Quanta Toolbox Application Manager

Getting Started Guide

Version 1.0.1

May 18, 2011
## Revision History

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1 INTRODUCTION

Quanta Toolbox is a cloud operating system designed to provide, manage, and monitor large collections of datacenter resources – server, storage and network – collectively as an elastic, reliable, and secured cloud operating environment to deliver Infrastructure as a Service (IaaS) at the application level. In this guide, we describe how you (the user) can create, launch, and monitor cloud applications in a Toolbox-enabled data center using web-based Toolbox Application Manager.

To access Application Manager, the following softwares are needed.

- A web browser with JavaScript support (Firefox v3.6+, Chrome v9+)
- Java Runtime Environment (JRE) v6.0+

2 ACCESSING APPLICATION MANAGER

2.1 Registration

Before using Toolbox, you will need an account with your cloud service provider. To register for a new account:

1. Go to https://[Provider_IP]//register using your web browser.
2. Enter the requested information and press the OK button at the bottom of the page (Fig. 2.1).
3. A message will appear indicating that an email was sent to the administrator (Fig. 2.2), press the Return button to exit this page.
4. Wait for an email notification from the administrator. Upon receiving this email, click the included link (Fig. 2.3) to complete the account registration process. A message will appear indicating that the account has been successfully created (Fig. 2.4). Click the Return button to go to the Toolbox login page.
Figure 2.1 – Account registration page

Figure 2.2 – Account registration request sent message
Dear ToolboxUser,

Welcome to the Toolbox!

In order to validate your registration, please click on the following link:
http://192.168.71.20/cert/Iwl9IjQF2CKGQqR3vaJVsyqtvOS9oLP342ydpw/

Sincerely,
Administrator

Figure 2.3 – Email notification to validate new account

<table>
<thead>
<tr>
<th>Application Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome to Toolbox, <strong>ToolboxUser</strong>!</td>
</tr>
<tr>
<td>Thanks for your registration. Your account is activated. You can login Toolbox now.</td>
</tr>
<tr>
<td>Please click following button back to Toolbox home page.</td>
</tr>
<tr>
<td>Return</td>
</tr>
</tbody>
</table>

Figure 2.4 – Account activation complete message

### 2.2 Login

Log into your account by going to [Provider_IP], enter your **Username** and **Password** and then press the **Login** button (Fig. 2.5). Clicking the **Sign up** button will lead you to the account registration page while clicking the **Forget Password** link will direct you to a page where you can retrieve your password using your username and email address (Fig. 2.6).
Once logged in, you will be redirected to Toolbox’s GUI consists of 4 main areas (Fig. 2.7):

- Title area at the top of the page that displays the Toolbox Application Manager version and name of the user currently logged in.
- Top menu bar below the Title area to access summary information, manage user account, and logout of Toolbox Application Manager.
The first page you will see is the Toolbox dashboard/summary page which shows account overview information; this includes a history of recent activities, important alerts, and resource usage summary (Fig. 2.7). If you wish to return to this page anytime while logged in, select Summary from the top menu bar. To quit using Toolbox’s Application Manager, select Logout from the top menu bar and you will be redirected back to the account login page.

3 ACCOUNT MANAGEMENT

Account information (Fig. 3.1) can be viewed and updated by selecting My Account from the top menu bar. Clicking My Account brings up an overlaying window containing your account information, a Download button, and a Modify button. You can modify any of the information
(except your username) by clicking the **Modify** button (Fig. 3.2), update the information, and then click **OK** to complete the update process. In addition, if you wish to access the underlying Eucalyptus system directly, you can download the required authorization key (certificate) by pressing the **Download** button and a pop-up menu will appear allowing you to specify where you wish to save this key (Fig. 3.3). To exit the account management, click the **X** button at the top-right corner of the overlaying window.

![Figure 3.1 – Account management window](image)

Figure 3.1 – Account management window
Figure 3.2 – Account modification page

Figure 3.3 – Eucalyptus key/certification download
4 APPLICATION DESIGN

Figure 4.1 shows the steps you need to perform to successfully create an application. We will show how each of these step is done in the following subsections.

