

A high-angle, over-the-shoulder photograph of a person sitting on a paved surface, typing on a silver laptop. The person is wearing a dark suit jacket and has a tattoo on their left forearm that includes the letters 'MUM' and a hot air balloon. The background is a grassy area. The Sage logo is in the top left, and the title 'Enterprise Management' is in the top center. The main title 'Architecture and system requirements' and 'Version 12' are in the middle left, and the date '11 2018' is below it. A disclaimer is at the bottom left.

sage

Enterprise Management

Architecture and system requirements

Version 12

11 2018

This document provides information on system requirements and setup for Sage Architecture for the platform used by Enterprise Management Version 12. This platform is a common technological platform for developing application software.

Audience

This document is intended for systems architects, systems engineers and experienced developers who need to provision resources for installing or upgrading Enterprise Management.

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General overview

The following application software is developed using the Enterprise Management Platform (EMP, previously named SAFE X3):

- Enterprise Management (ERP)
- Enterprise Management HR (HRM)
- Enterprise Management Warehousing (WMS)

The technical architecture is organized in layers and designed to:

- Separate layers of data management, process execution, and presentation in a multiple-tier architecture;
- Leverage load across several servers to ensure scalability when the application is deployed for many users;
- Provide multiple implementation options on different technical platforms and database engines;
- Provide access from various user devices including Windows and Apple computers, tablets, smartphones, and industrial terminals (radio frequency).

Enterprise Management folders

A folder is a repository that contains management rules, parameters, and data for one or more business entities. It consists of a directory tree set on the application server containing programmatic objects (programs, screen definitions, reports, etc.) and tables stored in a dedicated schema within the associated Oracle or SQL Server database.

When installing Enterprise Management (or Enterprise Management HR or Enterprise Management Warehousing), two folders are typically created:

- An X3 reference (or “parent”) folder: The reference folder that contains all the “standard” software programs, screens, reports, etc.
- SEED: A demonstration folder that can also serve as a model folder from which new folders can be created by parameters (and possibly partial data) duplication.

Folders administration tasks include:

- Creating new folders
- Duplicating folders from a model or a running folder (for instance: training folder)
- Removing unneeded folders (for instance, after training is finished)
- Creating backup folders

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Components

All the resources described herein are logical components. You can install them on the same computer or distributed across several machines according to the number of users to be connected, the size of the database, and the number of transactions to be processed. This model of distributed architecture offers a high level of scalability.

Mandatory components

Database server

The database server stores the application data, the description data for this application (dictionary), and the parameters data.

The platform products are developed according to the database editor recommendations, which guarantees the integrity and the consistency of the data stored in the database.

There is no limit to the size of the database. Most customers are below 100 GB for data size, however some large Enterprise Management installations use several terabytes. To reduce the size of the live database, you can purge large tables or archive them in a special archive folder that may use another database server.

Definition

APPLICATION DATA
Tables and indexes that store information recorded by application users such as suppliers, customers, products, inventory, sales, production, accounting, etc.

Application and Main process server(s)

This/these server(s) provides access to all the elements that make up the application including processes, screens, reports, etc. These elements are organized in directories by folder and are not repeated from parent folder to child folder except when they truly belong to the child folder. Otherwise, it is the element from the parent folder that is used. Three folder levels are managed in this way.

The application is organized as a hierarchy of folders where the root folder is the image of the standard delivery and the other folders are the customer folders, generated from the root folder and each representing an application.

From version 11, it is possible to have several application servers (but only through a manual set-up at current time). In this type of implementation, multiple application servers will use common files in a single location, typically on a shared file system provided by redundant servers or NAS. Setting up multiple application servers eliminates a single point of failure.

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Web presentation server

The web presentation server is a front-end server that end users access to open an Enterprise Management session through their internet browsers.

During installation, especially in documents and screens, the web presentation server can also be referred to as Syracuse.

It works in asynchronous mode based on the Node.js software platform, which contains a built-in HTTP server library which is used to provide a web publication server.

Each function has its own URL and sends normalized (SData) Java Script feeds in JSON format to the client (web browser on user's workstation or web services client).

Operating data, such as Windows customization, dashboard, endpoints, management roles, user information, and electronic documents that users can register via their storage area, are stored in a document-oriented MongoDB database.

The node.js web server can be clustered to ensure scalability when a high number of concurrent interactive connections and/or web services are needed.

This node.js Web Server also manages:

- Workflow links
- Incoming and outgoing SOAP and REST web service

Definitions

JSON

JavaScript object notation: a textual data format for structuring information with tags.

