuration or per disk in the VM template. By default these parameters can only be set by administrators belonging to oneadmin group.

1.1.5 Hybrid Clouds

Support for two new public cloud provider has been added. This opens the possibility to create templates with representations for VM specified in both local infrastructure, Amazon EC2, Microsoft Azure and IBM SoftLayer:

- **New driver for Microsoft Azure**, support added to outsource Virtual Machines to *Microsoft Azure cloud provider*.
- **New driver for IBM SoftLayer**, support added to outsource Virtual Machines to *IBM SoftLayer cloud provider*.

1.1.6 OneFlow

General improvement in the OneFlow and OneGate components:

- **Dynamic information sharing**, using the OneGate component users can now request information about the service dynamically allowing therefore to pass information across nodes in the service. Read the *OneGate guide* for more details.

- **Controlled deployment**, OneFlow can be configured to wait until a VM contacts OneGate to set it running state. This prevents deploying child roles before the nodes of the parent roles haven't completely booted up. Read more about *Running State*.
- **Improved network management**, network configuration can be defined for a service template. The number of network interfaces that will be used are *defined for a service* and then each *role selects what interfaces will use*. The network that is attached to each interface is defined by the user when the service template is instantiated.

1.1.7 Virtual Machine Templates

Regarding Virtual Machine templates there has been significant improvements in its usability:

- **Default parameters**, you can now *define a NIC_DEFAULT attribute* with values that will be copied to each new NIC. This is specially useful for an administrator to define configuration parameters, such as MODEL, that final users may not be aware of.

```
NIC_DEFAULT = [ MODEL = "virtio" ]
```

- **User inputs**, you can define *user inputs for a given template*. These attributes are provided by the user when the template is instantiated. For example you can define MYSQL_PASSWORD and each user can define a custom value for this variable for the new Virtual Machine. This feature is available through Sunstone and the CLI.

```
USER_INPUTS=[  
  ROOT_PASSWORD="M|password|Password for the root user"  
  ROOT_MSG="M|text|Text for the message" ]
```

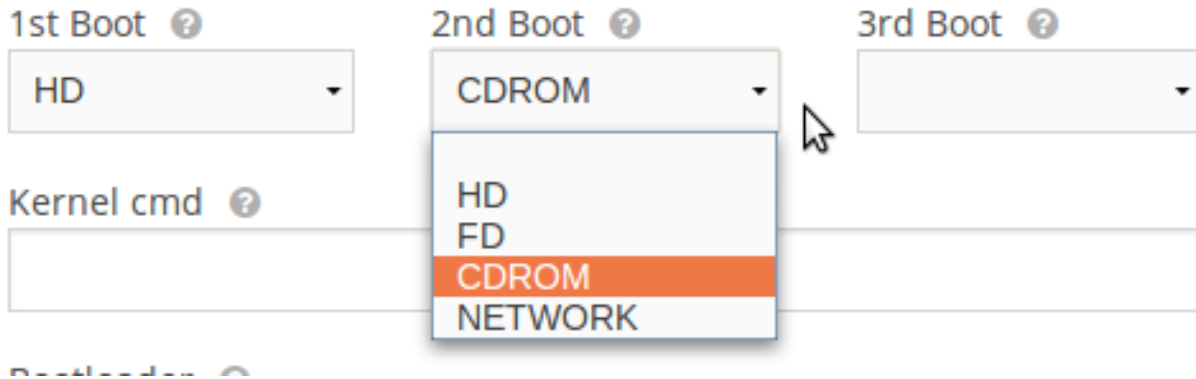
1.1.8 Sunstone

Sunstone, the portal to your OpenNebula cloud, has been improved to support flexible provisioning models:

- **VDCAdmin view**, a *new view based on the brand new cloud view* is available. VDC admin will be able to create new users and manage the resources of the VDC.
- **OneFlow easier to use**, OpenNebula Flow has been *integrated in the cloud and vdcadmin views*, now users can instantiate new services and monitor groups of Virtual Machines.
- **Better views management**, in 4.6 you could select the available *sunstone views* for new groups. In case you have more than one, you can now also select the default view.

- **Instantiate on hold**, although templates could be instantiated on hold before from the CLI, now you can also do that from Sunstone:

- **Multi boot support**, although *this could be done via CLI*, now you can set multi boot options also in the Template wizard.



- **Extended view configuration**, the table columns defined in the `view.yaml` file now apply not only to the main tab, but also to other places where the resources are used. You can see an example in the *Sunstone views documentation*.
- **Better view fine tuning**, The Virtual Network table has a new column that can be enabled in the *Sunstone view.yaml files*: VLAN ID.
- **Improved search**, now it is possible searching by any attribute in the users template in the *Sunstone Users dialog*.
- *Accounting information* is now available in Sunstone.

1.1.9 Contextualization

Virtual Machine contextualization now supports more guest OS:

- **Windows guests contextualization**, now supported to several different windows flavours. The process of provisioning and contextualizing a Windows guest context is described *here*.
- **New Context repository**, [context packages moved to addon repositories](#) to ease the incorporation from linux distros

1.2 Features

This section describes the **detailed features and functionality of OpenNebula** for the management of private clouds and datacenter virtualization(*). It includes links to the different parts of the documentation and the web site that provide extended information about each feature. We also provide a summarized table of [key features](#).

1.2.1 Powerful User Security Management

- Secure and efficient *Users and Groups Subsystem* for authentication and authorization of requests with complete functionality for [user management](#): create, delete, show...
- *Pluggable authentication and authorization* based on *passwords, ssh rsa keypairs, X509 certificates, LDAP or Active Directory*
- Special authentication mechanisms for *SunStone (OpenNebula GUI)* and the *Cloud Services (EC2)*

- Authorization framework with *fine-grained ACLs* that allows multiple-role support for different types of users and administrators, delegated control to authorized users, secure isolated multi-tenant environments, and easy resource (VM template, VM image, VM instance, virtual network and host) sharing

1.2.2 Advanced Multi-tenancy with Group Management

- Administrators can *groups users* into organizations that can represent different projects, division...
- Each group have *configurable access to shared resources* so enabling a multi-tenant environment with multiple groups sharing the same infrastructure
- Configuration of special *users that are restricted to public cloud APIs (EC2)*
- Complete functionality for management of *groups*: create, delete, show...
- Multiple group support, with the ability to define *primary and secondary groups*.

1.2.3 On-demand Provision of Virtual Data Centers

- A VDC is a fully-isolated virtual infrastructure environment where a Group of users, optionally under the control of the VDC admin, can create and manage compute and storage capacity.
- User Groups can be assigned one or more resource providers. Resource providers are defined as a cluster of servers, virtual networks, datastores and public clouds for cloud bursting in an OpenNebula zone. Read more in the *Users and Groups Management Guide*.
- A special administration group can be defined to manage specific aspects of the group like user management or appliances definition. Read more in the *Managing Users and Groups* guide.
- Sunstone views for new groups can be dynamically defined without the need of modifying the Sunstone configuration files. More information in the *Sunstone Views* guide.
- Groups can now be tagged with custom attributes. Read more in the *Managing Users and Groups* guide.

1.2.4 Advanced Control and Monitoring of Virtual Infrastructure

- *Image Repository Subsystem* with catalog and complete functionality for *VM image management*: list, publish, unpublish, show, enable, disable, register, update, saveas, delete, clone...
- *Template Repository Subsystem* with catalog and complete functionality for *VM template management*: add, delete, list, duplicate...
- *Full control of VM instance life-cycle* and complete functionality for *VM instance management*: submit, deploy, migrate, livemigrate, reschedule, stop, save, resume, cancel, shutdown, restart, reboot, delete, monitor, list, power-on, power-off,...
- Advanced functionality for VM dynamic management like *system and disk snapshotting, capacity resizing, or NIC hotplugging*
- *Programmable VM operations*, so allowing users to schedule actions
- Volume hotplugging to easily hot plug a volatile disk created on-the-fly or an existing image from a Datastore to a running VM
- *Advanced network virtualization capabilities* with traffic isolation, address reservation, flexible definition of address ranges to accommodate any address distribution, definition of generic attributes to define multi-tier services consisting of groups of inter-connected VMs, and complete functionality for *virtual network management* to interconnect VM instances: create, delete, monitor, list...

- *IPv6 support* with definition site and global unicast addresses
- Configurable *system accounting statistics* to visualize and report resource usage data, to allow their integration with chargeback and billing platforms, or to guarantee fair share of resources among users
- Tagging of users, VM images and virtual networks with arbitrary metadata that can be later used by other components
- *User defined VM tags* to simplify VM management and to store application specific data
- *Plain files datastore* to store kernels, ramdisks and files to be used in context. The whole set of OpenNebula features applies, e.g. ACLs, ownership...

