

YouTestMe Enterprise Edition

Installation and Support Manual

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1 Introduction

YouTestMe Enterprise Edition is a comprehensive software solution designed for organizations that create, deliver, and manage various assessments, tests, and exams. It is a powerful tool that helps companies to streamline their assessment processes, automate grading, and improve overall test efficiency.

The architecture of YouTestMe Enterprise Edition Software is based on a client-server model, with a three-tier architecture that includes a database layer, an application layer, and a presentation layer.

- At the database layer, the software utilizes a relational database management system (RDBMS) to store all data related to tests, questions, users, results, and other relevant information. The database is designed to be highly scalable and can handle large volumes of data.
- At the application layer, YouTestMe Enterprise Edition Software consists of several components that perform various functions. These include a web server, an application server, and a set of APIs that enable integration with other systems.
- Finally, the software provides a web-based interface at the presentation layer that allows users to create, deliver, and take tests. The interface is designed to be user-friendly and intuitive, with features such as drag-and-drop question creation and an easy-to-use test editor.



1.1 The Installation Process Overview

The installation of the enterprise edition of our software involves setting up four VMware virtual appliances: two Tomcat application servers, a PostgreSQL database server, and an Apache web server. The virtual appliances are available for download from the links provided upon software purchase.

Before installing, ensure your system meets the minimum requirements in the [Pre-Installation Steps](#). Once you have verified the requirements, download, and decompress the archived virtual appliances from the provided links.

- To install the software, you must deploy the virtual appliances on VMware ESXi servers, configure their settings (primarily networking), and start them. Once the virtual appliances are up and running, you must configure the Tomcat application server, the PostgreSQL database server, and the Apache web server to work together.
- Configuring the Tomcat application servers involves accessing the server console and configuring the server settings. The application code (WAR file) will be pre-deployed on the server.
- Configuring the PostgreSQL database server involves accessing the server console and modifying the access privileges. The initial demo set will be pre-loaded into the database.
- Configuring the Apache web server involves accessing the server console, configuring the server settings, and modifying a virtual host for the software.

After completing the installation and configuration, please verify that the software functions correctly and test its features. If you encounter any issues during the installation or configuration process, consult the troubleshooting section of the installation manual or contact our technical support team for assistance.

2 Pre-Installation Steps

2.1 Hardware Requirements

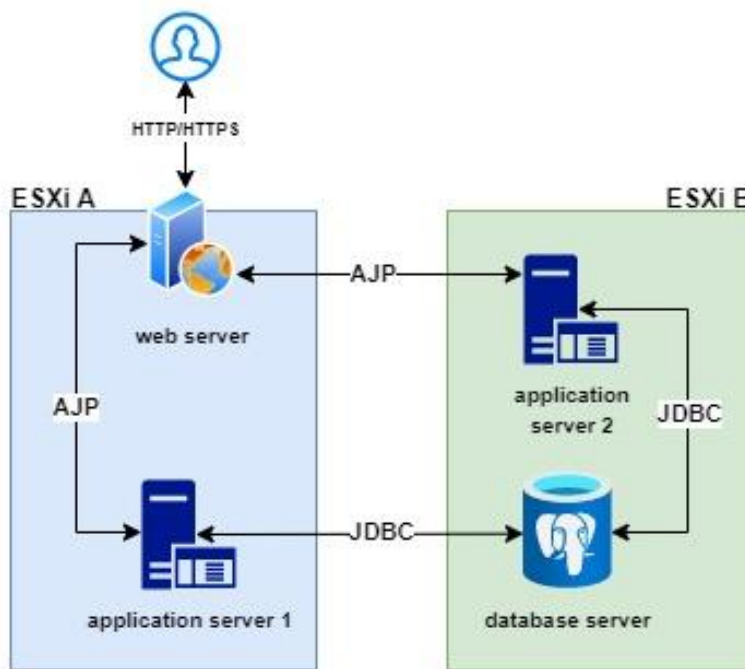
Before deploying YouTestMe Enterprise Edition software, you must ensure that your hardware meets the recommended requirements in the system requirements table. Then, to deploy the software, you have two options:

1. Rent or purchase two physical servers with ESXi installed and available hardware resources.
2. Use already employed ESXi servers that have enough free hardware resources.

The virtual appliances required for the software include the Apache web server, two instances of the Tomcat application server, and the PostgreSQL database server. To ensure that the virtual appliances are configured correctly, you will need to allocate the following resources to each virtual appliance:

| # | Virtual Appliance | Cores per vCPU | vCPU | RAM (GB) | Storage (GB) |
|----|----------------------------|----------------|------|----------|--------------|
| 1. | Apache web server | 1 | 4 | 8 | 50 |
| 2. | Tomcat application server | 1 | 8 | 32 | 320 |
| 3. | PostgreSQL database server | 1 | 4 | 16 | 500 |

When deploying the virtual appliances to two physical servers, you must ensure that the servers meet the hardware requirements specified in the system requirements table. The diagram below illustrates the deployment model, which shows the two physical servers and the virtual appliances deployed on each server.