MONGODB

A document-oriented database classified as a NoSQL database.

SADFSQ

An Enterprise Management internal communication protocol executable.

MongoDB server

MongoDB is a free open source NOSQL database. It is used to store all configuration and customization parameters for the Syracuse web presentation server and can also be used to store documents attached to business processes (for instance, scanned orders or invoices).

MongoDB can be clustered on multiple servers to ensure scalability and redundancy.

Elasticsearch search engine

Elasticsearch, is a free, open source search engine based on the 100% Java Lucene engine under Apache License 2.0. There are no additional database engines to be installed.

Elasticsearch provides real-time text-based search on the application data and metadata that have been setup to be indexed.

Elasticsearch can be clustered on multiple servers to ensure scalability.

Print server

This server is hosted on a machine running a Windows Server operating system. There can be multiple print servers per solution depending on volume requirements for printing.

The print server supports all print requests from interactive sessions as well as batch submissions and sends the files to the appropriate print destination (printer, file, PDF, FAX, etc.).

A Windows service is started on the computer that hosts the print server. This service is on port number 1890 by default, but it can be customized during installation. The print service manages an output queue of the requests submitted, and the execution of these reports can be dispatched on several editing processes or threads. The number of editing processes can be customized in the configuration console and must be adapted to the size of the server.

The print server communicates with two other servers in your environment: the application server that hosts the printing model and the database server that hosts the tables via an ODBC connection.

The report files are transferred using the SADFSQ internal communication protocol. The print server embeds a SADFSQ client able to address and communicate with a SADFSQ server running on the application and main process server.

Reports are designed using Crystal Reports 2008, (version 12.x) or Crystal Reports 2013 (version 14.1).

Additional components

Additional process servers

These servers manage processes when scalability is required. They can run processes linked to interactive sessions as well as web services sessions and batch processes (batch process support on additional process servers was not possible in previous versions).

Differences between the main process server and additional process servers are as follows:

- At least one main process server is mandatory and runs on the same machine as the application server.
- Additional process servers are optional and are used to load-balance among multiple resource processes related to Enterprise Management user sessions. Additional process servers load balancing is automatically managed by the front-end Syracuse web presentation server(s), and can be done according to multiple rules (group tagging, web services pools, batch capability definition)

Automated Data Collection (ADC) server

It's a technical server that manages communication with automated Data Collection devices (typically RF hand-held terminals)

This component embeds Apache HTTP and Apache Tomcat (web servlet container).

This component will be deprecated in future versions of Enterprise Management and replaced by Syracuse web server new modules.

It should normally be installed only to provide the following functionalities:

- Automated Data Collection devices (typically hand-held RF terminals)
- Enterprise Management HR employees portal

Legacy Java Bridge server

The Java Bridge server is a deprecated component. However, it can still be installed to support legacy outgoing web services (SOAP) and some other specific extensions.

Business Objects server

The Business Objects (BO) server that hosted Business Objects Enterprise XI in version 11 is not available yet for V12. The availability of this component will be announced later.

Auxiliary components

Configuration console

The configuration console is a tool used to install and manage platform components. The console configures the components and links them to define a “solution” or work environment.

The console uses different XML configuration files that are generated on each server when installing the various components.

The configuration console can be installed on any workstation running Windows 7 or higher, and/or on any Windows servers involved in the application infrastructure.

An Enterprise Management environment (or “solution”) can be managed by several users from different workstations or servers where the configuration console is installed.

Mail server or SMTP gateway

A mail server is a computer program or software that forwards electronic messages from one computer to another. Mail servers move and store mail over corporate networks via LANs and WANs and across the internet.

A mail server or SMTP gateway is mandatory for using workflow functionalities. Supplying and installing this server is not within Sage’s function and is not described in this document.

Batches management

From version 11, the Enterprise Management batch server (which launches and monitors batch tasks) runs within the Syracuse web presentation server.

From version 11, batch tasks can be now run on any process server, which provides full scalability for background tasks.

Each process server (including the main one) is “tagged” with the maximum number of batch tasks it can run simultaneously, from 0 to any (reasonable) number.

When a batch task is to be run, the batch scheduler will launch the task on a process server where a “batch slot” is available or wait for a batch slot to become available on any of the batch-enabled process server(s).

Definitions

BATCH SERVER

The platform framework embeds a deferred (batch) tasks scheduling and monitoring function with a comprehensive parameters management for these processes.

BATCH TASK

Unlike an interactive session, a batch task is a process launched in background mode and monitored by the task scheduler (batch server).

Client workstations

Desktop or laptop

Users can access Enterprise Management applications on the application server via a web browser from their workstations.