1.2.5 Complete Virtual Machine Configuration

- Complete *definition of VM attributes and requirements*
- VM attributes can be provided by the user when the template is instantiated
- Support for automatic configuration of VMs with advanced *contextualization mechanisms*
- *Cloud-init* support
- *Hook Manager* to trigger administration scripts upon VM state change
- Wide range of guest operating system including Microsoft Windows and Linux
- *Flexible network definition*
- *Configuration of firewall for VMs* to specify a set of black/white TCP/UDP ports

1.2.6 Advanced Control and Monitoring of Physical Infrastructure

- *Configurable to deploy public, private and hybrid clouds*
- *Host Management Subsystem* with complete functionality for management of **physical hosts**: create, delete, enable, disable, monitor, list...
- Dynamic creation of *clusters* as a logical set of physical resources, namely: hosts, networks and data stores, within each zone
- Highly scalable and extensible built-in *monitoring subsystem*

1.2.7 Broad Commodity and Enterprise Platform Support

- Hypervisor agnostic *Virtualization Subsystem* with broad hypervisor support (*Xen*, *KVM* and *VMware*), centralized management of environments with multiple hypervisors, and support for multiple hypervisors within the same physical box
- *Storage Subsystem* with support for multiple data stores to balance I/O operations between storage servers, or to define different SLA policies (e.g. backup) and performance features for different VM types or users
- *Storage Subsystem* supporting any backend configuration with different datastore types: *file system datastore*, to store disk images in a file form and with image transferring using ssh or shared file systems (NFS, GlusterFS, Lustre...), *LVM* to store disk images in a block device form, *Ceph* for distributed block device including RBD format 2, and *VMware datastore* specialized for the VMware hypervisor that handle the vmdk format and with support for VMFS
- Flexible *Network Subsystem* with integration with *Etable*, *Open vSwitch* and *802.1Q tagging*

- *Virtual Router* fully integrated with OpenNebula to provide basic L3 services like NATting, DHCP, DNS...

1.2.8 Distributed Resource Optimization

- Powerful and flexible *requirement/rank matchmaker scheduler* providing automatic initial VM placement for the definition of workload and resource-aware allocation policies such as packing, striping, load-aware, affinity-aware...
- *Advanced requirement expressions* with cluster attributes for VM placement, affinity policies, any host attribute for scheduling expressions, and scheduler feedback through VM tags
- Powerful and flexible *requirement/rank matchmaker scheduler* for storage load balancing to distribute efficiently the I/O of the VMs across different disks, LUNs or several storage backends
- *Resource quota management* to allocate, track and limit computing, storage and networking resource utilization
- Support for *cgroups* on KVM to enforce VM CPU usage as described in the VM Template

1.2.9 Centralized Management of Multiple Zones

- Federation of multiple OpenNebula zones for scalability, isolation or multiple-site support
- Users can seamlessly provision virtual machines from multiple zones with an integrated interface both in Sunstone and CLI.
- A new tool set has been developed to upgrade, integrate new zones and import existing zones into an OpenNebula federation. Read more in the *Federation Configuration* guide.
- Integrated zone management in OpenNebula core. Read more about this in the *Data Center Federation* guide.
- Redesigned data model to minimize replication data across zones and to tolerate large latencies. Read more about this in the *Data Center Federation* guide.
- Complete functionality for management of **zones**: create, delete, show, list...

1.2.10 High Availability

- Persistent database backend with support for high availability configurations
- *Configurable behavior in the event of host, VM, or OpenNebula instance failure to provide an easy to use and cost-effective failover solution*
- Support for *high availability architectures*

1.2.11 Community Virtual Appliance Marketplace

- **Marketplace** with an online catalog where individuals and organizations can quickly distribute and deploy virtual appliances ready-to-run on OpenNebula cloud environments
- *Marketplace is fully integrated with OpenNebula* so any user of an OpenNebula cloud can find and deploy virtual appliances in a single click through familiar tools like the SunStone GUI or the OpenNebula CLI
- Support for importing OVAs processed by the AppMarket Worker. Read more [here](#).

1.2.12 Management of Multi-tier Applications

- *Automatic execution of multi-tiered applications* with complete functionality for the management of groups of virtual machines as a single entity: list, delete, scale up, scale down, shutdown... and the management of Service Templates: create, show, delete, instantiate...
- *Automatic deployment and undeployment of Virtual Machines* according to their dependencies in the Service Template
- Provide configurable services from a catalog and self-service portal
- Enable tight, efficient administrative control
- Complete integration with the OpenNebula's *User Security Management* system
- Computing resources can be tracked and limited using OpenNebula's *Resource Quota Management*
- *Automatic scaling of multi-tiered applications* according to performance metrics and time schedule
- Dynamic information sharing where information can be passed across nodes in the service
- Network configuration can be defined for a service template
- OpenNebula Flow has been integrated in the Cloud and VDC Admin Sunstone views, so users can instantiate new services and monitor groups of Virtual Machines

1.2.13 Gain Insight into Cloud Applications

- *OneGate allows Virtual Machine guests to push monitoring information to OpenNebula*
- With a security token the VMs can call back home and report guest and/or application status in a simple way, that can be easily queried through OpenNebula interfaces (Sunstone, CLI or API).
- Users and administrators can use it to gather metrics, detect problems in their applications, and trigger *OneFlow auto-scaling rules*

1.2.14 Hybrid Cloud Computing and Cloud Bursting

- *Extension of the local private infrastructure with resources from remote clouds*
- *Support for Amazon EC2* with most of the EC2 features like tags, security groups or VPC; and simultaneous access to multiple remote clouds
- Support to outsource Virtual Machines to *Microsoft Azure cloud provider*
- Support to outsource Virtual Machines to *IBM SoftLayer cloud provider*

1.2.15 Standard Cloud Interfaces and Simple Provisioning Portal for Cloud Consumers

- *Transform your local infrastructure into a public cloud by exposing REST-based interfaces*
- *AWS EC2 API service*, the de facto cloud API standard, with *compatibility with EC2 ecosystem tools and client tools*
- Support for simultaneously exposing multiple cloud APIs
- *Provisioning portal implemented as a user Cloud View of Sunstone* to allow non-IT end users to easily create, deploy and manage compute, storage and network resources

- VDCAdmin Sunstone view where VDC admins are able to create new users and manage the resources of the VDC.

1.2.16 Rich Command Line and Web Interfaces for Cloud Administrators

- *Unix-like Command Line Interface* to manage all resources: users, VM images, VM templates, VM instances, virtual networks, zones, VDCs, physical hosts, accounting, authentication, authorization...
- *Easy-to-use Sunstone Graphical Interface* providing usage graphics and statistics with cloudwatch-like functionality, VNC support, different system views for different roles, catalog access, multiple-zone management...
- *Sunstone is easily customizable* to define multiple cloud views for different user groups

1.2.17 Multiple Deployment Options

- *Easy to install and update* with packages for most common Linux distributions
- Available in most popular Linux distributions
- *Optional building from source code*
- *System features a small footprint*, less than 10Mb
- *Detailed log files* with *syslog support* for the different components that maintain a record of significant changes

1.2.18 Easy Extension and Integration

- Modular and extensible architecture to fit into any existing datacenter
- Customizable drivers for the main subsystems to easily leverage existing IT infrastructure and system management products: *Virtualization, Storage, Monitoring, Network, Auth* and *Hybrid Cloud*
- New drivers can be easily written in any language
- Plugin support to easily extend SunStone Graphical Interface with additional tabs to better integrate Cloud and VM management with each site own operations and tools
- Easily customizable self-service portal for cloud consumers
- *Configuration and tuning parameters* to adjust behavior of the cloud management instance to the requirements of the environment and use cases
- Fully open-source technology available under Apache license
- Powerful and extensible low-level cloud API in *Ruby* and *JAVA* and *XMLRPC API*
- *OpenNebula Add-on Catalog* with components enhancing the functionality provided by OpenNebula

1.2.19 Reliability, Efficiency and Massive Scalability

- Automated testing process for functionality, scalability, performance, robustness and stability
- Technology matured through an active and engaged community
- Proven on large scale infrastructures consisting of tens of thousands of cores and VMs
- Highly scalable database back-end with support for *MySQL* and *SQLite*
- Virtualization drivers adjusted for maximum scalability

- Very efficient core developed in C++ language

(*) Because OpenNebula leverages the functionality exposed by the underlying platform services, its functionality and performance may be affected by the limitations imposed by those services.

- The list of features may change on the different platform configurations
- Not all platform configurations exhibit a similar performance and stability
- The features may change to offer users more features and integration with other virtualization and cloud components
- The features may change due to changes in the functionality provided by underlying virtualization services

1.3 Platform Notes

This page will show you the specific considerations at the time of using an OpenNebula cloud, according to the different supported platforms.

This is the list of the individual platform components that have been through the complete [OpenNebula Quality Assurance and Certification Process](#).