Note that you should not allocate all available hardware resources to the virtual machines, which can lead to performance issues. Instead, ensure that the virtual appliances are configured optimally regarding CPU allocation, RAM allocation, and storage allocation.

Useful link: [ESXi 7 Hardware Requirements](#)

If you decide to rent or purchase dedicated bare-metal servers for the YouTestMe Enterprise software, we recommend choosing servers with a similar or stronger hardware configuration to the one specified below:

- CPU: AMD Ryzen 9 5900X - 12c/24t - 3.7GHz/4.8GHz
- RAM: 64GB DDR4 ECC 3200MHz
- Storage: 2× 960GB SSD NVMe Soft RAID

2.2 Network Requirements

Proper network configuration is essential for installing and operating YouTestMe Enterprise Edition software.

Depending on whether you choose to host the software on dedicated ESXi servers or rent bare-metal servers from a hosting provider, there are specific network requirements that you need to consider.

Below are the network requirements you need to meet to ensure the smooth operation of the software.

- If you host dedicated ESXi servers in your data center, ensure the networking is correctly configured on both servers to communicate within the same VLAN. This will ensure that the virtual appliances can communicate with each other, and the outside world as needed.
- If you choose to rent dedicated bare-metal servers from a hosting provider, such as OVH, make sure that the servers support the following features:
 1. The hosting provider should offer a private network to establish isolated server communication. It is vital for security and performance reasons, as it allows the virtual appliances to communicate with each other without going through public networks.
 2. The public network bandwidth should be at least 500 Mbps, although we recommend using a 1 Gbps connection for optimal performance. This will ensure that the virtual appliances can communicate with the outside world quickly and efficiently.

Useful links:

1. [ESXi – configuring network settings](#)
2. [OVH vRack private network](#)

3 Download the Virtual Appliances

After you purchase an enterprise license for YouTestMe software, you will receive an email with the download links for all software components packed as preconfigured virtual appliances.

The virtual appliances are hosted on our dedicated secured FTP server, and the checksum verification of the virtual appliances will be performed automatically by VMware client software before the deployment process.

More details can be found in the [Installation and Support Manual for Standard Edition](#).

| # | virtual appliance | size (GB) | approximate download time (min) | software version |
|----|----------------------------|-----------|---------------------------------|------------------|
| 1. | Apache web server | 1.2 | 10 | 2.4.41 |
| 2. | Tomcat application server | 4 | 30 | 9.0.74 |
| 3. | PostgreSQL database server | 4 | 30 | 14.7 |

4 Installing the Virtual Appliances

Note: Please check the server diagram in [Chapter 2.1](#) to understand the layout of the machines across the ESXi servers.

After downloading the YouTestMe Virtual Appliances, please consult the document [YouTestMe Standard Edition-Installation and Support Manual.pdf](#) to perform the following actions for every each of them:

1. Deploy the Virtual Appliances to ESXi servers as described in [Chapter 5](#) of the installation manual for the Standard Edition.
2. [Start the Virtual Appliances](#) and perform [First Login](#)
3. [Configure the network settings](#) for all deployed virtual machines in your data center. If you use ESXi servers rented from a hosting provider, please refer to their documentation to properly configure networking on each virtual machine.

Useful links:

1. [OVH – Configuring a network bridge](#)
2. [OVH – Configuring the vRack](#)

4.1 Network Configuration Check

After the network configuration phase, the following requirements should be met:

- The network adapter is configured in the bridge mode (all VMs)
- The network adapter has assigned a unique private IP address (all VMs)
- All VMs must communicate within the same VLAN/subnet
- If you rent ESXi servers, only the VM that hosts the Apache web server should have two virtual network adapters / two IP addresses. Consequently, if needed, the web server may act like a router (public IP address assigned) and as a gateway for the other virtual machines.

In the table below, you can examine each VM's system parameters: default hostname, hypothetically private IP address, and OS firewall state.

For demonstration purposes, we assume you configured networking for all virtual machines in the following subnet: 192.168.1.1/24. Below, hostnames and IP addresses are given only as an example.

| # | virtual appliance | hostname | private IP address | firewall |
|----|-----------------------------|---------------|--------------------|----------|
| 1. | Apache web server | ytmwebserver1 | 192.168.1.5 | enabled |
| 2. | Tomcat application server 1 | ytmtomcat1 | 192.168.1.6 | disabled |
| 3. | Tomcat application server 2 | ytmtomcat2 | 192.168.1.7 | disabled |
| 4. | PostgreSQL database server | ytmdbase1 | 192.168.1.8 | disabled |

5 Server Configuration

5.1 Establishing SSH Connection

The most convenient way to connect and administrate all YouTestMe Servers is to establish an SSH connection from your workstation.