For further information, please consult this [table](#).

Smartphones and tablets

Other web-enabled devices can provide access to Enterprise Management and Enterprise Management HR applications, subject to certain display conditions.

For further information, please consult this [table](#).

Technology

Development platform

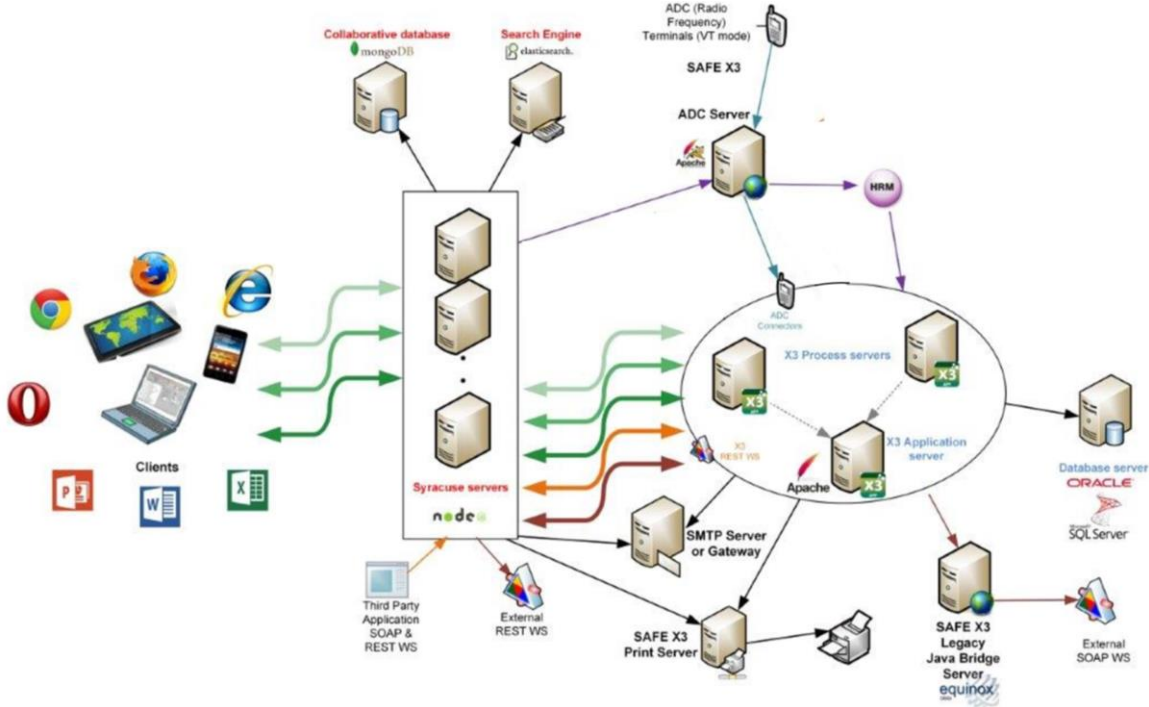
- Development workbench: Enterprise Management Framework
- Development language for the application software: 4GL
- Development language for the Web server: JavaScript, HTML5
- Exchange protocol between the client and the web server: pure HTTP/HTTPS (according to the HTML 5.x specifications) and web application interface built on a technology like Ajax
- Tool for packaging Enterprise Management components: IzPack, open source software built on the Java platform

Network bandwidth between front-end servers and workstations

Enterprise Management connection method	Front-end server	Bandwidth without printing, requesting BI, or downloading/uploading large documents
Web browser on user workstation	Syracuse web server (Sage)	60 Kbit/s per session 50 Kbit/s Web server > Browser 10 Kbit/s Browser > Web server
Web browser on remote desktop via RDP protocol	Remote desktop service (Microsoft)	24 Kbit/s per session
Web browser on remote desktop via ICA protocol	XenApp server (Citrix)	12 Kbit/s per session
ADC client (typically hand-held RF terminal)	ADC server (Sage)	20 Kbit/s per device

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Technical architecture: global schema



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Technical prerequisites for Enterprise Management V12

List of necessary components to build an Enterprise Management V12 environment

Component name	Tier	Description / Function	Mand.	Supplied on EM medium	Comments
RDBMS system	Database	Oracle RDBMS or Microsoft SQL Server RDBMS for storing application data.	Yes	No	See compatibility matrix below. Oracle RAC and SQL Server clusters are supported.
EMP Database Connector	Database	Allows database creation by EMP console.	Optional	Yes	Not needed if the database is created either by a DBA manually or with RDBMS vendor's management tools. Cannot be installed on an RDBMS cluster.
EMP Runtime	Application	4GL execution runtime.	Yes	Yes	Multiple instances can be supported in a cluster.
Enterprise Management Application	Application	Application core. Contains all 4GL programs, data dictionaries, user interface definition corresponding to Enterprise Management business logic.	Yes	Yes	Multiple instances can be supported in a cluster.