Certified Platform Component	Version		
RedHat Enterprise Linux	6.5, 7.0		
Ubuntu Server	12.04 (LTS) & 14.04 (LTS)		
SUSE Linux Enterprise	12.3		
CentOS	6.5, 7.0		
openSUSE	12.3		
Debian	7.1		
VMware	ESX 5.1 & vCenter 5.5		
XEN	3.2 & 4.2		
KVM	Supported version that is included in the kernel for the Linux distribution		
Amazon Web Service	Current API version		

1.3.1 All Front-Ends

- xmlrpc tuning parameters (MAX_CONN, MAX_CONN_BACKLOG, KEEPALIVE_TIMEOUT, KEEPALIVE_MAX_CONN and TIMEOUT) are only available with packages distributed by us as they are compiled with a newer xmlrpc-c library.
- for **cloud bursting**, a newer nokogiri gem than the one packed by current distros is required. If you are planning to use cloud bursting, you need to install nokogiri >= 1.4.4 prior to run `install_gems`

```
# sudo gem install nokogiri -v 1.4.4
```

- also for **cloud bursting**, precisely for Microsoft Azure and IBM SoftLayer, those supported distros with ruby versions <= 1.9.3 (like Centos 6.x or Ubuntu 12.04) please update the ruby installation or use `rvm` to run a newer (>= 1.9.3) version (remember to run `install_gems` after the ruby upgrade is done to reinstall all gems)

ESX 5.1 as VMware Node

- to accomplish disk hotplugging and nic hotplugging (ignore the first bullet for the latter)
 - disks need to be attached through SCSI, so their images should have a DEV_PREFIX="sd"

- VM template that will permit SCSI disk attaches afterwards needs to have an explicitly defined SCSI controller:

```
RAW=[TYPE = "vmware",
      DATA = "<devices><controller type='scsi' index='0' model='lsilogic' /></devices>"]
```

- to use SCSI disk based VMs, it is usually a good idea to explicitly declare the PCI bridges. This can be accomplished with the following added to the VM template:

```
FEATURES=[PCIBRIDGE="1"]
```

- to accomplish hot migration (through vMotion)
 - VM needs to have all network card model with model “E1000”

CentOS 6.5 as KVM Node

- to accomplish disk hotplugging:
 - disks need to be attached through SCSI, so their images should have a DEV_PREFIX=“sd”
 - VM template that will permit SCSI disk attaches afterwards needs to have an explicitly defined SCSI controller:

```
RAW=[TYPE = "kvm",
      DATA = "<devices><controller type='scsi' index='0' model='virtio-scsi'></controller></devices>"]
```

- due to libvirt version $\leq 0.10.2$, there is a [bug in libvirt/qemu attach/detach nic functionality](#) that prevents the reuse of net IDs. This means that after a successful attach/detach NIC, a new attach will fail.

Ubuntu 12.04 as KVM Node

- due to libvirt version $\leq 0.10.2$, there is a [bug in libvirt/qemu attach/detach nic functionality](#) that prevents the reuse of net IDs. This means that after a successful attach/detach NIC, a new attach will fail.

Ubuntu 14.04 with Cloud Bursting

The aws-sdk gem is needed for the hybrid model in OpenNebula to access Amazon EC2, but it is tricky to compile in Ubuntu 14.04. To install the dependency:

```
$ sudo gem install nokogiri --version 1.6.1 -- --use-system-libraries
$ sudo gem install aws-sdk
```

1.3.2 CentOS 6.5 Usage Platform Notes

Because home directory of oneadmin is located in /var, it violates SELinux default policy. So in ssh passwordless configuration you should disable SELinux by setting SELINUX=disabled in /etc/selinux/config.

1.3.3 CentOS 7.0 Platform Notes

This distribution lacks some packaged ruby libraries. This makes some components unusable until they are installed. In the frontend, just after package installation these command should be executed as root to install extra dependencies:

```
# /usr/share/one/install_gems
```

1.3.4 Debian Platform Notes

Debian Lenny as Xen 3 Node

- The `xen` packages on Debian Lenny seem to be broken, and they don't work with the `tap:aio` interface. A workaround for this problem is the following:

```
# ln -s /usr/lib/xen-3.2-1/bin/tapdisk /usr/sbin
# echo xenblktap >> /etc/modules
# reboot
```

1.3.5 openSUSE 12.3 Platform Notes

- Limited startup scripts → only for OpenNebula and Sunstone services

1.3.6 Ubuntu 12.04 Platform Notes

- Limited startup scripts → only for OpenNebula service
- Ubuntu12.04 presents `libvirt` 0.9.8. We recommend updating (manually, there are no packages) to 0.10.2 to use the `AttachNic` and `DetachNic` functionality.

1.3.7 Ubuntu 14.04 Platform Notes

- Limited startup scripts → only for OpenNebula service

1.3.8 Unsupported Platforms Notes

Installing on ArchLinux

OpenNebula is available at the Arch User Repository (AUR), please check the [opennebula package page](#).

Installing on Gentoo

You need to compile the `xmlrpc-c` package with threads support, as:

```
USE="threads" emerge xmlrpc-c
```

1.4 Compatibility Guide

This guide is aimed at OpenNebula 4.6 users and administrators who want to upgrade to the latest version. The following sections summarize the new features and usage changes that should be taken into account, or prone to cause confusion. You can check the upgrade process in the following [guide](#)

Visit the [Features list](#) and the [Release Notes](#) for a comprehensive list of what's new in OpenNebula 4.8.

1.4.1 OpenNebula Administrators and Users

Virtual Machines

When a guest is shutdown, the OpenNebula VM will now move to the `poweroff` state, instead of `unknown`.

Virtual Networks

Virtual Networks have undergone an important upgrade in 4.8. The VNET data model has been extended to implement a flexible VNET definition along with a whole new set of functionality, like reservations or network groups. Applications dealing directly with the XML representation need to be updated. Also two XML-RPC methods have been removed: `addleases` and `rmlleases`; although these methods have been preserved at the OCA and CLI level.

Note also that the definition of a VNET is different in 4.8, so any application that automates VNET creation needs to be ported to the new format.

OpenNebula's upgrade process will automatically migrate your networks to the new format. There is no need to update VM templates or Virtual Machines.

Images

Images can now be *cloned to a different Datastore*. The only restriction is that the new Datastore must be compatible with the current one, i.e. have the same `DS_MAD` drivers.

```
$ oneimage clone Ubuntu new_image --datastore new_img_ds
```

Usage Quotas

Up to 4.6, a quota of '0' meant unlimited usage. In 4.8, '0' means a limit of 0, and '-2' means unlimited. See the *quotas documentation* for more information.

Context Packages

The 4.8 context packages can make use of a new *context variable*, `GATEWAY_IFACE`:

This variable can be set to the interface number you want to configure the gateway. It is useful when several networks have `GATEWAY` parameter and you want to choose the one that configures it. For example to set the first interface to configure the gateway you use `GATEWAY_IFACE=0`

If you have guests contextualized with 4.6 packages, this variable will not have any effect until you upgrade them.

OneGate

The client usage of OneGate has changed. `ONEGATE_URL`, which used to be of the form `http://<server>:<port>/vm/<vmid>` has now been deprecated in favor of `ONEGATE_ENDPOINT` of the form `http://<server>:<port>`. OneGate API now has four possible actions: `GET /vm`, `PUT /vm`, `GET /service`, `GET /`. Additionally a new header must be sent to authenticate the API requests: `X_ONEGATE_VMID`. Read the *OneGate guide* for more information.

`PUT /vm/:id` is still available but it has been deprecated and will be removed in future releases

Sunstone

- The easy provisioning wizard has been completely removed from Sunstone. The easy provisioning, or self-service view, was a wizard introduced in 4.4, and replaced in 4.6 by the more complete Cloud view (read more in the [4.6 compatibility guide](#))
- The former vdcadmin view has been deprecated and a new version based on the simplified cloud view is available.

OneFlow

- Role names in a service template must only contain word characters (letter, number, underscore). Templates containing whitespaces or other special characters should be manually updated.
- Delete actions return 204 HTTP code instead of 201

1.4.2 Developers and Integrators

Public Clouds APIs

The OCCI server is no longer part of the distribution and now resides in an [addon repository](#). If you are searching for an OCCI server you'd better use the [rOCCI Server](#).

Storage

OpenNebula 4.8 includes a new datastore type to support raw device mapping. Together with the datastore a new set of transfer manager drivers has been developed and included in the OpenNebula distribution.

Support for RBD format 2 has been extended and improved for Ceph datastore using this type.

Logs

Log format has been extended to include the Zone ID to identify the originating Zone of the log message. Any application parsing directly `oned.log` may need to take this into account.

XML-RPC API

- New api calls:
 - `one.vn.reserve`: Reserve network addresses
 - `one.vn.add_ar`: Adds address ranges to a virtual network
 - `one.vn.rm_ar`: Removes an address range from a virtual network
 - `one.vn.update_ar`: Updates the attributes of an address range
 - `one.vn.free_ar`: Frees a reserved address range from a virtual network
- Deleted api calls:
 - `one.vn.addleases`: Use `one.vn.add_ar` instead
 - `one.vn.rmleases`: Use `one.vn.rm_ar` instead
- Changed api calls:

- `one.vn.update`: Now requires NET:ADMIN rights, instead of MANAGE
- `one.image.clone`: New optional parameter to set the target datastore

Monitoring Drivers

Management of VMs in UNKOWN state has been improved in OpenNebula 4.8. When a VM is not running in a hypervisor is moved to the POWEROFF state, while if the hypervisor itself cannot be contacted the VMs are put in UNKOWN. Any custom monitoring driver needs to follow this behavior and include `VM_POLL=YES` even no VM is in the hypervisor list.

