



APPLICATIONS MANAGER
BEST PRACTICES

This document will list the best practices to be followed by the users of ManageEngine Applications Manager

1. Hardware and Software requirements
2. Starting and Shutting Down Applications Manager
3. Configuring Applications Manager
4. Securing Applications Manager
5. Fault Management
6. Log file Management
7. Applications Manager Database Management
8. Crash & Recovery

1. Hardware and Software requirements

Performance of Applications Manager depends considerably on the CPU and memory of the system. The following table describes the configuration of the system required for various deployments. We strongly recommend having a dedicated server for Applications Manager when going into production. Each deployment of Applications Manager can have up to 500 monitors.

The hardware configuration (dedicated resource) for Stand Alone and Enterprise Edition setup is mentioned below.

Edition	Number of Monitors	Processor	Memory*	Hard Disk
Professional Edition/Plugin Professional Edition	1 to 100	2 Core / 2.0 GHz and above	4 GB RAM	100 GB & above
	101 to 250	2 Core / 2.0 GHz and above	8 GB RAM	150 GB & above
	251-500	4 Core / 2.0 GHz and above	12 GB RAM	200 GB & above
Enterprise Edition/Plugin Enterprise Edition	251 to 1000 1 Admin & 2-3 Managed servers	4 Core / 2.0 GHz and above	12 GB RAM	200 GB & above per instance
	1001 to 10000 1 Admin & 2-20 Managed servers	4 Core / 2.0 GHz and above	16 GB RAM	200 GB & above per instance

**The above mentioned memory does not include memory used by OS which should account for another 4 GB
If the number of Managed Servers is high, 16 GB RAM for the Admin Server is recommended.

Performance of Applications Manager is also influenced by the other factors such as

- Type of monitors configured and amount of telemetry data being collected.
- Polling interval set
- Number of reports enabled attributes, scheduled reports configured, duration of reporting data present
- Number of thresholds and actions configured
- Network Speed
- Number of concurrent users connected to the system

When you are going for large deployments, we recommend adding the monitors in the range of 25 – 50 at a time and determine the performance before adding more monitors. When the threshold is reached and when you find that Applications Manager system is slow to handle requests, then you may need to add the remaining monitors to another Managed Server.

Recommended Operating Systems:

The following table lists the recommended software requirements for an AppManager installation.

Software	Evaluation	Production
Windows OS	Windows 10/8/7 (or) Windows Server 2019/ 2016/ 2012 R2	Windows Server 2019 / 2016 / 2012 R2
Linux OS	Ubuntu / openSUSE / Red Hat Enterprise Linux (up to version 8) / Fedora / CentOS / Oracle Enterprise Linux	CentOS Stream (8 and above)/ Debian/ Fedora/ openSUSE/ Oracle Linux/ RHEL (7 and above)/ SUSE Linux Enterprise/ Ubuntu
Browsers	Chrome/ Firefox/ Edge	Chrome (preferred)/ Firefox/ Edge

- Using VMware or Hyper-V virtual machines is supported for all the supported operating systems
- Can be installed on Amazon Elastic Compute Cloud (Amazon EC2) or Azure Virtual Machines (VM) or Google Compute Engine or Oracle Cloud Infrastructure – Compute or similar Cloud Virtual Machines on the operating versions listed above.

Supported Database Backends

Applications Manager supports PostgreSQL and MS SQL database backends for storing all the configuration information and data collected.

PostgreSQL Server

- PostgreSQL v10.16 for 32-bit variants and v11.11 for 64-bit variants comes bundled with your download of Applications Manager from Build 15150 and above.
- For Remote PostgreSQL, Applications Manager supports PostgreSQL versions v10.16 and above for 32-bit variants and v11.11 and above for 64-bit variants.

Microsoft SQL Server

The supported 64-bit version of Microsoft SQL Server versions that you may use are - SQL Standard / Enterprise Edition of:

- SQL Server 2019
- SQL Server 2017
- SQL Server 2016
- SQL Server 2014
- SQL Server 2012

SQL Server Collation: Any case-insensitive collation. By default:

- English with collation setting (SQL_La_n1_General_CP1_CI_AS)
- Norwegian with collation setting (Danish_Norwegian_CI_AS)
- Simplified Chinese with collation setting (Chinese_PRC_CI_AS)
- Japanese with collation setting (Japanese_CI_AS)
- German with collation setting (German_PhoneBook_CI_AS)

Notes:



- Windows Authentication mode and mixed mode (when using SQL authentication) are supported
- Ensure that latency between Applications Manager and Microsoft SQL server is low for better performance (preferred less than 100ms)
- Use SQL Server Express only for evaluations or small environments (up to 25 monitors)
- You can also use JDBC driver for data collection if you choose Microsoft SQL Server as your database back end.

2. Starting and Shutting Down Applications Manager

Starting Applications Manager:

In Windows:

Click **Start → Programs → ManageEngine Applications Manager XX → Applications Manager Start** (or) Invoke the batch file **startApplicationsManager.bat** file located in the <Applications Manager Home> directory.

Once the server is initialized, a tray icon is placed in the Windows system tray . After the server has started completely, the icon changes to  and a message "Server Ready for Monitoring!" is displayed over the icon. Right-click on the Applications Manager tray icon to connect to the web client or stop Applications Manager.

Starting Applications Manager as a Windows Service:

In Windows, you can start Applications Manager as a service. With this feature you can start the Applications Manager server automatically when the Windows system starts.

By default, during product installation, you can choose to install it as a service ([More on Installation](#)). If you have not enabled it then, use the following option to setup Applications Manager as a service.

1. Go to <AppManager Home>/bin directory, execute the installservice.bat file. On executing this file, 'ManageEngine Applications Manager' service is added in Windows Services and the startup type is set as 'Automatic', by default. (To ensure if it is installed as a service, check for the 'Services' under 'Windows Administrative Tools').

Note: For installing Applications Manager as service, you need to have administrative privileges in that system usage.

2. Now, when you start Windows system, Applications Manager is automatically started. You can swap between Automatic and Manual modes.

To uninstall this service, go to <AppManager Home>/bin directory and execute the **uninstallservice.bat** file.

In Linux:

Execute the **startApplicationsManager.sh** file in the <AppManager Home> directory. It is recommended that you execute the script in the below mentioned format:

```
nohup sh startApplicationsManager.sh &
```

Starting Applications Manager as a Linux service:

You can start Applications Manager as a Linux service. With this feature, you can start the Applications Manager server automatically when the system starts. Follow the steps mentioned below to install AppManager as a service on a Linux box:

1. Copy the attached [AppManageLinuxService](#) file to /etc/init.d directory as the file "AppManager".
2. Edit the MDIR variable in this file which should point to the Home folder of AppManager Installation

directory. Typically, the default installation folder on a Linux box will be `/opt/ME/AppManager_Home`. Hence the value for MDIR will be: **MDIR=/opt/ME/AppManager_Home**.

3. Provide executable permissions for this script using: **chmod 755 /etc/init.d/AppManager**.
4. Use **chkconfig** command to add "AppManager" as a service: **chkconfig --add AppManager** or use `update-rc.d AppManager defaults`

Note: Tested for Ubuntu 10.04 & above Build No: 11 & above.

Shutting down Applications Manager:

In Windows:

- Click **Start → Programs → ManageEngine Applications Manager XX → Applications Manager Shutdown** (or)
- In Applications Manager's Admin tab, under Tools, click on **Shut Down Applications Manager** icon (or)
- Invoke **shutdownApplicationsManager.bat** file located in the <Applications Manager Home> directory (or)
- Execute **shutdownApplicationsManager -force** from <Applications Manager Home> directory (or)
- Right-click on the Applications Manager tray icon and click **Stop Applications Manager** (or)
- Go to **Start → Run → services.msc → opens up Services console → stop ManageEngine Applications Manager**. [If Applications Manager is running as service]

In Linux:

Use **shutdownApplicationsManager.sh** script located in the <AppManager Home> directory to shutdown Applications Manager.

You can also use the **Shut Down Applications Manager** tool under **Admin tab** in Applications Manager.

3. Configuring Applications Manager

Performance of Applications Manager can be improved by configuring the following attributes.

Enterprise Edition Setup:

Each installation of Applications Manager can normally support monitoring up to 500 monitors. This could go higher based on the hardware configuration of the server on which Applications Manager is deployed and based on the load of the monitored server.

When you need to monitor more monitors (greater than 500), for the above given system configuration, then it is recommended to move to distributed setup supported through Applications Manager Enterprise Edition setup. It works by supporting an Admin Server and Managed Server environment.

Refer the following link for more information on Enterprise Edition:

https://www.manageengine.com/products/applications_manager/enterprise-edition.html

The below table gives the number of Managed Servers required for given number of monitors:

Total No. of Monitors	Managed Servers
500	1
750	2
1000	2
2000	4

**Better numbers are possible with better hardware supporting over 500 monitors per server.*

Increase data collection threads:

Applications Manager uses different types of threads for data collection of different monitors. Applications Manager uses a separate thread for every data collection of monitors; the default number of threads used is controlled by the respective schedulers specified under

Applications Manager -> Admin Tab -> Server Settings (Under Product Settings column) ->Threads Configuration Tab

However, the default value may need to be increased/adjusted according to the number of monitors. The details for the same have been given in the table below:

Total No. of Monitors	Number of threads (Recommended)
Up to 50 Monitors	25
100 Monitors	30
200 Monitors	40
300 Monitors	50
400 Monitors	60
500 Monitors and above	70

Note: Setting the schedulers from the web-client in the Admin Server will affect all its respective Managed Servers. Increase in the 'Data Collection' thread will lead to slight increase in CPU usage.

Alternate Method

You can also configure the default number of threads used by configuring the respective schedulers specified in the following file:

AppManager_Home/working/conf/threads.conf

The maximum number that can be given in ***threads.conf*** is 99..

The table lists the types of threads and the respective modules they affect along with the default values:

Thread Pool Name	Default number of threads	Monitor types using this thread pool
CustomMonitor Thread	4	JMX Applications, JMX/SNMP Dashboard, and SNMP/Network Device.
DataCollection Thread	25	DB2, IBM i, Java Runtime, Microsoft .NET, MS SQL, MySQL, Oracle Application Server, PHP, SAP Server, Servers, Siebel Enterprise Server, Web Server, WebLogic Cluster, WebLogic Integration, and WebLogic Server
KeyValueMonitor Thread	25	Active Directory, Db2 for i, Amazon, Apache ActiveMQ, Apache Geronimo Server, Apache Kafka, Apache Solr, Apache Spark, Apache Zookeeper, Brand Reputation, Cassandra, Ceph Storage, Cisco UCS, Citrix Hypervisor, Citrix Virtual Apps, Couchbase, DNS Monitor, Docker, Elasticsearch Cluster, Exchange Server, File / Directory Monitor, FTP/SFTP Monitor, GlassFish, Google Cloud Platform, Hadoop, HAProxy, Hazelcast, HBase, Hyper-V Virtual Machine, IIS Server, Informix, Istio, JBoss Server, Jetty Server, Kubernetes, KVM, LDAP Server, Mail Server, ME ADManager Plus, ME OpManager, ME ServiceDeskPlus, Memcached, Microsoft 365, Microsoft Azure, Microsoft BizTalk, Microsoft Dynamics AX, Microsoft, Dynamics CRM / 365 (On-Premise), Microsoft MQ (MSMQ), Microsoft Skype for Business, MongoDB, MS Office SharePoint, Neo4j, Network Policy Server (Radius Server), Nginx, Nginx Plus, Novell, Nutanix, OpenShift, OpenStack, Oracle, Oracle Cloud, Oracle Coherence, Oracle EBS, Oracle NoSQL, Oracle Tuxedo, Oracle VM Virtual Infrastructure, Ping Monitor, Ping Monitor (Non EUM), PostgreSQL, RabbitMQ, Real Browser Monitoring, Redis, Resin, REST API Monitor, RHEV Host, SAP HANA, SAP MaxDB, Script Monitor, Service Monitoring, SilverStream, SQL Anywhere, SSL Certificate Monitor, Sybase ASE, Sybase Replication, Telnet, Telnet (EUM), Tomcat Server, VMWare ESX/ESXi, VMware Horizon View, Connection Broker,

		VMware vFabric tc Server, Webpage Analyzer, Website Content Monitor, WebSphere Server, and Windows Cluster monitor.
MQSeriesMonitor Thread	2	IBM Websphere MQ
QueryMonitor Thread	5	Database Query monitor
WebService_Monitor Thread	5	Web services
URLMonitor Thread	5	HTTP(s) URLs, HTTP(s)-URL Sequence, SAP-CCMS

Increase number of connections in database connection pool:

You can configure the no. of non-transaction connections to be established with the database under **Applications Manager -> Admin Tab -> Server Settings (Under Product Settings column) ->Database Params Configurations**

When the number of monitors is **greater** than 100, connection pool can be increased by editing the **No. of Database Connections**. The default value of 6 can be set to 90 percent of the number of data collection threads.

Alternative Method

When the number of monitors is greater than 100, connection pool can be increased by editing the NON_TRANS_CONNECTIONS field in

AppManager_Home/working/conf/database_params.conf

Note:

- *Increase in the 'Data Collection' thread will lead to slight increase in CPU usage.*
- *Setting the Number of Database Connections in the Admin Server will affect all its respective Managed Servers.*

Poll Intervals:

When performance polling is set only the availability and health check will happen at every polling event while other performance data will be collected only at the end of scheduled number of polls. This will reduce the load on the system when you want to monitor only health and availability.

This option is available under 'Admin' - 'Performance Polling' where you can set the number of polls before collecting performance data for server monitors. We recommend having a Poll Interval of 10 minutes for every monitor and a performance poll value of 3.

PostgreSQL database configuration:

- **To reduce disk space, to repair/reindex the database:**

VACUUM FULL ANALYZE VERBOSE;

Note:

This script should to be executed in Applications Manager's database (AMDB).

You can also choose to do this using the option in the GUI. It can be accessed by navigating to: **Support -> Database Information.**

Vacuum Reindex Remove Dead Tuples

Show 500 entries

<input type="checkbox"/>	Table Name	Rows	Table Size (KB)	Data Length (KB)	Index Length (KB)	Live Tuples	Dead Tuples	Last Vacuum	Last AutoVacuum
<input type="checkbox"/>	am_attributesdependency	11554	1192	648	544	11554	0	31 Dec 2019 11:48:43.227	
<input type="checkbox"/>	am_attributes	10760	4152	1312	2840	10760	0	31 Dec 2019 11:49:11.366	
<input type="checkbox"/>	am_attributes_ext	10610	4136	3592	544	10610	0		31 Dec 2019 11:22:34.599
<input type="checkbox"/>	am_attributes_archival	7835	904	616	288	7835	0	31 Dec 2019 11:49:27.846	
<input type="checkbox"/>	am_rcamapper	5732	1056	520	536	5768	50		

- **Fine Tuning in Postgres_ext.conf**

effective_cache_size - This can be set of 1/2 of total memory up to 3/4 of memory. We have kept this as 512MB.

work_mem = 12MB

maintenance_work_mem = 100MB

checkpoint_segments = 15

checkpoint_timeout = 11min

checkpoint_completion_target = 0.9

seq_page_cost = 1.0

random_page_cost = 2.0

synchronous_commit=off

temp_buffers = 8MB

- **Fine Tuning in Postgresql.conf**

checkpoint_segments = 15

checkpoint_timeout = 11min

checkpoint_completion_target = 0.9

shared_buffers = 512MB - A reasonable starting value for shared_buffers is 1/4 of the memory in your system.

Note:

The Postgresql.conf and Postgres_ext.conf files can be found under the AppManager_home/working/pgsql/data/amdb folder.

MS SQL database configuration:

- **To repair the database:**
DBCC CHECKDB WITH ALL_ERRORMSG, NO_INFOMSGS;
- **To reindex/reduce size:**
EXEC sp_MSforeachtable @command1="print '?' DBCC DBREINDEX ('?', '', 80)";
EXEC sp_updatestats;

Note:

*This script should to be executed in Applications Manager's database (AMDB), preferably through **SQL Server Management Studio (SSMS)***

Set the Space Allocated size for both the log and the data file to be much larger than the initial database. Consider how much the database can grow over of a year. Ideally, the log and data files are allocated in a contiguous extent so that data does not end up fragmented all over the disk.

Memory settings

Change the minimum memory allocation to as large a number as possible. If the database is running on a separate computer, use all the memory. The default settings do not aggressively allocate memory, which hinders performance on almost any database. You should be most aggressive in allocating memory on production machines.

Processor settings

Modify the processor settings and, most importantly, select the Boost SQL Server Priority on Windows check box so that the server uses as many cycles as possible. The Use NT Fibers setting is less important, but you may want to select it too.

Database settings

The most important setting is Recovery Interval, which specifies the maximum amount of time to wait for recovery after a crash. The default setting is one minute. Using a larger value, from 5 to 15 minutes, improves performance because it gives the server more time to write changes from the database log back into the database files.

Note:

This setting does not compromise the transactional behavior because it changes only the length of the log file replay that must be done on startup.

Increase AM JVM heap size

Java memory fine-tuning helps users achieve greater throughput and optimizes the performance of applications. We recommend the following java memory allocation for Applications Manager based on the number of monitors:

Total No. of Monitors	VM Heap Size (Reccommended)
Up to 50 Monitors	2 GB
100 Monitors	3 GB
200 Monitors	4 GB
300 Monitors	5 GB
400 Monitors	6 GB
500 Monitors and above	8 GB

You can configure the JVM Heap Size by going to:

Applications Manager -> Admin Tab -> Server Settings (Under Product Settings column) -> JVM Params Configurations

Alternative Method

Applications Manager JVM heap size can be increased according to your environment by editing the -Xms and -Xmx parameters in the files:

AppManager_Home/startApplicationsManager.sh for Linux

AppManager_Home/startApplicationsManager.bat for Windows

Applications Manager installed as Windows service

On such cases memory tuning can be achieved by editing the following parameters in **wrapper.conf** file available under the directory

AppManager_Home/working/conf

wrapper.java.initmemory – Initial Java Heap Size

wrapper.java.maxmemory – Maximum Java Heap size

Load Factor

The load factor can be determined by navigating to **AppManager > Support Tab > Load Factor**.

The load factor is represented in the format **x.y**, where

x = The Java Heap Memory Load (Range is 0-9)

y = The database load (Range is 0-9)

It is recommended that you check the load factor before adding a monitor to ensure optimal performance of Applications Manager.

If x and $y \leq 5$, you can add the monitor, else you will have to choose a different managed server.

4. Securing Applications Manager

When moving Applications Manager to Production environment, some of the configuration details have to be taken care.

Installation Configuration

Have a dedicated OS User (System) account for installing Applications Manager. This OS user account needs full permissions on all folders and sub-folders in the installation root of Applications Manager only. Also make sure this OS User account is fully secure. It is NOT necessary to install Applications Manager in a root (in Linux) or administrator (windows) OS User account. But make sure the whole installation is done using the same OS user account. Do not install using root and try to run using an OS user account. That will fail.

User configuration

- Make sure you change the password for the default **'admin'** Web Client User within Applications Manager. You will be prompted to force change the password when you login for the first time.
- You can configure Password Expiry under **Admin -> User Management -> Account Policy -> Enforce password expiry for user accounts.**
- If you want to give full 'Read-Only' privileges to certain Web Client Users in your organization, and then ensure that you create a client login with **'USER'** role.
- If you want to give restricted 'Read-Only' privileges to certain Web Client Users in your organization, and then make sure you create a client login with **'Operator'** role. 'Operator' can view only servers that they own.
- You can also restrict user operations for Administrator accounts by navigating to **Admin -> User Management -> Account Policy -> Restrict User Operations for Administrator Accounts**

File upload configuration

By default, uploading binaries, MIBs, scripts are allowed in Applications Manager. This may be required in the initial stages while using Applications Manager for uploading MIBs, action scripts etc.

5. Fault Management

These sections list the steps to prevent false alarms that are generated in Applications Manager due to overloaded network.

Socket Timeout

Increasing the socket timeout values **AppManager_Home/conf/AMServer.properties** by changing the **'am.sockettest.timeout'** value from 5 to 10 will help to eradicate false alerts generated.

Network Availability check

When the Applications Manager is out of the network or is not connected to the network, the status of all the Monitors that are currently been monitored will be shown as 'Down'. You can avoid this by enabling the 'Check for Network Availability' option.

When this option is enabled, Applications Manager will generate alerts for the unavailability of resources only if the specified host is reachable in the network. For example, let us assume that the system/host which runs the Applications Manager has been isolated from the network. Enable this option and specify a hostname in the network (preferably not the hostname where Applications Manager runs). Now, Applications Manager tries to ping that machine for its availability in the network. If not available, alerts are not generated and resources are not shown as down.

You can also specify the IP of your routers, gateways, etc., to check the system/host which runs the Applications Manager is present in the network.

URL Availability check

When the Applications Manager is out of the network or if external proxy settings are not configured, the status of all the URLs that are currently been monitored will be shown as 'Down'. You can avoid this by enabling the 'Check URL Availability' option.

When this option is enabled, Applications Manager will generate alerts for the unavailability of URL only if the other specified URL is down. For example, let us assume that the system/host which runs the Applications Manager has been isolated from the network. Enable this option and specify another URL which is expected to be up always. Now, Applications Manager tries to monitor URL for its availability. If not available, alerts are not generated and URL is not shown as down. Further a mail is sent to the configured mail address intimating the same.

Consecutive polls check

You can use this option to determine the number of consecutive polls the error exists before reporting the error to system. Consecutive polls count in 'Admin' - Action / Alert Settings can be increased from default value of 1 to 2. So that alerts will be generated after two consecutive polls which would eradicate false alarms.

6. Log File Management

Applications Manager logs the data collection details, error traces under the

AppManager_Home/logs

You can also access the logs from the following location: http://APM_Host:port/viewLogs.do

Default size and number for log file rotation can be changed in the file

AppManager_Home/working/class/log4j_conf.xml

7. Applications Manager Database Management

Data backup

It is very important to take a backup of the Applications Manager data in database every month, so that data is not lost in case of any disaster. Refer the following link on how to take a backup of the data:

https://www.manageengine.com/products/applications_manager/help/data-backup.html

It is also recommended to upgrade Applications Manager to latest stable version mentioned in [Service Packs](#) page.

8. Crash & Recovery

Under 'Admin'-'Global Settings', 'Restart the product in case of serious server error' checkbox is provided to automatically restart Applications Manager in case of any serious errors. Make sure that the option is checked so that Applications Manager can recover automatically on error.

Other General Guidelines

- Refer the Security/Firewall Requirements documents given in below link to understand what changes are required in the firewall.

https://www.manageengine.com/products/applications_manager/help/secure-configuration.html

- You can install Applications Manager as a Windows Service or configure a cron job on Linux to start on server start up. Refer the below link for more information:

https://www.manageengine.com/products/applications_manager/help/starting-applications-manager.html

- If you are planning to use the Enterprise Edition, fully understand the EE architecture

https://www.manageengine.com/products/applications_manager/help/enterprise-edition.html

- **To change the default HTTP port used by Applications Manager, refer the Server Settings document given in the following link:**

https://www.manageengine.com/products/applications_manager/help/server-settings.html

- **It is recommended to restart Applications Manager every fortnight.**

It is recommended to use SNMP or WMI mode for monitoring Windows machine and SSH or Telnet for monitoring UNIX machine.

Addendum

AppManager_Home refers to the directory in which you have installed the Applications Manager product. This directory location is specified by you when you install the product.

For example, let us assume that you have installed Applications Manager under the default Program Files directory of C drive in your system. In this case, **AppManager_Home** denotes:

C:\Program Files\ManageEngine\AppManager15

In Linux, if Applications Manager is installed under the home directory, then

AppManager_Home denotes ~/opt/ME/AppManager15