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SQL Server client tools	Application	Tools for supporting the access from EMP runtime to Microsoft SQL Server RDBMS.	With SQL Server only	No	<p>Installed with RDBMS when SQL Server is on the same host as EMP client.</p> <p>Should be installed when SQL Server is neither on the same host as EMP runtime or on additional EMP runtimes.</p>
Apache HTTP server	Application	<p>Provides platform-independent access to Enterprise Management application resources for the web presentation server.</p> <p>Typically installed on the same host as the Enterprise Management application component.</p>	Yes	No	<p>Multiple instances can be supported. Internal use only.</p> <p>See compatibility matrix below.</p>

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EMP Web Server	Presentation	<p>Web presentation server for Enterprise Management software family.</p> <p>Based on Node.js.</p> <p>Provides: Interactive access to application from a browser on a workstation, tablet or smartphone; Incoming SOAP and REST web services; Outgoing REST web services and framework for outgoing SOAP web services.</p> <p>Handles application access security through multiple authentication methods (Basic, LDAP, LDAPS, oAuth2, SAML2).</p> <p>Manages: Batch jobs, Workflows.</p>	Yes	Yes	<p>Multiple instances can be supported in a cluster.</p>
MongoDB	Presentation	Stores all technical information for the web presentation server.	Yes	Yes	<p>Sage provides a MongoDB easy-installer package with Community Edition.</p> <p>It can also be installed from MongoDB Open-Source or Enterprise standard distribution.</p> <p>MongoDB clustering is supported.</p>

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Elasticsearch	Application	Provides fast, flexible and powerful indexing capabilities on application data.	Yes	Yes	Sage provides an Elasticsearch easy-installer package. It can also be installed from Elasticsearch standard distribution.
EMP AdxAdmin	Management	Management engine	Yes	Yes	Required for managing components in Enterprise Management.
EMP Console	Management	Management console used to configure / update components in Enterprise Management environments. Uses EMP AdxAdmin management engine.	Yes	Yes	To be installed on a Windows server or workstation. Multiple console installations are supported.
EMP Print Server	Reporting	Crystal Reports Print Engine based reporting server. Generates reports to various printing devices or multiple file formats.	Yes	Yes	To be installed on a Windows server or workstation. Multiple instances can be supported.
EMP ADC Server	Presentation	Provides access to subsets of functions (manufacturing, stock management) through ADC hand-held terminals.	Optional	Yes	Multiple instances can be supported.
EMP Java Bridge	Middleware	Provides outgoing SOAP web services framework.	Optional	Yes	Will be deprecated in a future version.
EMP Production Scheduler	Application	Optional production scheduler.	Optional	Yes	-
EMP BO Connector	Reporting	Connector for business objects	Optional	No	Delivery schedule will be announced later.

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General technical prerequisites for installing Sage Enterprise Management V12 components

Java

Installers for Enterprise Management components are based on IZpack open-source framework. They require Oracle Java Runtime Environment (JRE) 8 or higher to run.

Elasticsearch requires Oracle Java Development Kit (JDK) version 8 or higher to run.

After January 2019, Oracle's policy regarding free availability of JRE/JDK version 8 will change. Due to this change, Enterprise Management will support equivalent open source versions of JRE/JDK (OpenJDK builds).

.Net Framework

The following components require Microsoft .Net 3.5 & 4 Framework:

- EMP Console
- EMP Print Server

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OS/Database compatibility matrix for Enterprise Management V12 server components

The table below describes the possible OS/Database combinations for installing Enterprise Management components.