1.5 Known Issues

1.5.1 CLI

- #3037 Different ruby versions need different time formats

1.5.2 Core & System

- #3020 OpenNebula should check the available space in the frontend before doing an undeploy
- #2880 Unicode chars in VM name are truncated
- #2502 deleting image in locked state leaves current operation in progress and files not cleaned
- #2488 A failed resume action will destroy and recreate the VM on the next resume

1.5.3 Drivers - Network

- #3093 Review the Open vSwitch flows
- #2961 review nic attach with 802.1Q

1.5.4 Drivers - Storage

- #3097 volume hot attach stops working after first attach and detach
- #1573 If an image download fails, the file is never deleted from the datastore

1.5.5 Drivers - VM

- #2511 EC2 Tags are not correctly formatted before sending them to EC2

1.5.6 OneFlow

- #2101 Validator schema is not correctly shown in the CLI after a parsing error
- #3134 Service Templates with dynamic networks cannot be instantiated from the CLI, unless the a template file with the required attributes is merged

1.5.7 Packaging

- [#2866](#) opennebula starting before mysql in debian based distros

1.5.8 Scheduler

- [#1811](#) If more than one scheduled actions fit in a scheduler cycle, the behaviour is unexpected

1.5.9 Sunstone

- [#2292](#) sunstone novnc send ctrl-alt-del not working in Firefox
- [#2219](#) Calendar picker buttons for next month/year close the dialog
- [#1877](#) if syslog enabled disable the logs tab in the VM detailed view
- [#3135](#) In the Cloud View, the “change cardinality” button applies the action, but it does not refresh the view automatically
- [#3133](#) In the accounting graphs, sometimes the bars are not properly stacked. This only affects the graph, the data in the table is still correct

1.6 Acknowledgements

The OpenNebula project would like to thank the [community members](#) and [users](#) who have contributed to this software release by being active with the discussions, answering user questions, or providing patches for bugfixes, features and documentation.

The new features for Cloud View and VDCAdmin View introduced in OpenNebula 4.8 were funded by [Produban](#) in the context of the Fund a Feature Program. The new feature that redefined virtual networks in OpenNebula 4.8 were funded by [BlackBerry](#) in the context of the Fund a Feature Program.

1.7 Upgrading from OpenNebula 4.6.x

This guide describes the installation procedure for systems that are already running a 4.6.x OpenNebula. The upgrade will preserve all current users, hosts, resources and configurations; for both Sqlite and MySQL backends.

Read the [Compatibility Guide](#) and [Release Notes](#) to know what is new in OpenNebula 4.8.

1.7.1 Upgrading a Federation

If you have two or more 4.6 OpenNebulas working as a *Federation*, you can upgrade each one independently. Zones with 4.6 and 4.8 OpenNebulas can be part of the same federation, since the shared portion of the database is compatible.

The only compatibility issue is in the Sunstone web interface. If your users access different Zones from a unique Sunstone server, you will need to upgrade all Zones to 4.8, or enable a local Sunstone server for each Zone to ensure that a 4.6 OpenNebula is only accessed through a 4.6 Sunstone. Read the *federation architecture documentation* for more details.

The rest of the guide applies to both a master or slave Zone. You don't need to stop the federation or the MySQL replication to follow this guide.

1.7.2 Preparation

Before proceeding, make sure you don't have any VMs in a transient state (prolog, migr, epil, save). Wait until these VMs get to a final state (runn, suspended, stopped, done). Check the *Managing Virtual Machines guide* for more information on the VM life-cycle.

Stop OpenNebula and any other related services you may have running: EC2, OCCI, and Sunstone. As `oneadmin`, in the front-end:

```
$ sunstone-server stop
$ oneflow-server stop
$ econe-server stop
$ occi-server stop
$ one stop
```

1.7.3 Backup

Backup the configuration files located in `/etc/one`. You don't need to do a manual backup of your database, the `onedb` command will perform one automatically.

```
# cp -r /etc/one /etc/one.YYYY-MM-DD
```

Note: Substitute `YYYY-MM-DD` with the date.

1.7.4 Installation

Follow the *Platform Notes* and the *Installation guide*, taking into account that you will already have configured the passwordless ssh access for `oneadmin`.

It is highly recommended **not to keep** your current `oned.conf`, and update the `oned.conf` file shipped with OpenNebula 4.8 to your setup. If for any reason you plan to preserve your current `oned.conf` file, read the *Compatibility Guide* and the complete `oned.conf` reference for 4.6 and 4.8 versions.

1.7.5 Configuration Files Upgrade

If you haven't modified any configuration files, the package managers will replace the configuration files with their newer versions and no manual intervention is required.

If you have customized **any** configuration files under `/etc/one` we recommend you to follow these steps regardless of the platform/linux distribution.

1. Backup `/etc/one` (already performed)
2. Install the new packages (already performed)
3. Compare the old and new configuration files: `diff -ur /etc/one.YYYY-MM-DD /etc/one`. Or you can use graphical diff-tools like `meld` to compare both directories, which are very useful in this step.
4. Edit the **new** files and port all the customizations from the previous version.
5. You should **never** overwrite the configuration files with older versions.

1.7.6 Database Upgrade

The database schema and contents are incompatible between versions. The OpenNebula daemon checks the existing DB version, and will fail to start if the version found is not the one expected, with the message ‘Database version mismatch’.

You can upgrade the existing DB with the ‘onedb’ command. You can specify any SQLite or MySQL database. Check the *onedb reference* for more information.

Warning: Make sure at this point that OpenNebula is not running. If you installed from packages, the service may have been started automatically.

Note: If you have a `MAC_PREFIX` in `oned.conf` different than the default `02:00`, open `/usr/lib/one/ruby/onedb/local/4.5.80_to_4.7.80.rb` and change the value of the `ONEDCONF_MAC_PREFIX` constant.

After you install the latest OpenNebula, and fix any possible conflicts in `oned.conf`, you can issue the ‘`onedb upgrade -v`’ command. The connection parameters have to be supplied with the command line options, see the *onedb manpage* for more information. Some examples:

```
$ onedb upgrade -v --sqlite /var/lib/one/one.db
```

```
$ onedb upgrade -v -S localhost -u oneadmin -p oneadmin -d opennebula
```

If everything goes well, you should get an output similar to this one:

```
$ onedb upgrade -v -u oneadmin -d opennebula
MySQL Password:
Version read:
Shared tables 4.4.0 : OpenNebula 4.4.0 daemon bootstrap
Local tables 4.4.0 : OpenNebula 4.4.0 daemon bootstrap

>>> Running migrators for shared tables
  > Running migrator /usr/lib/one/ruby/onedb/shared/4.4.0_to_4.4.1.rb
  > Done in 0.00s

  > Running migrator /usr/lib/one/ruby/onedb/shared/4.4.1_to_4.5.80.rb
  > Done in 0.75s
```

```
Database migrated from 4.4.0 to 4.5.80 (OpenNebula 4.5.80) by onedb command.
```

```
>>> Running migrators for local tables
Database already uses version 4.5.80
Total time: 0.77s
```

Note: Make sure you keep the backup file. If you face any issues, the `onedb` command can restore this backup, but it won’t downgrade databases to previous versions.

1.7.7 Check DB Consistency

After the upgrade is completed, you should run the command `onedb fsck`.

First, move the 4.6 backup file created by the upgrade command to a safe place.


```
$ mv /var/lib/one/mysql_localhost_opennebula.sql /path/for/one-backups/
```

Then execute the following command:

```
$ onedb fsck -S localhost -u oneadmin -p oneadmin -d opennebula
MySQL dump stored in /var/lib/one/mysql_localhost_opennebula.sql
Use 'onedb restore' or restore the DB using the mysql command:
mysql -u user -h server -P port db_name < backup_file
```

```
Total errors found: 0
```

1.7.8 Update the Drivers

You should be able now to start OpenNebula as usual, running 'one start' as oneadmin. At this point, execute `onehost sync` to update the new drivers in the hosts.

Warning: Doing `onehost sync` is important. If the monitorization drivers are not updated, the hosts will behave erratically.

1.7.9 Testing

OpenNebula will continue the monitoring and management of your previous Hosts and VMs.

As a measure of caution, look for any error messages in `oned.log`, and check that all drivers are loaded successfully. After that, keep an eye on `oned.log` while you issue the `onevm`, `onevnet`, `oneimage`, `oneuser`, `onehost list` commands. Try also using the **show** subcommand for some resources.

1.7.10 Restoring the Previous Version

If for any reason you need to restore your previous OpenNebula, follow these steps:

- With OpenNebula 4.8 still installed, restore the DB backup using 'onedb restore -f'
- Uninstall OpenNebula 4.8, and install again your previous version.
- Copy back the backup of `/etc/one` you did to restore your configuration.

1.7.11 Known Issues

If the MySQL database password contains specials characters, such as `@` or `#`, the `onedb` command will fail to connect to it.

The workaround is to temporarily change the oneadmin's password to an ASCII string. The `set password` statement can be used for this:

```
$ mysql -u oneadmin -p
mysql> SET PASSWORD = PASSWORD('newpass');
```

1.8 Upgrading from OpenNebula 4.4.x

This guide describes the installation procedure for systems that are already running a 4.4.x OpenNebula. The upgrade will preserve all current users, hosts, resources and configurations; for both Sqlite and MySQL backends.

Read the Compatibility Guide for 4.6 and 4.8, and the [Release Notes](#) to know what is new in OpenNebula 4.8.

1.8.1 Preparation

Before proceeding, make sure you don't have any VMs in a transient state (prolog, migr, epil, save). Wait until these VMs get to a final state (runn, suspended, stopped, done). Check the *Managing Virtual Machines guide* for more information on the VM life-cycle.

Stop OpenNebula and any other related services you may have running: EC2, OCCI, and Sunstone. As `oneadmin`, in the front-end:

```
$ sunstone-server stop
$ oneflow-server stop
$ econe-server stop
$ occi-server stop
$ one stop
```

1.8.2 Backup

Backup the configuration files located in `/etc/one`. You don't need to do a manual backup of your database, the `onedb` command will perform one automatically.

1.8.3 Installation

Follow the *Platform Notes* and the *Installation guide*, taking into account that you will already have configured the passwordless ssh access for `oneadmin`.

It is highly recommended **not to keep** your current `oned.conf`, and update the `oned.conf` file shipped with OpenNebula 4.8 to your setup. If for any reason you plan to preserve your current `oned.conf` file, read the *Compatibility Guide* and the complete `oned.conf` reference for 4.4 and 4.8 versions.

1.8.4 Database Upgrade

The database schema and contents are incompatible between versions. The OpenNebula daemon checks the existing DB version, and will fail to start if the version found is not the one expected, with the message 'Database version mismatch'.

You can upgrade the existing DB with the 'onedb' command. You can specify any Sqlite or MySQL database. Check the *onedb reference* for more information.

Warning: Make sure at this point that OpenNebula is not running. If you installed from packages, the service may have been started automatically.

Note: If you have a `MAC_PREFIX` in `oned.conf` different than the default `02:00`, open `/usr/lib/one/ruby/onedb/local/4.5.80_to_4.7.80.rb` and change the value of the `ONEDCONF_MAC_PREFIX` constant.

After you install the latest OpenNebula, and fix any possible conflicts in `oned.conf`, you can issue the `'onedb upgrade -v'` command. The connection parameters have to be supplied with the command line options, see the *onedb manpage* for more information. Some examples:

```
$ onedb upgrade -v --sqlite /var/lib/one/one.db
```

```
$ onedb upgrade -v -S localhost -u oneadmin -p oneadmin -d opennebula
```

If everything goes well, you should get an output similar to this one:

```
$ onedb upgrade -v -u oneadmin -d opennebula
MySQL Password:
Version read:
Shared tables 4.4.0 : OpenNebula 4.4.0 daemon bootstrap
Local tables 4.4.0 : OpenNebula 4.4.0 daemon bootstrap

>>> Running migrators for shared tables
  > Running migrator /usr/lib/one/ruby/onedb/shared/4.4.0_to_4.4.1.rb
  > Done in 0.00s

  > Running migrator /usr/lib/one/ruby/onedb/shared/4.4.1_to_4.5.80.rb
  > Done in 0.75s
```

Database migrated from 4.4.0 to 4.5.80 (OpenNebula 4.5.80) by onedb command.

```
>>> Running migrators for local tables
Database already uses version 4.5.80
Total time: 0.77s
```

Note: Make sure you keep the backup file. If you face any issues, the `onedb` command can restore this backup, but it won't downgrade databases to previous versions.

1.8.5 Check DB Consistency

After the upgrade is completed, you should run the command `onedb fsck`.

First, move the 4.4 backup file created by the upgrade command to a safe place.

```
$ mv /var/lib/one/mysql_localhost_opennebula.sql /path/for/one-backups/
```

Then execute the following command:

```
$ onedb fsck -S localhost -u oneadmin -p oneadmin -d opennebula
MySQL dump stored in /var/lib/one/mysql_localhost_opennebula.sql
Use 'onedb restore' or restore the DB using the mysql command:
mysql -u user -h server -P port db_name < backup_file
```

```
Total errors found: 0
```

1.8.6 Update the Drivers

You should be able now to start OpenNebula as usual, running `'one start'` as `oneadmin`. At this point, execute `onehost sync` to update the new drivers in the hosts.

Warning: Doing `onehost sync` is important. If the monitorization drivers are not updated, the hosts will behave erratically.

1.8.7 Testing

OpenNebula will continue the monitoring and management of your previous Hosts and VMs.

As a measure of caution, look for any error messages in `oned.log`, and check that all drivers are loaded successfully. After that, keep an eye on `oned.log` while you issue the `onevm`, `onevnet`, `oneimage`, `oneuser`, `onehost list` commands. Try also using the `show` subcommand for some resources.

1.8.8 Restoring the Previous Version

If for any reason you need to restore your previous OpenNebula, follow these steps:

- With OpenNebula 4.8 still installed, restore the DB backup using `'onedb restore -f'`
- Uninstall OpenNebula 4.8, and install again your previous version.
- Copy back the backup of `/etc/one` you did to restore your configuration.

1.8.9 Known Issues

If the MySQL database password contains specials characters, such as `@` or `#`, the `onedb` command will fail to connect to it.

The workaround is to temporarily change the `oneadmin`'s password to an ASCII string. The `set password` statement can be used for this:

```
$ mysql -u oneadmin -p
mysql> SET PASSWORD = PASSWORD('newpass');
```

1.9 Upgrading from OpenNebula 4.2

This guide describes the installation procedure for systems that are already running a 4.2 OpenNebula. The upgrade will preserve all current users, hosts, resources and configurations; for both Sqlite and MySQL backends.

Read the Compatibility Guide for [4.4](#), [4.6](#) and [4.8](#), and the [Release Notes](#) to know what is new in OpenNebula 4.8.

Warning: With the new *multi-system DS* functionality, it is now required that the system DS is also part of the cluster. If you are using System DS 0 for Hosts inside a Cluster, any VM saved (`stop`, `suspend`, `undeploy`) **will not be able to be resumed after the upgrade process**.

Warning: Two drivers available in 4.0 are now discontinued: **ganglia** and **iscsi**.

- **iscsi** drivers have been moved out of the main OpenNebula distribution and are available (although not supported) as an `addon`.
- **ganglia** drivers have been moved out of the main OpenNebula distribution and are available (although not supported) as an `addon`.

1.9.1 Preparation

Before proceeding, make sure you don't have any VMs in a transient state (prolog, migr, epil, save). Wait until these VMs get to a final state (runn, suspended, stopped, done). Check the *Managing Virtual Machines guide* for more information on the VM life-cycle.

Stop OpenNebula and any other related services you may have running: EC2, OCCI, and Sunstone. As `oneadmin`, in the front-end:

```
$ sunstone-server stop
$ oneflow-server stop
$ econe-server stop
$ occi-server stop
$ one stop
```

1.9.2 Backup

Backup the configuration files located in `/etc/one`. You don't need to do a manual backup of your database, the `onedb` command will perform one automatically.

1.9.3 Installation

Follow the *Platform Notes* and the *Installation guide*, taking into account that you will already have configured the passwordless ssh access for `oneadmin`.

It is highly recommended **not to keep** your current `oned.conf`, and update the `oned.conf` file shipped with OpenNebula 4.8 to your setup. If for any reason you plan to preserve your current `oned.conf` file, read the *Compatibility Guide* and the complete `oned.conf` reference for 4.2 and 4.8 versions.

1.9.4 Database Upgrade

The database schema and contents are incompatible between versions. The OpenNebula daemon checks the existing DB version, and will fail to start if the version found is not the one expected, with the message 'Database version mismatch'.

You can upgrade the existing DB with the 'onedb' command. You can specify any Sqlite or MySQL database. Check the *onedb reference* for more information.

Warning: Make sure at this point that OpenNebula is not running. If you installed from packages, the service may have been started automatically.

Note: If you have a `MAC_PREFIX` in `oned.conf` different than the default `02:00`, open `/usr/lib/one/ruby/onedb/local/4.5.80_to_4.7.80.rb` and change the value of the `ONEDCONF_MAC_PREFIX` constant.

After you install the latest OpenNebula, and fix any possible conflicts in `oned.conf`, you can issue the 'onedb upgrade -v' command. The connection parameters have to be supplied with the command line options, see the *onedb manpage* for more information. Some examples:

```
$ onedb upgrade -v --sqlite /var/lib/one/one.db

$ onedb upgrade -v -S localhost -u oneadmin -p oneadmin -d opennebula
```

If everything goes well, you should get an output similar to this one:

```
$ onedb upgrade -v -u oneadmin -d opennebula
MySQL Password:
Version read:
Shared tables 4.4.0 : OpenNebula 4.4.0 daemon bootstrap
Local tables 4.4.0 : OpenNebula 4.4.0 daemon bootstrap

>>> Running migrators for shared tables
  > Running migrator /usr/lib/one/ruby/onedb/shared/4.4.0_to_4.4.1.rb
  > Done in 0.00s

  > Running migrator /usr/lib/one/ruby/onedb/shared/4.4.1_to_4.5.80.rb
  > Done in 0.75s

Database migrated from 4.4.0 to 4.5.80 (OpenNebula 4.5.80) by onedb command.

>>> Running migrators for local tables
Database already uses version 4.5.80
Total time: 0.77s
```

If you receive the message “ATTENTION: manual intervention required”, read the section *Manual Intervention Required* below.

Note: Make sure you keep the backup file. If you face any issues, the onedb command can restore this backup, but it won't downgrade databases to previous versions.

1.9.5 Check DB Consistency

After the upgrade is completed, you should run the command `onedb fsck`.

First, move the 4.2 backup file created by the upgrade command to a safe place.

```
$ mv /var/lib/one/mysql_localhost_opennebula.sql /path/for/one-backups/
```

Then execute the following command:

```
$ onedb fsck -S localhost -u oneadmin -p oneadmin -d opennebula
MySQL dump stored in /var/lib/one/mysql_localhost_opennebula.sql
Use 'onedb restore' or restore the DB using the mysql command:
mysql -u user -h server -P port db_name < backup_file

Total errors found: 0
```

1.9.6 Update the Drivers

You should be able now to start OpenNebula as usual, running 'one start' as oneadmin. At this point, execute `onehost sync` to update the new drivers in the hosts.

Warning: Doing `onehost sync` is important. If the monitorization drivers are not updated, the hosts will behave erratically.

1.9.7 Setting new System DS

With the new *multi-system DS* functionality, it is now required that the system DS is also part of the cluster. If you are using System DS 0 for Hosts inside a Cluster, any VM saved (stop, suspend, undeploy) **will not be able to be resumed after the upgrade process**.

You will need to have at least one system DS in each cluster. If you don't already, create new system DS with the same definition as the system DS 0 (TM_MAD driver). Depending on your setup this may or may not require additional configuration on the hosts.

You may also try to recover saved VMs (stop, suspend, undeploy) following the steps described in this [thread of the users mailing list](#).

1.9.8 Testing

OpenNebula will continue the monitoring and management of your previous Hosts and VMs.

As a measure of caution, look for any error messages in oned.log, and check that all drivers are loaded successfully. After that, keep an eye on oned.log while you issue the onevm, onevnet, oneimage, oneuser, onehost **list** commands. Try also using the **show** subcommand for some resources.

1.9.9 Restoring the Previous Version

If for any reason you need to restore your previous OpenNebula, follow these steps:

- With OpenNebula 4.8 still installed, restore the DB backup using 'onedb restore -f'
- Uninstall OpenNebula 4.8, and install again your previous version.
- Copy back the backup of /etc/one you did to restore your configuration.

1.9.10 Known Issues

If the MySQL database password contains specials characters, such as @ or #, the onedb command will fail to connect to it.

The workaround is to temporarily change the oneadmin's password to an ASCII string. The `set password` statement can be used for this:

```
$ mysql -u oneadmin -p
mysql> SET PASSWORD = PASSWORD('newpass');
```

1.9.11 Manual Intervention Required

If you have a datastore configured to use a tm driver not included in the OpenNebula distribution, the onedb upgrade command will show you this message:

```
ATTENTION: manual intervention required
```

```
The Datastore <id> <name> is using the
custom TM MAD '<tm_mad>'. You will need to define new
configuration parameters in oned.conf for this driver, see
http://opennebula.org/documentation:rel4.4:upgrade
```

Since OpenNebula 4.4, each `tm_mad` driver has a `TM_MAD_CONF` section in `oned.conf`. If you developed the driver, it should be fairly easy to define the required information looking at the existing ones:

```
# The configuration for each driver is defined in TM_MAD_CONF. These
# values are used when creating a new datastore and should not be modified
# since they define the datastore behaviour.
# name      : name of the transfer driver, listed in the -d option of the
#            TM_MAD section
# ln_target : determines how the persistent images will be cloned when
#            a new VM is instantiated.
#            NONE: The image will be linked and no more storage capacity will be used
#            SELF: The image will be cloned in the Images datastore
#            SYSTEM: The image will be cloned in the System datastore
# clone_target : determines how the non persistent images will be
#              cloned when a new VM is instantiated.
#              NONE: The image will be linked and no more storage capacity will be used
#              SELF: The image will be cloned in the Images datastore
#              SYSTEM: The image will be cloned in the System datastore
# shared    : determines if the storage holding the system datastore is shared
#            among the different hosts or not. Valid values: "yes" or "no"

TM_MAD_CONF = [
    name      = "lvm",
    ln_target  = "NONE",
    clone_target= "SELF",
    shared    = "yes"
]
```

1.10 Upgrading from OpenNebula 4.0.x

This guide describes the installation procedure for systems that are already running a 4.0.x OpenNebula. The upgrade will preserve all current users, hosts, resources and configurations; for both SQLite and MySQL backends.

Read the [Compatibility Guide for 4.2, 4.4, 4.6 and 4.8](#), and the [Release Notes](#) to know what is new in OpenNebula 4.8.

Warning: With the new *multi-system DS* functionality, it is now required that the system DS is also part of the cluster. If you are using System DS 0 for Hosts inside a Cluster, any VM saved (stop, suspend, undeploy) **will not be able to be resumed after the upgrade process**.

Warning: Two drivers available in 4.0 are now discontinued: **ganglia** and **iscsi**.

- **iscsi** drivers have been moved out of the main OpenNebula distribution and are available (although not supported) as an [addon](#).
- **ganglia** drivers have been moved out of the main OpenNebula distribution and are available (although not supported) as an [addon](#).

Warning: There are combinations of **VMware storage** no longer supported (see *the VMFS Datastore guide* for the supported configurations).

If you want to upgrade and you are using SSH, NFS or VMFS without SSH-mode, you will need to manually migrate your images to a newly created VMFS with SSH-mode datastore. To do so implies powering off all the VMs with images in any of the deprecated datastores, upgrade OpenNebula, create a VMFS datastore and then manually register the images from those deprecated datastores into the new one. [Let us know](#) if you have doubts or problems with this process.

1.10.1 Preparation

Before proceeding, make sure you don't have any VMs in a transient state (prolog, migr, epil, save). Wait until these VMs get to a final state (runn, suspended, stopped, done). Check the *Managing Virtual Machines guide* for more information on the VM life-cycle.

Stop OpenNebula and any other related services you may have running: EC2, OCCI, and Sunstone. As `oneadmin`, in the front-end:

```
$ sunstone-server stop
$ oneflow-server stop
$ econe-server stop
$ occi-server stop
$ one stop
```

1.10.2 Backup

Backup the configuration files located in `/etc/one`. You don't need to do a manual backup of your database, the `onedb` command will perform one automatically.

1.10.3 Installation

Follow the *Platform Notes* and the *Installation guide*, taking into account that you will already have configured the passwordless ssh access for `oneadmin`.

It is highly recommended **not to keep** your current `oned.conf`, and update the `oned.conf` file shipped with OpenNebula 4.8 to your setup. If for any reason you plan to preserve your current `oned.conf` file, read the *Compatibility Guide* and the complete `oned.conf` reference for 4.0 and 4.8 versions.

1.10.4 Database Upgrade

The database schema and contents are incompatible between versions. The OpenNebula daemon checks the existing DB version, and will fail to start if the version found is not the one expected, with the message 'Database version mismatch'.

You can upgrade the existing DB with the 'onedb' command. You can specify any Sqlite or MySQL database. Check the *onedb reference* for more information.

Warning: Make sure at this point that OpenNebula is not running. If you installed from packages, the service may have been started automatically.

Note: If you have a `MAC_PREFIX` in `oned.conf` different than the default `02:00`, open `/usr/lib/one/ruby/onedb/local/4.5.80_to_4.7.80.rb` and change the value of the `ONEDCONF_MAC_PREFIX` constant.

After you install the latest OpenNebula, and fix any possible conflicts in `oned.conf`, you can issue the 'onedb upgrade -v' command. The connection parameters have to be supplied with the command line options, see the *onedb manpage* for more information. Some examples:

```
$ onedb upgrade -v --sqlite /var/lib/one/one.db

$ onedb upgrade -v -S localhost -u oneadmin -p oneadmin -d opennebula
```

If everything goes well, you should get an output similar to this one:

```
$ onedb upgrade -v -u oneadmin -d opennebula
MySQL Password:
Version read:
Shared tables 4.4.0 : OpenNebula 4.4.0 daemon bootstrap
Local tables 4.4.0 : OpenNebula 4.4.0 daemon bootstrap

>>> Running migrators for shared tables
  > Running migrator /usr/lib/one/ruby/onedb/shared/4.4.0_to_4.4.1.rb
  > Done in 0.00s

  > Running migrator /usr/lib/one/ruby/onedb/shared/4.4.1_to_4.5.80.rb
  > Done in 0.75s

Database migrated from 4.4.0 to 4.5.80 (OpenNebula 4.5.80) by onedb command.

>>> Running migrators for local tables
Database already uses version 4.5.80
Total time: 0.77s
```

If you receive the message “ATTENTION: manual intervention required”, read the section *Manual Intervention Required* below.