Open a terminal or SSH client on your workstation and connect to the remote server using the SSH protocol.

Note: SSH username and password can be obtained from the description of the virtual machine.

Suppose the private IP address of your workstation belongs to the same network as YouTestMe virtual machines. In that case, you can connect directly to the database server using its private IP address:

```
$ ssh [username]@[database_ip]
```

Here are the steps you can follow to establish an SSH connection to a server located in a different subnet:

1. Determine the IP address of the server you want to connect to.
2. Determine the IP address of your local computer and the subnet it belongs to.
3. Configure your network settings to allow communication between the two subnets. The procedure may involve setting up routing rules, configuring firewall rules, or creating VPN connections.
4. Test the connection between your local computer and the remote server by pinging its IP address.

5.2 Configuring Database Server

5.2.1 Configuring Access Privileges

PostgreSQL Virtual Appliance is configured to accept all connections in the default IP range 192.168.1.1/24.

You should specify from which IP addresses should be established database connection by performing the following actions:

1. Switch to "postgres" user (SSH password is in VM's description):
\$ su - postgres
2. Open the access policy configuration file:
\$ vim /var/lib/pgsql/14/data/pg_hba.conf
3. Safelist the IP address of the application servers by adding the following lines in the "IPv4 local connections" sections:

| | | | | |
|------|-----|-----|-----------------------------|---------------|
| host | all | all | [application_server1_IP]/32 | scram-sha-256 |
| host | all | all | [application_server2_IP]/32 | scram-sha-256 |

```
# TYPE DATABASE USER ADDRESS METHOD
# "local" is for Unix domain socket connections only
local all all trust
# IPv4 local connections:
host all all 127.0.0.1/32 trust
host all zbx_monitor 0.0.0.0/0 md5
host all all 192.168.1.6/32 scram-sha-256 #app server 1
host all all 192.168.1.7/32 scram-sha-256 #app server 2
# IPv6 local connections:
host all all ::1/128 scram-sha-256
# Allow replication connections from localhost, by a user with the
# replication privilege.
local replication all peer
host replication all 127.0.0.1/32 scram-sha-256
host replication all ::1/128 scram-sha-256
```

4. Save the changes and exit the file
5. Reload the PostgreSQL server to accept the new access privileges:
\$ /usr/pgsql-14/bin/pg_ctl reload

Note: If necessary, you can safelist an entire subnet or add an additional IP address for administrative purposes.

5.3 Configuring Application Servers

5.3.1 Setting Up Server Hostname

You need to configure unique server identification to help address the specific application server as needed.

The following change should be applied to every deployed application server.

1. Log in to the application server as "root" user (locate password in VM's description)
`$ su - root`
2. Edit the following configuration file:
`$ vim /etc/hostname`
3. Adjust the existing hostname by modifying the ordinal number at the end of the string to achieve the unique name in the following format ytm`tomcat`[id].
For example ytm`tomcat`1, ytm`tomcat`2, etc.
4. Save the changes and exit the file
5. Reboot the virtual machine:
`$ reboot`

5.3.2 Adjusting Engine Element

The following change should be applied to every deployed application server.

1. Log in as the application "ytm1" user (locate password in VM's description):
`[ytmlogin@ytmtomcat2 ~]$ su - ytm1`
2. Open server configuration file "server.xml":
`[ytm1@ytmtomcat2 ~]$ vim ${TOMCAT_DIR}/conf/server.xml`
3. Change the "jvmRoute" attribute in the Engine element:
`<Engine name="Catalina" defaultHost="localhost" jvmRoute="jvm2">`
4. Save the changes and exit the file.

Engine "jvmRoute" attribute must be unique across all Tomcat servers within the application cluster.

Coordinating the naming convention for the server hostname and Engine attribute "jvmRoute" is recommended. If you specified the hostname as "ytm`tomcat`1", the Engine attribute value should be "jvm1".

5.3.3 Updating Database Hostname

The following change should be applied to every deployed application server!

The application server addresses a database using a hostname. Therefore, you must update the database IP address corresponding to the predefined database hostname.

1. Log in to the application server as "root" user (locate password in VM's description)
`$ su - root`
2. Edit the following configuration file:
`$ vim /etc/hosts`
3. Replace the default IP address with the actual configured IP address of the database server:

```
127.0.0.1    localhost localhost.localdomain localhost4 localhost4.localdomain4
::1         localhost localhost.localdomain localhost6 localhost6.localdomain6
192.168.1.8 dbserver
```

4. Save the changes and exit the file
5. Restart the Tomcat server:
 - `$ tstop`
 - wait 10 seconds to allow Tomcat enough time to gracefully shutdown
 - `$ tstart`

5.4 Configuring Apache Web Server

5.4.1 Updating Application Server Hostnames

Apache web server addresses the application servers using hostnames. Therefore, you need to update IP addresses that correspond to predefined hostnames of the application servers.