Component name	RDBMS Vendor/Version/ Edition	Operating Systems on Intel x86_64 architecture			Comments
		Microsoft Windows 2012R2 64-bit	Microsoft Windows 2016 64-bit	RedHat Enterprise Linux 7.x (> 7.2) 64-bit Oracle Enterprise Linux 7.x (>7.2) 64-bit	
EMP Database Connector	SQL Server 2012 SE or EE	Compatible	Compatible	No	Mixing Windows and Linux platforms for these components in the application tier is not supported. “Compatible” means that this combination is supported for upgrades from previous Enterprise Management versions (formerly known as Sage ERP X3) but should not be used for new installations.
EMP Runtime Enterprise Management Application	SQL Server 2014 SE or EE	Yes	Yes	No	
	SQL Server 2016 SE or EE	Yes	Yes	No	
	SQL Server 2017 SE or EE	No	Yes	No	
	Oracle 11Gr2 (11.2.0.4) SE1, SE or EE	Compatible	Compatible	Compatible	
	Oracle 12cR1 (12.1.0.2) SE2 or EE	Yes	Reported to work but not formally validated by Oracle	Yes	
Oracle 12cR2 (12.2.0.1) SE2 or EE	No	Yes	Yes		

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Apache HTTPD	RDBMS-neutral	Yes	Yes	Yes	<p>Apache 2.2.x is deprecated, you should use Apache 2.4.</p> <p>On Linux, you can use the HTTPD standard package based on Apache 2.4.</p>
MongoDB	RDBMS-neutral	Yes	Yes	Yes	<p>Installer on Enterprise Management provides MongoDB 3.4.</p> <p>Supported MongoDB versions: 3.0, 3.2 and 3.4.</p>
Elasticsearch	RDBMS-neutral	Yes	Yes	Yes	<p>Installer on Enterprise Management provides Elasticsearch 2.4.4.</p> <p>Supported versions: 1.5.x and 2.4.x.</p>
EMP Console	For all application tier supported OS/ database combinations	Yes	Yes	No	<p>Can also be installed on users' workstations running Windows 7, 8, 8.1 & 10.</p>

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EMP Print Server	For all application tier supported OS/ database combinations	Yes	Yes	No	Can also be installed on users' workstations running Windows 7, 8, 8.1 & 10. For test and development environments, not production.
EMP ADC Server	RDBMS-neutral	Yes	Yes	Yes	-
EMP Java Bridge	RDBMS-neutral	Yes	Yes	Yes	To be deprecated in a future Enterprise Management version.

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Comments regarding Oracle Database hosting and configurations

Database hosting

If the version is compatible (12cR1, 12cR2), Oracle database can be hosted on other Hardware/OS combinations than the ones described above.

For instance, you may use Oracle 12cR1 or 12cR2 hosted on IBM p-Series running AIX, or Oracle Sun running Solaris, in single-server or RAC cluster configurations.

In this case, however, you will not be able to use the EMP Console to install the EMP AdxAdmin & EMP Oracle Connector components for creating the Oracle database associated with your Enterprise Management environment. This will require either a manual creation using scripts or the use of Oracle's DBCA tool.

ODBC drivers on Enterprise Management Print Server

When using Oracle 12cR1 or 12cR2 as RDBMS, you will need to install (and license) Crystal Reports Designer 2013 on all machines hosting Enterprise Management print server to benefit from latest Crystal Reports ODBC drivers without having to decrease Oracle network access protocol security to 8i (unsafe) level.

Enterprise Management V12 server components hosting – Recommendations

Hardware generic recommendations

Below are generic recommendations on hardware to achieve best performance.

More precise sizing recommendations will come in a later version of this document.

CPU considerations

Whether Enterprise Management V12 is hosted in physical servers or virtualized, underlying hardware should leverage recent processor generations (Intel® Xeon® E5 v3 or later, E7 v3 or later).

New AMD EPYC™ processors family has not yet been benchmarked with Enterprise Management.

AMD Opteron™ processors, that are optimized for floating point, are slower than equivalent Intel® Xeon® processors for most Enterprise Management computations that are performed with BCD integers (to avoid floating-point precision loss).

High CPU clock speed will give higher application throughput for single operations and high CPU core count will give a best overall resilience with multi-user workloads. Since having both at the same time implies expensive processors, you may have to balance a high number of cores vs a high clock speed.

Avoid low-energy consumption processors (Xeon® L models) in order not to impair the throughput and use. Use CPUs running at 2.4 GHz or higher to get good performances.

Memory considerations

Memory bus speed should be as fast as possible as Enterprise Management architecture uses a small amount of memory bandwidth.

Please note that on certain motherboard generations/chipsets, the real memory bus bandwidth decreases with the number of memory sticks (and chips) installed.

In such cases, the memory bus speed will be slower when used for a total memory composed of a high number of small capacity memory sticks (leveraging small memory chips). It is better to use a small number of high capacity memory sticks (leveraging big memory chips). Even though this recommended configuration is usually more expensive.

Please consult the technical documentation of your server's vendor before choosing between possible options of components configuration for RAM.

Network considerations

Networking between RDBMS server(s) and EMP Runtime/Application

Enterprise Management is a highly interactive product with a lot of communications between the application tier and the database tier.