4.1 Create and Upload Images

Toolbox comes with a few default images (CentOS 5.4, Load Balancer, and Memcached) which can be viewed by selecting “Template → Image” from the left selection menu (Fig. 4.2). To view detail regarding a specific image, click on the image icon and its ID, file name, and owner will be shown (Fig. 4.3).
You can also create your own service images by following the Xen image creation process (quick guide available from [http://www.jansipke.nl/creating-a-centos-xen-virtual-machine-image](http://www.jansipke.nl/creating-a-centos-xen-virtual-machine-image)) to create a Linux-based image or follow the steps outlined in Appendix A to create a Windows-based image. Once you have a working image, upload it to Toolbox/Euca by:

1. Select “Template → Upload Image” from the left selection menu to bring up the image upload interface. Please note that if the system time of your machine is not in sync with Euca system, a pop-up window (Fig. 4.4) will appear asking you to adjust your clock (this is necessary because Euca will not accept commands with timestamp 5 minutes before and after its system time).
2. Enable Euca2ool support by clicking the Download button next to the appropriate OS type and manually install the package (Fig. 4.5, 4.6).
3. Select the image you wish to upload using the Browse button and click the Upload button to complete the uploading process (Fig. 4.5, upload status will appear in the text box below the buttons).
4. If successful, you image will now be assigned an image ID and the newly created image will show up in the image list (“Template → Image”, Fig. 4.2).
Figure 4.4 – Time-sync warning message

Figure 4.5 – Image upload page
4.2 Create Server Templates

Next step you need to do is to create server templates using either the default Toolbox images or images you uploaded. To create a new server template, go to the Server Template page (“Template  Server Template”, Fig. 4.7), clicking the New server template () icon and a pop-up window will appear (Fig. 4.8). Enter a service name, choose an image from the pull-down menu, the computing resource type, the operating system type (Linux or Windows) and then press the OK button to complete the process. Table 4.1 shows the default computing resource type definition which may be different for your Toolbox system; please check with your Toolbox administrator to obtain the correct definition.
Figure 4.7 – Server template page

Figure 4.8 – Add new template pop-up window
Table 4.1 – Resource type definition

<table>
<thead>
<tr>
<th>Resource type</th>
<th>CPUs</th>
<th>Memory (MB)</th>
<th>Disk (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>m1.small</td>
<td>1</td>
<td>256</td>
<td>3</td>
</tr>
<tr>
<td>c1.medium</td>
<td>1</td>
<td>512</td>
<td>5</td>
</tr>
<tr>
<td>m1.large</td>
<td>2</td>
<td>768</td>
<td>10</td>
</tr>
<tr>
<td>m1.xlarge</td>
<td>2</td>
<td>1024</td>
<td>20</td>
</tr>
<tr>
<td>c1.xlarge</td>
<td>4</td>
<td>2048</td>
<td>20</td>
</tr>
</tbody>
</table>

All server templates created will appear in the template table list (Fig. 4.9). To delete a template, press the Delete button and a pop-up window will appear asking you to confirm your selection (Fig. 4.10). Press the Yes button and that template will be removed from your account.
Figure 4.10 – Template deletion

4.3 Design Profile (Application)

Continue the application design process by selecting “Profile → New Profile” from the left selection menu and a pop-up window will appear (Fig. 4.11) allowing you to add a new profile. Enter the profile name and the optional profile description and press the OK button.
A new profile entry will then appear in the left selection menu, select it to go to the profile design page (Fig. 4.12) containing:

- View tabs at the top to switch between profile design, auto-scaling rule setting, instance status page, and performance page.
- Template subview on the right containing Toolbox-supplied and user-defined servers and storage templates.
- Design space subview in the middle shows the current application infrastructure.
- Action buttons at the bottom of design space subview to run profile, stop profile, delete profile, pin components to current location, and save design as an application template (Fig. 4.13).
In the following subsections, we will describe how to design your profile, including adding server, adding persistent storage, saving design as application template, and adding scripts.

### 4.3.1 Adding servers

To add a custom server (from server templates that you created) to your profile, select “Server” from the template subview and drag it to the design space. A pop-up window (Fig. 4.14) will appear.
asking you to choose an icon to represent the server and enter the name and number of server instances (VMs) that you want to start your application with. Click the OK button to complete the process.

![Toolbox User Guide](image)

**Figure 4.14 – Adding new service to profile**

You will now see the newly added server appearing in the design space. Mouse over the server icon and you will see various icons appearing which you can use to perform the following actions (Fig. 4.15).