1. Log in to the web server as "ytmlogin" user (locate password in VM's description)
`$ su - ytmlogin`
2. Switch to "root" user (find the password in VM's description)
`$ su - root`
3. Edit the following configuration file:
`$ vim /etc/hosts`
4. Replace the default IP addresses with the actual configured IP addresses of the application servers:

```
127.0.0.1    localhost localhost.localdomain localhost4 localhost4.localdomain4
::1         localhost localhost.localdomain localhost6 localhost6.localdomain6
192.168.1.6 ytmtomcat1
192.168.1.7 ytmtomcat2
```

Critical Note: The IP addresses and hostnames of the application servers are linked to their corresponding **jvmRoute** attribute, which allows the web server to identify and communicate with the correct application server.

Suppose the default IP addresses are not replaced with the actual ones in the `"/etc/hosts"` file in the specified order. In that case, the web server will be unable to correctly identify which application server has which **jvmRoute** attribute, which can cause issues with the proper application functioning.

Therefore, following the instructions and replacing the default IP addresses with the actual ones in the `"/etc/hosts"` file in the specified order is essential.

5. Save the changes and exit the file
6. Restart the Apache HTTPD server:
`$ systemctl restart httpd`

6 Test the Software Functionality

After installing and configuring the YouTestMe software components, it is crucial to test their functionality to ensure that everything is working correctly.

The first step in testing the software functionality is to verify that the Apache web server is correctly configured to use the "mod_proxy_balancer" module. This module is used to distribute incoming traffic across multiple application servers.

6.1 Mapping the Test Domain to the Web Server IP Address

The Apache web server is configured by default to allow access via the dummy URL:

<https://ytmap.example.com>

To access the application using the test domain "ytmap.example.com", you need to map it to the current web server IP address.

To accomplish this, edit the specific configuration file located on your local machine depending on the Operating System you are using:

Windows:

1. Open the "Start" menu and search for "Notepad".
2. Right-click on "Notepad" and select "Run as administrator".
3. In Notepad, click on "File" and select "Open".
4. Navigate to "C:\Windows\System32\drivers\etc" and select the "hosts" file.
5. Add a new line at the bottom of the file with the following text:
 <web server IP address> ytmap.example.com
 Replace "<web server IP address>" with the actual IP address of your web server.
6. Save the changes to the "hosts" file.

Mac:

1. Open the "Terminal" application.
2. Type "sudo nano /private/etc/hosts" and press "Enter".
3. Enter your administrator password if prompted.
4. In the Nano editor, add a new line at the bottom of the file with the following text:
 <web server IP address> ytmap.example.com
 Replace "<web server IP address>" with the actual IP address of your web server.
5. Save the changes by pressing "Ctrl+O", then press "Enter".
6. Close the Nano editor by pressing "Ctrl+X".

Once you have made these changes, you should be able to access the deployed application by entering "ytmapp.example.com" in your web browser.

