



ECO4CLOUD USER MANUAL

ECO4CLOUD SUITE FOR DATA CENTERS V 2.4.X

With:

- VMware VSphere >= 4.x

This document supports the version of each product listed and supports all subsequent versions until the document is replaced by a new edition. To check for more recent editions of this document, see <http://www.eco4cloud.com/support>.

The Eco4Cloud Web site also provides the latest product updates. If you have comments about this documentation, submit your feedback to info@eco4cloud.com.

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ABOUT THIS BOOK

About this book

This document, the Eco4Cloud User Manual, describes how to install and use the Eco4Cloud software components, monitor and manage the information generated by the components, build your Eco4Cloud datacenter environment, consolidate virtual machines within the datacenter environment, and set up rules for virtual machines, hosts and clusters included into the datacenter environment.

INTENDED AUDIENCE

The information presented in this manual is written for system administrators who are experienced Windows or Linux system administrators and who are familiar with VMware virtual machine technology and datacenter operations.

DOCUMENT FEEDBACK

Eco4Cloud welcomes your suggestions for improving our documentation. If you have comments, send your feedback to info@eco4cloud.com.

INSTALLATION REQUIREMENTS

Installation requirements

Eco4Cloud is composed of two components: a java monitor and virtual machines consolidator, and a web dashboard. Eco4Cloud provides a vApp to simplify the software installation.

The vApp can be imported into a VMware Datacenter or into free, stand-alone systems, like VMware Player or VMware Server or non-free systems, like VMware Workstation.

HARDWARE AND SOFTWARE COMPATIBILITIES

Eco4Cloud Virtual Machine has a VMware version 7 virtual hardware, and has the following requirements.

Minimum System Requirements

- 4 GB of RAM memory;
- 1 processor;
- 20 GB of thin provisioned storage – SATA drive with a 15MBps throughput;
- 1 network card.

Recommended System Requirements

- 8 GB of RAM memory;
- 1 processor;
- 40 GB of thick provisioned, eager zeroed, storage – SSD drive with a 100MBps throughput;
- 1 network card.

Virtual systems supporting vApp are:

- ESX/ESXi >= 4.x
- vCenter >= 4.x vCloud Director 1.x
- Server 2.0
- Workstation >= 6.5.x
- VMware Player.

OPERATING SYSTEM AND FEATURES

VApp is a Virtual Machine with an Ubuntu 10.04 Operating System with a single 64-bit processor, 4GB of RAM memory, a network card and a CD-ROM. Of course, virtual hardware can be modified according to new needs even after the installation.

INSTALLATION ON VMWARE SYSTEMS

Installation on VMware Systems

INSTALLATION THROUGH OVF IMPORT

Default Virtual Machine format is OVF 1.0, so compatibility is guaranteed with VMware vSphere 4.x and 5.x or VMware vCloud Director 1.0.

If requested, also OVF 0.9 is available, as it can be imported into legacy systems like ESX/ESXi 3.5 and VMware stand-alone products as Workstation 6.5.x or 7.x.

Moreover, ZIP format for free systems as VMware server and player is available, too.

The following procedure shows standard OVF 1.0 format import.

Choose the option “Deploy OVF Template” (Fig. 1), from “File” menu in the vSphere Client connected to vCenter. A wizard will start, including an automatic download of Eco4Cloud virtual application files.

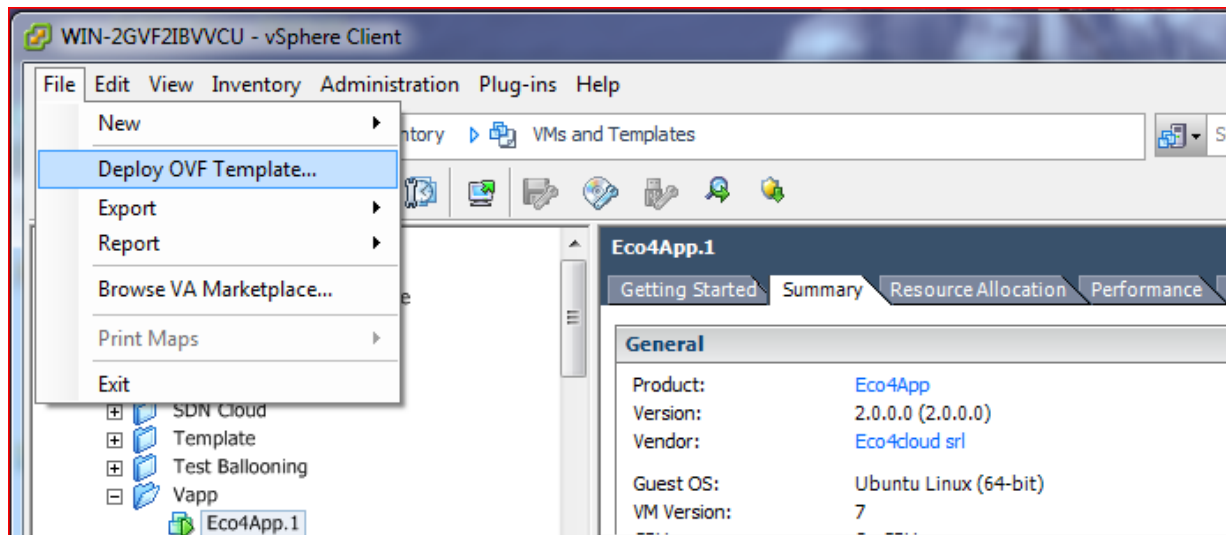


Fig. 1 Deploy OVF Template wizard

INSTALLATION ON VMWARE SYSTEMS

In the first wizard window, the .ovf file URL for Internet download will be requested. Alternatively, it is possible to enter a folder from local file system or CD-ROM.

In the following procedure a URL will be used (Fig. 2).

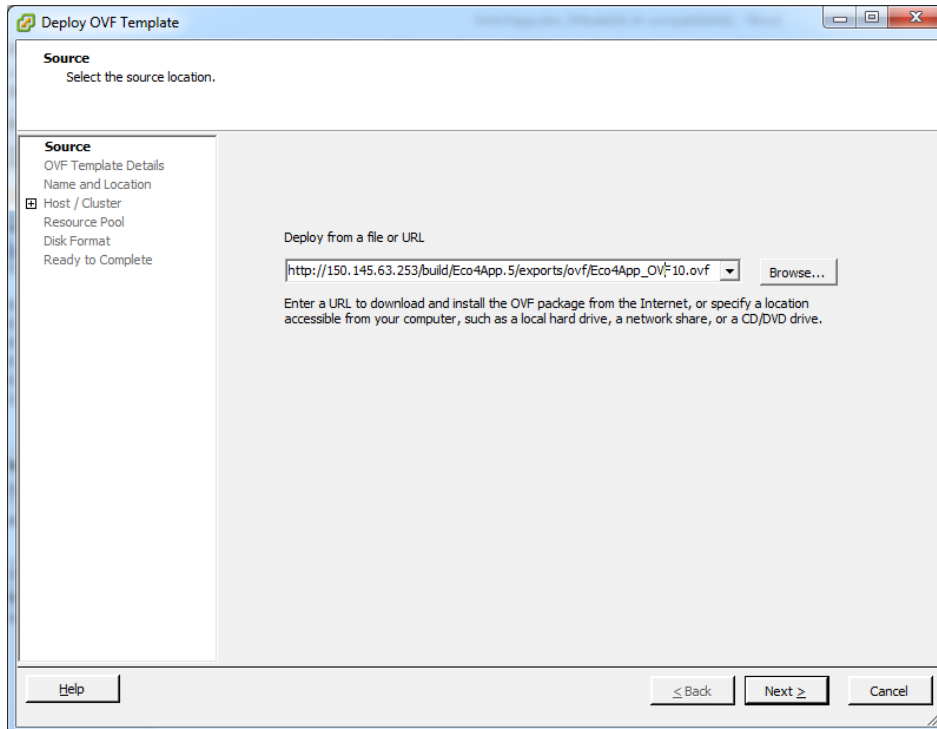


Fig. 2 Selecting .ovf file source

INSTALLATION ON VMWARE SYSTEMS

Clicking on “Next” button, a first virtual machine features recap window will be shown (Fig.3).

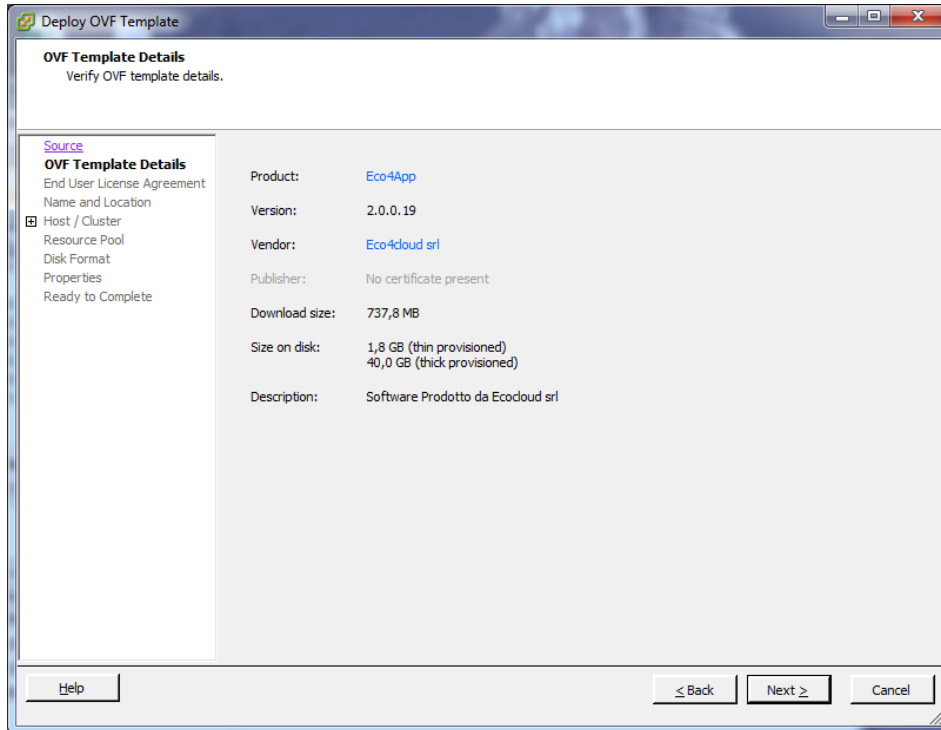


Fig. 3 OVF template details.

INSTALLATION ON VMWARE SYSTEMS

In the following window it is possible to accept End User License Agreement by clicking “Accept” and then going ahead clicking on the “Next” button (Fig.4).

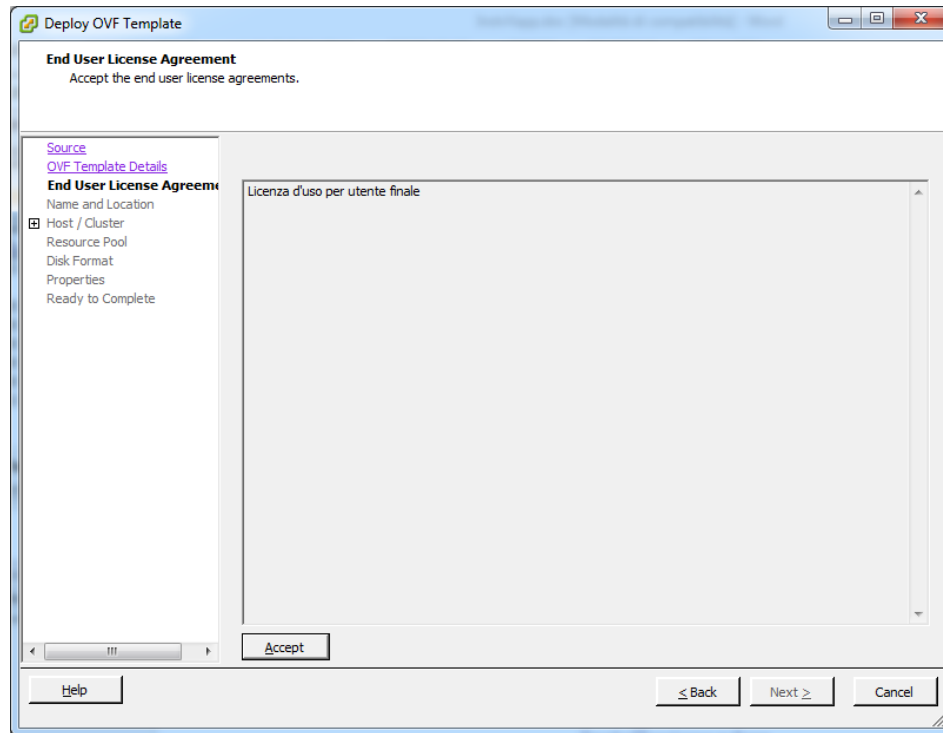


Fig. 4 End User License Agreement.

INSTALLATION ON VMWARE SYSTEMS

The next step is the choice of Eco4Cloud virtual machine name and the datecenter wherein it must be deployed (Fig. 5).

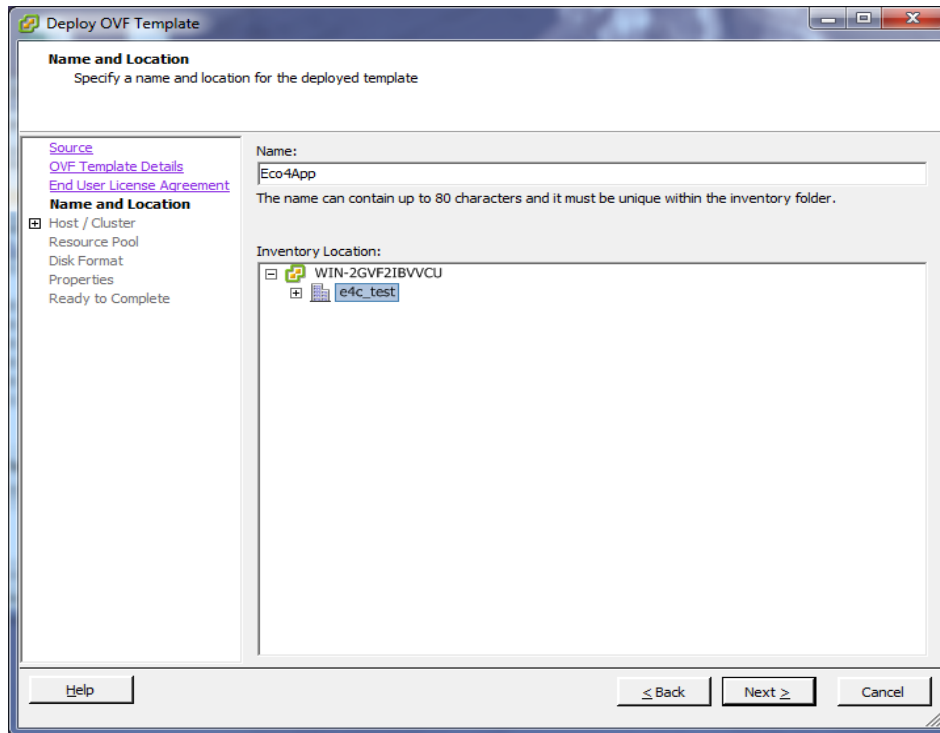


Fig. 5 Virtual machine name and datecenter.

INSTALLATION ON VMWARE SYSTEMS

When datacenter is selected, it is possible to choose the cluster where the virtual machine must be deployed (Fig. 6) and the specific host within the chosen cluster (Fig. 7).

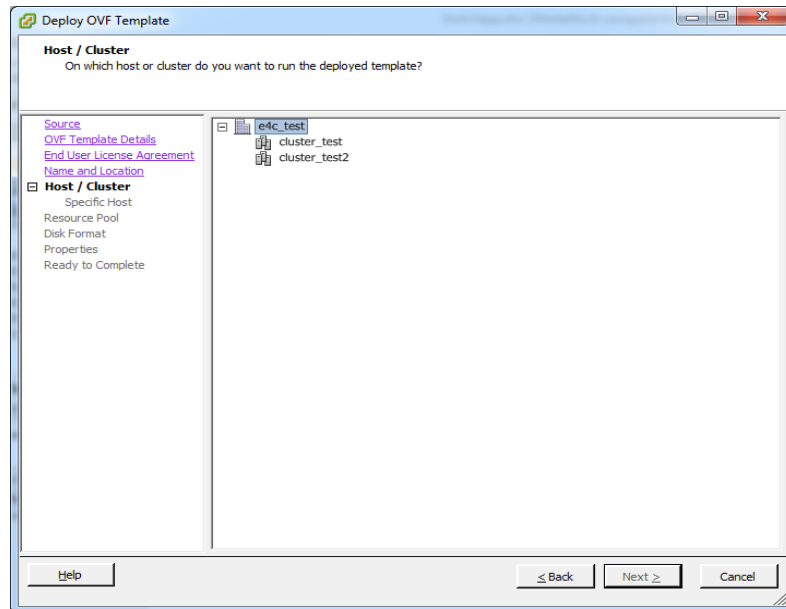


Fig. 6 Cluster choice for the Eco4Cloud VM

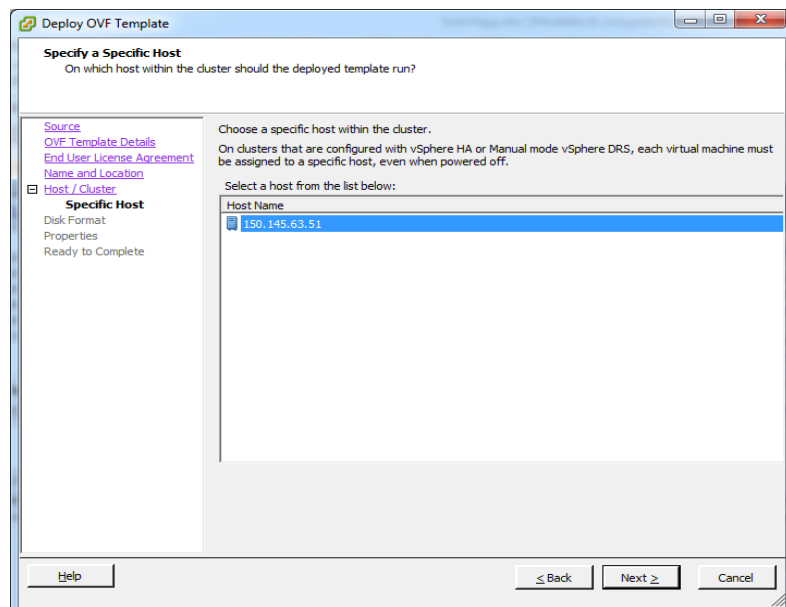


Fig. 7 Host choice for the Eco4Cloud VM

INSTALLATION ON VMWARE SYSTEMS

Furthermore it is possible to insert the datastore where virtual disks will be stored, and their format (Fig.8 e Fig. 9).

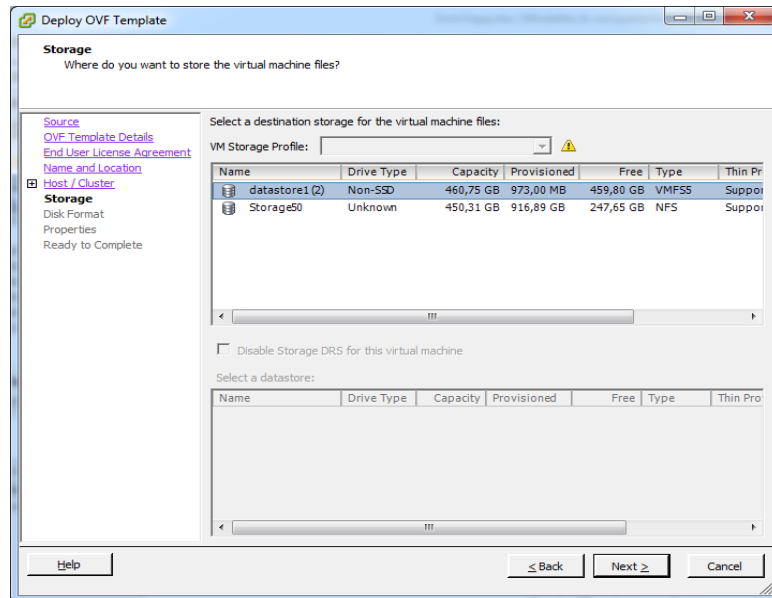


Fig. 8 Storage choice for the Eco4Cloud VM

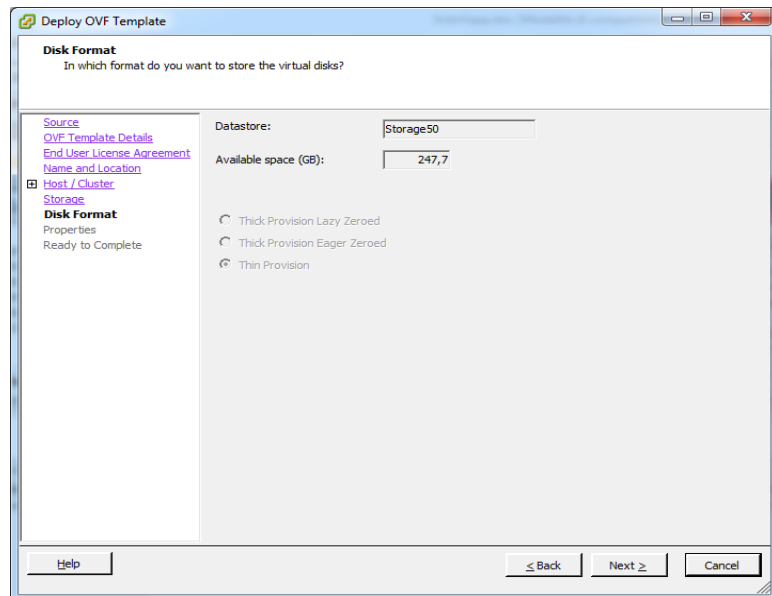


Fig. 9 Storage format for the Eco4Cloud VM

INSTALLATION ON VMWARE SYSTEMS

Clicking again on “Next” button, the choice of network parameters is available (Fig. 10). It is noteworthy that, leaving blank fields, DHCP, if previously configured in the network, will take charge of setting network parameters automatically.

The screenshot shows a window titled "Deploy OVF Template" with a sidebar on the left and a main content area. The sidebar contains a tree view with the following items: "Source", "OVF Template Details", "End User License Agreement", "Name and Location", "Host / Cluster" (which is selected and has a plus icon), "Storage", "Disk Format", and "Properties". Below the tree view, it says "Ready to Complete". The main content area is titled "Networking Properties" and contains four sections: "Default Gateway" with a text box and the instruction "The default gateway address for this VM. Leave blank if DHCP is desired."; "DNS" with a text box and the instruction "The domain name servers for this VM (comma separated). Leave blank if DHCP is desired."; "Network 1 IP Address" with a text box and the instruction "The IP address for this interface. Leave blank if DHCP is desired."; and "Network 1 Netmask" with a text box and the instruction "The netmask or prefix for this interface. Leave blank if DHCP is desired.". At the bottom of the window, there are three buttons: "Help", "< Back", and "Next >", and a "Cancel" button on the far right.

Fig. 10 Network properties

INSTALLATION ON VMWARE SYSTEMS

Finally, clicking on the “Finish” button, the import procedure will start (Fig. 11).

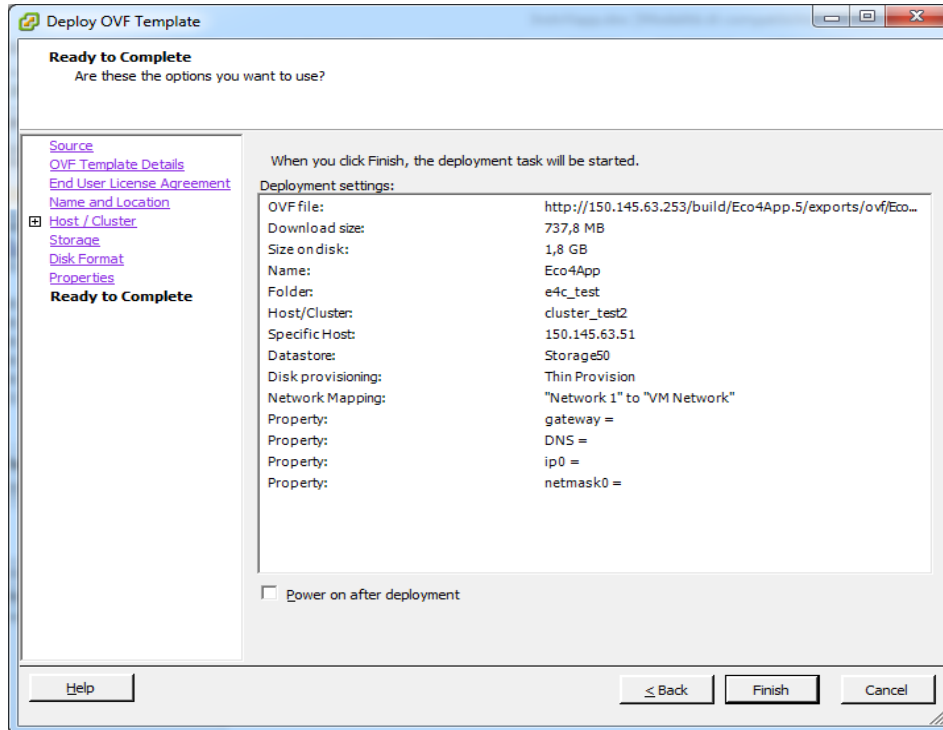


Fig. 11 Final configuration recap.

BEST PRACTICES

Once Eco4Cloud virtual appliance starts working, network communication starts between the appliance and the vCenter. For performances reasons, it is advisable to run Eco4Cloud and vCenter on the same physical machine.

In order to do that, it is possible to set affinity rules between the virtual appliance and the virtual machine where vCenter runs. Depending on vCenter installation, if the vCenter has been installed directly on a physical host, an affinity rule can be set between E4C appliance and the physical host running the vCenter.

If affinity rules are not available, it is also possible to disable consolidation of E4C virtual appliance (and optionally of the vCenter virtual machine itself) via E4C dashboard, as described in section “Virtual machines consolidation constraints”.

VAPP MANAGEMENT

VApp Management

VMWARE CONSOLE

After importing Eco4Cloud vApp into vCenter, it needs to be powered on. The first boot can be slower because the virtual machine has to install possible new Operating System updates and configure the environment. Once the boot is completed, the starting window, the console, will appear (Fig. 12).

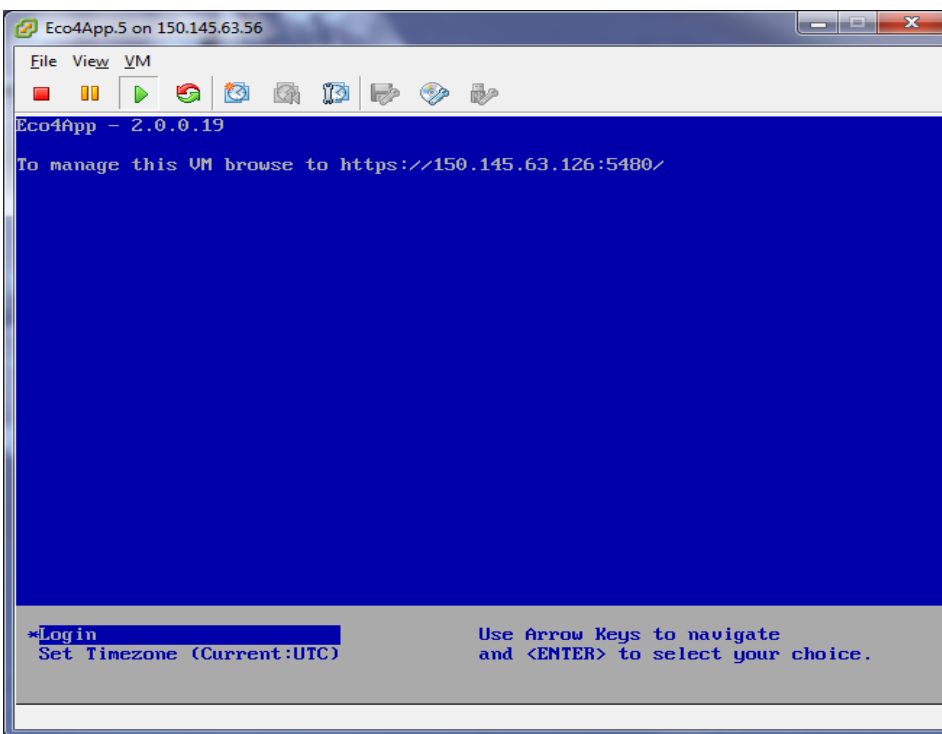


Fig. 12 Vapp Console.

VAPP MANAGEMENT

The vApp can be managed via browser, inserting the IP address, as suggested in the screen shown in Figure 12. Alternatively, the console let the user to log in into the Operating System (Ubuntu 10.4.4) or to modify time zone settings. Choosing Set Timezone the screen in Figure 13 will appear. The following screens show how to modify the time zone.

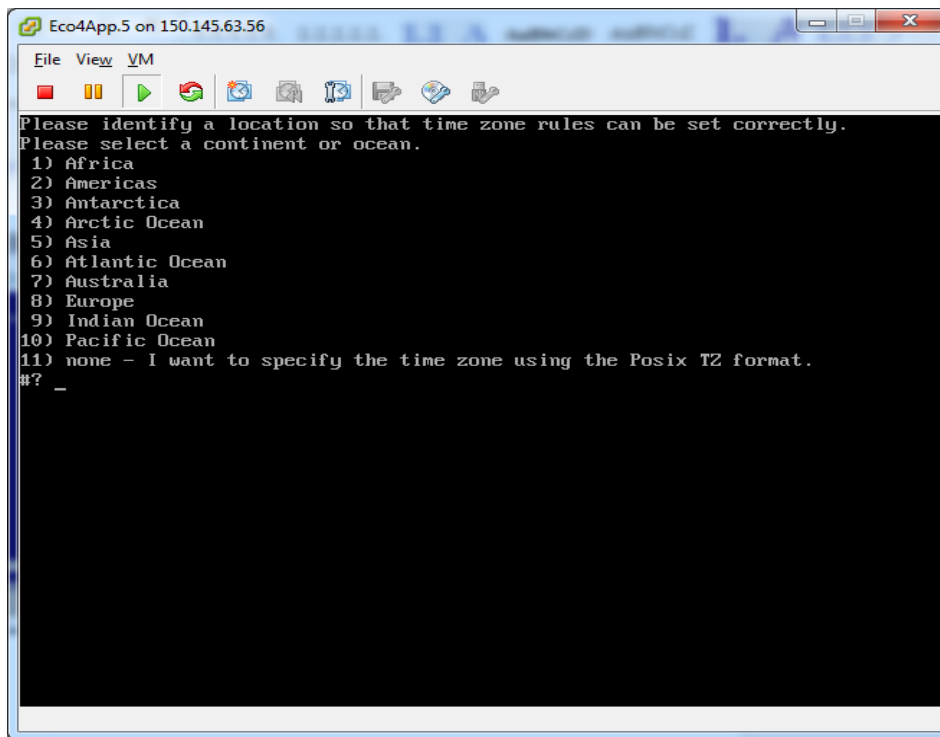


Fig. 13 Time zone modify.

VAPP MANAGEMENT

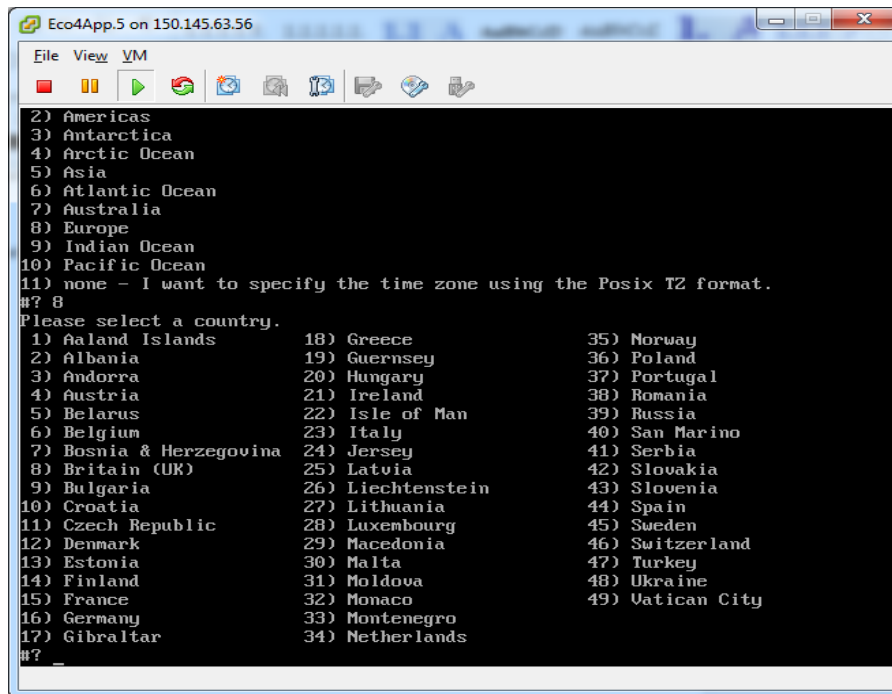


Fig. 14 Time zone modify - 2.

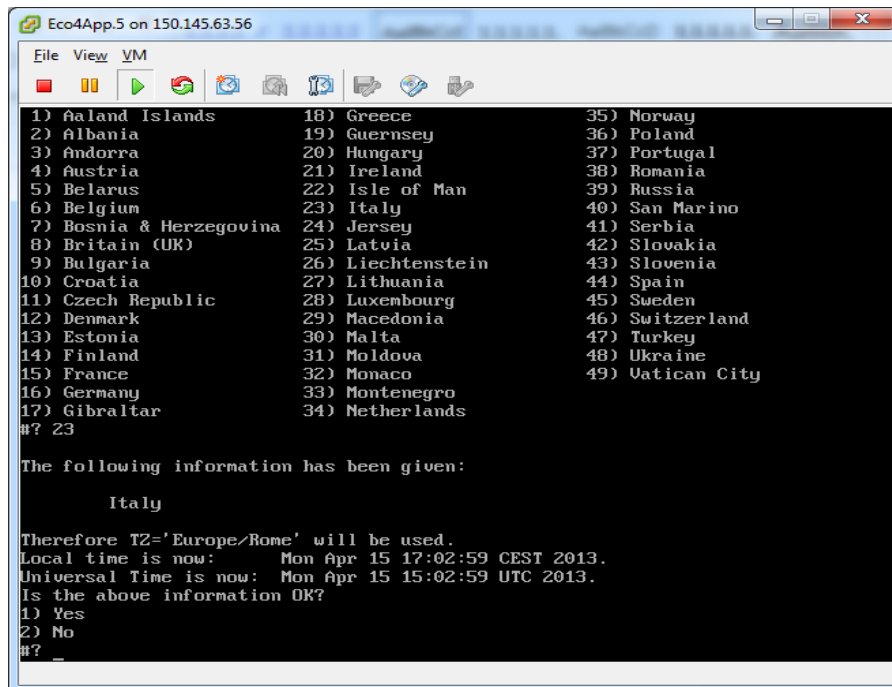


Fig. 15 Location choice.

VAPP MANAGEMENT

WEB APPLICATION

The vApp can be managed via browser, inserting the url `https://\IPAddress:5480`, as previously suggested in the screen shown in Figure 12 and using the following credentials:

- User name: **eco4cloud**
- Password: **cloud4eco**

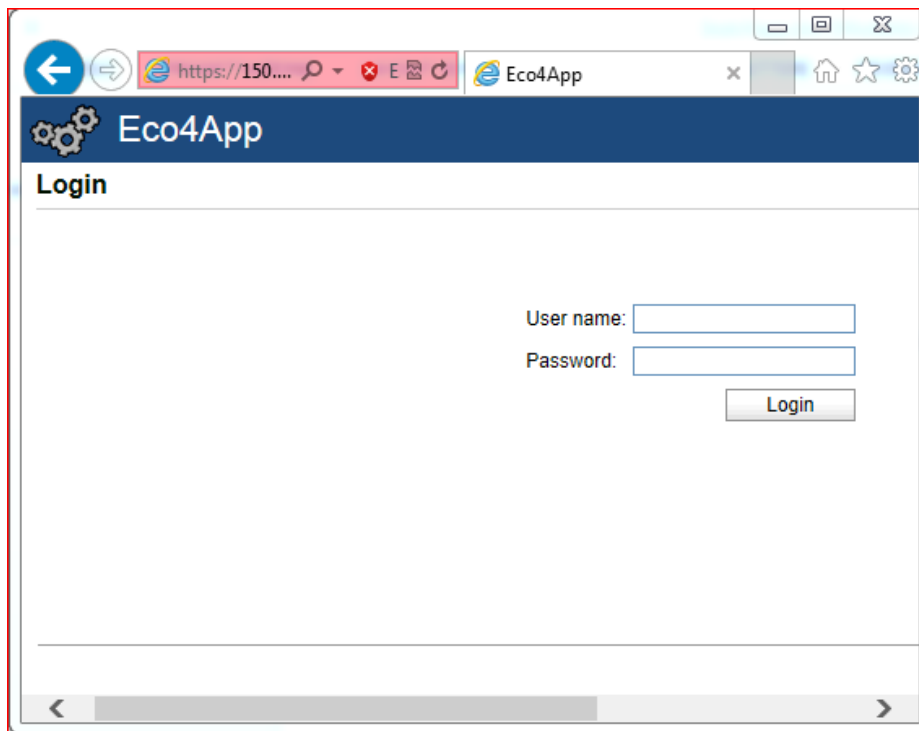


Fig. 16 Initial screen for login.

VAPP MANAGEMENT

Once the login is completed, the initial vApp screen appears, with three tabs.

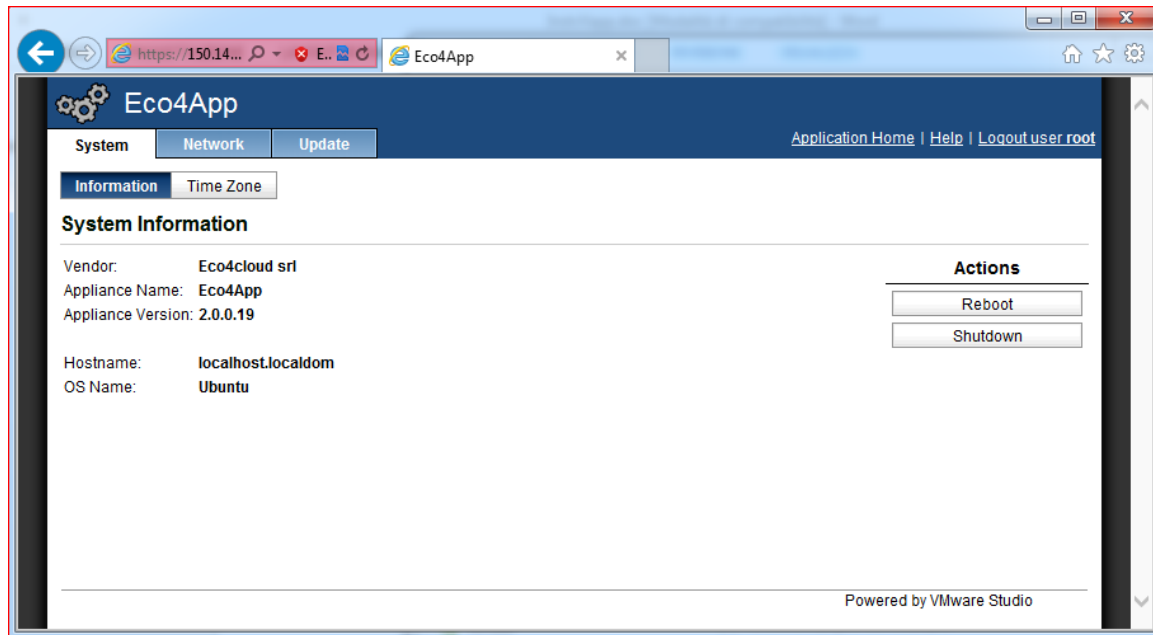


Fig. 17 Initial page for vApp configuration

VAPP MANAGEMENT

The first tab (default) is “System”, wherein all main information on software version, virtual machine name and operating system. On the right, one can find “Actions” button, useful to reboot or shutdown the vApp.

Clicking on “Time zone” button, it is possible to modify the assigned time zone. After entering all the desired settings modifications, it is necessary to press button “Save Settings”.

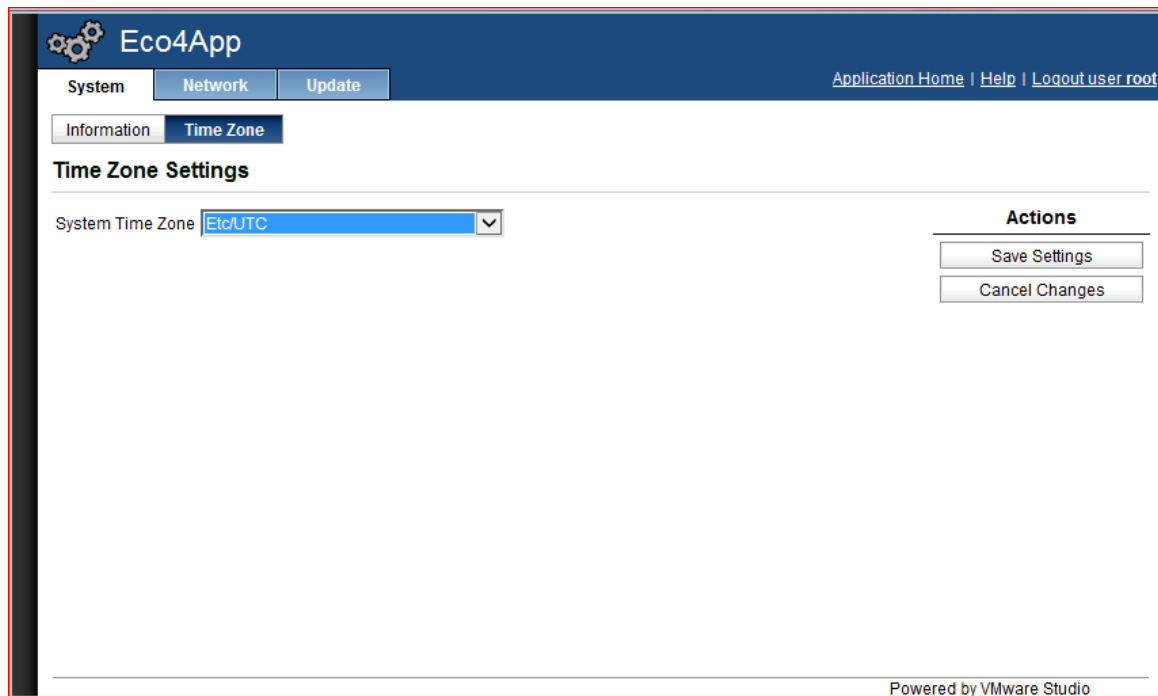


Fig. 18 Time zone modify page

VAPP MANAGEMENT

The second tab (Network) is useful to configure network, or better, to modify network settings compared to those entered during vApp installation (Fig. 10).

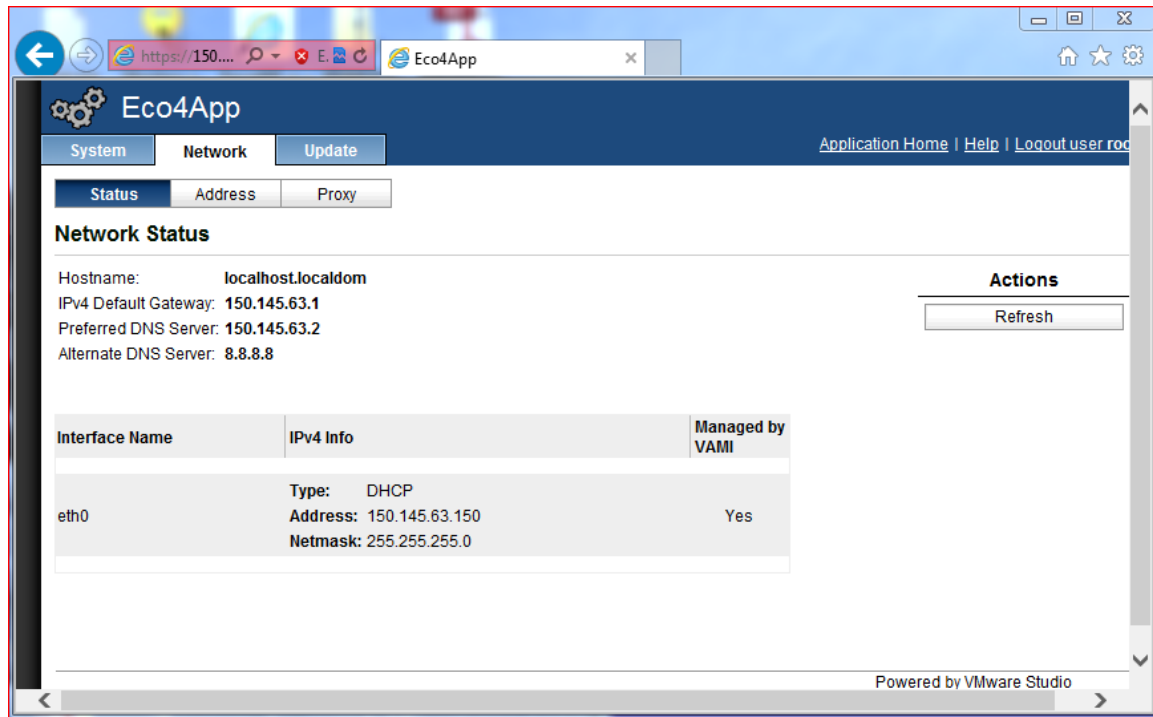


Fig. 19 Network Settings

VAPP MANAGEMENT

In the “Status” page, network settings currently used by vApp are available, as IP address, DNS address, etc. Modifying settings is possible by clicking on the “Address” button (Fig. 20).

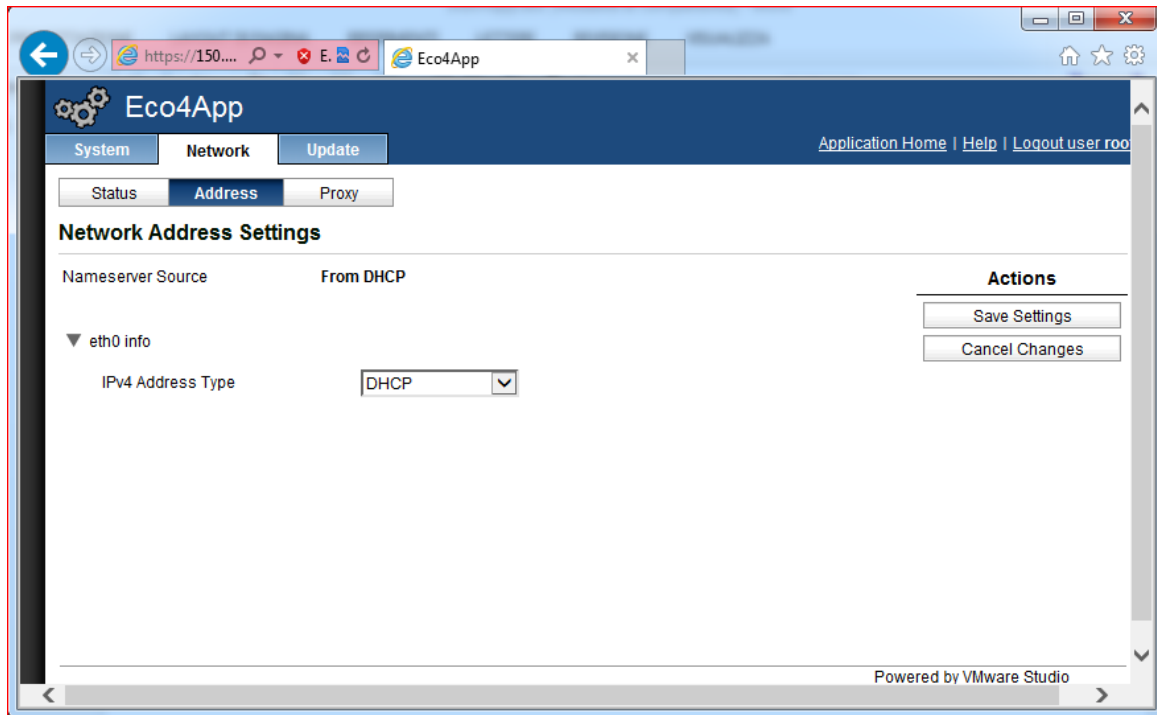


Fig. 20 Network Settings using DHCP

In the example in Figure 20, the DHCP automatically sets up network configuration, but it is possible to configure statically the network choosing a different option in the dropdown menu.

VAPP MANAGEMENT

In Figure 21 it is shown how modify the default gateway, the DNS address, the IP address, the subnet mask, and the hostname.

The screenshot shows a web browser window with the URL <https://150...> and a tab labeled 'Eco4App'. The application interface has a dark blue header with the 'Eco4App' logo and navigation links: 'Application Home', 'Help', and 'Logout user root'. Below the header, there are three tabs: 'System', 'Network' (which is active), and 'Update'. Under the 'Network' tab, there are three sub-tabs: 'Status', 'Address' (which is active), and 'Proxy'. The main content area is titled 'Network Address Settings'. It contains several configuration fields: 'Nameserver Source' set to 'From Configuration', 'Hostname' set to 'localhost.localdom', 'IPv4 Default Gateway' set to '150.145.63.1', 'Preferred DNS Server' set to '150.145.63.2', and 'Alternate DNS Server' set to '8.8.8.8'. Below these, there is a section for 'eth0 info' which includes 'IPv4 Address Type' set to 'Static', and empty fields for 'IPv4 Address' and 'Netmask'. On the right side of the settings area, there is an 'Actions' panel with two buttons: 'Save Settings' and 'Cancel Changes'. At the bottom right of the application window, it says 'Powered by VMware Studio'.

Fig. 21 manual network settings

VAPP MANAGEMENT

The last button “Proxy” allows configuring the vApp (Fig. 22) in order to surf the internet using a proxy server. To do so, check the option “Use a proxy server” and enter further requested information as IP address, port, user name and password. Finally, save all new information clicking “Save Settings”.

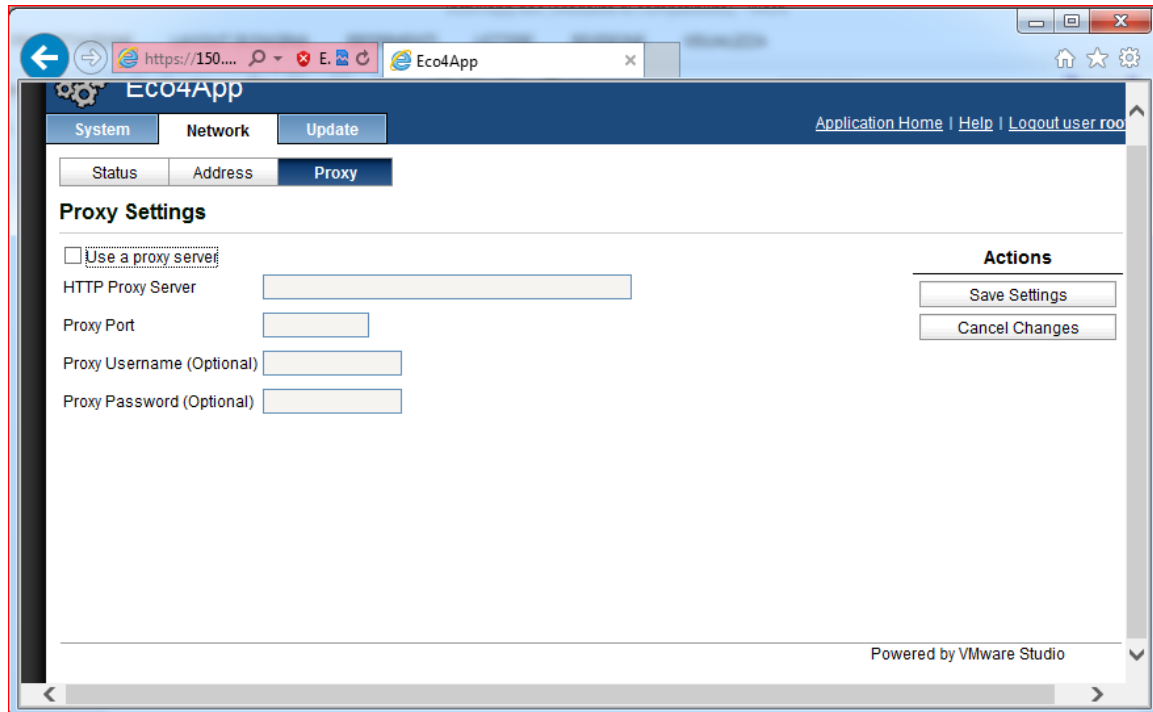


Fig. 22 Proxy server settings

UPDATES MANAGEMENT

Updates management

One of the best features of vApp is that it can be updated. The updates may include, for example, the addition of modules of the operating system or running a particular configuration script or changes in the Eco4Cloud software.

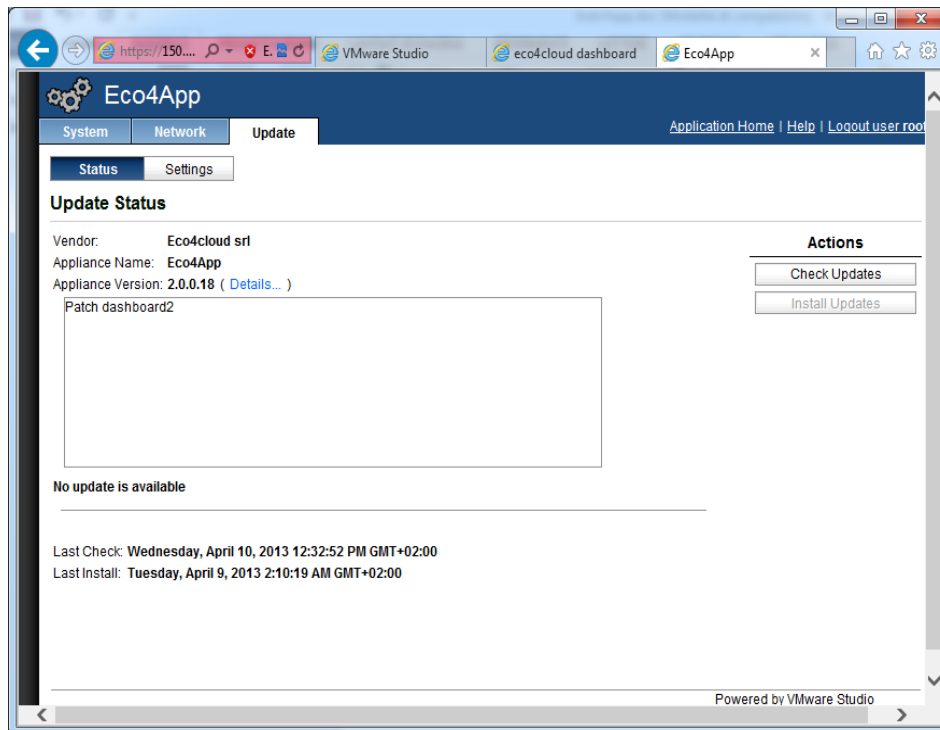


Fig. 23 Update Status and appliance version.

UPDATES MANAGEMENT

By clicking on the “Update” tab, you will see a summary page on the application version. Before you can check for new updates you need to click on the “Settings” button and verify all the parameters.

The configuration page allows you to automate or semi-automate or manual leaving all the updates management. By default, automatic updates are not enabled (Fig. 24).

You can change the settings and choose "Automatic check for updates" with which the vApp periodically checks whether new updates have been published, but not install them. The installation is carried out manually by clicking on the button "Install updates" from the first screen (Fig. 23). Finally, if you want to fully automate you have to select "Automatic check and install updates" and choose the frequency and time.

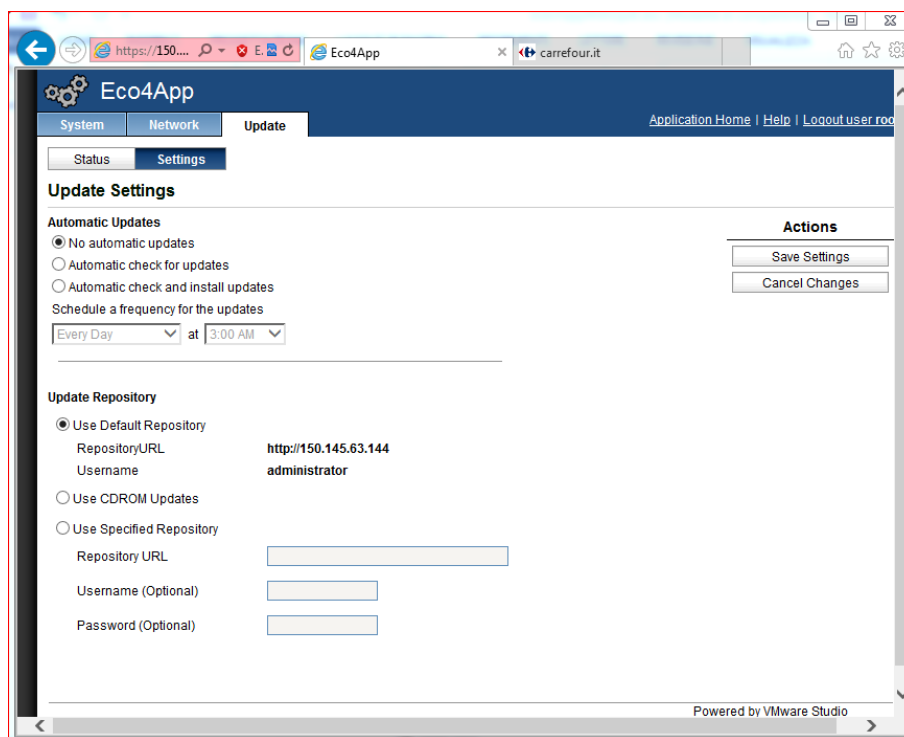


Fig. 24 Automatic updates management

UPDATES MANAGEMENT

At the bottom of the screen you have to choose the update repository. By default it is configured eco4cloud company repository server. Otherwise, if the vApp does not have internet access, Eco4Cloud will send a CD-ROM with the updates, and then you need to select “Use CD-ROM Updates”. Finally, if the URL of the repository changes, you will need to select “Use Specified Repository”, writing the new url and login credentials.

As stated above, for manual installation or a manual check for updates, click on the “Status” button back to the previous page, and then click “Check Updates” and “Instll Updates” (Fig.25). If new updates are available, anotify appears with the words “Available Updates” and the serial number of the new software version.

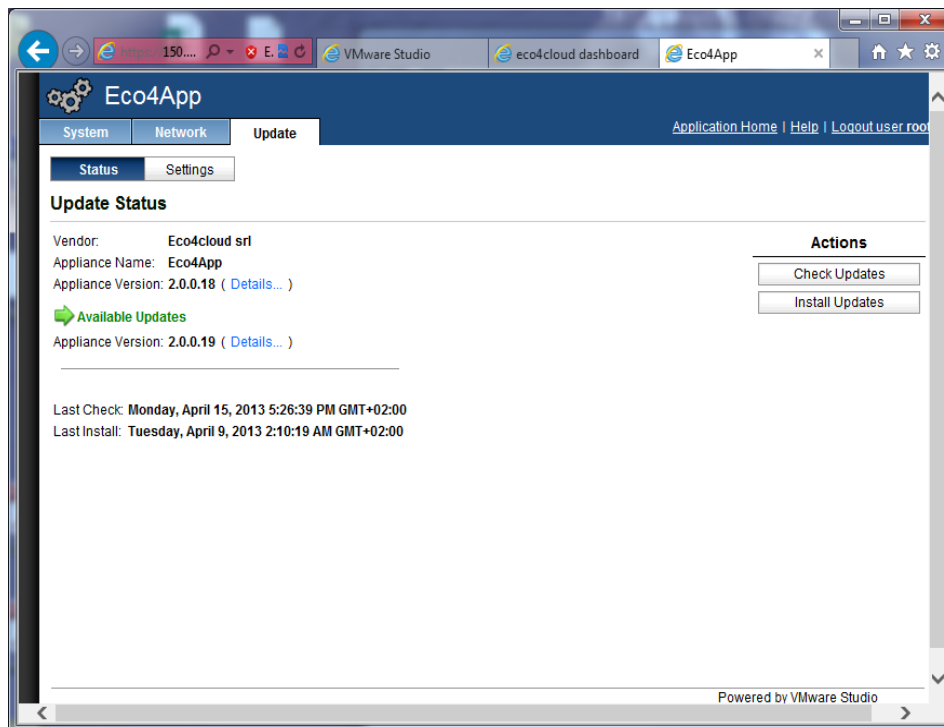


Fig. 25 Updates check

UPDATES MANAGEMENT

Figures 26 and 27 illustrate the process of updates installation.

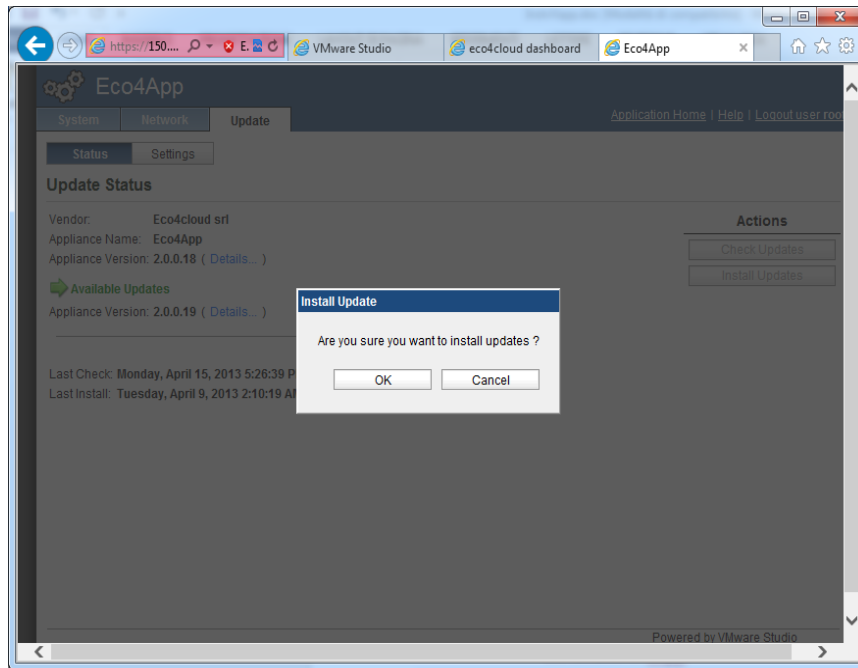


Fig. 26 Update process

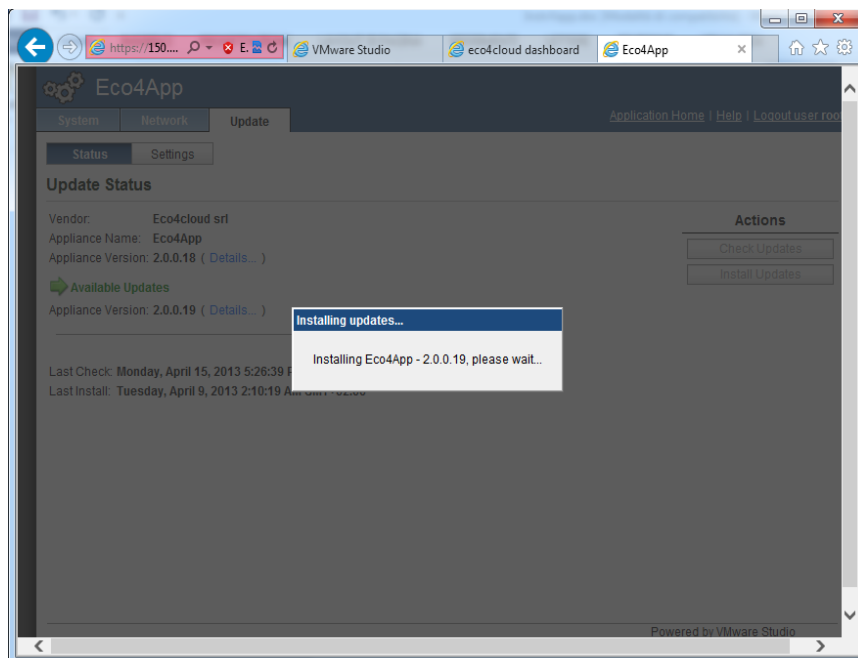


Fig. 27 Updates installation

UPDATES MANAGEMENT

UPDATES LOGS.

If for some reason the updates were not installed properly will need to check the logs. In order to do this, you need to access the console or via ssh to vApp and read files `updatecli.log` and `vami.log` in the `/opt/vmware/var/log/Vami` folder.

SETUP OF A PROXY UPDATE SERVER

It's possible to maintain independently a proxy server for Eco4cloud vApp updates management. The only prerequisite is to have a web server available. In case of Windows environments the web server may be **IIS** web server, in case of Linux environments this may be **Apache** web server.

Once you have successfully configured the web server, simply copy the two folders for managing updates, **manifest** and **package-pool**, in the web server root folder. These will be sent in a zip file. The customer has to properly explode it in the root of the web sever. The example below shows a possible configuration.

A "Ecorep" site was created and the two folders, **manifest** and **package-pool**, copied in it. In this example the Ecorep site is available via the url `http://<name-of-server>` or `http://<server-ip-address>`.

All the network communications will take place through HTTP protocol on TCP port 80.

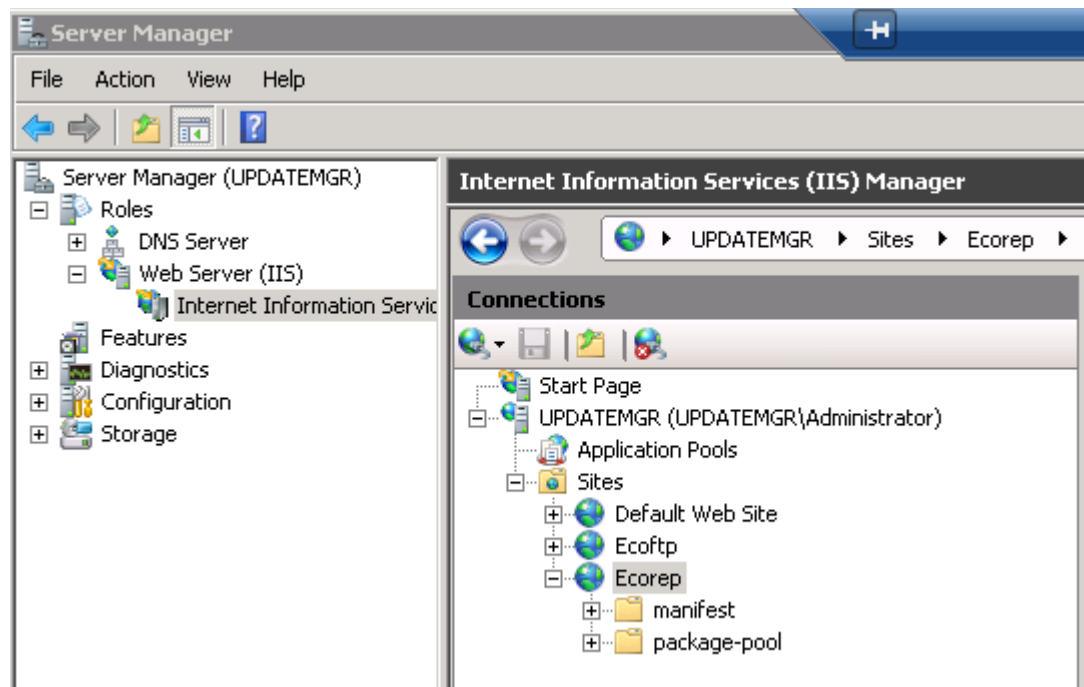


Fig. 28 Example of IIS configuration for update

INITIAL SETUP OF ECO4CLOUD DASHBOARD

Initial setup of Eco4Cloud dashboard

Once Eco4Cloud virtual appliance is installed, it is possible to access it remotely, via browser, entering the url `https://IPaddress of the virtual machine`, either assigned by DHCP, or entered manually.

The first requirement is to log in the Eco4Cloud dashboard, filling the module shown in Figure 29. Each Eco4Cloud virtual appliance comes with the following default credentials:

- User name: **admin**
- Password: **cloud4eco**

After logging in for the first time, a simple wizard will help you to change admin password and to configure the Eco4cloud dashboard.

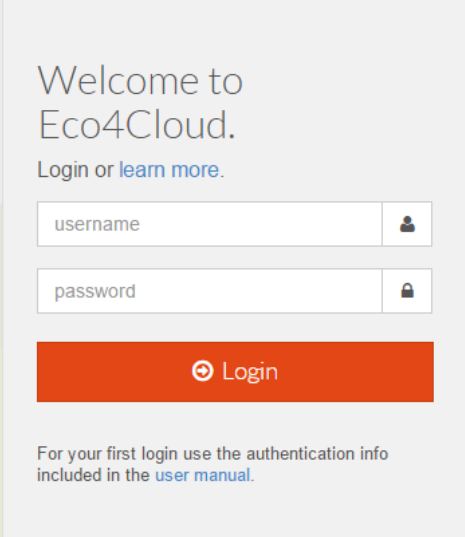
The image shows a login form for the Eco4Cloud dashboard. At the top, it says "Welcome to Eco4Cloud." followed by "Login or [learn more](#)." Below this are two input fields: "username" and "password", each with a small icon to its right (a person icon for username and a lock icon for password). Below the input fields is a large orange button with a white circular arrow icon and the text "Login". At the bottom, there is a note: "For your first login use the authentication info included in the [user manual](#)."

Fig. 29 Eco4Cloud Dashboard Login

After changing admin password, you have to compile a form (Fig. 30) with company info, such as Company name (the only mandatory field), company website, a brief description of the company, and finally you can add Company logo

INITIAL SETUP OF ECO4CLOUD DASHBOARD

The screenshot shows the 'Company' step of the initial setup. At the top, a progress bar indicates five steps: 1. Change Password, 2. Company (active), 3. Server Farm, 4. Virtual Farm, and 5. Smtip. The main heading reads 'You are logged as **admin**, please set your Company Informations'. Below this, there are three input fields: 'Company Name (*)' with the value 'Eco4Cloud', 'Company Website' with the value 'www.eco4cloud.com', and 'Company Description' with the placeholder text 'Please, insert your Company description'. At the bottom, there is a preview of the company logo, a file upload section showing 'images.jpeg_preview' (107 X 90 - 2.39 KB) with a 'Delete' button, and a 'Next' button. A note at the bottom states '(*) Required fields'.

Fig. 30 First login form

The next step is to configure your Server Farm, inserting a Farm Name and a brief description (Fig. 31) useful if you will work with several farms at the same time.

The screenshot shows the 'Server Farm' step of the initial setup. The progress bar at the top now highlights step 3, 'Server Farm'. The main heading reads 'You are logged as **admin**, please set your Server Farm Informations'. Below this, a descriptive text states: 'A Server Farm is a logical container of Virtual Farms, useful to identify your company environments (production, test and dev, etc)'. There are two input fields: 'Server Farm Name (*)' with the value 'My Server Farm' and 'Description'. At the bottom, there is a 'Next' button and a note stating '(*) Required fields'.

Fig. 31 Farm Information

In the next step another form (Fig. 32) collect data about your Virtual Farm, such as Ip address, username and password to gain access to your virtual farm.

INITIAL SETUP OF ECO4CLOUD DASHBOARD

The screenshot shows the 'Virtual Farm' setup page. At the top, a progress bar indicates the steps: 1 Change Password, 2 Company, 3 Server Farm, 4 Virtual Farm (current), and 5 Smtip. The main heading is 'You are logged as **admin**, please set your Virtual Farm Informations'. Below this, a note states: 'A Virtual Farm is a centralized platform, such as VMware vCenter Server, for managing virtualized environments.' The form contains five input fields: 'Virtual Farm Name (*)' with the value 'My Virtual Farm', 'Virtual Farm Description' (empty), 'Virtual Farm Address (*)' with the value 'myVcenterAddress', 'Virtual Farm Username (*)' with the value 'user@vsphere.local', and 'Virtual Farm Password (*)' (masked with dots). Below the fields is a radio button for 'Virtual Farm' with 'VMWare VSphere' selected. A legend indicates that (*) denotes required fields. A 'Next' button is at the bottom right.

Fig. 32 Virtualization Platform information

After clicking on next button, you can configure your SMTP server (Fig. 33) settings or skip this step and configure it afterwards, as explained in the Mailer paragraph of Administration panel section of this manual

The screenshot shows the 'SMTP configuration' page. The progress bar at the top shows steps 1 Change Password, 2 Company, 3 Server Farm, and 4 Virtual Farm. The main heading is 'You are logged as **admin**, please set your SMTP Server'. Below this is an orange warning icon followed by the word 'ADVICE'. The text reads: 'You need to configure both an SMTP Server and a list of receiver addresses for E4C automated mails'. A note in italics says: 'Configure your SMTP server now to obtain monitoring reports, configuration issues alerts and performances improvement advices for your Server Farms.' At the bottom, there are two buttons: 'Configure Later' (red) and 'Configure Now' (blue with a right arrow).

Fig. 33 Smtip configuration

After few seconds, E4C will begin to collect data performances and if you click on your configured Virtual Farm the following popup (Fig. 34) appears.

INITIAL SETUP OF ECO4CLOUD DASHBOARD

E4C is collecting the usage history of your server farms. A consolidation scenario will be available within minutes in the consolidation scenarios tab in the company page. ✕

If you already configured your **mail server** and your **email address** you will also receive it in your inbox.

OK

Fig. 34 Data collecting popup

Once the configuration wizard is completed, monitoring begin to collect performance data.

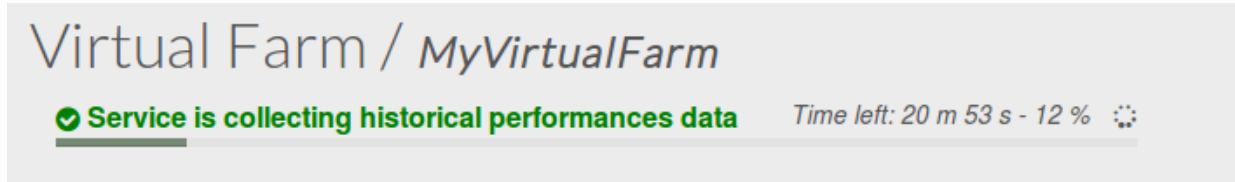


Fig. 35 Performances data collection.

MONITORING

Monitoring

When the user logs into the dashboard all Eco4Cloud products (Monitor, Workload Consolidation, Troubleshooter, CDSM) appear on the top of the page. At the very beginning, only **Monitor** product is active and free for use.

After the historical performances data have been completely collected, you can start working with the dashboard. On the left top side of the home page you will see the resources inventory of your **farm**.

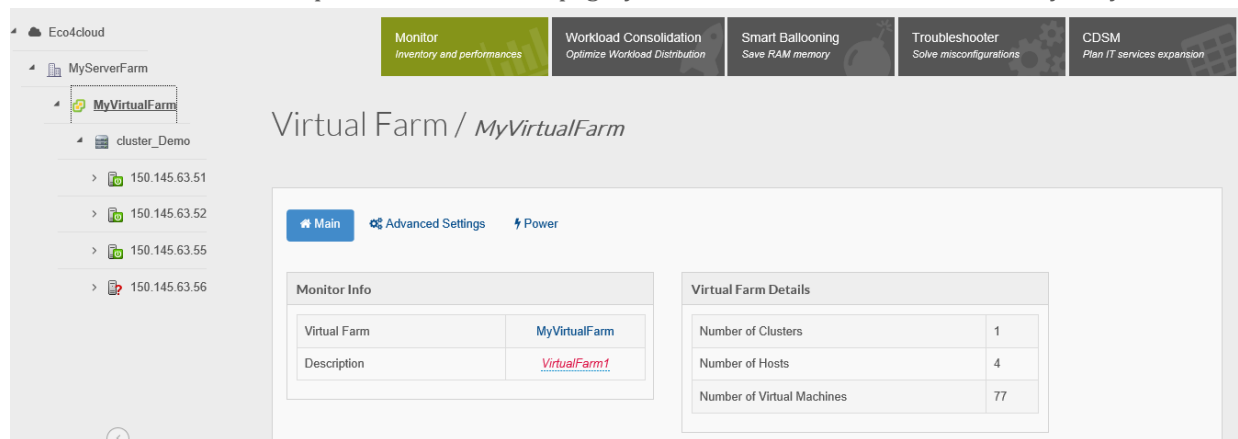


Fig. 36 Dashboard Home

In the **Main** tab, after two info panes, three charts are available: **Cpu and Ram utilization Performances**, **Cpu Ready Time** and **Ballooned Memory**. **CPU Ready time** is a metric showing how much time virtual CPU is ready to be scheduled onto a physical (or HT) core by the CPU scheduler. **Ballooned Memory** is the RAM Memory reclaimed by Vmware balloon driver. The user can monitor both performance metrics, allowing knowing when they get too high: this is a symptom of contention on CPU and memory, respectively.

You can change any Virtual farm information, including **Virtual Farm name** and **description**, **IP**, **username** or **password**, by clicking on **Virtual Farm** in the resources inventory and then on Advanced Settings. After modifying parameters, you can click on **update** button.

MONITORING

Main Advanced Settings Power

Global Settings

Virtual Farm name	MyVirtualFarm
Virtual Farm description	VirtualFarm1

Edit Virtual Farm Settings Update

Virtual Farm IP address	150.145.63.60	
Username	eco4cloud	
Password	••••••••	

Fig. 37 Performances data collection.

RESOURCE MAIN TAB

After selecting a resource in the **resource inventory** on the left side of main window, further information and details will be shown in the right pane. For example, clicking on a host (Fig. 38) the status of VMs belonging to will be shown. Moreover **Host Details** pane will show some hardware and software information about the host.

Monitor Info

Host name	150.145.63.51
Description	Set Value

Host Details Show more properties

Number of Powered ON VMs	5
Number of Powered OFF VMs	10
Number of Suspended VMs	0
Number of VMs Templates	1

Virtualization Software Version	VMWare 5.0.0
Host Power State	Powered On
Vendor	Supermicro
Model	X8DTT-IBX
Processor Model	Intel(R) Xeon(R) CPU E5520 @ 2.27GHz
Number of CPU Sockets	2
CPU Frequency	2266.00 MHz
Number of CPU cores	8
RAM	24 GB
% CPU utilization	6.00%
% Memory utilization	92.20%

Fig. 38 Resource properties

MONITORING

RESOURCE POWER TAB

Alongside Main tab you find **Power** tab (Fig. 39); it collects three charts: **Power monitoring compliance** that shows the number of Hosts compliant with the power consumption monitoring feature, **Average power consumption** (Fig. 39) that shows the power consumption of the hosts compliant with the power consumption monitoring feature, **Overall power consumption** shows the sum of the host power consumption measured in Wh per Host per day.

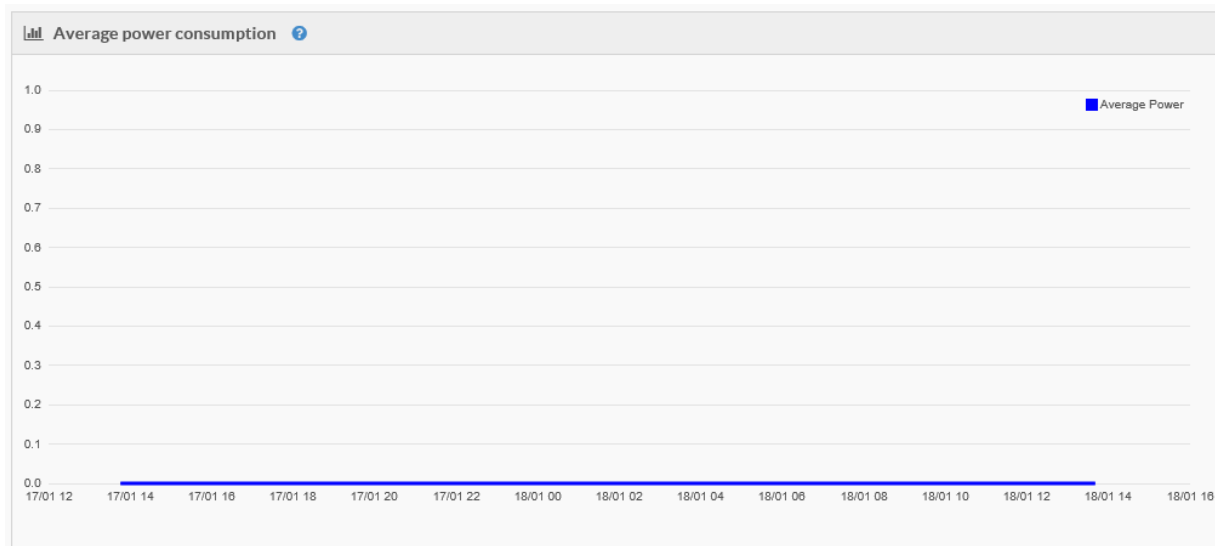


Fig. 39 Average power consumption

COMPANY PAGE

After clicking on your company, in the resource inventory, a details page appears with three tabs that contain different information respect other resources.

Main tab

The main tab shows a new Index for the Computational Efficiency of Data Center: the HUE (Host Usage Effectiveness)(Fig. 40). The **HUE index** is the ratio of the number of servers actually used to the *minimum number of servers* that could be used to support the same load if they were used at full capacity. So it indicates the computational efficiency. An HUE=1 means that the computational efficiency is optimal; HUE=2 means that the number of utilized servers is twice the number of servers strictly necessary to support the same workload.

MONITORING

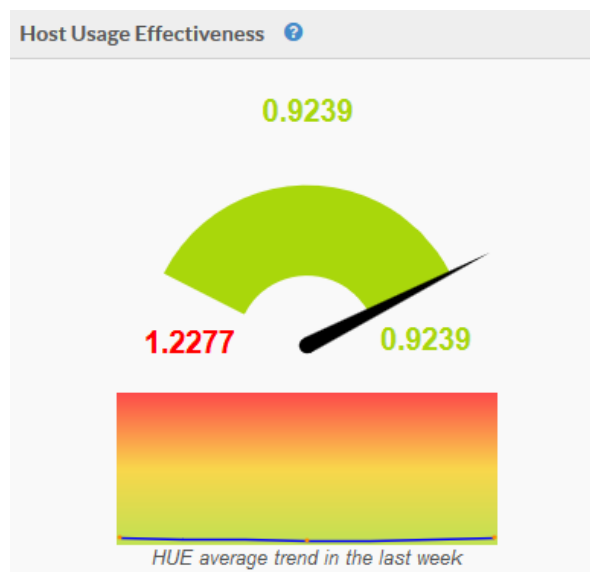


Fig. 40 Host Usage Effectiveness

Beside the HUE you can find the table **Achievable results**. It shows a summary of improvements achievable using eco4cloud. The last row contains the last automatic generated consolidation scenario report. Two reports are automatically generated on 2nd and 16th day of a month. Finally, you can find **Assets Details** table. It includes a summary of the assets of your farms.

Advanced settings

In advanced settings tab you can manage your server farms. By using the proper buttons, you can add or delete a server farm.

Consolidation Scenarios

It is a feature that allows simulating Eco4cloud Workload Consolidation in your own farm. In this pane you can find the **New Consolidation Scenario** button (Fig. 41) and a list of the previous consolidation scenarios.

The screenshot shows the 'Consolidation Scenario' tab in the Eco4cloud interface. It includes a 'Scenarios List' table with columns for Name, Creation Date, Start Date, End Date, Ta, Th, and Status. A 'New Consolidation Scenario' button is visible in the top right corner of the table area.

Name	Creation Date	Start Date	End Date	Ta	Th	Status
Automatic Consolidation Scenario of 2015-10-16	2015-10-16 23:18	2015-10-02	2015-10-16	80.0	90.0	COMPLETED

Fig. 41 Simulation list window

MONITORING

After clicking on **New consolidation scenario** button, a wizard pops up to configure a new simulation (Fig. 42). In a multifarm environment, you can select one or more Server Farms and within them you can choose which Virtual Farms will take part in the scenario.

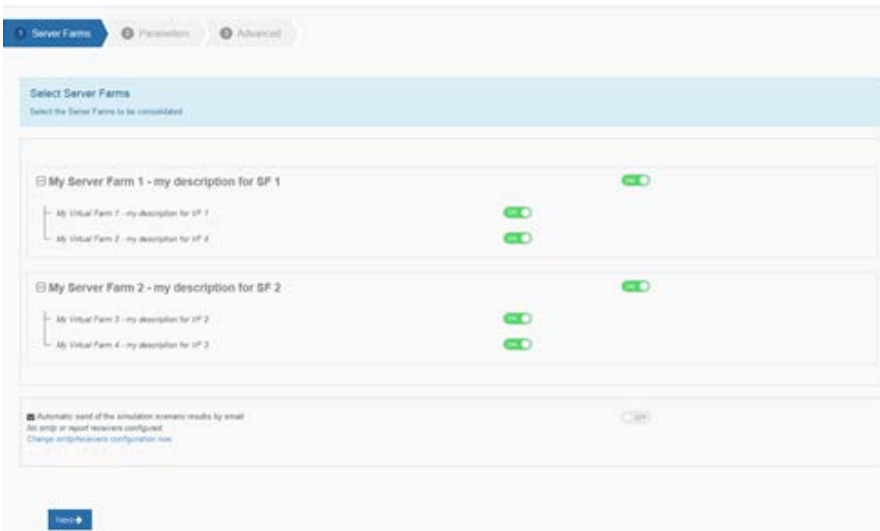


Fig. 42 Simulation list window

If you configured SMTP server, you can switch on “Automatic send of the simulation results by email” in the last pane. In the next step, fill the **Simulation name** field, **Target Resource Simulation** (E4C Workload Consolidation will optimize host utilization up to this value) and **Maximum Resource Utilization** (E4C Workload Consolidation will migrate VMs away from hosts with utilization rates higher than this value) finally choose **Start Date** and **End Date** (both not older than two weeks) of simulation (Fig. 43).

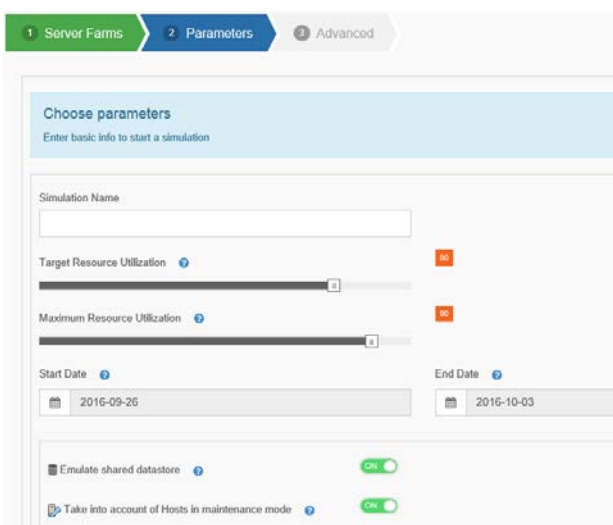


Fig. 43 Simulation Parameters

MONITORING

Finally you can set two other switches:

- **Emulate shared datastore:** If enabled, a shared datastore is emulated for each Cluster
- **Take into account of Hosts in maintenance mode:** If enabled, all VMs are migrated out when a Host enters in maintenance mode. Also the host cannot be switched off.

In the next step, **Advanced settings** of clusters, servers and VMs can be set. For servers and VMs you can decide to switch on/off **Consolidation** and automated **StandBy** for idle hosts, for each **cluster** you can set the minimum host number that must be always on (Fig. 44).

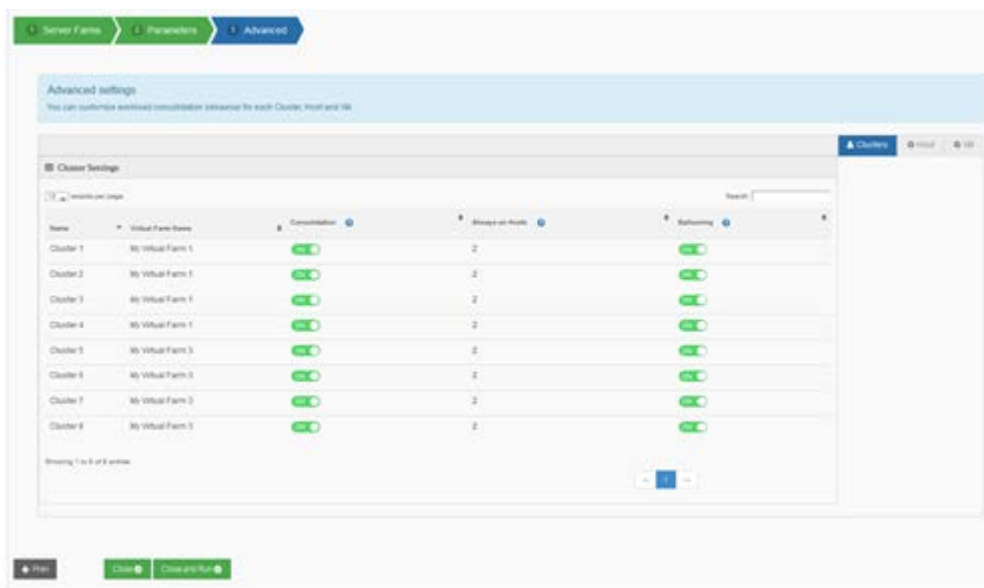


Fig. 44 Advanced simulation Parameters

Clicking next, simulation runs and results are shown in a downloadable pdf document, or clicking on the view link on the popup.

MONITORING

SIMULATION RESULTS

The results are divided in four sections: **Test Description**, **Resources utilization without Eco4Cloud**, **Resources utilization using Eco4Cloud** and an appendix with scenario parameters details .

Resources utilization without Eco4Cloud

This section reports four graphs:

- The first chart is **Average CPU and RAM utilization of the hosts before using Eco4Cloud** and it shows the average CPU utilization of the hosts during the monitoring period. It also shows the average RAM allocation (again in percentage with respect to the total amount of RAM) of the servers.
- The second chart is **Average power consumption of each server**. Eco4Cloud is able to collect hosts power consumption data, so the overall power consumption of the physical hosts in the data center and the overall energy consumption per host per day can be reported.
- The third chart reports the **CPU ready time**. VMWare has set two thresholds for the CPU ready time of a VM: 5% is a warning threshold, while 10% represents an alert.
- The fourth chart reports the **amount of ballooned memory**. VMWare specifies that the presence of ballooned memory should be avoided, even if a small presence of memory ballooning is not a sign of serious memory contention

Resources utilization using Eco4Cloud

This section includes two charts:

- The first chart is the **Number of active servers with and without Eco4Cloud** (Fig. 45) and it reports the number of active servers, with and without the use of Eco4Cloud.
- The second chart is the **Number of overload prevention and workload consolidation migrations per hour** and it reports the number of migrations per hour in the whole data center during the week of simulated Eco4Cloud operations.

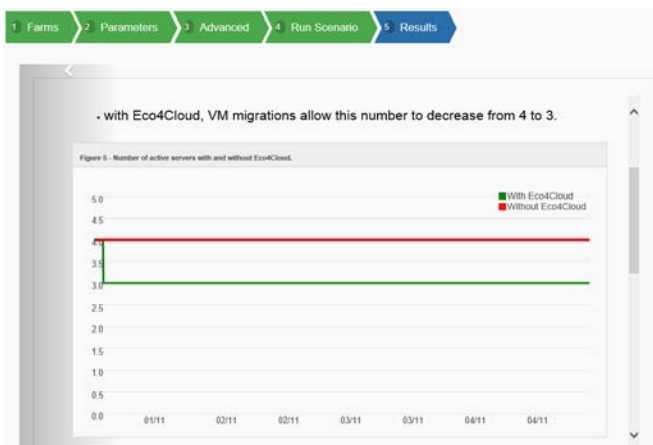


Fig. 45 Number of active servers with and without Eco4Cloud

MONITORING

Appendix

This section includes all clusters details by means of tables that contain:

- **Hardware configuration:** Number of hosts, Cores per Host, Ram per Host
- **CPU Usage:** Minimum, Average and Maximum percentage of use
- **Memory Usage:** Minimum, Average and Maximum percentage of use
- **CPU Ready Time:** Minimum, Average and Maximum percentage
- **Host switch On/Off:** when a host was put in stand-by mode or resumed by Eco4Cloud

ADMINISTRATION PANEL

Administration Panel

In the right top of home page, there is the Menu' for **changing** admin **password**, **logout** from session and **Administration panel**.

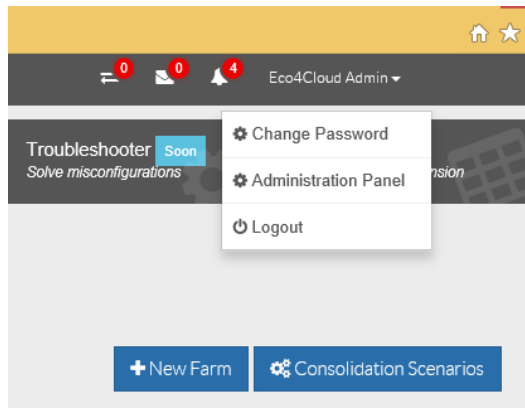


Fig. 46 Right top Menu

The administration panel allows you to manage **products licenses**, **mailer**, **users**, **Advanced configurations** and **Support**.

LICENSES

In the license section, you can find all licensed products, license expiration date, number of hosts supported, current active licenses, residual licenses number and the license status. To add or upgrade a license (Fig. 47) you have to contact Eco4Cloud by clicking on **Request License** button.

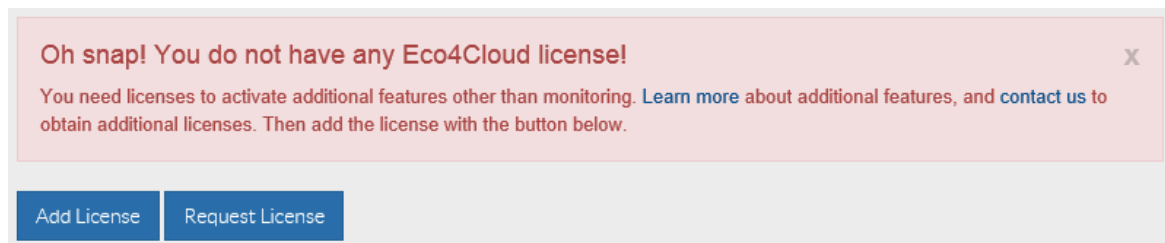


Fig. 47 Add or request a license

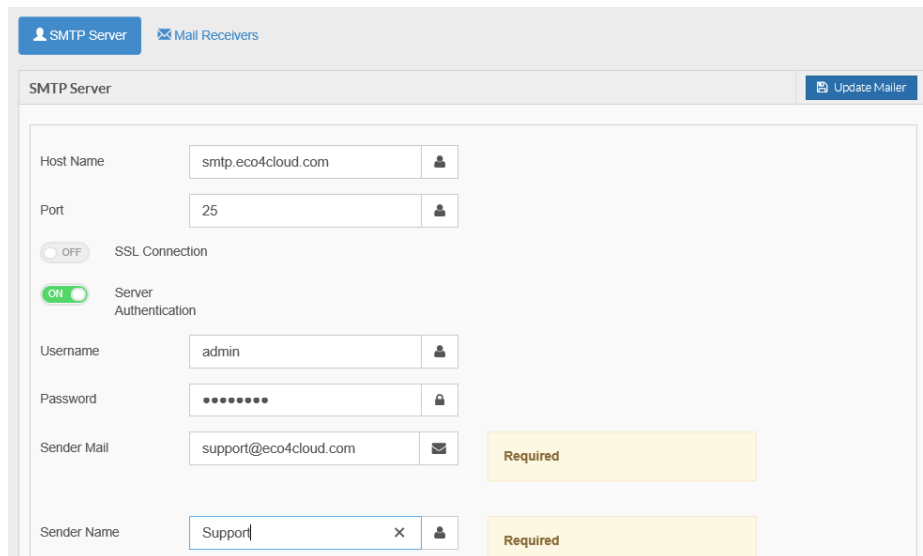
A pre-compiled form appears and you have just to specify which product you want to license, then press **Send** button to email to eco4cloud support your request. The same form appears if you click on a (unlicensed) product button and click on **Request Trial License Now!** button in the popup. If you have not configured the smtp server in the mailer section yet, you have to compile the form and then click on the link just below send button and follow the instruction.

ADMINISTRATION PANEL

MAILER

The Fig. 48 shows mailer configuration panel. Eco4Cloud sends periodical reports of its activity and immediately notifies users of possible malfunctions. In order to obtain this service, the user needs to configure the mail service.

Host name, **port**, **sender mail** and **sender name** are mandatory fields. If you enable Server Authentication, you have to fill **Username** and **password** field too. If you use an SMTP server that requires an encrypted session, you have to switch on **SSL Connection**.

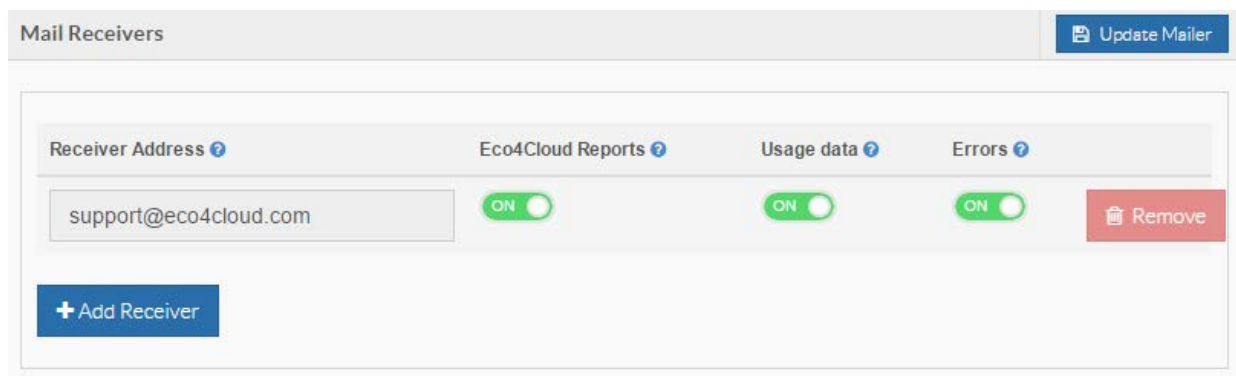


The screenshot shows the 'SMTP Server' configuration panel. At the top, there are two tabs: 'SMTP Server' (selected) and 'Mail Receivers'. Below the tabs, there is a 'Update Mailer' button. The main configuration area includes the following fields and controls:

- Host Name:** A text input field containing 'smtp.eco4cloud.com' with a user icon on the right.
- Port:** A text input field containing '25' with a user icon on the right.
- SSL Connection:** A toggle switch currently set to 'OFF'.
- Server Authentication:** A toggle switch currently set to 'ON'.
- Username:** A text input field containing 'admin' with a user icon on the right.
- Password:** A text input field with masked characters (dots) and a lock icon on the right.
- Sender Mail:** A text input field containing 'support@eco4cloud.com' with an envelope icon on the right. A yellow 'Required' label is positioned to the right of the field.
- Sender Name:** A text input field containing 'Support' with a close icon (X) and a user icon on the right. A yellow 'Required' label is positioned to the right of the field.

Fig. 48 Mailer configuration

In the **Mail receivers** section you can add the email address of users that will receive **Reports**, **usage data**, **Errors** generated by eco4cloud service. The section also to modify/remove a recipient (Fig. 49), and to enable or disable the message dispatch of each category.



The screenshot shows the 'Mail Receivers' configuration panel. At the top, there is a 'Update Mailer' button. Below it, there is a table with columns for 'Receiver Address', 'Eco4Cloud Reports', 'Usage data', and 'Errors'. Each column has a help icon (question mark). The table contains one row with the email address 'support@eco4cloud.com'. For each category, there is a toggle switch set to 'ON'. A red 'Remove' button with a trash icon is located to the right of the row. Below the table, there is a blue '+ Add Receiver' button.

Receiver Address ?	Eco4Cloud Reports ?	Usage data ?	Errors ?
support@eco4cloud.com	ON	ON	ON

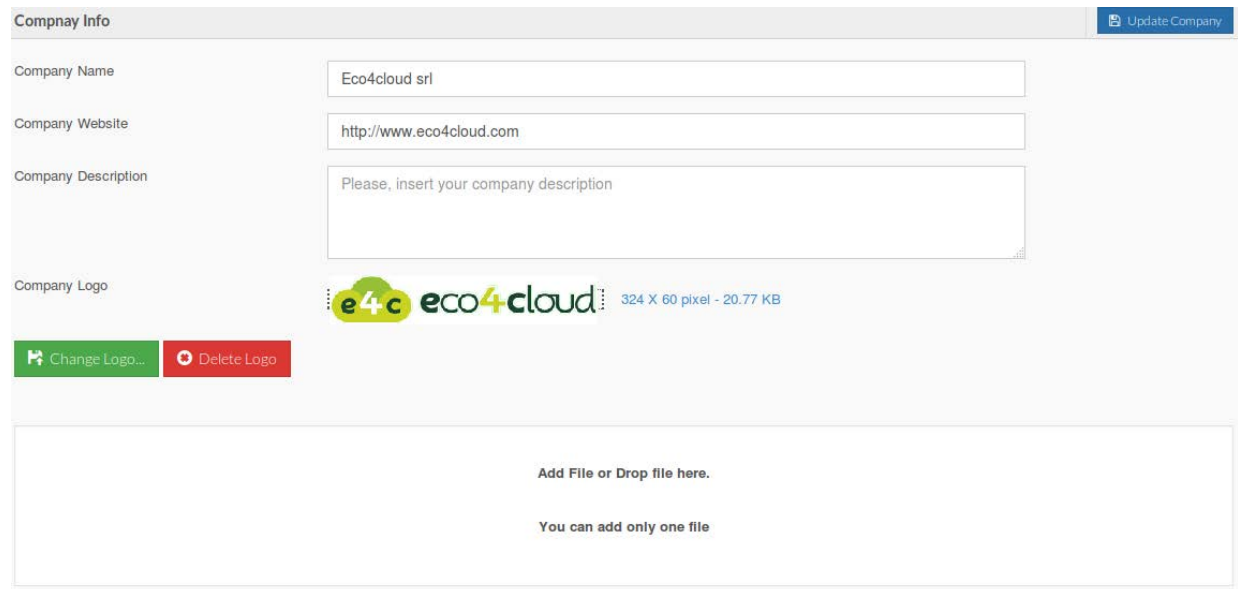
+ Add Receiver

Fig. 49 Mail Receivers

ADMINISTRATION PANEL

COMPANY INFO

The **company info** section (Fig. 50) shows the information about your company. All data can be edited. After completing click on update company button to save your changes.

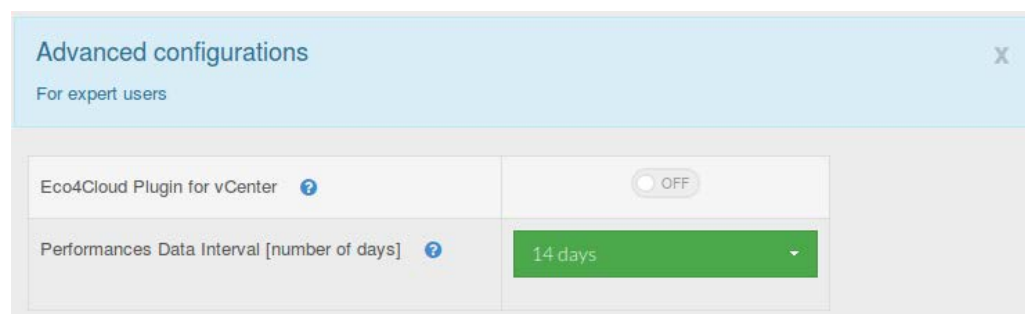


The screenshot shows the 'Company Info' section of the administration panel. It features a header bar with the title 'Company Info' and an 'Update Company' button. Below the header, there are four input fields: 'Company Name' (containing 'Eco4cloud srl'), 'Company Website' (containing 'http://www.eco4cloud.com'), 'Company Description' (containing 'Please, insert your company description'), and 'Company Logo' (displaying the 'eco4cloud' logo). Below the logo field, there are two buttons: 'Change Logo...' and 'Delete Logo'. At the bottom of the section, there is a large empty box with the text 'Add File or Drop file here.' and 'You can add only one file'.

Fig. 50 Company info

ADVANCED CONFIGURATIONS

This section shows other advanced configurations of Eco4cloud dashboard (Fig. 51). The first switch permits to install Eco4cloud plug-in in the vClient. After switched on a new eco4cloud item appears when you right click a resource as a host or a VM. By clicking on Eco4cloud menu' you can manage all Eco4cloud parameters from vmware vclient. **Performance Data Interval**, permits to specify the number of days (starting from now to backward) in order to save performances data on database. Performances data are used to run consolidation scenarios and/or CDSM scenarios. More days require more datastore allocation for eco4cloud Virtual appliance.



The screenshot shows the 'Advanced configurations' section of the administration panel. It features a header bar with the title 'Advanced configurations' and a close button. Below the header, there are two configuration items: 'Eco4Cloud Plugin for vCenter' with a toggle switch set to 'OFF', and 'Performances Data Interval [number of days]' with a dropdown menu set to '14 days'.

Fig. 51 Advanced configurations

ADMINISTRATION PANEL

USERS

This section shows the list of Eco4Cloud users. By clicking on **Add User** button, a new user wizard. Fill the fields in the first part of wizard with the user data information, and then set its permissions as Fig. 52 shows. A user could have Administrator permissions (i.e. Full Control on selected farm), **Nothing** (if checked, the user will not be able to see the Server Farm), **Read only** (if checked, the user will be able to see Server Farm but he will not be allowed to change anything) or **read/write** permission. Finally confirm data. After creating a new user, you can modify its permissions by clicking **edit** link.

Wizard

1 User Account 2 Permissions 3 Confirm

DashBoard

Administrator ? OFF

MyServerFarm

Nothing ? ON

Read Only ? OFF

Read & Write ? OFF

← Prev Next →

Fig. 52 User Permissions

HEALTH STATUS

In the **health status** section you can control if the E4C services are running.

Services Health Status					
VCenter	Monitoring	Workload Consolidator	Smart Ballooning	Troubleshooter	CDSM
MyVcenter	✓ OK	✓ OK	✓ OK	✓ OK	✓ OK

Fig. 53 Services Health Status

The table (Fig. 54) below service health status shows the user permissions that eco4cloud user has to have so that all services work properly.

ADMINISTRATION PANEL

Permission	Monitoring	Workload Consolidator	Smart Ballooning	Troubleshooter	CDSM	Optional	VCenter Plugin
System.Anonymous	OK	OK	OK	OK	OK		
System.View	OK	OK	OK	OK	OK		
System.Read	OK	OK	OK	OK	OK		
Global.VCServer		OK	OK				

Fig. 54 Eco4cloud user permission

SUPPORT

This section gives the opportunity to generate (by pressing **Generate** button) the Eco4cloud application log and download (by pressing **Download** button), the generated tar.gz file to desktop. This file can be sent to support@eco4cloud.com to control Eco4Cloud anomalies or errors. By switching on **Obfuscate content Data Base** (default is **OFF**), datacenter private data are not written into logs and not showed to Eco4Cloud support.

Support [X]

Contact us at: support@eco4cloud.com to know how to provide data for support.

[Get data for support]

Get data for support [Generate] [Download]

☐ OFF Obfuscate content Data Base

Data last creation: Tue Nov 11 14:42:17 CET 2014

Fig. 55 Support section

SOFTWARE UPDATES

This section gives the opportunity to upgrade software (Fig. 56). After Eco4cloud support sends you the **zip** file containing updates, you have to click on **Upload Patch file** button.

ADMINISTRATION PANEL

Then selects the package and waits for the upload to finish.

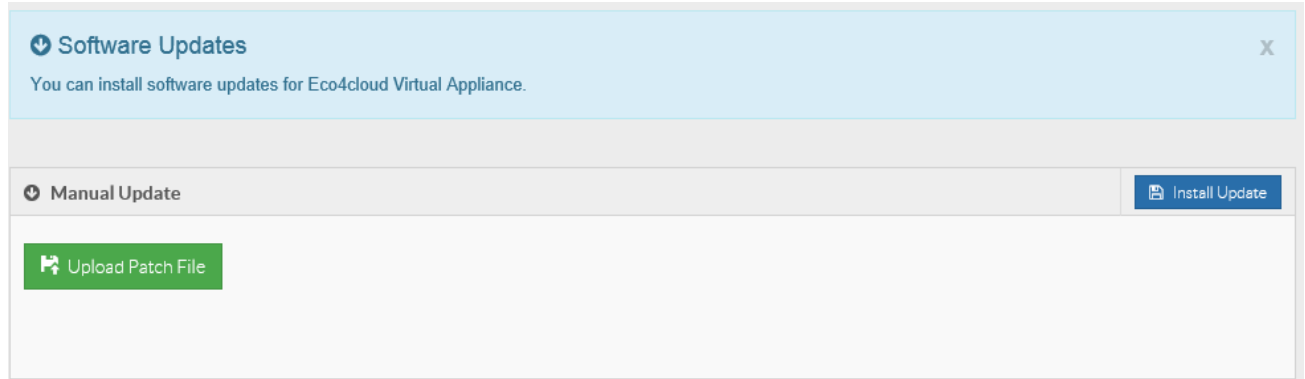


Fig. 56 Software Updates

By pressing Install Update button the vapp will be upgraded to new version. Logout and login again to navigate in the dashboard.

MIGRATIONS, WARNINGS AND ERRORS

In the right top of home page, there are three icons representing respectively **Migrations**, **Warnings** and **Errors** (Fig. 57).

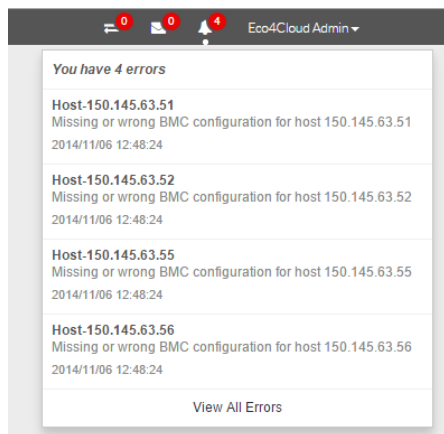


Fig. 57 Errors

By clicking on view all errors, you can see more details. In the same way, you can view warnings and migrations.

ADMINISTRATION PANEL

SEARCH RESOURCES

Just above inventory tree (Fig. 58) the **Search** section helps you finding anything in your **Server Farm**.

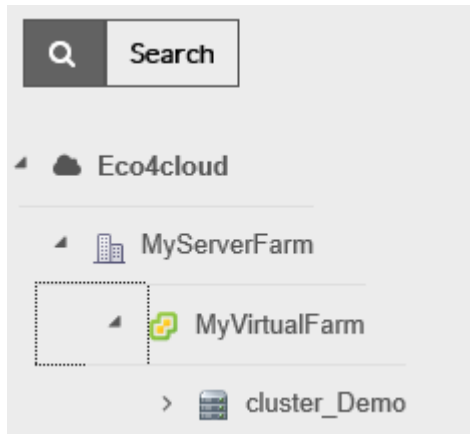


Fig. 58 Search Section

In the **Search Parameter** (Fig. 59) text box you simply insert part of name of a resource such as a cluster or VM, search function will list all resources containing typed character.

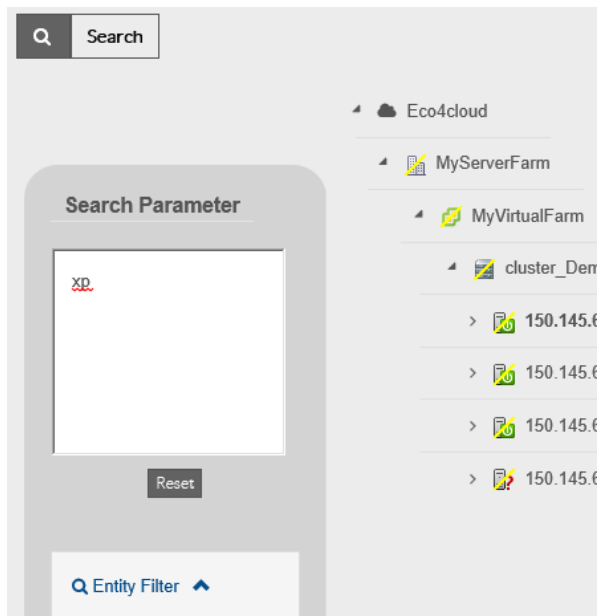


Fig. 59 Search Parameter

To optimize the search (Fig. 60) you can use the other sections:

- **Entity Filter:** to narrow the search to a specific part of the inventory.

ADMINISTRATION PANEL

- **Status Filter:** to narrow the search to entities in a particular status (in workload consolidation, for example, you can specify if it is enabled or not on that host)

The screenshot shows a vertical sidebar on the left side of a web application. At the top is a search bar labeled 'Entity Filter' with a magnifying glass icon and an upward arrow. Below it are five radio button options: 'Server Farm', 'Virtual Farm', 'Cluster', 'Host', and 'Virtual Machine'. A horizontal separator line follows. Below the separator is another search bar labeled 'Status filter' with a magnifying glass icon and an upward arrow. Underneath this are two checkbox options: 'WorkLoad Consolidation Enabled' (unchecked) and 'WorkLoad Consolidation Disabled' (checked). Another horizontal separator line follows. Below the separator is a search bar labeled 'Search Result' with a magnifying glass icon and an upward arrow. At the bottom, it says 'Found 1 result' and displays a single result: 'win-xp-base-001' with a small icon to its left and a downward arrow to its right.

Fig. 60 Search optimization

WORKLOAD CONSOLIDATION

Workload Consolidation

Workload Consolidation requires you insert a license. In order to obtain a valid code, contact Eco4Cloud support at support@eco4cloud.com, go to **Administration Panel**, click on **Licenses**, then **Add licence** and insert it. After that, click on **Workload Consolidation** button and select a farm previously configured. Enabling Consolidation, Eco4Cloud will be able to migrate VMs between hosts inside this farm and switch on/off hosts (if BMC are correctly configured in **power management** section in VMware vClient).

The screenshot shows a settings panel titled "Workload Consolidation settings". It contains a table with five rows. The first row has a "Consolidation" label and a green "ON" toggle switch. The second row is "Target Resource Utilization" with a value of 81. The third row is "Maximum Resource Utilization" with a value of 85. The fourth row is "Power off min uptime" with a value of 121. The fifth row is "Power on min downtime" with a value of 120. Each row has a question mark icon. At the bottom, there is a blue button labeled "Overridable migration warnings".

Workload Consolidation settings	
Consolidation ?	ON ?
Target Resource Utilization ?	81
Maximum Resource Utilization ?	85
Power off min uptime ?	121
Power on min downtime ?	120

Overridable migration warnings

Fig. 61 Workload Consolidation Settings.

The screenshot shows a panel titled "Workload Consolidation Info". It contains a table with four rows. The first row has a "Consolidation" label and a green "ON" toggle switch with a speech bubble icon. The second row is "Replicate DRS vm options" with a green "ON" toggle switch. The third row is "Power off min uptime" with a value of 120. The fourth row is "Power on min downtime" with a value of 120. Each row has a question mark icon.

Workload Consolidation Info	
Consolidation ?	ON ?
Replicate DRS vm options ?	ON
Power off min uptime ?	120
Power on min downtime ?	120

Fig. 62 Workload Consolidation Info for Virtual Farm

Fig. 61 shows workload consolidation settings. You can enable or disable consolidation with the appropriate switch. You have to specify the reason (at least 10 characters) of the operation and finally confirm. You can also change:

- **Target Resource Utilization**, the target percentage of hosts resource utilization to be reached through virtual machines consolidation. Default is 80%;
- **Maximum Resource Utilization**, the maximum percentage of hosts resource utilization to be reached through virtual machines consolidation. If the resource utilization goes above this threshold, virtual machines migrations will be issued to lower the utilization. Default is 90%;
- **Power off min uptime**: Minimum number of minutes of activity before a host can be powered off (default: 120)
- **Power on min uptime**: : Minimum number of minutes of activity before a host can be powered on (default: 120)

WORKLOAD CONSOLIDATION

By enabling consolidation on farm, all the resources in the **resource inventory** will inherit this property. If you don't want consolidation be active for some resource, it can be disabled separately. On the contrary, if consolidation is disabled on farm, automatically it is disabled on entire **resource inventory**. Under Virtual Farm section there is a panel that shows Workload Consolidation Info. With the **Replicate DRS vm options** switch enabled Eco4cloud will be able to replicate VMware DRS options on Virtual Machines in the dashboard. If disabled Eco4cloud will migrate Virtual Machines without taking into account the configurations of vCenter DRS settings.

Override Migration warnings button shows a warning's list that could be ignored during VMs migrations. You can switch on/off nearly every warning based on your policies (Fig. 63). For example: Eco4Cloud wants to migrate a VM and a "No guest heartbeats" warning stops the migration. In this scenario, if the switch is on the "on" position, the warning will be overridden and the migration can go on.

This is the list of warnings to be ignored during vm migrations

Update

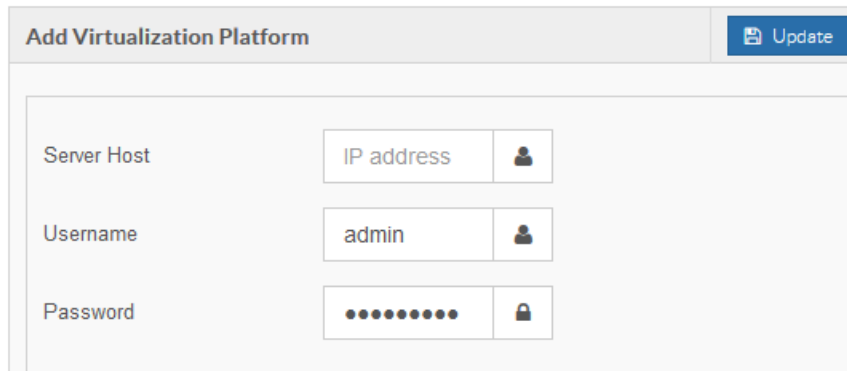
Ignore All ☐ OFF ?

Description	Ignored in to migration validation
NO GUEST OS HEARTBEATS (knowledge-base)	<input checked="" type="checkbox"/> ON
DEVICE BACKING NOT ACCESSIBLE (knowledge-base)	<input type="checkbox"/> OFF

Fig. 63 Override Migration warnings

New Vcenter button allows to add a new vCenter server. You have to fill the form (Fig. 64) filling **Server Host** field with IP address or hostname, then **username** and **password** of an administrative account, and finally press **Update** button.

WORKLOAD CONSOLIDATION



The screenshot shows a web interface for adding a virtualization platform. The title bar reads 'Add Virtualization Platform' and has an 'Update' button. Below the title bar, there are three input fields arranged vertically. The first field is labeled 'Server Host' and contains the text 'IP address' next to a user icon. The second field is labeled 'Username' and contains the text 'admin' next to a user icon. The third field is labeled 'Password' and contains a series of dots next to a lock icon.

Fig. 64 New Vcenter

This configuration data can be modified/deleted afterwards, selecting the vCenter in the left pane.

New Domain Controller button allows to add a new Domain controller to manage Microsoft Hyper-V environments. Finally, you can also delete a Datacenter.

SETTINGS ON CLUSTER, HOST AND VM

Depending on the selected resource in the left pane, the Workload Consolidation settings pane has a second different field other than consolidation switch.

- For clusters: **Always-on hosts** field is the minimum number of hosts that must be always switched on in this cluster
- For hosts: **StandBy Enabled** field. If it is disabled and Consolidation is enabled on this server, Eco4Cloud will be able to migrate VMs (in/out this server), but the server will never be switched off.

CHARTS

Selecting a farm, or a cluster, additional information is available, a chart and two tables respectively: **Number of active hosts with and without Eco4Cloud, Host Switch On/Off Events, VM Migrations**

WORKLOAD CONSOLIDATION

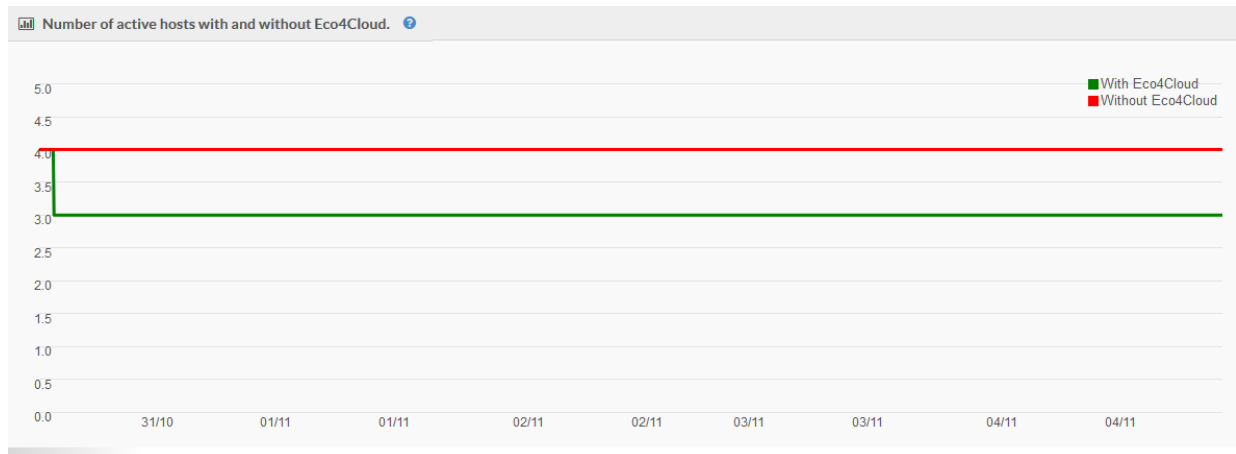


Fig. 65 Number of active hosts with and without Eco4Cloud graph

The chart in Fig. 65 reports the number of active servers with and without the use of Eco4Cloud.

The table **Host Switch On/Off Events** shows which hosts, and when, E4C Workload Consolidation switched on/off.

The last table **VM Migrations** (Fig. 66) shows the VM migrations issued by E4C Workload Consolidation.

VM Migrations						
10 records per page		Search:				
Vm	Source Host	Destination Host	Date	Cause	Resource	
EcoAppTelecom20140218	150.145.63.51	150.145.63.56	2014-11-03 21:21	Overload prevention	RAM	
Eco4Cloud_V2_Lagana	150.145.63.51	150.145.63.56	2014-11-04 18:11	Overload prevention	RAM	
Eco4Cloud_V2_Testing	150.145.63.51	150.145.63.56	2014-11-08 02:09	Overload prevention	RAM	
Ubuntu49	150.145.63.51	150.145.63.56	2014-11-03 18:01	Overload prevention	RAM	
Showing 1 to 4 of 4 entries						
← 1 →						

Fig. 66 VM Migrations issued.

Selecting a Host, you can see only **Host Switch On/Off Events** and **VM Migrations**.

Finally, selecting a VM you will see only **VM Migrations**.

WORKLOAD CONSOLIDATION

SMART BALLOONING

Smart Ballooning

Smart Ballooning allows releasing unused memory by virtual machines and making it available for ESX/ESXi, which possibly will allocate it to other Virtual machine in the data center. Smart Ballooning is inspired by a mechanism already available in VMware systems, named memory ballooning, and which allows releasing consumed memory. In order to enable Smart Ballooning, switch it on in Smart Ballooning Settings pane.

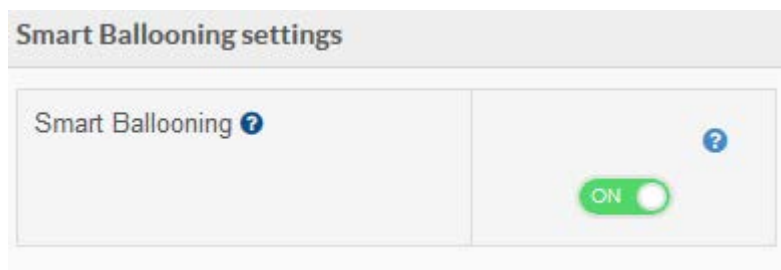


Fig. 67 Smart Ballooning settings

Under Smart ballooning setting pane, you will find the Smart Ballooning Operations table (Fig. 68) that shows the Smart Ballooning activities on each VM. In the table you will see when Smart Ballooning activities happened, as well.

The image shows a 'Smart Ballooning Operations' table. It has a title bar 'Smart Ballooning Operations' with a help icon. Below the title bar, there's a search bar and a dropdown menu for 'records per page' set to '10'. The table has five columns: 'VM', 'Start Date', 'End Date', and 'Reclaimed Memory (MB)'. There are five rows of data. At the bottom, there's a pagination bar showing 'Showing 1 to 5 of 5 entries' and a page number '1' with navigation arrows.

VM	Start Date	End Date	Reclaimed Memory (MB)
Eco4Cloud_V2_Demo	2014-11-12 07:18:10.0	2014-11-12 07:18:31.0	10.0
Eco4Cloud_V2_Leopoldo	2014-11-11 17:28:57.0	2014-11-11 17:29:17.0	0.0
OpenVPN-AS-Appliance	2014-11-11 17:44:03.0	2014-11-11 17:47:10.0	23.0
SRV-Backup	2014-11-12 17:08:48.0	2014-11-12 17:11:34.0	316.0
Vmware UpdateMgr	2014-11-12 17:12:50.0	2014-11-12 17:13:55.0	26.0

Fig. 68 Smart Ballooning Operations

The next two charts (Fig. 69 e Fig. 70) show the amount of memory reclaimed hourly by Smart Balloning and RAM Memory reclaimed by Vmware balloon driver respectively.

SMART BALLOONING

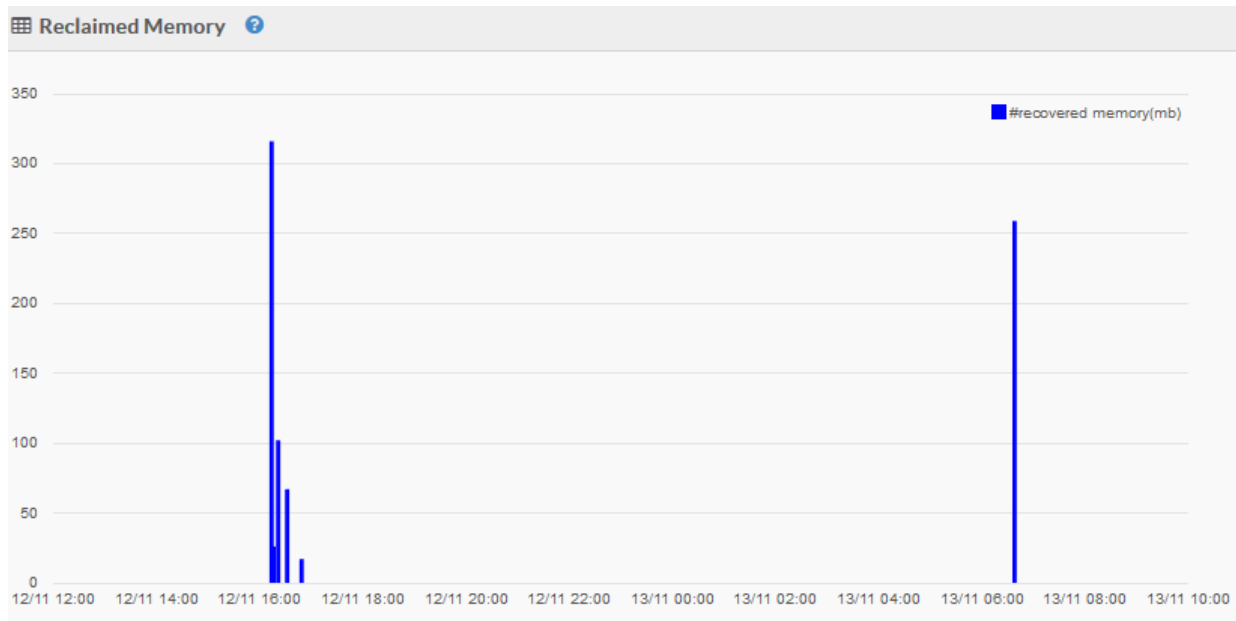


Fig. 69 Smart Ballooning Reclaimed Memory

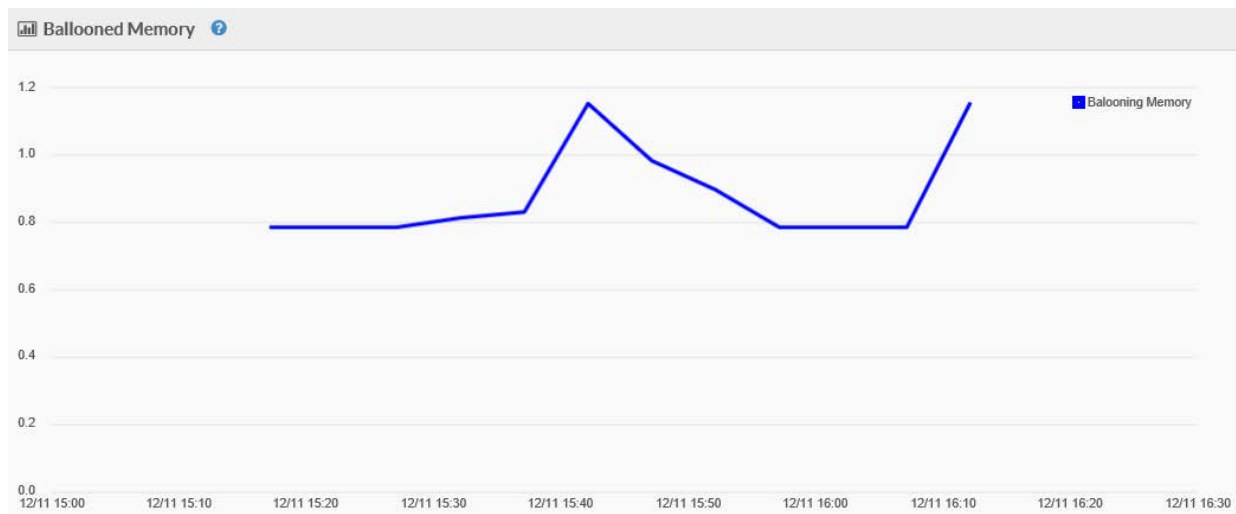


Fig. 70 Smart Ballooning Memory

TROUBLESHOOTER

Troubleshooter

Virtualization comes with a wealth of needed configurations, along with the benefits delivered by isolation of virtual machines. More often than expected, a virtualized environment is not properly configured, and non-optimal configurations lead to resources waste, poor consolidation ratio, uncertain SLA compliance.

Troubleshooter performs continuous monitoring of well-known virtualization options and sets immediate warning/alerts when wrong configurations are detected and Help virtual infrastructure administrator to solve possible drawbacks.

TOUBLESHOOTER SETTINGS

By clicking on troubleshooter button, the configuration settings pane appears (Fig. 71):

Troubleshooter settings

[Generate Report](#) [Schedule Weekly Report](#) [Configure Visibility categories](#) [Ignore Rules](#)

Generate Report [Generate](#) [Download](#)

Start date [?](#)

End Date [?](#)

☒ Send report by email after generation [?](#) ☐ OFF

Fig. 71 Troubleshooter settings

You can immediately generate a report by selecting Start date and End date, moreover you can switch on **Send report by email after generation** to automatically send the Report to the **Mail Receivers** configured in Mailer configuration settings. You can also download the generated Report clicking on Download.

Schedule Weekly Report [Update Changes](#)

Receive Weekly Report ☒

Send on at :

Receiver Address [?](#) [?](#)

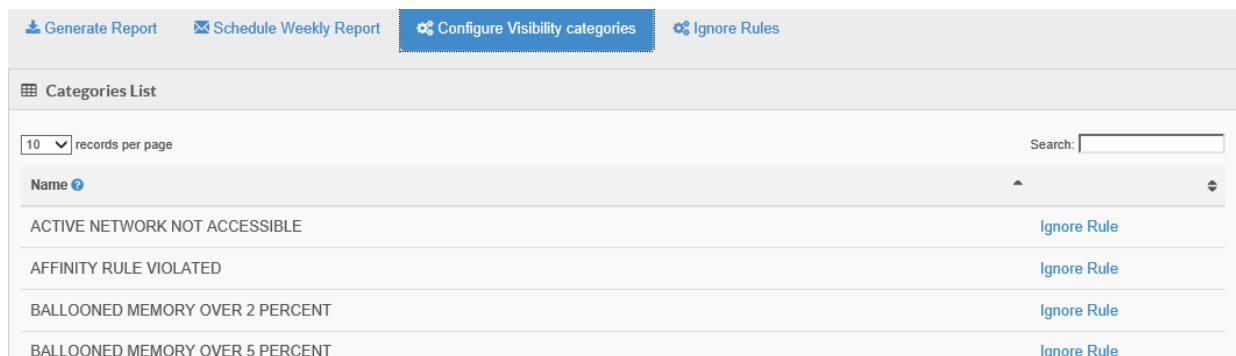
☒ Send report by email after generation [?](#) ☐ OFF

Fig. 72 Schedule Weekly Report

TROUBLESHOOTER

By selecting **Schedule Weekly Report** (Fig. 72) you can automatically receive weekly report. You need to specify the day and the hour and which users will receive the report by email.

By selecting **Configure Visibility categories** (Fig. 73), you can customize your reports.



Generate Report	Schedule Weekly Report	Configure Visibility categories	Ignore Rules
Categories List			
10 records per page		Search: <input type="text"/>	
Name			
ACTIVE NETWORK NOT ACCESSIBLE	Ignore Rule		
AFFINITY RULE VIOLATED	Ignore Rule		
BALLOONED MEMORY OVER 2 PERCENT	Ignore Rule		
BALLOONED MEMORY OVER 5 PERCENT	Ignore Rule		

Fig. 73 Configure Visibility categories

Every category in the list is included in the report. If you want to exclude one of them from the report, click on **Ignore rule** on the right side, and a new pop-up appears (Fig. 74). Then you can decide if ignoring this category on all entities switching on the side button and/or **Ignore Category on Single Entity** such as Cluster, Farm Host or VM.

Ignore Category on All entity ☒

[Ignore Category on Single Entity](#)



10 records per page	Search: <input type="text"/>	
Type	Name	Ignore Category
CLUSTER	CLUSTER-cluster_test	OFF
FARM	FARM-icar dem	ON
HOST	HOST-150.145.63.51	ON
HOST	HOST-150.145.63.55	OFF

Fig. 74 Ignore Category list

In the last tab of Troubleshooter settings, there is a summary of all **Ignored rules** (Fig. 75). Every ignored rule can affect a single entity or a category or both. By clicking on **Resolve**, the rule is canceled.

TROUBLESHOOTER

[Generate Report](#) [Schedule Weekly Report](#) [Configure Visibility categories](#) [Ignore Rules](#)

Ignore Rules

10 records per page

Search:

Entity	Category	Rule	
	ACTIVE NETWORK NOT ACCESSIBLE	ACTIVE NETWORK NOT ACCESSIBLE is Ignored	Resolve
CLUSTER-cluster_test	MISSING BMC CONFIGURATION	CATEGORY MISSING BMC CONFIGURATIONIS IGNORED ON CLUSTER cluster_test is Ignored	Resolve
CLUSTER-cluster_test	VIRTUAL DISK NOT ACCESSIBLE	CATEGORY VIRTUAL DISK NOT ACCESSIBLEIS IGNORED ON CLUSTER cluster_test is Ignored	Resolve

Fig. 75 Ignore Rules

TROUBLESHOOTER RISK AND EFFICIENCY

For every resource you select, troubleshooter will compute two scores: **Risk** and **Efficiency**. Risk is a value influenced by the set of problems, and respective severity, that affect the selected resource and all its children. The score is comprised between 0% (no observed problems) to 100% (maximum risk severity) value.

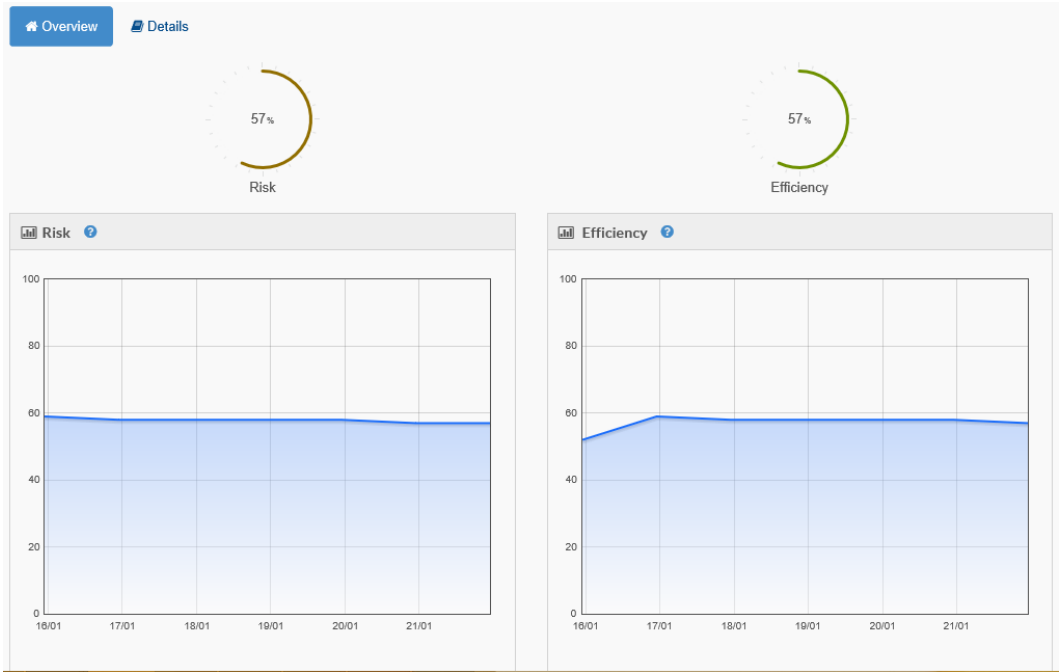


Fig. 76 Risk and Efficiency

TROUBLESHOOTER

Efficiency is a score conveying the right allocation (and configuration) of resources of selected resource and of all its children under it.

Fig. 76 shows risk and efficiency computed on a farm.

Fig. 77 represents Risk Factor deriving from hosts health state. In this charts, Troubleshooter represents the main risks for a farm such as high CPU ready time or too much Ballooned memory. Other risks are the Hosts in maintenance mode or hosts disconnected. Host operational status is represented also with the pie chart below.

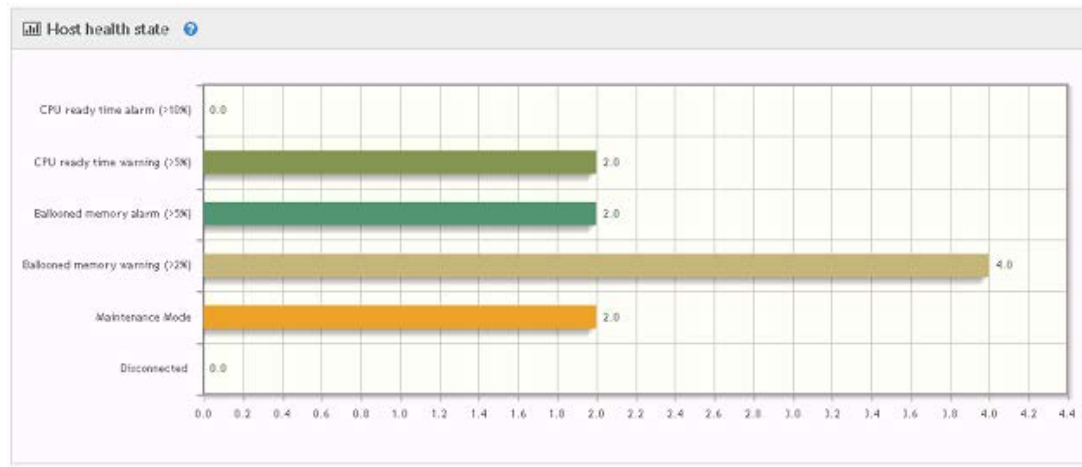


Fig. 77 Host health state

Fig. 78 represents the factors affecting VMs performances such as Resources Limit, Resources reservation, etc. VMs resources reservation is represented also with the pie chart below.

TROUBLESHOOTER

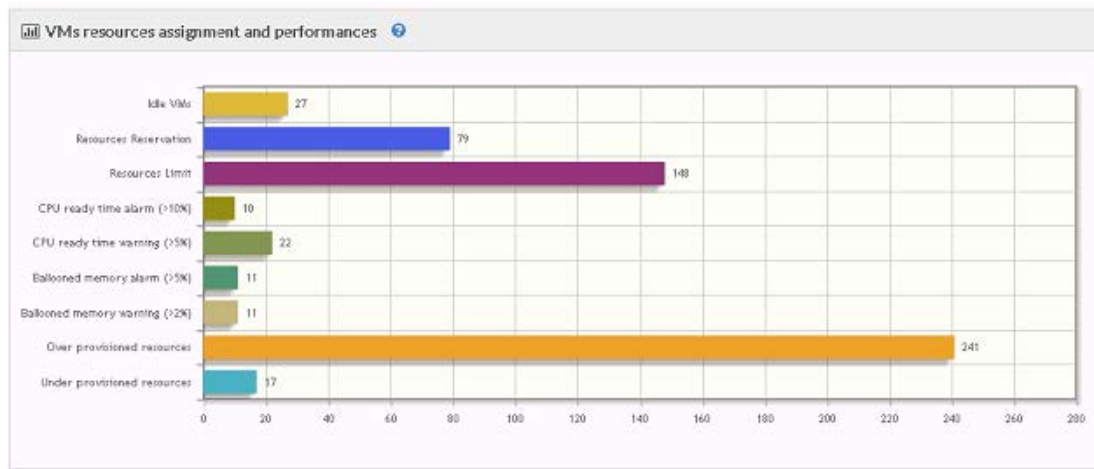


Fig. 78 VMs resources assignment and performances

Depending on the selected resource in the left pane, Eco4cloud Troubleshooter shows the specific **Entity Properties** (Fig. 79)

Entity Properties for:

- **Hosts:** show the possible states of hosts such as disconnected or Maintenance mode or ballooned memory alarm or Cpu ready time alarm.
- **VMs:** show the possible states of VMs such as powered off (idle) or ballooned memory alarm or Cpu ready time alarm or over/under provisioned, etc.

Entity Properties	
Properties	Value
Disconnected	<input checked="" type="checkbox"/> NO
Maintenance Mode	<input checked="" type="checkbox"/> NO
Ballooned memory warning (>2%)	<input checked="" type="checkbox"/> NO
Ballooned memory alarm (>5%)	<input checked="" type="checkbox"/> NO
CPU ready time warning (>5%)	<input checked="" type="checkbox"/> NO
CPU ready time alarm (>10%)	<input checked="" type="checkbox"/> NO

Fig. 79 Host entity properties

TROUBLESHOOTER

DETAILS VIEW

In order to understand errors and warnings, you can click on **Details** button near overview. Another pane (Fig. 80) opens and shows errors and warning by Categories and Problems and below you can find ignore rules that you have configured.

Source	Type	Category	Description	Time
CLUSTER-cluster_test	Warning	SMALL CLUSTER	Cluster cluster_test is too small (4 ho	07:04:47
CLUSTER-cluster_test	Warning	CLUSTER RECOMMENDATIONS	There are 0 unapplied recommendation(s)	07:03:41
SERVER-150.145.63	Error	MISSING BMC CONFIGURATION	Missing or wrong BMC configuration for	06:32:32
SERVER-150.145.63	Error	MISSING BMC CONFIGURATION	Missing or wrong BMC configuration for	06:32:32
SERVER-150.145.63	Error	MISSING BMC CONFIGURATION	Missing or wrong BMC configuration for	06:32:32
SERVER-150.145.63	Error	MISSING BMC CONFIGURATION	Missing or wrong BMC configuration for	06:32:32
VM-Eco4App20140318	Error	CPU READY TIME OVER	CPU Ready Time of vm Eco4App20140318	07:04:46
VM-Eco4App20140318	Warning	CPU READY TIME OVER	CPU Ready Time of vm Eco4App20140318	07:04:46
VM-OpenVPN-AS-App	Error	NO GUEST OS HEARTBEATS	No guest OS heartbeats are being received	07:03:28
VM-Eco4App_Clone1	Error	NO GUEST OS HEARTBEATS	No guest OS heartbeats are being received	07:03:27
VM-Eco4Cloud_V2_2	Error	NO GUEST OS HEARTBEATS	No guest OS heartbeats are being received	07:03:27
VM-Eco4App-Win2k8	Warning	VIRTUAL MACHINE CONFIGURATION	Unable to access the virtual machine configuration	07:03:26
VM-Eco4AppTelecom	Warning	VIRTUAL MACHINE CONFIGURATION	Unable to access the virtual machine configuration	07:03:25

Fig. 80 Details view

By clicking on the name of a category a new browser window links the Eco4cloud Knowledge Base explaining the problem and the official solution by the relative vendor and/or Eco4Cloud. Beside the category, there is the occurrences number and then the **ignore** link.

Ignore Rule	Toggle
Ignore All problems on farm icar dem	OFF
Ignore MISSING BMC CONFIGURATION on farm icar dem	OFF
Ignore MISSING BMC CONFIGURATION on all Entity	OFF

Close Save changes

Fig. 81 Ignore

You can choose if to ignore the error on the selected entity, or on all entities, or even to ignore all problems on the entire Farm, by switching right side button on/off, finally pressing **Save Changes** button.

TROUBLESHOOTER

On the right side of Details pane there is the list of all problems. By clicking on a single problem you can see the details, such as where the problem is, at which time it occurred, and the description.

Finally, on the bottom of details pane, you can find the exclusion rules. Clicking on **active** link you can see **Ignore Reason List** (Fig. 82) that shows where the rule is applied. On the right side, you can click on **resolve** to cancel the rule.

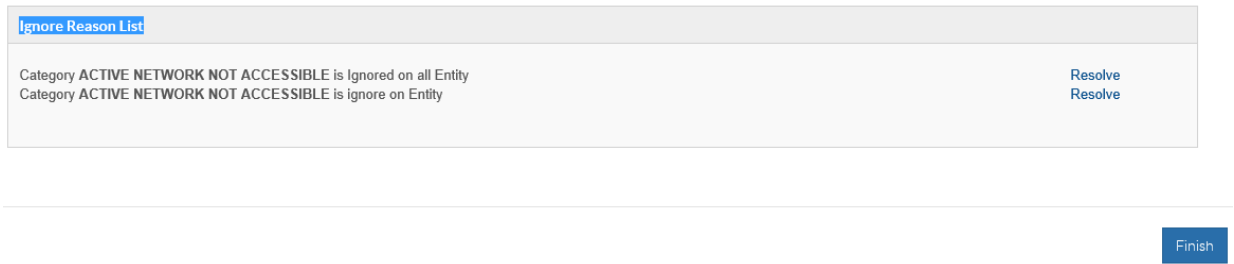


Fig. 82 Ignore Reason List

CDSM - CAPACITY DECISION SUPPORT MANAGER

CDSM - Capacity Decision Support Manager

Capacity Decision Support Manager (CDSM) is a capacity planning software, enhanced by Eco4Cloud's workload consolidation algorithm, which provides a solution to efficiently plan and use shared pools of resources in virtualized data centers.

Eco4Cloud's CDSM addresses and solves the capacity planning problem by modeling it with historical workloads and considering the peak workload for resource allocation. In fact, CDSM creates demand patterns through the analysis of workload traces measured in the data center. This enables CDSM to accurately predict future demands.

CDSM allows planning the whole virtualization layer within few minutes from the initial deployment. The setup is quick and hassle-free. CDSM immediately starts collecting historical performance data sampled by virtualization platform and makes capacity planning features available in few minutes.

The results obtained through CDSM are enhanced by Eco4Cloud's workload consolidation algorithm, guaranteeing the best resource utilization possible.

CDSM WIZARD

Clicking CDSM button, the CDSM list pane appears. This shows all CDSM scenarios you made and a **new CDSM** button to create a new one. In the general settings you can choose the scenario name and the type of environment: **Production** to prioritize QoS or **Test and Dev** to prioritize resources efficiency.

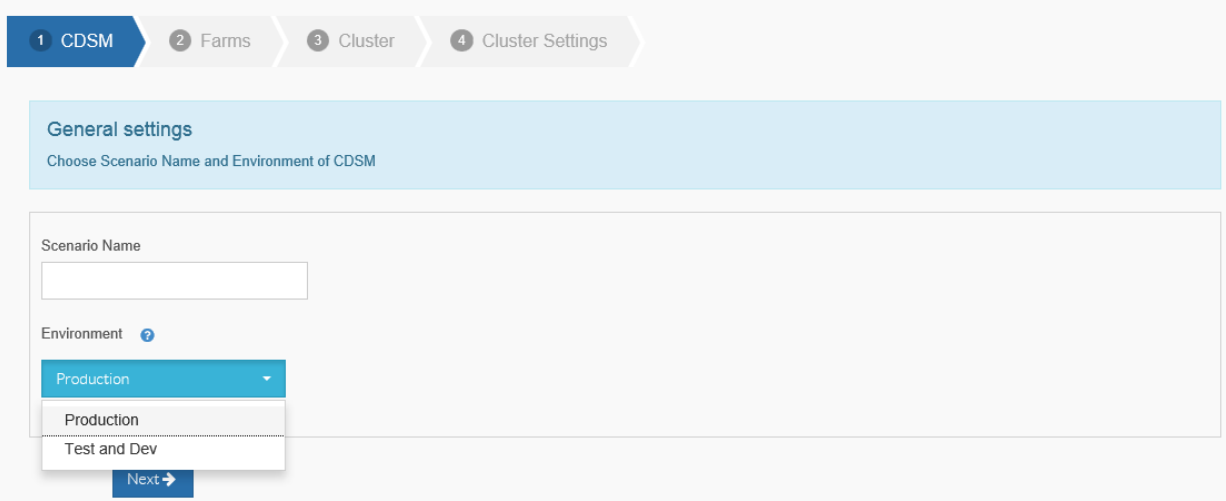


Fig. 83 New CDSM wizard

In the next page, you can choose the farm included in the scenario, if you have more than one.

CDSM - CAPACITY DECISION SUPPORT MANAGER

The next step is choosing the clusters to include (Fig. 84). You can also exclude one of the listed clusters by switching off the button.

DATACENTER_1

Cluster Settings

Add Cluster ?

10 records per page Search:

Name	Inclusion ?
CLUSTER_1	<input checked="" type="checkbox"/>
CLUSTER_2	<input checked="" type="checkbox"/>
CLUSTER_3	<input checked="" type="checkbox"/>
CLUSTER_4	<input type="checkbox"/>
CLUSTER_5	<input checked="" type="checkbox"/>
CLUSTER_6	<input checked="" type="checkbox"/>
CLUSTER_7	<input checked="" type="checkbox"/>
CLUSTER_8	<input type="checkbox"/>

Fig. 84 Cluster settings

You can create a new cluster, too, by clicking on **Add Cluster** button and adding a name (Fig. 85). Afterwards, in the final step, you will choose the load for this cluster.

Add Cluster to Farm DATACENTER_1

Cluster Name

Cluster_9 x

+ Add Cluster ?

Close Add

Fig. 85 Add Cluster

After clicking on **Add** and then clicking on **Next**, the final step is changing workload and hosts settings for each cluster (Fig. 86).

CDSM - CAPACITY DECISION SUPPORT MANAGER

Cluster Settings

You can change workload and hosts settings for each cluster

Global Settings

Cluster_9

CLUSTER_8

CLUSTER_7

CLUSTER_6

CLUSTER_5

CLUSTER_3

CLUSTER_2

CLUSTER_1

Run

Fig. 86 Cluster Settings

First and foremost, you can choose the global settings (Fig. 87) for all clusters such as **Load** or **Hosts Action**

Global Settings

Settings from all cluster in this scenario

Select Host category

Medium HOST: 32 Cores - 256 GB of Memory

Cluster Load

-100%0+500%

Hosts Action for all cluster

Relocate	ON
Dismiss	ON
Add	ON

Fig. 87 Global Settings

CDSM - CAPACITY DECISION SUPPORT MANAGER

You can choose also the **host category**. The menu proposes three types of host as shown in the below figure (Fig. 88). These represent three typical host configurations combining different amount of CPU and memory. The hosts, according to your choice, will be added to your environment if needed.

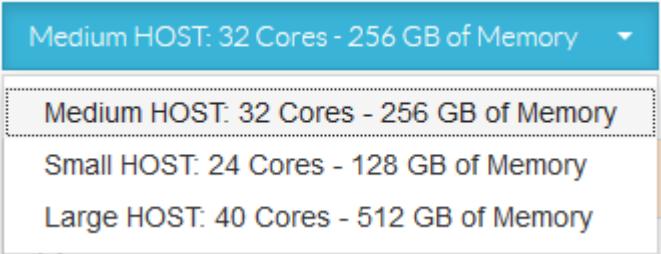


Fig. 88 Host category

NEW CLUSTERS CONFIGURATION

For new clusters you can configure incoming load in term of VMs. By clicking **Add VM Template** button, you can choose the number of VMs, the **type**, and the percentage of **CPU usage** and **RAM usage** (Fig. 89). When you click on type menu, a list of VMs templates that will be used to simulate the load appears, from a **tiny VM** template with one CPU core and 512 MB of RAM until **Gigantig VM Plus** template with 24 CPU cores and 64 GB of RAM. Furthermore, in the **Cluster Property** pane, by switching on/off **Relocate**, you can decide if this cluster can be modified during the scenario creation moving in hosts from other clusters or moving hosts out to other clusters.

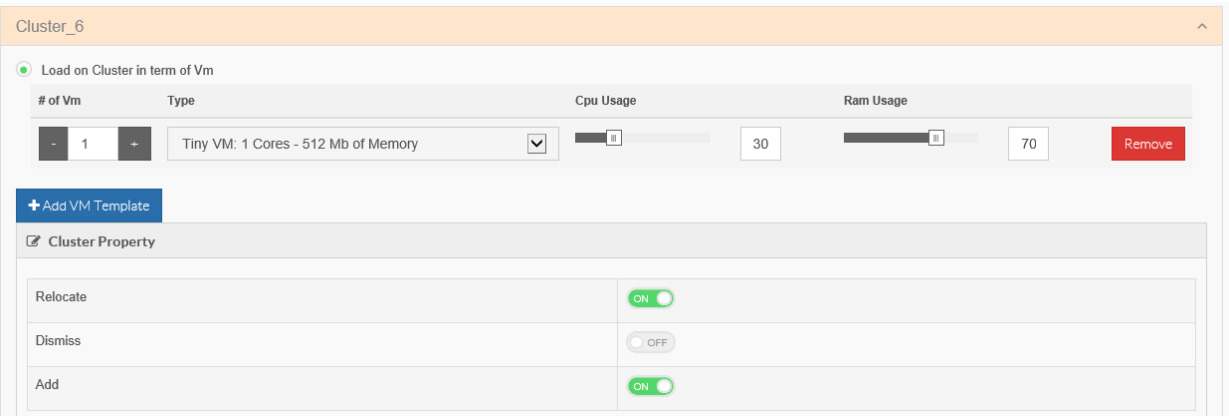


Fig. 89 Adding load to new cluster

Finally, if you would to add new hosts to this cluster, switch on **Add**.

CDSM - CAPACITY DECISION SUPPORT MANAGER

EXISTING CLUSTERS CONFIGURATION

The first step of an existing cluster configuration, is to decide if the type of load on the cluster will be calculated on percentage of Load variation or in term of VMs.

Load variation

Default choice is **Load variation** and it can be modified increasing or decreasing **Cluster Load** slider.

When the percentage gets modified, the **number of VMs** in the **Current Cluster Load** pane varies. The **Type** of VM displayed represents a sample of all VMs inside the cluster. In the case that the cluster load type is based on Load variation, the type of VM, **CPU usage** (Typical daily based maximum CPU usage of the VM) and **RAM usage** (Typical daily based maximum memory usage of the VM) cannot be modified.



CLUSTER_5

Cluster Load Type ?

Load variation(%)

Load variation(%)

Load on Cluster in terms of Vm

Cluster Load ?

-100% +500%

0

Current Cluster Load ?

Number of Vms ?	Type ?	Cpu Usage ?	Ram Usage ?
221	Medium VM: 1 Cores - 4 GB of Memory	35	72

Fig. 90 Load Variation (%).

Load on Cluster in terms of Vm

Choosing **Load on Cluster in terms of VM**, you could change all the values in **Cluster Load** pane (Fig. 91).

The **number of VMs** currently shown, represents the original number of VMs; it can be changed with the best value that fits your aim. The type of VM displayed is a representative sample of all VMs inside the cluster and cannot be modified. Instead, **CPU usage** and **RAM usage** can be modified either by the slider or manually writing the value in the field.

If you want **Additional workload**, you can add other VMs, by pressing **Add VM Template** button. In this pane, you can modify **number of VMs**, **Type** of VM, **CPU usage** and **RAM usage**.

CDSM - CAPACITY DECISION SUPPORT MANAGER

The screenshot shows the CDSM interface for a cluster named 'CLUSTER_3'. At the top, there's a 'Cluster Load Type' dropdown menu set to 'Load on Cluster in terms of Vm'. Below this, the 'Cluster Load (CLUSTER_3)' section is active. It features a table with columns for 'Number of Vm', 'Type', 'Cpu Usage', and 'Ram Usage'. The first row shows 143 'Medium VM: 1 Cores - 4 GB of Memory' with a CPU usage slider at 23 and a RAM usage slider at 60. Below this, the 'Additional workload' section has a table with one row: 1 'Tiny VM: 1 Cores - 512 MB of Memory' with a CPU usage slider at 30 and a RAM usage slider at 70. A 'Remove' button is next to this row. At the bottom left, there is a '+ Add VM Templates' button.

Number of Vm	Type	Cpu Usage	Ram Usage
143	Medium VM: 1 Cores - 4 GB of Memory	23	60

Number of Vm	Type	Cpu Usage	Ram Usage	
1	Tiny VM: 1 Cores - 512 MB of Memory	30	70	Remove

Fig. 91 Load in term of VMs.

When you click on **Type** menu, a list of VMs templates that will be used to simulate the load appears, which allows selecting the VM category ranging from a **tiny VM** template with one CPU core and 512 MB of RAM up to **Gigantic VM Plus** template with 24 CPU cores and 64 GB of RAM.

Host Action

In the **Host Action** pane you can specify which actions to enable on the hosts of the current cluster. The **Relocate** and **Add** options have already been covered. **Dismiss** option allows to remove obsolete and inefficient hosts from this cluster.

CDSM REPORT

After configuring all settings and pressing the **Run** button, CDSM will generate a report. A brief introduction will describe what CDSM is and what the output of the scenario will be.

The first paragraphs of the report will describe the scenario of the test and the **Resources utilization**, with a major focus on Ram usage during monitoring period. In **Scenario Parameter** paragraph, you will find the summary of configuration settings of all clusters that you made.

CDSM - CAPACITY DECISION SUPPORT MANAGER

The following paragraph will show the results that consist in two scenarios for all single clusters, both of them contains:

- Residual workload on each cluster
- How many hosts, if any, are needed to add to each cluster
- Which hosts are recommended to relocate for optimal hardware usage
- Which hosts are recommended to dismiss due to inefficiency

The first scenario, called *"Low Impact"* is a light solution, where workload is distributed on available hosts and only useless hardware is dismissed.

The second scenario, called *"High Impact"* is a solution in which all obsolete hardware is replaced by newer and more efficient hardware.

At last, the **Final Considerations** paragraph will display the list of actions you need to take on the hosts in order to achieve the given goals, for each scenario, and eventually the shopping list!

APPENDIXES

Appendixes

APPENDIX A – PRIVILEGES

The following tables list the privileges that should be assigned to the Eco4Cloud user. When setting permissions, verify all the object types are set with appropriate privileges for each particular action. Some operations require access permission at the root folder or parent folder in addition to access to the object being manipulated. The best practice is to add privileges to the root folder in order to ensure the user has all the needed privileges all over the virtualized environment.

Requirements

Initially, a Windows user must be registered on the server where vCenter is installed with the name of **eco4cloud**. The user can be created locally if working on a stand-alone server or in the domain if working on an active directory environment.

Manual Role creation

In the section Home -> Administration -> Roles (Fig. A) a new role must be created with the set of privileges in the following. The name to assign to role will be **E4CRole**

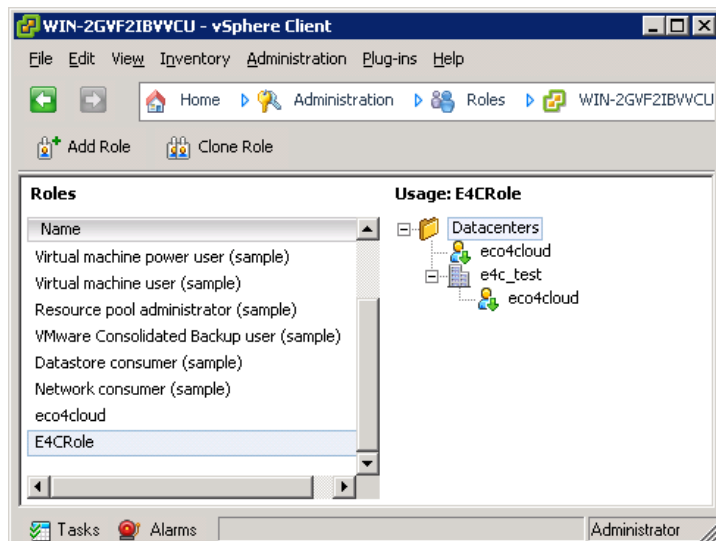


Fig. A Role creation

APPENDIXES

Automatic Role Creation by powershell script

We create two PowerCli scripts for automatic role creation:

1. CreateEco4CloudRole.ps1
2. CreateEco4CloudRole_PowerCLI4.0.ps1

The first one is for powerCli version 5.0 or above, the second one for Powercli version 4.0

The scripts can be used on the vCenter server locally or remotely from other PC with Powercli installed on.

In local mode you have to open a PowerCli console with administrator permission and launch **CreateEco4CloudRole.ps1**. The script will create E4CRole with the necessary permissions.

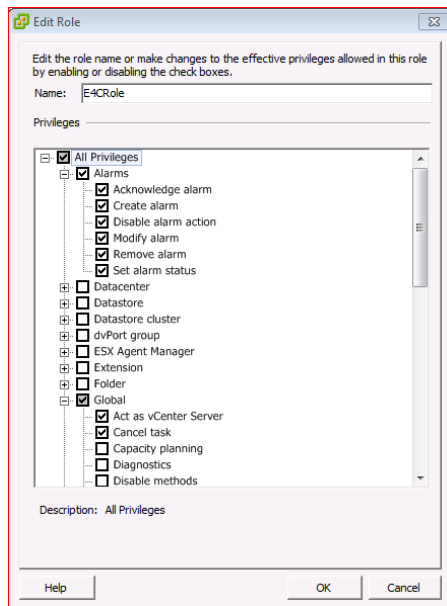
In remote mode you have to open a PowerCli console and launch the same script with following parameters:
vCenter Ip Address, vCenter administrator username and password

./CreateEco4CloudRole.ps1 vCenterAddress vCenterUsername vCenterPassword

After creating E4CRole, you can add **eco4cloud** user account to the role.

APPENDIXES

Now it is possible to assign the required privileges by clicking with the right button of the mouse on the name of the role.



Alarms privileges: control the ability to set and respond to alarms on inventory objects.

This class of privileges is required to insert automatic alarms within the vCenter in case of overloads.

Acknowledge alarm: recognition of an alarm

Create alarm: creation of a new alarm.

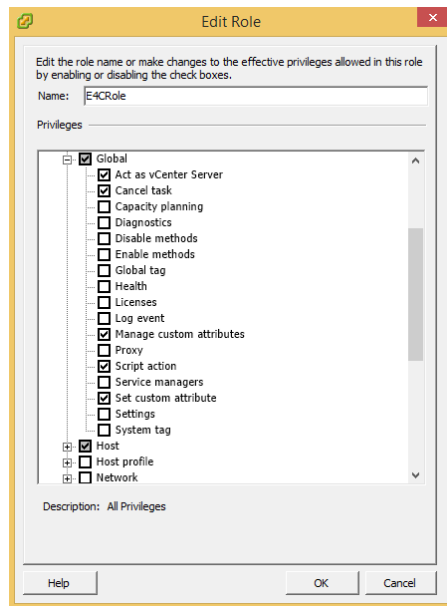
Disable alarm action: block of the reaction to an alarm

Modify alarm: modify of an alert object

Remove alarm: removal of an alert object

Set alarm status: modify the status of an alarm to Normal, Warning, or Alert

Fig. B Alarms



Global privileges: control global tasks related to tasks, scripts, and extensions. Furthermore it is used to manage custom attributes such as Annotations.

Act as vCenter Server: Prepares or starts a vMotion

Cancel task: Cancels an executing task

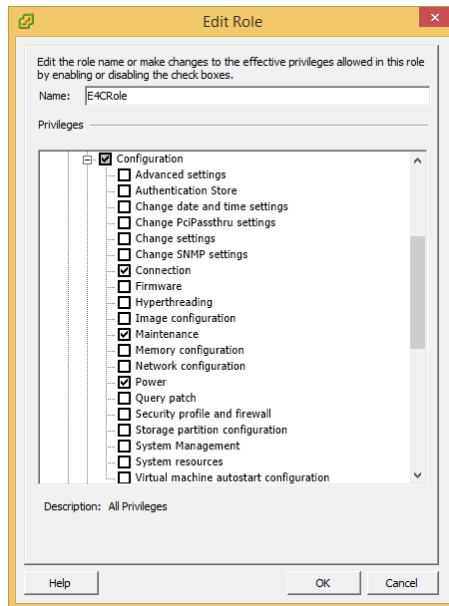
Manage Custom attributes: Add, remove, or rename custom field definitions.

Script Action: Schedule a scripted action in conjunction with an alarm.

Set Custom attribute: View, create, or remove custom attributes for a managed object.

Fig. C Global

APPENDIXES



Privileges **Host->configuration**: in this section privileges for hosts configuration are set.

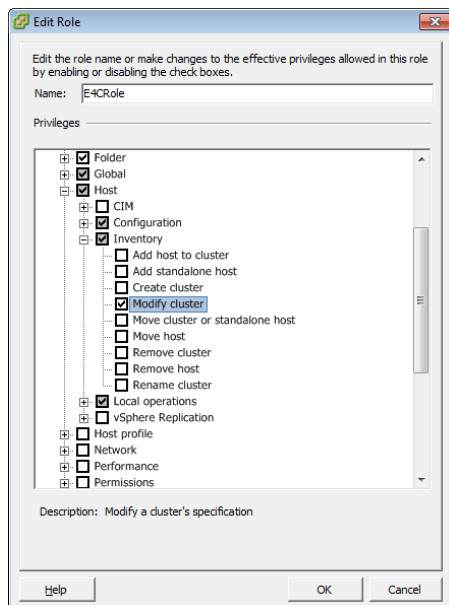
This class of privileges is required to put hosts in maintenance mode or power them down.

Connection: Change the connection status of a host (connected or disconnected).

Maintenance: allows to put a host in maintenance mode for administrator tasks, such as update and reconfiguration, and allows to power down and reboot a host.

Power: configuration of energy savings settings.

Fig. D Host: configuration



Privileges **Host->inventory**: in this section privileges for hosts inventory are set:

Host inventory privileges control adding hosts to the inventory, adding hosts to clusters, and moving hosts in the inventory. So it is required to put a cluster in partially/fully automated or manual mode

Modify cluster: Change the properties of a cluster.

Fig. E Host: Inventory

APPENDIXES

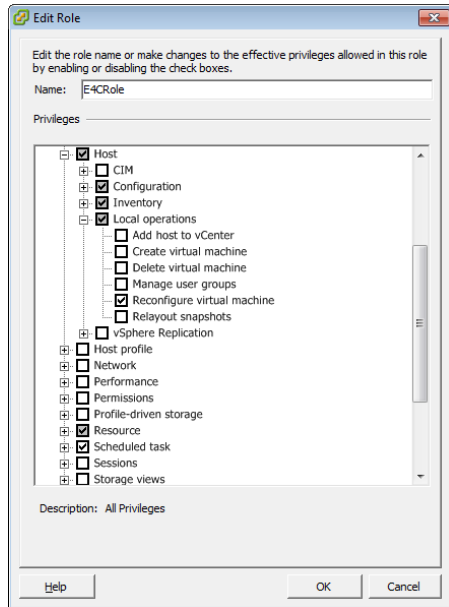


Fig. F Host: Local Operations

Privileges **Host->Local Operations**: controls action executed when vSphere Client is directly connected to a host.

The “smart ballooning” module requires this class of privileges to modify VM memory resources limits.

Reconfigure virtual machine: reconfigure virtual machine memory limits

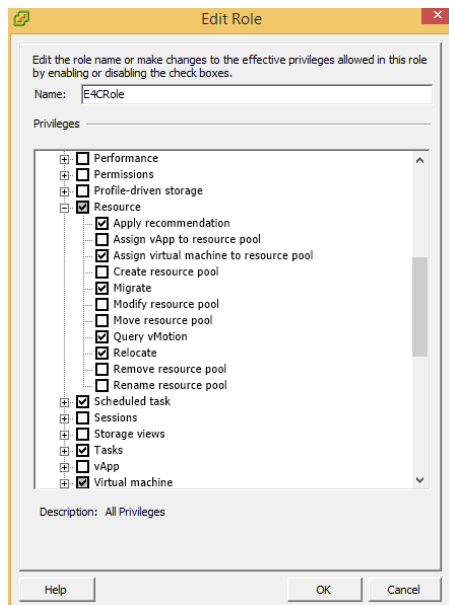


Fig. G Resource

Privileges **Resource**: controls resources pool and virtual machines migrations.

Apply recommendation: Ask the server to go ahead with a suggested vMotion.

Assign virtual machine to resource pool: Assign a VM to a specific resource pool

Migrate: VM migration to a resource pool or a host

Query vMotion: verify compatibility of a VM to a target host for vMotion

Relocate: Allows cold migration of a virtual machine's execution to a specific resource pool or host.

APPENDIXES

Privileges **Scheduled Task**: control the ability to create, modify and removed scheduled tasks.

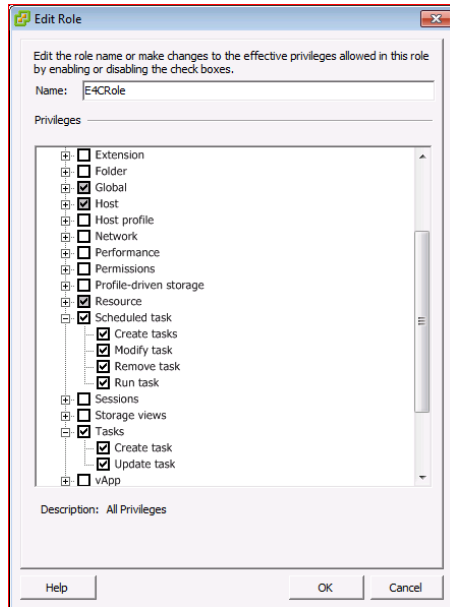


Fig. H Tasks and Scheduled task

Create tasks: create a new scheduled task

Modify task: modify a scheduled task

Remove task: remove a scheduled task

Run task: run a scheduled task

Privileges **Tasks**: control extensions ability to create and update activities on vCenter server.

Create task: allows an extension to create a user defined task.

Update task: allows an extension to modify a user defined task.

This class of privileges are useful to schedule needed operations to VM consolidation.

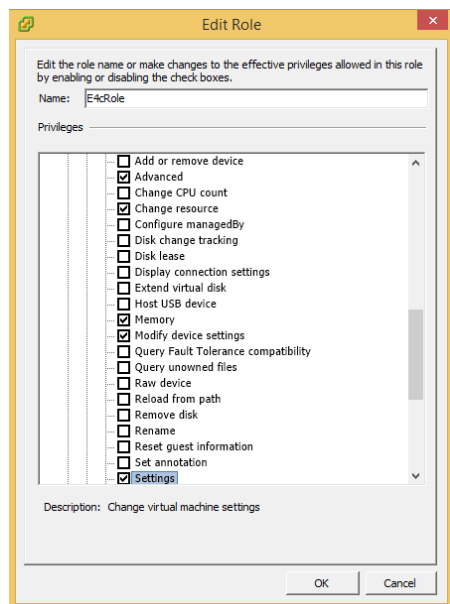


Fig. I Virtual Machine: configuration

Privileges **Virtual Machine -> configuration**: control the ability to configure VM and devices options.

Advanced: add or modify advanced options in VM configuration file.

Change resource: Change resource configuration of a set of VM nodes in a given resource pool. It is required for the use of the Smart Ballooning.

Memory: modify the allocated memory to the VM.

Modify device settings: Allows changing the properties of an existing device.

Settings: Allows changing general virtual machine settings.

APPENDIXES

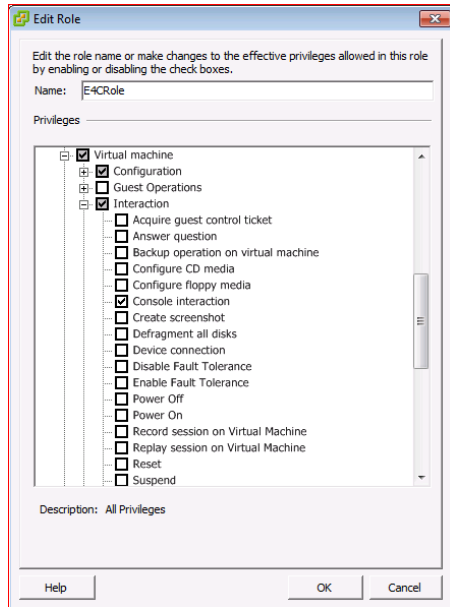


Fig. L Virtual Machine: Interaction

Privileges **Virtual Machine -> Interaction**: to control the ability to interact with VM console, to configure media, to execute power up/down operations and install VMware Tools.

Console Interaction: interaction with VM, using mouse, keyboard and monitor.

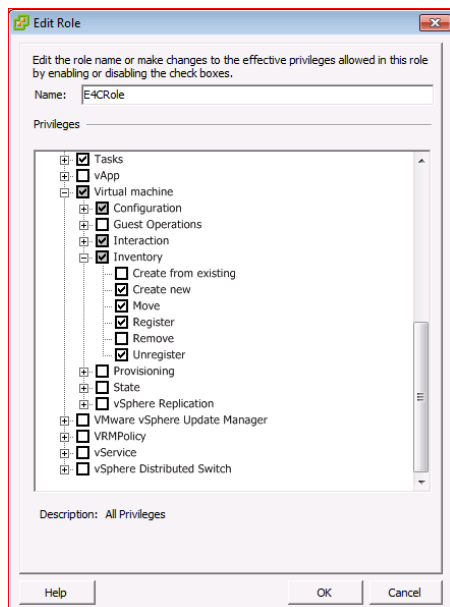


Fig. M Virtual Machine Inventory

Privileges **Virtual Machine -> Inventory**: control the ability to add, move and remove VMs.

This class of privileges is required to issue vMotions.

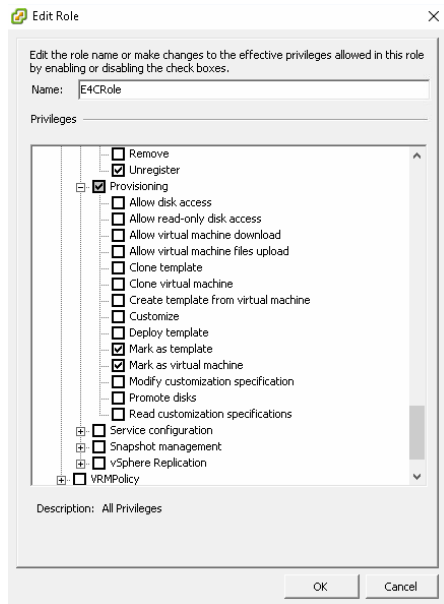
Create new: Create a new VM

Move: move a VM in the hierarchy

Register: add a VM to vCenter server or host inventory

Unregister: remove a VM to vCenter server or host inventory

APPENDIXES



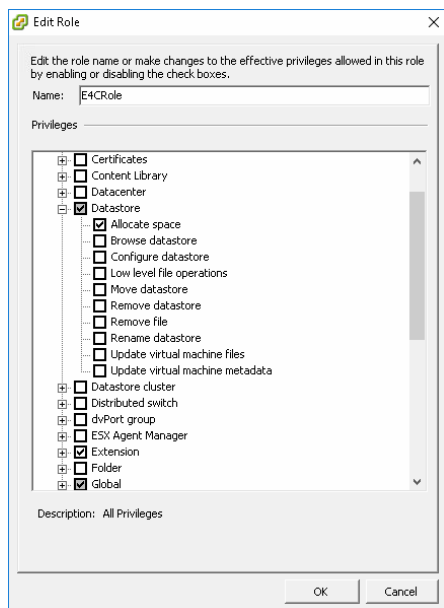
Virtual Machine Provisioning privileges control activities related to deploying and customizing virtual machines.

This class of privileges is required to manage and move templates.

Mark as template: Allows marking an existing powered off virtual machine as a template

Mark as virtual machine: Allows marking an existing template as a virtual machine.

Fig. N Virtual Machine Provisioning



Privileges **Datastore:** Datastore privileges control the ability to browse, manage, and allocate space on datastores.

This class of privileges is required to issue vMotions between different datastores and to move powered off VM or templates

Allocate Space: Allows allocating space on a datastore for a virtual machine, snapshot, clone, or virtual disk.

Fig. O Datastore

APPENDIXES

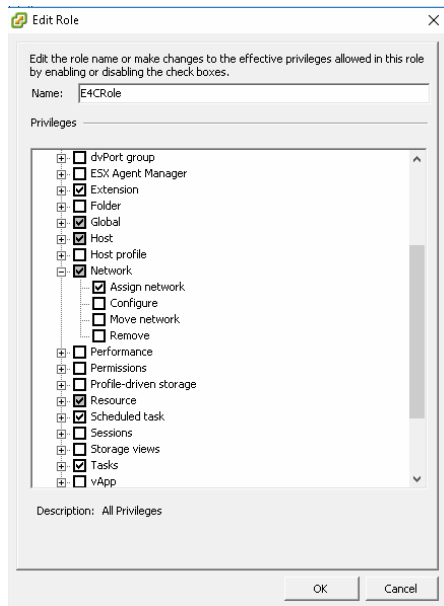


Fig. P Network

Privileges **Network**: Network privileges control tasks related to network management.

Assign Network: Allows assigning a network to a virtual machine.

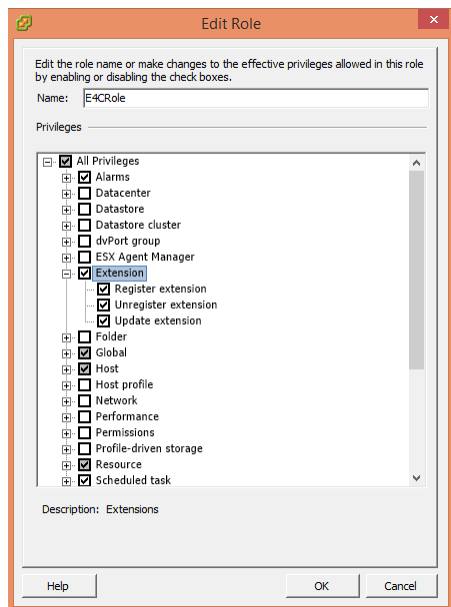


Fig. Q Extension

Privileges **Extension**: control the ability to install and manage plug-ins

This class of privileges is required to use Eco4Cloud Plug-in

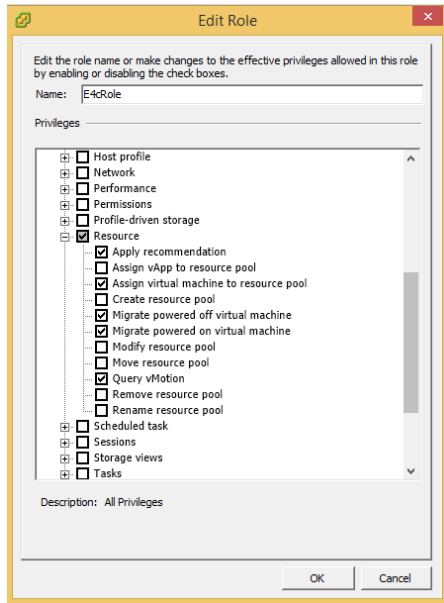
Register extension: Registers an extension (plug-in)

Unregister extension: Unregisters an extension (plug-in)

Update extension: Updates an extension (plug-in)

APPENDIXES

FOR VSPHERE >= 6.X



In the new versions of VMware vSphere ($\geq 6.x$) some privileges are changed. In particular:

Migrate and Relocate privileges have been respectively replaced by:

Migrate powered off virtual machine: Allows migration of a powered off virtual machine to a different resource pool or host.

Migrate powered on virtual machine Allows migration of a powered off virtual machine to a different resource pool or host.

Fig. Q Migrate and relocate in vSphere ≥ 6

APPENDIXES

APPENDIX B – IMPORTANT NOTES ABOUT ECO4CLOUD SOFTWARE

During normal operations, eco4cloud software will generate two scheduled tasks

1. "HypervisorLifeChecker"
2. "E4C Crash Detection Task"

and an alarm:

1. "E4C Crash Detection Alarm"

These tasks and alarms are needed to allow normal vCenter operation in case of failure of eco4cloud or in case vApp doesn't reach vCenter. **These tasks and alarms must not be canceled.**