- Click the X icon at the upper-right hand corner to remove this server from your design
- Click the tool (_module) icon at the lower-right hand corner to view and update server information. You can also associate scripts to this service by clicking the “Add Script” tab (see Section 4.3.4 for detail) in the pop-up window (Fig. 4.16).
- Connect (click, hold, and drag) one of the 4 dots on the side of the icon to a dot on another service/storage icon to associate these two components (Fig. 4.17). A line will appear if the association was made successfully (Fig. 4.18).
Click and hold anywhere else in the icon (a 4-way arrow will appear) to move this icon to another location in the design space. Note that moving the icons in the design window does not pin them to their location; if you exit and come back to the profile design page, the location information will be lost. To preserve the location of icons, click the Pin icon location action button.

Figure 4.15 – Server icon actions
Figure 4.16 – Server detail window

Figure 4.17 – Connecting two components
Toolbox comes with two pre-built server templates that you can use. The Load Balancer server can be used to distribute traffic (using round-robin algorithm) to a set of connecting service instances while the Memcached server is an object-caching service that you can use to speed up remote data access from a connecting server.

To use Load Balancer server, select “Load Balancer” from the template subview and drag the *round robin* icon (this indicate that round robin algorithm is used to balance workload) to the design space. A pop-up window will appear, choose the representative icon, name of the server, and decide if you wish to assign an IP to it (Fig. 4.19, see Section 4.4 for how to request IPs). Click the OK button and associate the newly appeared icon with the target server you wish to balance workload (i.e., form a line between load balancer and target server). To enable work distribution, log into the Load Balancer server instance once it is up and running and configure it so it knows which servers are attached to it (and thus distribute work to).
To use Memcached server, select “Memcached” from the template subview and drag the *mem_1* icon to the design space. A pop-up window will appear, enter the name of the server and select the number of Memcached server that you want to use (Fig. 4.20, more server = larger cache). Click the OK button and associate the newly appeared icon with the target server you wish to speed up remote access for. Next, open up the target server’s Add Script page (click the tool icon and click Add Script tab) and you will see that a script called *memcached_init.sh* has been added to the server and several arguments called MEMIP_# appearing at the bottom of the page. The number of arguments appearing will depend on the number of Memcached servers defined; for example, if 3 Memcached servers are defined, arguments MEMIP_1, MEMIP_2, and MEMIP_3 will appear. Use the pull-down menu next to each of these arguments to point to IPs of Memcached servers.
4.3.2 Adding persistent storage

Adding a new storage device to your design works a little differently than adding a server. To add a new (persistent) storage device:

1. Select “Storage” from the template subview and drag the New icon to the design window.
2. Select a representative icon, enter the storage name and capacity in the pop-up window and click the Start button (Fig. 4.21).
3. Associate the storage device to the appropriate server (server that will be accessing the storage device) in the design space (must be a 1-to-1 relationship). Note that you can only attach storage devices to a server with 1 instance. An error message will appear if you attempt to attach storage devices to server with >2 instances (Fig. 4.22). Similarly, you cannot change the number of server instance while a storage device is attached to it (Fig. 4.23).
Figure 4.21 – Adding a new storage device

Figure 4.22 – Error message preventing you from attaching storage to a server with 2+ instances
Figure 4.23 – Error message preventing you from changing the number of server instances when storage device is attached

You can view the list of storage devices created at any time by selecting “Storage → Storage List” from the left selection menu (Fig. 4.24). Storage device with an instance ID associated with it means that the refined storage space has already been allocated by the system. Storage devices in used will display the profile and server that they are attached to while free storage devices (ones that can be reuse) will not contain this information and can be deleted by clicking the Delete button.
If you wish to reuse an existing storage device (which may or may not have been allocated):

1. Select “Storage” from the template subview and drag the **Reuse** icon to the design space.
2. Choose a representative icon, select the storage device to reuse from the pull-down menu and click the **Start** button (Fig. 4.25, only usable devices will appear in the pull-down menu).
3. Associate the storage device to the appropriate service in the design space. Similar to adding a new storage device, you can only attach the reused storage device to server with 1 instance. An error message will appear if you attempt to do otherwise.
4.3.3 Saving design for reuse

You can also save your design as an application template so it can be reused as a single component. To do this, click the **Save as Application** action button (Fig. 4.13), enter the name of this application template, and press the **OK** button (Fig. 4.26). A new application template will be created and can now be used by selecting “Application” from the template subview (Fig. 4.27).