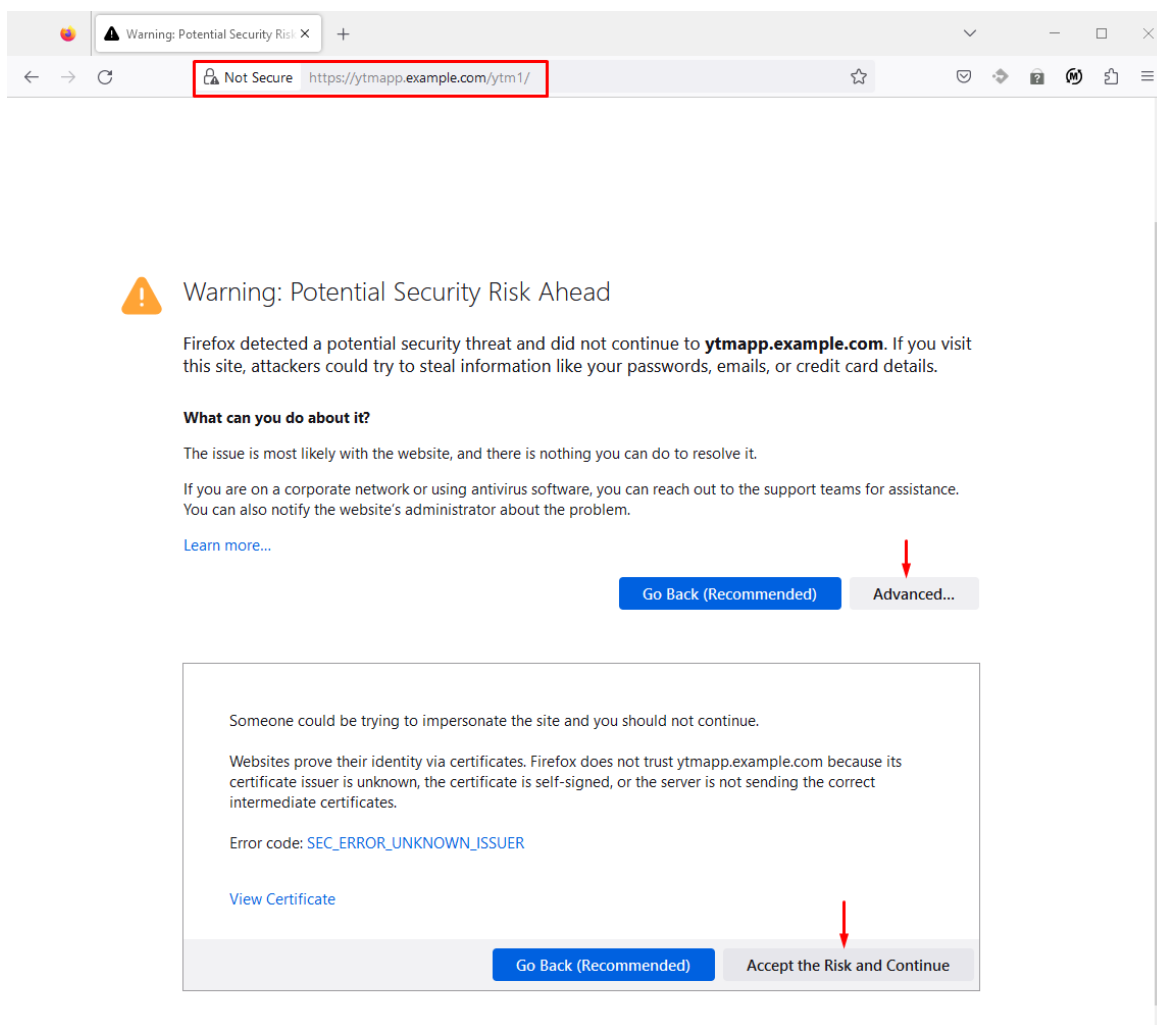
6.2 Testing Load Balancing

To verify that the load balancing module is working correctly, perform the following steps:

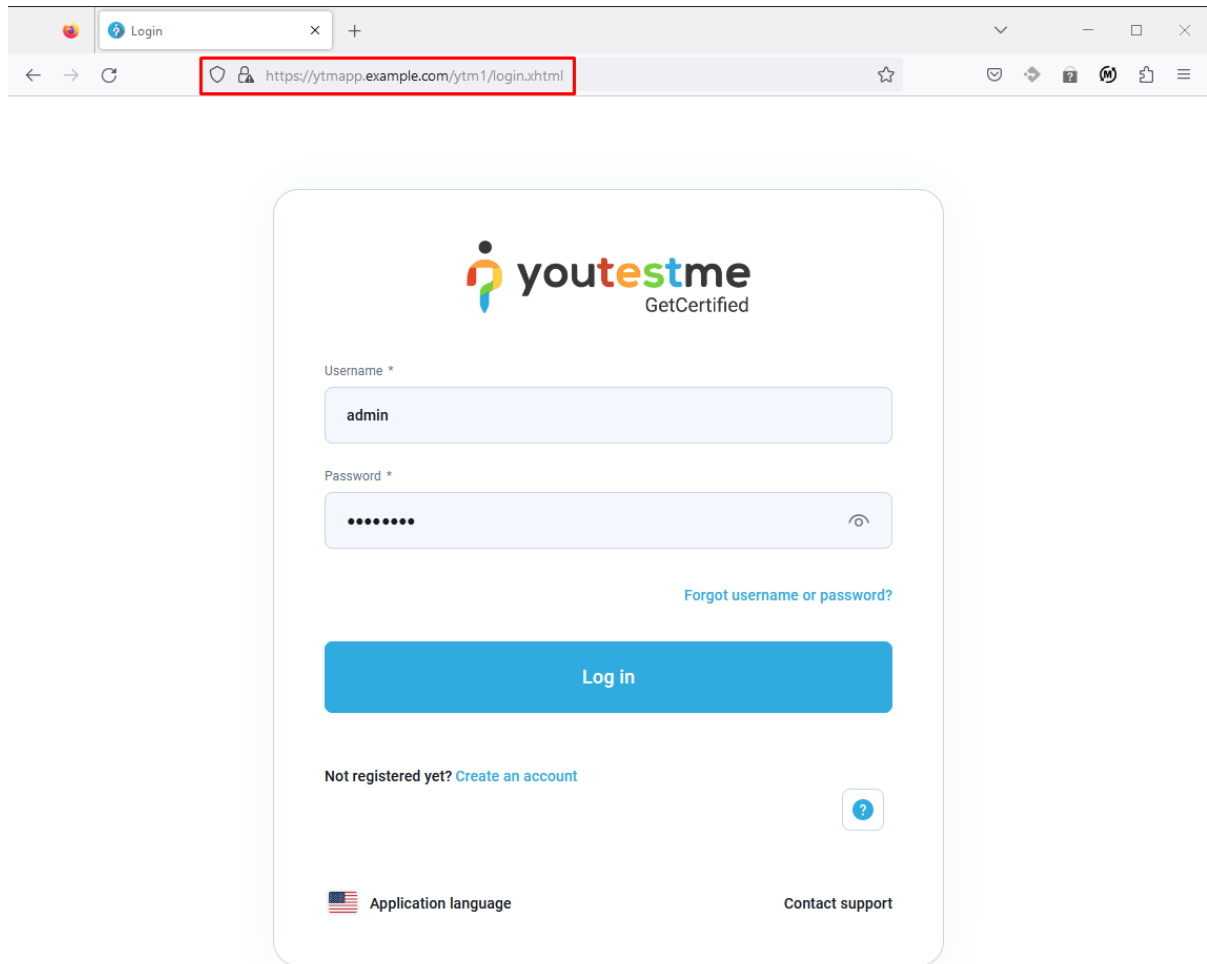
1. Open a web browser and navigate to the URL of the web server using the test domain:
<https://ytmapp.example.com>

The browser will not trust the SSL certificate installed on the web server. It's the expected behavior because the certificate serves demonstration purposes, and a valid Certificate Authority does not sign it.

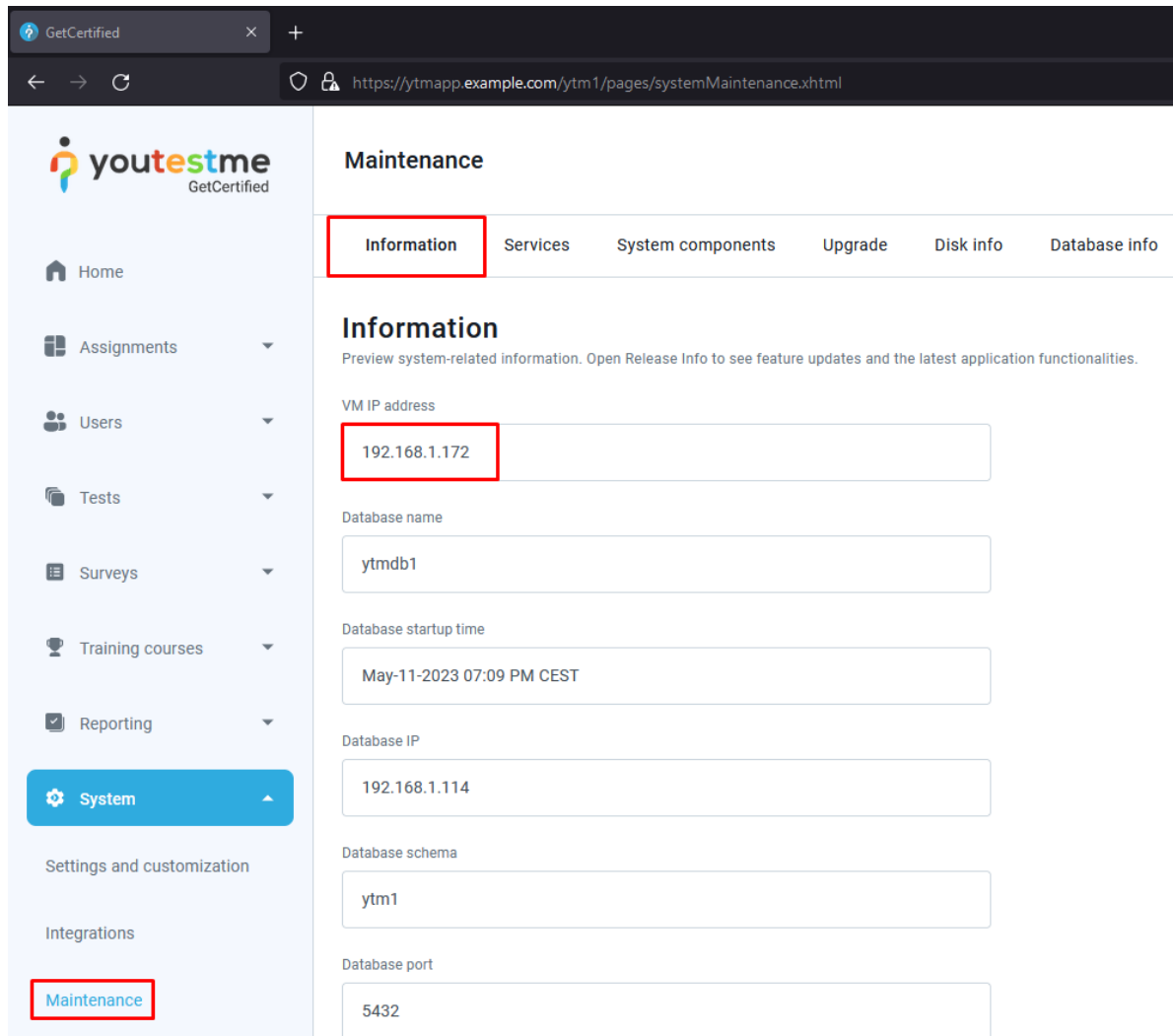
You can see the example in the picture below when you are using Mozilla Firefox to access the application and how to navigate through the security dialog:



2. Log in to the GetCertified application using the default credentials sent to you via email:



3. Open an additional session in the private window using the same browser (Chrome: "Ctrl+Shift+N" Firefox: "Ctrl+Shift+P") and use the same test domain to access the application and log in.
4. Navigate to the "System->Maintenance" page and select the "Information" tab. Next, check the "VM IP address" field in both sessions opened in separate windows. The displayed IP addresses should be different to confirm that the load balancer distributes HTTP traffic to both servers.



6.3 Testing GetCertified Functionalities

Test the functionality of the YouTestMe GetCertified software by performing various tasks in the application, such as creating and managing tests, quizzes, and exams and generating reports. Test all the software features you plan to use in your organization.

To ensure that the software is working correctly, consider performing the following tests:

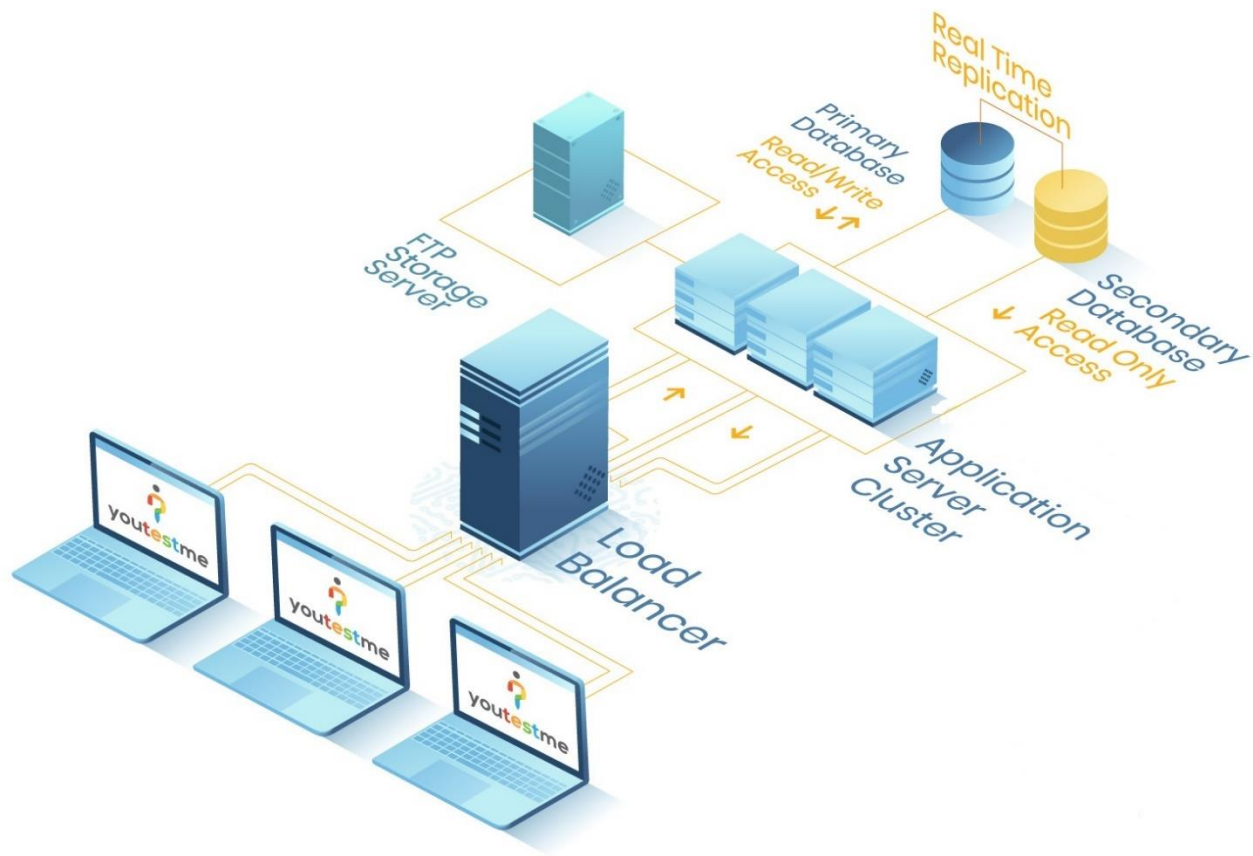
1. Create a new test, quiz, or exam and verify that the questions are displayed correctly.
2. Add and remove questions from an existing test and verify that the changes are saved correctly.
3. Generate reports and verify that they contain the expected data.
4. Check the system logs for any error messages or warnings.

By performing these tests, you can ensure that the YouTestMe software is working correctly and that you can rely on it to manage your organization's training and certification needs.

7 Configuring PostgreSQL Hot Standby Database

YouTestMe Enterprise Plus Edition supports an additional database server that provides high availability and fault tolerance in a PostgreSQL database system ensuring minimal downtime and data loss.

The PostgreSQL Hot Standby database operates in read-only mode and can be used for querying in parallel with the primary server serving the application requests.



Please consult the [YouTestMe PostgreSQL Hot Standby Database Configuration Manual](#) to learn how to install, configure and maintain the additional database to gain several benefits:

- Improved Performance
- Backup and Reporting
- High Availability and Scalability
- Maintenance and Upgrades

8 Appendix

8.1 Using Your Domain and SSL to Access the Application

Follow the instructions below if you want to use your domain to access the application and set up SSL certificates:

1. Obtain a domain name: If you do not have a domain name, register one through a domain registrar like GoDaddy, Namecheap, or Google Domains.
2. Map the domain to the web server's IP address: you need to configure the domain's DNS settings to point to the IP address of the web server. The operation can be done through the domain registrar's DNS management interface.
3. Set up SSL certificates: To secure the website and enable HTTPS, you should obtain and install SSL certificates. There are several options for obtaining SSL certificates, including:
 - **"Let's Encrypt"**: A free, automated, open certificate authority that provides SSL certificates.
 - **"Cloudflare"**: A content delivery network that offers free SSL certificates and security features.
 - **"Comodo", "DigiCert"**, or other commercial certificate authorities: These are paid options that offer higher levels of validation and support.
4. Configure Apache to use SSL certificates for your domain:
 1. Copy your SSL certificate files (private key, SSL certificate, and Certificate Authority (CA) Bundle) to the web server
 2. Update a virtual host in the "httpd-vhosts.conf" Apache configuration file by executing the following steps:
 - `$ vim /usr/local/httpd/conf/extra/httpd-vhosts.conf`
 - Replace a test domain "ytmap.example.com" with your domain name
 - Add the absolute paths to your SSL certificate files replacing the dummy SSL certificate paths used for demonstration purposes
 - Save the changes and exit the file
 - Restart the Apache HTTPD server:
`$ systemctl restart httpd`

```
<VirtualHost *:80>
    ServerName          ytmapp.example.com
    Redirect             / https://ymapp.example.com/
</VirtualHost>

<VirtualHost *:443>
    ServerName          ytmapp.example.com

    SSLEngine on

    SSLCertificateFile   /etc/ssl/certs/test/example.com.crt
    SSLCertificateKeyFile /etc/ssl/certs/test/example.com.key
    SSLCertificateChainFile /etc/ssl/certs/test/ca.crt

    Header add Set-Cookie "ROUTEID=.%{BALANCER_WORKER_ROUTE}e; path=/" env=BALANCER_ROUTE_CHANGED

    RewriteEngine On
    RewriteCond %{REQUEST_URI} ^/$
    RewriteRule (.*?) /ym1/ [R=301]

    RewriteCond %{HTTP:Upgrade} websocket [NC]
    RewriteCond %{HTTP:CONNECTION} Upgrade$ [NC]
    RewriteRule /(.*) balancer://wscluster1/$1 [P,L]

    ProxyPass            /ym1 balancer://mycluster1/ym1
    ProxyPassReverse     /ym1 balancer://mycluster1/ym1

    ErrorLog /usr/local/httpd/logs/ymapp-error.log
    CustomLog /usr/local/httpd/logs/ymapp-access.log vhost

</VirtualHost>
```

9 Contact Information

If you encounter any difficulties during the process or have any questions, please do not hesitate to contact our support team at support@youtestme.com. Our dedicated team of experts is available to assist you with any issue that you may have.

<https://www.youtestme.com/support-services/>