Note: Make sure you keep the backup file. If you face any issues, the onedb command can restore this backup, but it won't downgrade databases to previous versions.

1.10.5 Check DB Consistency

After the upgrade is completed, you should run the command `onedb fsck`.

First, move the 4.0 backup file created by the upgrade command to a safe place.

```
$ mv /var/lib/one/mysql_localhost_opennebula.sql /path/for/one-backups/
```

Then execute the following command:

```
$ onedb fsck -S localhost -u oneadmin -p oneadmin -d opennebula
MySQL dump stored in /var/lib/one/mysql_localhost_opennebula.sql
Use 'onedb restore' or restore the DB using the mysql command:
mysql -u user -h server -P port db_name < backup_file

Total errors found: 0
```

1.10.6 Update the Drivers

You should be able now to start OpenNebula as usual, running 'one start' as oneadmin. At this point, execute `onehost sync` to update the new drivers in the hosts.

Warning: Doing `onehost sync` is important. If the monitorization drivers are not updated, the hosts will behave erratically.

1.10.7 Setting new System DS

With the new *multi-system DS* functionality, it is now required that the system DS is also part of the cluster. If you are using System DS 0 for Hosts inside a Cluster, any VM saved (stop, suspend, undeploy) **will not be able to be resumed after the upgrade process**.

You will need to have at least one system DS in each cluster. If you don't already, create new system DS with the same definition as the system DS 0 (TM_MAD driver). Depending on your setup this may or may not require additional configuration on the hosts.

You may also try to recover saved VMs (stop, suspend, undeploy) following the steps described in this [thread of the users mailing list](#).

1.10.8 Testing

OpenNebula will continue the monitoring and management of your previous Hosts and VMs.

As a measure of caution, look for any error messages in oned.log, and check that all drivers are loaded successfully. After that, keep an eye on oned.log while you issue the onevm, onevnet, oneimage, oneuser, onehost **list** commands. Try also using the **show** subcommand for some resources.

1.10.9 Restoring the Previous Version

If for any reason you need to restore your previous OpenNebula, follow these steps:

- With OpenNebula 4.8 still installed, restore the DB backup using 'onedb restore -f'
- Uninstall OpenNebula 4.8, and install again your previous version.
- Copy back the backup of /etc/one you did to restore your configuration.

1.10.10 Known Issues

If the MySQL database password contains specials characters, such as @ or #, the onedb command will fail to connect to it.

The workaround is to temporarily change the oneadmin's password to an ASCII string. The `set password` statement can be used for this:

```
$ mysql -u oneadmin -p
mysql> SET PASSWORD = PASSWORD('newpass');
```

1.10.11 Manual Intervention Required

If you have a datastore configured to use a tm driver not included in the OpenNebula distribution, the onedb upgrade command will show you this message:

```
ATTENTION: manual intervention required
```

```
The Datastore <id> <name> is using the
custom TM MAD '<tm_mad>'. You will need to define new
configuration parameters in oned.conf for this driver, see
http://opennebula.org/documentation:rel4.4:upgrade
```

Since OpenNebula 4.4, each `tm_mad` driver has a `TM_MAD_CONF` section in `oned.conf`. If you developed the driver, it should be fairly easy to define the required information looking at the existing ones:

```
# The configuration for each driver is defined in TM_MAD_CONF. These
# values are used when creating a new datastore and should not be modified
# since they define the datastore behaviour.
# name      : name of the transfer driver, listed in the -d option of the
#            TM_MAD section
# ln_target : determines how the persistent images will be cloned when
#            a new VM is instantiated.
#            NONE: The image will be linked and no more storage capacity will be used
#            SELF: The image will be cloned in the Images datastore
#            SYSTEM: The image will be cloned in the System datastore
# clone_target : determines how the non persistent images will be
#              cloned when a new VM is instantiated.
#              NONE: The image will be linked and no more storage capacity will be used
#              SELF: The image will be cloned in the Images datastore
#              SYSTEM: The image will be cloned in the System datastore
# shared    : determines if the storage holding the system datastore is shared
#            among the different hosts or not. Valid values: "yes" or "no"

TM_MAD_CONF = [
    name      = "lvm",
    ln_target = "NONE",
    clone_target= "SELF",
    shared    = "yes"
]
```

1.11 Upgrading from OpenNebula 3.8.x

This guide describes the installation procedure for systems that are already running a 3.8.x OpenNebula. The upgrade will preserve all current users, hosts, resources and configurations; for both SQLite and MySQL backends.

Read the Compatibility Guide for 4.0, 4.2, 4.4, 4.6 and 4.8, and the [Release Notes](#) to know what is new in OpenNebula 4.8.

Warning: With the new *multi-system DS* functionality, it is now required that the system DS is also part of the cluster. If you are using System DS 0 for Hosts inside a Cluster, any VM saved (stop, suspend, undeploy) **will not be able to be resumed after the upgrade process**.

Warning: Two drivers available in 3.8 are now discontinued: **ganglia** and **iscsi**.

- **iscsi** drivers have been moved out of the main OpenNebula distribution and are available (although not supported) as an [addon](#).
- **ganglia** drivers have been moved out of the main OpenNebula distribution and are available (although not supported) as an [addon](#).

Warning: There are combinations of **VMware storage** no longer supported (see *the VMFS Datastore guide* for the supported configurations).

If you want to upgrade and you are using SSH, NFS or VMFS without SSH-mode, you will need to manually migrate your images to a newly created VMFS with SSH-mode datastore. To do so implies powering off all the VMs with images in any of the deprecated datastores, upgrade OpenNebula, create a VMFS datastore and then manually register the images from those deprecated datastores into the new one. [Let us know](#) if you have doubts or problems with this process.

1.11.1 Preparation

Before proceeding, make sure you don't have any VMs in a transient state (prolog, migr, epil, save). Wait until these VMs get to a final state (runn, suspended, stopped, done). Check the *Managing Virtual Machines guide* for more information on the VM life-cycle.

Stop OpenNebula and any other related services you may have running: EC2, OCCI, and Sunstone. As `oneadmin`, in the front-end:

```
$ sunstone-server stop
$ oneflow-server stop
$ econe-server stop
$ occi-server stop
$ one stop
```

1.11.2 Backup

Backup the configuration files located in `/etc/one`. You don't need to do a manual backup of your database, the `onedb` command will perform one automatically.

1.11.3 Installation

Follow the *Platform Notes* and the *Installation guide*, taking into account that you will already have configured the passwordless ssh access for `oneadmin`.

It is highly recommended **not to keep** your current `oned.conf`, and update the `oned.conf` file shipped with OpenNebula 4.8 to your setup. If for any reason you plan to preserve your current `oned.conf` file, read the *Compatibility Guide* and the complete `oned.conf` reference for 3.8 and 4.8 versions.

1.11.4 Database Upgrade

The database schema and contents are incompatible between versions. The OpenNebula daemon checks the existing DB version, and will fail to start if the version found is not the one expected, with the message 'Database version mismatch'.

You can upgrade the existing DB with the 'onedb' command. You can specify any Sqlite or MySQL database. Check the *onedb reference* for more information.

Warning: Make sure at this point that OpenNebula is not running. If you installed from packages, the service may have been started automatically.

Note: If you have a `MAC_PREFIX` in `oned.conf` different than the default `02:00`, open `/usr/lib/one/ruby/onedb/local/4.5.80_to_4.7.80.rb` and change the value of the `ONEDCONF_MAC_PREFIX` constant.

After you install the latest OpenNebula, and fix any possible conflicts in `oned.conf`, you can issue the 'onedb upgrade -v' command. The connection parameters have to be supplied with the command line options, see the *onedb manpage* for more information. Some examples:

```
$ onedb upgrade -v --sqlite /var/lib/one/one.db

$ onedb upgrade -v -S localhost -u oneadmin -p oneadmin -d opennebula
```

If everything goes well, you should get an output similar to this one:

```
$ onedb upgrade -v -u oneadmin -d opennebula
MySQL Password:
Version read:
Shared tables 3.8.0 : OpenNebula 3.8.0 daemon bootstrap
Local tables 3.8.0 : OpenNebula 3.8.0 daemon bootstrap

MySQL dump stored in /var/lib/one/mysql_localhost_opennebula.sql
Use 'onedb restore' or restore the DB using the mysql command:
mysql -u user -h server -P port db_name < backup_file
```

```
>>> Running migrators for shared tables
> Running migrator /usr/lib/one/ruby/onedb/shared/3.8.0_to_3.8.1.rb
> Done in 0.36s

> Running migrator /usr/lib/one/ruby/onedb/shared/3.8.1_to_3.8.2.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/3.8.2_to_3.8.3.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/3.8.3_to_3.8.4.rb
> Done in 0.56s

> Running migrator /usr/lib/one/ruby/onedb/shared/3.8.4_to_3.8.5.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/3.8.5_to_3.9.80.rb
```

ATTENTION: manual intervention required

Virtual Machine deployment files have been moved from /var/lib/one to /var/lib/one/vms. You need to move these files manually:

```
$ mv /var/lib/one/[0-9]* /var/lib/one/vms

> Done in 1.10s

> Running migrator /usr/lib/one/ruby/onedb/shared/3.9.80_to_3.9.90.rb
```

ATTENTION: manual intervention required

IM and VM MADS have been renamed in oned.conf. To keep your existing hosts working, you need to duplicate the drivers with the old names.

For example, for kvm you will have IM_MAD "kvm" and VM_MAD "kvm", so you need to add IM_MAD "im_kvm" and VM_MAD "vmm_kvm"

```
IM_MAD = [
    name          = "kvm",
    executable    = "one_im_ssh",
    arguments     = "-r 0 -t 15 kvm" ]
```

```
IM_MAD = [
    name          = "im_kvm",
    executable    = "one_im_ssh",
    arguments     = "-r 0 -t 15 kvm" ]
```

```
VM_MAD = [
  name      = "kvm",
  executable = "one_vmm_exec",
  arguments  = "-t 15 -r 0 kvm",
  default    = "vmm_exec/vmm_exec_kvm.conf",
  type       = "kvm" ]

VM_MAD = [
  name      = "vmm_kvm",
  executable = "one_vmm_exec",
  arguments  = "-t 15 -r 0 kvm",
  default    = "vmm_exec/vmm_exec_kvm.conf",
  type       = "kvm" ]

> Done in 0.41s

> Running migrator /usr/lib/one/ruby/onedb/shared/3.9.90_to_4.0.0.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.0.0_to_4.0.1.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.0.1_to_4.1.80.rb
> Done in 0.09s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.1.80_to_4.2.0.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.2.0_to_4.3.80.rb
> Done in 0.68s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.3.80_to_4.3.85.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.3.85_to_4.3.90.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.3.90_to_4.4.0.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.4.0_to_4.4.1.rb
> Done in 0.00s

> Running migrator /usr/lib/one/ruby/onedb/shared/4.4.1_to_4.5.80.rb
> Done in 0.39s
```

Database migrated from 3.8.0 to 4.5.80 (OpenNebula 4.5.80) by onedb command.

```
>>> Running migrators for local tables
Database already uses version 4.5.80
```

```
Total time: 3.60s
```

Note: Make sure you keep the backup file. If you face any issues, the onedb command can restore this backup, but it won't downgrade databases to previous versions.

1.11.5 Check DB Consistency

After the upgrade is completed, you should run the command `onedb fsck`.

First, move the 4.0 backup file created by the upgrade command to a safe place.

```
$ mv /var/lib/one/mysql_localhost_opennebula.sql /path/for/one-backups/
```

Then execute the following command:

```
$ onedb fsck -S localhost -u oneadmin -p oneadmin -d opennebula
MySQL dump stored in /var/lib/one/mysql_localhost_opennebula.sql
Use 'onedb restore' or restore the DB using the mysql command:
mysql -u user -h server -P port db_name < backup_file
```

```
Total errors found: 0
```

1.11.6 Virtual Machine Directories

Note: Only for OpenNebula versions < 3.8.3

If you are upgrading from a version **lower than 3.8.3**, you need to move the Virtual Machine deployment files from `/var/lib/one` to `/var/lib/one/vms`:

```
$ mv /var/lib/one/[0-9]* /var/lib/one/vms
```

1.11.7 Driver Names

OpenNebula default driver names have changed in the configuration file. Now the names of the vmm and im drivers are not prepended by the type of driver:

- `vmm_kvm` → `kvm`
- `vmm_xen` → `xen`
- `vmm_vmware` → `vmware`
- `vmm_ec2` → `ec2`
- `vmm_dummy` → `dummy`
- `im_kvm` → `kvm`
- `im_xen` → `xen`
- `im_vmware` → `vmware`
- `im_ec2` → `ec2`
- `im_ganglia` → `ganglia`
- `im_dummy` → `dummy`

To keep your existing hosts working, you need to duplicate the drivers with the old names.

For example, for `kvm` you will have `IM_MAD kvm` and `VM_MAD kvm`, so you need to add `IM_MAD im_kvm` and `VM_MAD vmm_kvm`


```

IM_MAD = [
    name      = "kvm",
    executable = "one_im_ssh",
    arguments  = "-r 3 -t 15 kvm" ]

IM_MAD = [
    name      = "im_kvm",
    executable = "one_im_ssh",
    arguments  = "-r 3 -t 15 kvm" ]

VM_MAD = [
    name      = "kvm",
    executable = "one_vmm_exec",
    arguments  = "-t 15 -r 0 kvm",
    default    = "vmm_exec/vmm_exec_kvm.conf",
    type       = "kvm" ]

VM_MAD = [
    name      = "vmm_kvm",
    executable = "one_vmm_exec",
    arguments  = "-t 15 -r 0 kvm",
    default    = "vmm_exec/vmm_exec_kvm.conf",
    type       = "kvm" ]

```

1.11.8 Manual Intervention Required

Note: Ignore this section if onedb didn't output the following message

If you have a datastore configured to use a tm driver not included in the OpenNebula distribution, the onedb upgrade command will show you this message:

```
ATTENTION: manual intervention required
```

```
The Datastore <id> <name> is using the
custom TM MAD '<tm_mad>'. You will need to define new
configuration parameters in oned.conf for this driver, see
http://opennebula.org/documentation:rel4.4:upgrade
```

Since OpenNebula 4.4, each tm_mad driver has a TM_MAD_CONF section in oned.conf. If you developed the driver, it should be fairly easy to define the required information looking at the existing ones:

```
# The configuration for each driver is defined in TM_MAD_CONF. These
# values are used when creating a new datastore and should not be modified
# since they define the datastore behaviour.
# name      : name of the transfer driver, listed in the -d option of the
#            TM_MAD section
# ln_target : determines how the persistent images will be cloned when
#            a new VM is instantiated.
#            NONE: The image will be linked and no more storage capacity will be used
#            SELF: The image will be cloned in the Images datastore
#            SYSTEM: The image will be cloned in the System datastore
# clone_target : determines how the non persistent images will be
#               cloned when a new VM is instantiated.
#            NONE: The image will be linked and no more storage capacity will be used
#            SELF: The image will be cloned in the Images datastore
#            SYSTEM: The image will be cloned in the System datastore
```

```
# shared : determines if the storage holding the system datastore is shared
#         among the different hosts or not. Valid values: "yes" or "no"

TM_MAD_CONF = [
    name       = "lvm",
    ln_target  = "NONE",
    clone_target= "SELF",
    shared     = "yes"
]
```

1.11.9 Update the Drivers

You should be able now to start OpenNebula as usual, running ‘one start’ as oneadmin. At this point, execute `onehost sync` to update the new drivers in the hosts.

Warning: Doing `onehost sync` is important. If the monitorization drivers are not updated, the hosts will behave erratically.

1.11.10 Setting new System DS

With the new *multi-system DS* functionality, it is now required that the system DS is also part of the cluster. If you are using System DS 0 for Hosts inside a Cluster, any VM saved (stop, suspend, undeploy) **will not be able to be resumed after the upgrade process**.

You will need to have at least one system DS in each cluster. If you don’t already, create new system DS with the same definition as the system DS 0 (TM_MAD driver). Depending on your setup this may or may not require additional configuration on the hosts.

You may also try to recover saved VMs (stop, suspend, undeploy) following the steps described in this [thread of the users mailing list](#).

1.11.11 Testing

OpenNebula will continue the monitoring and management of your previous Hosts and VMs.

As a measure of caution, look for any error messages in `oned.log`, and check that all drivers are loaded successfully. After that, keep an eye on `oned.log` while you issue the `onevm`, `onevnet`, `oneimage`, `oneuser`, `onehost list` commands. Try also using the **show** subcommand for some resources.

1.11.12 Restoring the Previous Version

If for any reason you need to restore your previous OpenNebula, follow these steps:

- With OpenNebula 4.8 still installed, restore the DB backup using ‘`onedb restore -f`’
- Uninstall OpenNebula 4.8, and install again your previous version.
- Copy back the backup of `/etc/one` you did to restore your configuration.

1.11.13 Known Issues

If the MySQL database password contains special characters, such as @ or #, the onedb command will fail to connect to it.

The workaround is to temporarily change the oneadmin's password to an ASCII string. The `set password` statement can be used for this:

```
$ mysql -u oneadmin -p
mysql> SET PASSWORD = PASSWORD('newpass');
```