To get the best performance and user experience, you should ensure that the network latency between database and application tiers is as low as possible. When RDBMS and application/runtime tiers are not hosted in the same server, this is achieved by using 10Gbit/s high quality networking equipment and paying attention to the whole networking stack (network adapters drivers, network switches firmware, virtual NIC types, etc.)

Networking between EMP Runtime/Application and EMP Syracuse Web presentation server

There is less exigence on this network path, so when the database and application are hosted in the same server (so you don't have a physical network path between RDBMS and EMP runtime), you may use 1Gbit/s network equipment.

Storage considerations

Oracle or SQL Server Database Storage

Storage quality is paramount for database performance.

You should use a storage configuration giving high IOPs performance for volumes hosting databases datafiles, whether it's Oracle (system tablespaces, redo logs, data and indexes tablespaces) or SQL Server (TempDB datafiles, log, data and indexes filegroups).

This is achieved by using SSD storage (with RAID-10, RAID-1, RAID-5 or RAID-6 redundancy), or if you cannot use SSD, by using the best "spinning" disks in the optimal performance RAID configuration, that is a high number of 15krpm disk drives with RAID-10 redundancy.

A high number of small disk drives is better than a few bigger drives, as the IOPs capability is given by the number of drives in a RAID array, not by their sizes.

7.2krpm drives and/or RAID-5 or RAID-6 redundancy should never be used for hosting a production database.

Enterprise Management Application Storage

Enterprise Management application storage does not require as many IOPs as database storage.

In your Enterprise Management application, EMP components may reside on a storage tier providing moderate IOPs, like 10krpm disk drives with RAID-5 or RAID-6 redundancy.

7.2krpm drives are not recommended as they may impair performance in technical operations like patch integration, folders creation, etc.

MongoDB data storage

Unless you plan to use MongoDB for intensively storing Enterprise Management attachments, IOPs needs are moderate.

You may then use the same kind of storage configuration as for Enterprise Management application.

7.2krpm drives are not recommended as it may slow down operations when there is high concurrency on MongoDB access, for instance when there are many user logs in Enterprise Management within a short amount of time.

Elasticsearch data Storage

If you plan to make a massive use of Elasticsearch indexing, you may consider using a performing storage tier for hosting Elasticsearch data.

SSD may be too much, using 10krpm drives in RAID-10 will give adequate performance to users' search queries, and to Elasticsearch indexes updates.

Other Enterprise Management components storage

Other Sage components are mostly static data, with little disk access and don't require high-end storage. 10krpm disks in RAID-5 or RAID-6 will be largely enough. 7.2krpm drives may impair technical operations like components updating.

Virtualization considerations

You may deploy the solution on physical servers or in a virtual environment like VMware vSphere, Hyper-V, RedHat KVM, Citrix XenServer or Oracle VM.

Most Enterprise Management components below can be deployed on virtual machines.

- Application and main process server(s)
- Additional process server(s)
- MongoDB server(s)
- Elasticsearch server(s)
- Syracuse web server(s)
- Print server(s)
- ADC server(s)
- Legacy Java Bridge server(s)

If you decide to virtualize your architecture, you must build a physical infrastructure adapted to a virtual environment for optimum performance. We recommend dedicated resources assigned to your Enterprise Management environment, rather than sharing resources.

A production virtualization architecture is usually built with multiple physical hosts and relies on a shared storage system (SAN) providing high availability and adequate performance to cope with the I/O and throughput needs of all hosted VMs and applications.

Apart from development / test or small production environments, it is NOT RECOMMENDED to run the RDBMS (SQL Server or Oracle) in a virtualized environment.

However, if you decide to run RDBMS in a virtual machine, you must take all precautions to ensure this virtual machine will be able to run at full throttle any time, and not suffer from bottlenecks on CPU, memory or storage I/Os due to resource overprovisioning in the virtualization platform.

CPU bottlenecks due to over-provisioning is also a performance killer for the servers that host the 4GL execution engines (EM runtime).

To help determine the quality of an infrastructure regardless of its nature (physical or virtual, single or multi-tier, Oracle or SQL Server, Unix-Linux or Windows, etc.), Sage provides the AIOBENCH test program to meter the performance of Enterprise Management by performing a set of data I/O operations of the reference folder to simulate some high-demand transactions.

The results of this program can help to compare metered performance to known reference systems and feedback from other customers' production infrastructures.

Security considerations

Plan to acquire adequate backup tools so that you can save online virtual machines.
Ensure redundancy for physical servers and storage systems.

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Important sizing considerations for virtualization

Keep virtual machines small!
Huge virtual machines won't work properly, unless they run in a dedicated virtualization environment where there is NO overprovisioning at all (which removes most benefits from virtualization).

A full Enterprise Management environment you would put in a physical, dual-socket 24-core server will NOT run properly in a "big" 24-vCPU VM in most cases and MUST be split on several smaller VMs.

4 to 6 vCPUs per VM is considered a "reasonable" upper limit. This number may be raised to higher values if virtualization platform consists of servers with a high core count AND there is no or "moderate" CPU overprovisioning.

Virtualizing MongoDB, Elasticsearch and Syracuse: good practices

On PRODUCTION systems, do NOT deploy Elasticsearch in the same VM as Syracuse (node.js).
In most cases, MongoDB can be deployed in the same server than Syracuse (node.js), but if you use MongoDB intensively to store documents, it is wise to host it on a dedicated server.

Using different servers makes it much easier to tune the configuration because different components will not be competing for the same resources (memory, CPU, disk I/O) inside a single VM. It also makes it easier to modify the deployment if you identify a performance bottleneck in one of the components.

MongoDB usually requires less CPU and memory than the node.js component. You can start with a smaller VM configuration. Ideally you should set up a cluster (replica set) with an odd number of nodes (3 is a good start). There are many resources on the Internet about tools and techniques to tune MongoDB deployment. Don't oversize/over-architect it unless you see that Mongo is your performance bottleneck. Mongo is designed to handle very large datasets and very high transaction rates and Enterprise Management is stressing it very little in comparison to some of the larger web apps/sites that use Mongo.

Elasticsearch uses more memory and CPU than MongoDB but usage varies widely. You can start with the same configuration as MongoDB and then scale up if necessary. Some interesting facts about the Elasticsearch component: It is decoupled from the rest so if you have a performance issue in this layer it does not impact the rest of the application, just the search function. It is easy to redeploy on a larger VM because it does not hold critical data. It is only an index that can be rebuilt from data in a MongoDB or Enterprise Management database (SQL or Oracle). It can be clustered and you'll find resources on the Internet about cluster deployment.

Node.js (Syracuse server) is the most difficult of the three to configure and the most likely to be responsible for poor performance.

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Helpful ideas for presentation tier virtualization

Memory and CPU considerations for Syracuse

With default configuration values, a healthy node.js process should take less than 1.5GB or RAM. If it goes above, it starts to garbage collect aggressively and that's usually when it starts to saturate its CPU thread. It is important to keep the individual node.js processes below 75% of 1 CPU (20% of overall CPU on a 4-core VM) and below 1.5GB.

As you need to keep CPU resources for the operating system, a Syracuse VM should at least have 2 cores. A minimum of 2GB RAM should be available for the operating system.

A node.js process is required for about 25 interactive sessions, depending on their activity. A session corresponds to an opened tab if the user uses à Classic page, plus one session for all tabs opened by a user on Syracuse functions.

A CPU core is required for 2 to 4 node.js process (according to their activity).

For instance, a VM with 2 cores and 8GB is adequate to run 4 node.js processes with default sizing values.

If you manage huge grids in *classic pages*, you might need to increase the memory size associated to node.js (it can be raised up to 8GB). Refer to the dedicated *node.js sizing* documentation for more details.

Remember the following rules:

- Node.js is single threaded so if you have 4 cores and a node.js process is taking 25% of overall CPU it means it is saturating its CPU thread - not good.
- You should observe overall memory usage while the app is running and bump the number of node processes until overall memory usage reaches 75-80%.

Web services sizing

If a significant part of your transactions to go through web services, you should deploy a node.js cluster and dedicate one or more nodes of your cluster to web services.

In this case, do not mix web services and interactive sessions on the same cluster node(s).

MongoDB sizing

In case your MongoDB instance, consider than:

- The memory sizing of MongoDB is not correlated to the Syracuse memory sizing. MongoDB generally uses less than 1GB which makes a 3GB VM suitable.
- As a rule of thumb, give MongoDB less than 20% VM CPU allocation than for Syracuse.

Elasticsearch sizing

Elasticsearch requires at least 2 cores and 4GB of RAM and should be hosted on a dedicated VM. If you index huge database, more CPU and memory may be required.

Storage considerations

Syracuse does very little I/O. Save the high-end disks for MongoDB and Elasticsearch.

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Client-side prerequisites for accessing Enterprise Management V12

Workstation or remote desktop access

Client workstation configuration

Workstation resource	Minimal configuration	Recommended
Processor	Dual-core processor, Intel Celeron/Pentium or AMD equivalent	Intel Core i3, i5 or i7, or AMD equivalent
Memory	3 GB RAM	4 GB or more
Display	32-bit color, 1280 x 768 pixels	1440 x 900 pixels or more
Network	10 Mbit/s, WiFi or wired	100 Mbit/s or more, WiFi or wired
OS	32-bit Windows, OS-X or Linux	64-bit Windows, OS-X or Linux

Supported combinations of operating systems and browsers

Browser	Minimal browser version	Workstation/remote desktop Operating System		
		Microsoft Windows 7, 8, 8.1, 10 32- & 64-bit Remote desktop on Windows Server 2008R2, 2012, 2012R2 & 2016	Apple Mac OS-X	Linux 32- & 64-bit
Mozilla Firefox	44	Supported	Supported	Compatible
Google Chrome	48	Supported	Supported	Compatible
Microsoft Internet Explorer	11	Supported	Not available	Not available
Microsoft Edge	EdgeHTML 15	Supported	Not available	Not available
Apple Safari	9	Not supported	Supported	Not available
Opera	35	Supported	Supported	Compatible

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In this table, “compatible” for browsers on Linux platform means that the OS/browser combination has passed tests with Enterprise Management V12 on some variants of Linux but was not tested on all available combinations.

Other browsers (based or not on one the browsers mentioned above) may work with Enterprise Management V12, but Sage does not certify other combinations.

Add-ons and optional tools on client workstation or remote desktop

Component	Version(s) & comments
Microsoft Office (32 and 64-bit editions). Requires IE11 installed.	2010, 2013, 2016 Enterprise Management plugin for Microsoft Office is available only for Windows platforms.
Microsoft Office as part of Office 365 (32 and 64-bit editions) installed on workstation. No support for Office online. Requires IE11 installed.	2013, 2016 Enterprise Management plugin for Microsoft Office is available only for Windows platforms.
Microsoft Outlook (32 and 64-bit editions).	2010, 2013, 2016 Enterprise Management plugin for Microsoft Office is available only for Windows platforms.
Microsoft Outlook as part of Office 365 (32 and 64-bit editions) installed on workstation. No support for Office online.	2013, 2016 Enterprise Management plugin for Microsoft Office is available only for Windows platforms.
Crystal Reports Designer	CR2013 Required for Enterprise Management reports development.
Adobe Flash rendering	Embedded in IE11, Edge, Google Chrome (Windows) Adobe Flash Player 10 or higher for Mozilla Firefox. Needed only for a few “classic” functions (for instance: Process Designer). Not required for users who don’t use the Flash-enabled functions.

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PDF documents viewer	<p>Adobe Reader DC or equivalent PDF viewer.</p> <p>A PDF display tool is needed for viewing reports generated by Enterprise Management through EMP print server.</p> <p>Some browsers (for example: Google Chrome, Microsoft Edge) natively embed a PDF-renderer and do not require a specific utility to be installed.</p>
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Mobile platforms access (smartphones, tablets)

Platform's Operating System	Minimal OS version	Supported browsers	Comments
Apple iOS	10 (can run on 9 but this is now an old iOS version)	Safari, Chrome, Firefox, Opera Mini	<p>For the minimal browser's version see the browsers version table for workstations.</p> <p>Other browsers may work but they are not certified.</p>
Google Android	7 (Nougat) (may run on 6 Marshmallow but it is no longer supported by Google)	Chrome, Firefox, Opera Mini	
Microsoft Windows Phone	8.1	Internet Explorer	
Microsoft Windows RT	8.1	Internet Explorer	
Windows Embedded	8.1	Internet Explorer	

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Additional comments

Windows 2019 compatibility

The latest operating system has not yet been validated. The result of tests and compatibility will be announced later.

Crystal Reports Designer

Enterprise Management still executes Reports created by Crystal Report Designer 2013. The compatibility with Crystal Reports Designer 2016 has not yet been validated and will be announced further.

Warning: You need to have Windows Server 2012 to use Crystal Reports Designer 2013. It is not compatible with Windows Server 2016.

Amazon Web Services implementation

An issue has been reported for some customers installing Enterprise Management on AWS environments. When using Windows 2016 C4 and M4 instances, random disconnections happen between the web server and the application server.

This is linked to Microsoft-supplied network drivers used on these instance types. This issue has been investigated by Sage, a test done with Windows 2012 R2 drivers (which were used in early versions of AWS W2K16 AMIs) shows that the issue disappears. This has been reported to AWS but we don't have a solution for now.

A way to avoid this issue is to switch to equivalent C5 or M5 instance types (which deliver better performance at same cost).



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