![Figure 4.25 – Reuse an existing storage device](image-url)
Figure 4.26 – Saving design as an application template

Figure 4.27 – Profile design: application template

Note that if a storage device is saved as part of the application template, using this application template will create a new storage device of the same size rather than using the original storage device. For example, our example AppTemplate contains a storage device named Linux_Storage of size 5 GB. If we drag AppTemplate to the design space, a new storage device named Linux_Storage_1 of the same size will be created automatically.
4.3.4 Adding scripts

You can define various scripts to setup your servers. To create a new script, select “Script → Add New Script” from the left selection menu (Fig. 4.28). In this window, enter script’s name, description, type (installation or configuration), content, and a list of parameters. Next, click the OK button and this script will now be available to add to servers.

![Figure 4.28 – Adding new script](image)

Please note that in order to run the script created in this fashion, server VMs that you wish to run these scripts must have the Toolbox-pre-package rpm installed. To do this, download the rpm using the link (Fig. 4.29, Toolbox-pre-package-0.1.0.noarch.rpm) and a pop-up window will appear to specify where you wish to save this package. Copy the download package and install it to your server VMs.
You can view all available scripts at any time by selecting “Script ➔ View Script” from the left selection menu. This will bring up a list of scripts defined. Click on the table entry brings up an overlay window showing selected script’s content (Fig. 4.30). To close this window, Click on the X button at the top-right corner.
After creating your scripts, you can then add them to servers by clicking target server’s tool icon (Section 4.3.1) and select the Add Script tab (Fig. 4.31). From this window, choose the script type (installation or configuration), the script you want to use (only script of the correct type will appear in the list), when the script will run (boot up or shutdown), and then click the Add button.

![Figure 4.31 – Adding scripts to server](image_url)

The script that you specified will then appear below the Bootup Scripts or Shutdown Scripts section depending on your selection (press the Delete button to remove it from the list) along with the parameters that can be defined (Fig. 4.32). Finally, choose the parameter type (IP of an attached server/storage device or String), enter the value (if String type is chosen) and click the OK button to complete the process.
4.4 Public IP Request

If your Toolbox system provides NAT service, you can request up to 5 public IPs by clicking the Request New Public IP (●) icon on the Network Setting page (“Network → IP association”, Fig. 4.33). If successful, a new public IP entry will appear in the list (Fig. 4.34) which you can later associate with an instance of your application (Section 5. If NAT is not available, a message will appear informing you that there are no public IP available). When you no longer need the public IP, click the Deallocate button next to the IP entry (note that this IP must NOT be associated with any instance if you wish to release it) and the selected IP will be freed (Fig. 4.35).
Figure 4.33 – IP association page

Figure 4.34 – Public IP table after adding a new IP
5 APPLICATION EXECUTION

When you are satisfied with your profile design, click the Run Profile action button to begin running your application (Fig. 4.13). A pop-up window (Fig. 5.1) will appear asking you to confirm this action followed by another pop-up window informing you that your request has now been submitted to the Toolbox system and is attempting to run (Fig. 5.2). Please note that once a profile is running, you cannot make changes to its design; you will need to stop the application before making changes to the design (by clicking the Stop Profile action button).
Figure 5.1 – Run profile confirmation window

Figure 5.2 – Message indicating the run profile command has started
To view the status of your application, click the **Instance** view tab. From this view, you will see the deployment status (booting, volume attaching, ready, failed, terminating) for the entire application and within the table, you will see information regarding each instances such as instance ID, server group name, execution status (booting, ready, failed, terminating), instance’s public and private IP, and the CPU and memory allocated (Fig. 5.3, 5.4, 5.5). You can also associate a public IP to an instance by clicking the **Associate** button, this will automatically assign one of the public IP you requested (Section 4.4) to your instance (an error message will appear if you do not have a free public IP available). To free an associated public IP, click the **Dissociate** button next to the target instance (Fig. 5.4). Once your instances are running (status = ready), you can start accessing them using the IPs listed in the table.

![Deployment status, VM instances booting](image)

**Figure 5.3 – Deployment status, VM instances booting**
Figure 5.4 – Deployment status, volumes attaching

Figure 5.5 – Deployment status, ready
5.1 Performance Monitoring

You can view the performance of your application by clicking the Performance view tab. To better demonstrate this, we used a more complex PHPMotion application (Fig. 5.6) as an example; this application consists of a Load Balancer instance, a Web instance, a Memcached instance, a Database instance, a Samba instance, and a 2GB storage device (Fig. 5.7).

Currently, Toolbox tracks the percentage CPU utilization statistic for all running instances. For example, in Figure 5.8, CPU utilization rates for Web and DB instances are shown. If the instance is a Load Balancer server, Toolbox also shows its response time which is the same as the average response time of the whole application (Fig. 5.9).
Figure 5.8 – PHPMotion performance for Web and DB

Figure 5.9 – PHPMotion performance for Load Balancer
5.2 Auto-Scaling

Toolbox can analyze the performance statistics collected in real-time and scale out and down the application according to a pre-defined set of criteria. To enable the auto-scale feature, click the AutoScale view tab and then click the Add auto scale rule icon, a pop-up window (Fig. 5.10) will appear allowing you to define rules for auto-scaling.

To define a rule, fill in all of the required information.

- Choose the service you wish to enable auto-scaling using the Group pull-down menu.
- Choose either the response time or CPU utilization as the performance metrics to monitor.
- Enter the scale-out rule by specifying the minimal performance value, duration, and number of instances to scale out. For example, definition shown in Figure 5.11 specify that scaling-out is activated when DB’s CPU utilization is greater than 70% for a more than 15 seconds. Once scaling-out is activated, a single DB instance will be added to the system up if less than 3 DB instances are running.
- Enter the Scale-down rule similar to the scale-out rule.
Enter the minimal and maximum number of instances. Scaling-out and scaling-down will not be performed if the result of scaling is less than the minimal value or greater than the maximum value.

Enter the calm down time which indicate the minimal amount of time between scaling actions. For example, calm down time of 3 minutes means that after a scale-out or scale-down operation, no scaling operation will be performed for at least 3 minutes.

Enter the valid decision threshold which indicates the percentage of instances that must satisfy the scaling condition before scaling action is performed. For example, if the application currently has 5 DB instances running, a threshold of 60% means that at least 3 of these instances must satisfy the scale out/down rule for it to be activated.

Click the OK button to add these rules. Rules added can be viewed and modified from the AutoScale page (Fig. 5.12) by clicking the Modify button next to the table entry.

![Figure 5.11 – DB auto-scaling rule definition]
6 LOG AND EUCALYPTUS INSTANCES

Toolbox keeps a log of events with respect to each account. To view this log, select “Log → Event Log List” from the left selection menu (Fig. 6.1). Log entries are shown with respect to their timestamp (latest ones are shown first) and contain information such as log timestamp, the type of the event (info, warning, error), name of the profile that generated the event, and the log message. By default, only 15 latest log entries are shown with older log entries viewable using the first/prev/next/last links and page numbers at the top of the log table (total number of log entries are shown above these links). In addition, you can filter log events based on type, profile name, and/or specific keyword using the Filter menu above the log table (Fig. 6.2) and the system will automatically refresh the log to only display matching events.
Figure 6.1 – Event log list

Figure 6.2 – Log filtered to show only events of type INFO generated by profile My_First_App
Besides deploying your application using the process discussed in this document (Section 4 and 5), you can also create and run new VM instances using the underlying Eucalyptus system directly. To view all instances created using Eucalyptus commands, select “Profile → Made by Euca” from the left selection menu (Fig. 6.3).

![Eucalyptus instance status](image)

Figure 6.3 – Eucalyptus instance status
A. CREATING WINDOWS IMAGE

In this section, we briefly outline the steps to create a Windows image using CentOS 5.4 x86_64 Hypervisor-Xen 3.4.2 environment.


   Dd if=/dev/zero of="name.img" bs="base block size" count="block number"

   Example:
   dd if=/dev/zero of=windows-2003.img bs=1M count=2000 mkfs.ext3 centos-root.img

2. Create VM using Windows OS ISO file and then shutdown the VM. Please note that for windows 2003, you will need to install PV driver if you wish to attach a persistent storage to it. Download the gplpv_2003x32_0.10.0.134 driver from https://download.hs-mittweida.de/gplpv/

   virt-install -n "name" -r "memory size" -f "image file" -v -c "the installing image file"

   Example:

3. Using euca command "euca-bundle-image" to bundle the image.

   euca-boudle-image -i "image name"

   Example:
   euca-boudle-image -i windows-2003
4. Using euca command "euca-upload bundle" to upload the image.

euca-upload-bundle -b "upload image's name" -m "image_location"

Example:

5. Using euca command "euca-register" to register the image.

euca-register "image_location"

Example: