



# SAS® Marketing Operations Management

## Architecture and Security

WHITE PAPER

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## Introduction

This white paper describes the architecture of SAS Marketing Operations Management and various aspects of its deployment and security. The information in this paper is valid for versions 6.0 R14, R14 Update 1 and R14 Update 2 (which is the current version).

The following areas are covered:

- High-level architecture overview.
- Architectural components.
- Ecosystem.
- Virtualization.
- Deployment options.
- Deployment best practices.
- Security.

This paper is intended for those involved in purchasing, selling and implementing SAS Marketing Operations Management, including system administrators and anyone seeking an understanding of the solution's architecture and security.

## High-Level Architecture Overview

SAS Marketing Operations Management's architecture includes the following highlights:

- A Web-based multitiered marketing solution.
- An intuitive and interactive AJAX-based user interface that can be extended easily.
- Use of common user-interface (UI) widgets, application services, marketing processes and marketing information models.
- Extensible and configurable information and process models.
- An XPDL-standard-compliant marketing process engine.
- A star schema-based rich marketing information model.
- An SOA that facilitates integration with existing enterprise applications.

SAS Marketing Operations Management is an efficient and effective enterprise marketing solution that uses advanced software and networking technologies. As a Web-based solution, SAS Marketing Operations Management enables marketing professionals to automate and streamline their marketing operations and processes.

SAS Marketing Operations Management has an n-tier architecture. Its well-defined, comprehensive Web-service interface implements the business logic necessary for a robust and scalable marketing operations management solution. It constitutes a service-oriented architecture (SOA) that allows integration with other enterprise applications and systems.

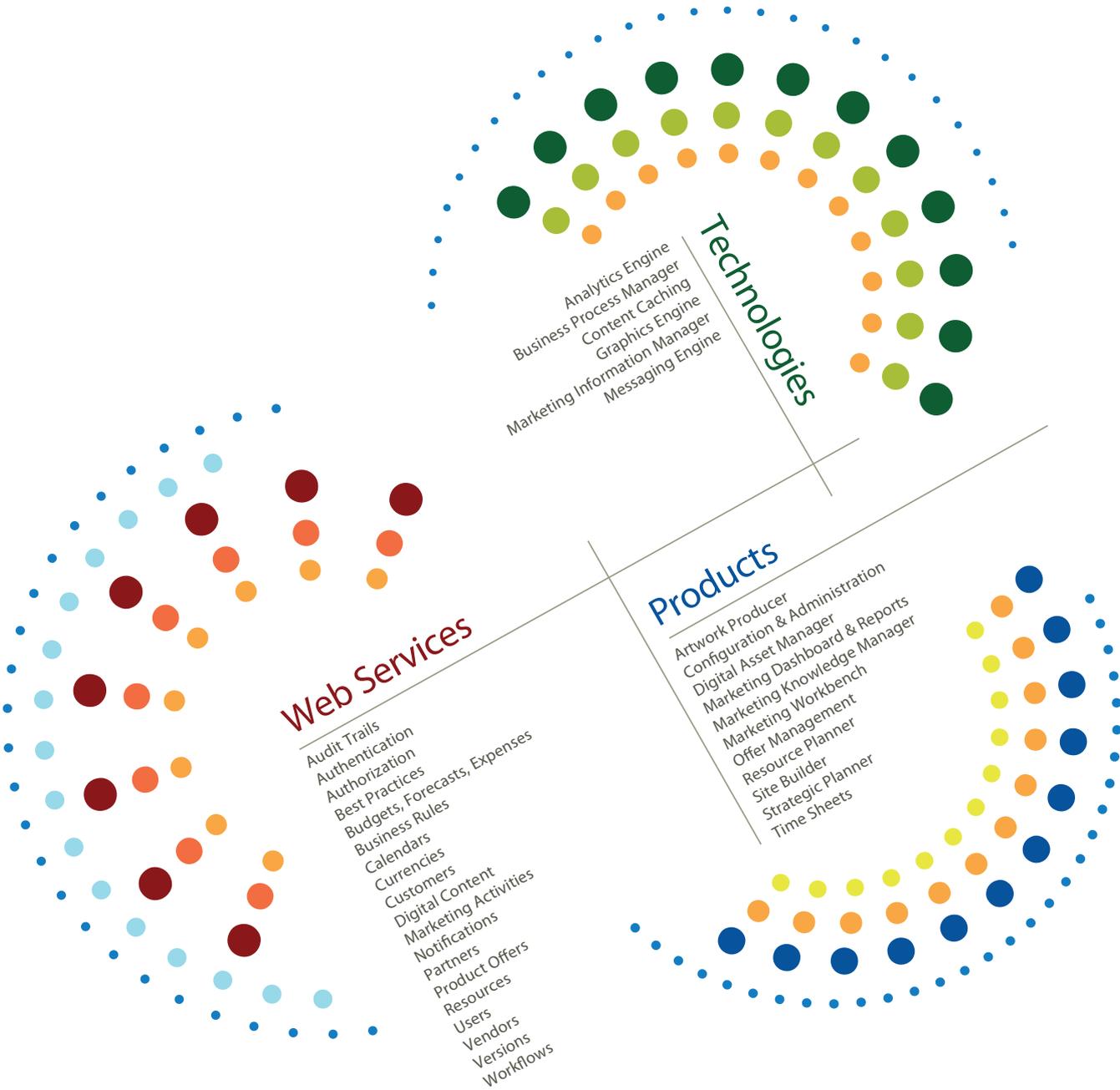


Figure 1: SAS Marketing Operations Management modules, Web services and technology ecosystem.

SAS Marketing Operations Management has a rich user interface framework that includes a comprehensive library of forms, custom controls and widgets to help quickly develop customer need-based user interface screens. All modules are built using this framework to ensure a consistent user experience. The framework-based approach gives users the flexibility to customize the existing user interface according to their specific needs.

At its core, SAS Marketing Operations Management offers powerful information and process management capabilities. Its unique data model represents marketing data in terms of entity and facet objects. It has a unique way of retrieving, adding and updating marketing data to and from the database, which enhances its performance and scalability.

Process modeling is based on the Workflow Management Coalition (WfMC) approved XPD L standards ([wfmc.org/xpdl-implementations.html](http://wfmc.org/xpdl-implementations.html)) for representing processes, and it allows integration with various business process modeling or business process execution language tools or software.

The solution's process designer enables users to define marketing workflow processes based on business process modeling notation (BPMN). Users can also define processes using any software based on BPMN modeling and then import those processes into SAS Marketing Operations Management via the process designer.

SAS Marketing Operations Management components have been separated into appropriate n-tier architecture to provide maximum flexibility in terms of configuration and scalability. The solution's components use industry-standard platforms and Internet technologies.

## SAS® Marketing Operations Management Foundation

SAS Marketing Operations Management Foundation provides the common infrastructure, application services and configuration tools for all modules within SAS Marketing Operations Management.

### **SAS Marketing Operations Management Foundation includes:**

- Marketing information management.
- Marketing process management.
- Web services.
- Applications framework.
- Modules.

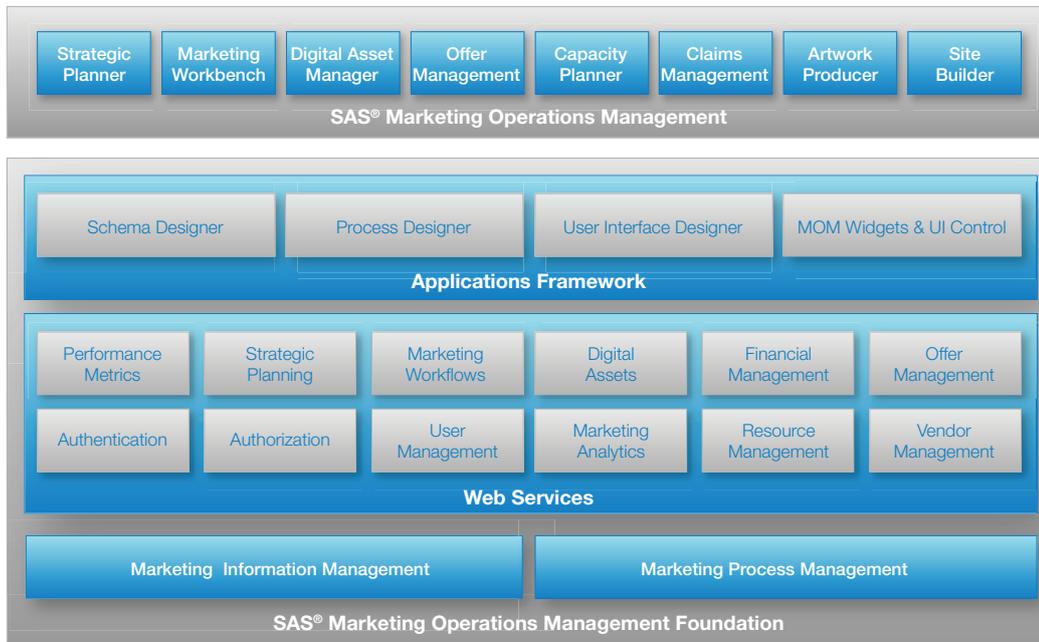


Figure 2: SAS Marketing Operations Management Foundation.

## Marketing Information Management

The marketing information object model includes more than 150 predefined marketing entities (plans, activities, budgets, resources, estimates, vendors, digital assets, etc.). Its key features are:

- A highly scalable and flexible star schema database.
- Configurable relationships between marketing entities without requiring any development effort.
- Configurable extension of the schema by association of customer-specific metadata, called facets.
- Support for hierarchical lookup values.
- An operational data store for ad hoc reporting functionalities.

## Marketing Process Management

The marketing process management engine includes predefined representation of almost every marketing workflow task (plan approval, project execution and multiple project type configurations, such as product launch, packaging and promotions design, etc.). Its key features are:

- Compliance with WfMC standard XPD format for defining marketing processes.
- Based on industry standard BPMN graphical process notation.
- Support for hierarchical process definition and process dependencies.
- Support for manual and automated process initiations.

- Support for predefined task types based on standard marketing processes.
- Support for human resource management.
- Support for integration with other systems through Web services.

## Web Services

The SAS Marketing Operations Management Web services implement all the business logic required by marketing operations management solutions. Its key features are:

- A highly modular, service-oriented architecture.
- Easy integration with ERP, CRM and other enterprise applications.

## Applications Framework

The SAS Marketing Operations Management applications framework includes the following:

- **Schema designer** – Enables client-specific extensions to the SAS Marketing Operations Management database schema.
- **Process designer** – Enables client-specific configuration of marketing processes.
- **User interface designer** – Enables easy creation and extension of user interfaces and provides consistent user interactions for all marketing solutions.
- **Widgets** – Includes commonly used UI objects required for implementing complex marketing functionality for consistent usage across all modules within SAS Marketing Operations Management (e.g., approvals, discussion forums, search, navigation into the digital library.)
- **User interface controls** – Includes UI objects that incorporate common user interactions (e.g., search, hierarchical lists, task panes, forms) used by all SAS Marketing Operations Management modules.

## SAS® Marketing Operations Management Modules

SAS Marketing Operations Management is built on SAS Marketing Operations Management Foundation and includes several modules, each focused on a well-defined marketing operation. The following modules are included:

- Marketing Dashboards.
- Calendars.
- Strategic Planner.
- Marketing Workbench.
- Capacity Planner.
- Timesheets.
- Digital Asset Manager.
- Claims Management.
- Artwork Producer.
- Approvals.
- Marketing Knowledge Manager.
- Site Builder.
- Offer Management.
- Reports.

## Architectural Components

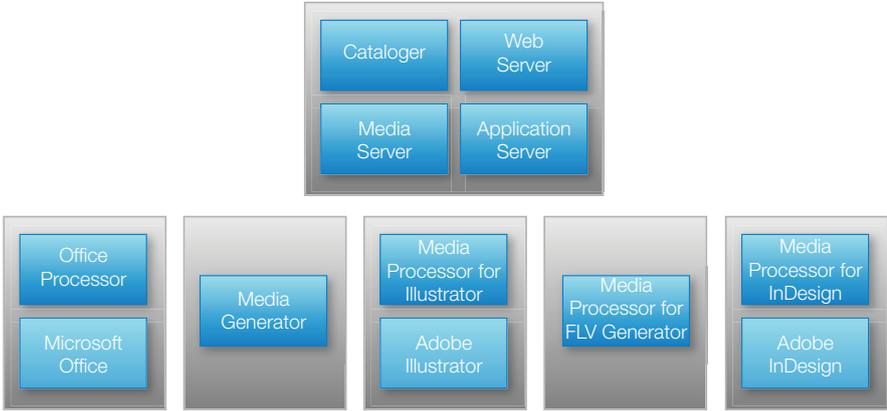


Figure 3: Architectural components of SAS Marketing Operations Management.

### Cataloger

The cataloger is responsible for importing digital assets into the SAS Marketing Operations Management system. Multiple catalogers can be deployed to manage uploading large volumes of digital assets. The cataloger distinguishes between single and batch file uploads and reduces upload waiting time for users.

### Web Server

The Web server hosts the SAS Marketing Operations Management suite. Users have access to the Web server via Internet or intranet, depending on the deployment.

### Application Server

The application server hosts the Web services belonging to SAS Marketing Operations Management Foundation.

### Media Server

The media server is an optional component for a standard SAS Marketing Operations Management installation. It is an essential component for a digital asset management-centric deployment. If more than 500 assets or assets greater than 5GB are uploaded or downloaded per month, the deployment could be defined as digital asset management-centric.

The media server hosts the digital asset repository to store digital content. It facilitates faster downloads due to fewer machine hops. It also facilitates the downloading of large files without hampering system usage.

## Media Generator

The media generator is an advanced and dedicated component responsible for high-volume processing of assets. It is responsible for generating previews, thumbnails and various renditions of the digital assets.

## Media Processor for FLV Generator

This media processor is responsible for FLV preview generation for video files to allow annotation on them.

## Media Processor for Illustrator and InDesign

This media processor is responsible for artwork generation using Adobe Illustrator and InDesign.

## Office Processor

The office processor is installed on a Microsoft Office server and is essential for generating previews and thumbnails of Microsoft Office files. It also helps with the processing required to consolidate comments made on Microsoft Office files routed for approval.

## Platform and Technology

SAS Marketing Operations Management is based on the following industry-standard platforms and technologies.

### Operating System

SAS Marketing Operations Management is supported on Microsoft Windows Server 2008 R2 Standard (64-bit). Microsoft Internet Information Server (IIS) is used as the application server.

### Database

SAS Marketing Operations Management stores all structured data and metadata related to digital content and collaborative workflows in a relational database management system (RDBMS). Currently, Microsoft SQL Server 2008 R2 is the only supported database. The database can be accessed using the .NET data providers.

## Internet Technology

This layer contains software that enables users to interact with SAS Marketing Operations Management components across the Internet or intranet. This includes:

1. SMTP servers for email notifications.
2. FTP servers for file transfers for cataloging or remote downloads.
3. Microsoft IIS for communicating with users via HTTP or HTTPS.

## Adobe Acrobat and Microsoft Office 2010

Adobe PDF (versions 8.0/9.0/9.3.2/X) and Microsoft Office 2010 (64-bit version) files can be routed, reviewed and approved using the Web browser.

## .NET Framework, ASP.NET, MTOM, AJAX and Flex

The multiuser and transaction-oriented data access and business logic components of SAS Marketing Operations Management are implemented on .NET Framework and ASP.NET. The UI is developed using ASP.NET and AJAX. A rich graphical UI has been developed using Flex.

SAS Marketing Operations Management uses the standard message transmission optimization mechanism (MTOM) protocol to transfer files across the application server and Web server tiers.

Use of a limited number of proven, industry-standard platforms and technologies provides a controlled environment for the application framework, which simplifies implementation and maintenance while enhancing robustness.

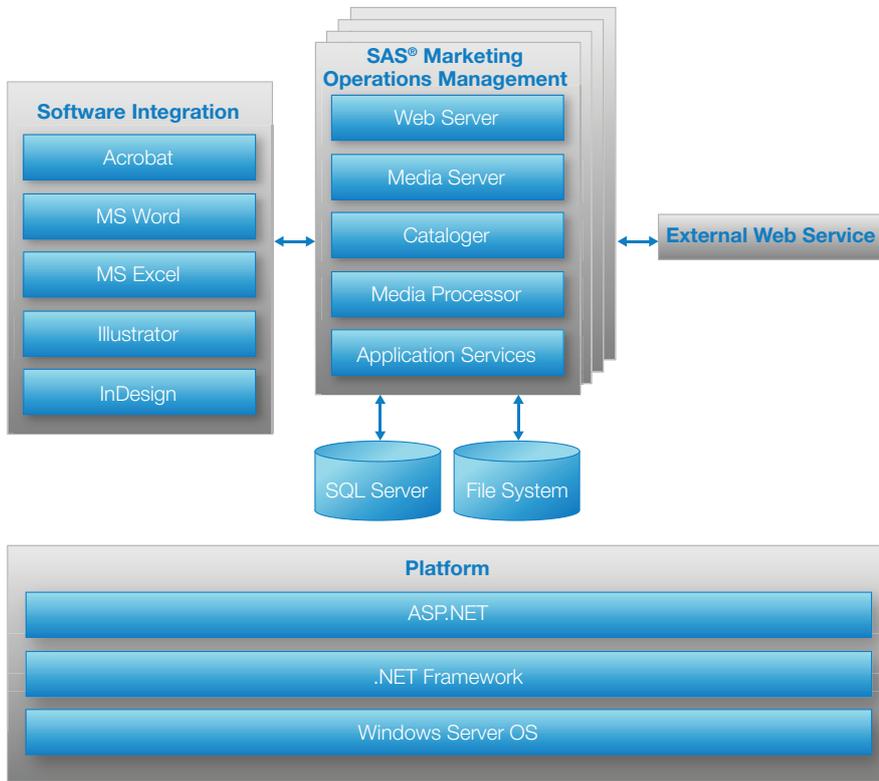


Figure 4: SAS Marketing Operations Management platform and technology.

### Versions of Platform Technology

SAS Marketing Operations Management is based on Microsoft technologies. **Please note, however, that the software and hardware versions listed in the table below are subject to change with newer versions of SAS Marketing Operations Management. To ensure that you have the most current list, please refer to the SAS Marketing Operations Management installation document that matches the version of the software that you installed from the SAS Support site.**

Platform	Platform Version
Server Operating System	Windows Server 2008 R2 (64-bit)
.NET Framework	3.51
ASP.NET	3.51

## Database

SAS Marketing Operations Management currently supports SQL Server Database 2008 R2. The architecture allows the system to be ported to a new database by adding a database-specific query processor in the data access layer.

## Third-Party Software

SAS Marketing Operations Management requires certain third-party software for the Dashboards, Desktop, Artwork Producer and Approvals related functionality. A detailed list of software and hardware requirements is provided below in the next section.

## Software and Hardware Requirements

### Software Requirements

Please note: The architecture described in this paper is valid for versions SAS Marketing Optimization Management 6.0 R14 , R14 Update 1 and R14 Update 2 (the current version at the time of publication).

Software	License required / Freely downloadable / Redistributed	Usage									
		Application Server	Web Server	Cataloger	Media Server	Database Server	Media Processor for Illustrator	MS Office Processor for InDesign	MS Office Server	Media Generator	Usage
Windows Server 2008 R2 standard (64-bit) EN-US Locale	License required to be purchased by customer	Y	Y	Y	Y	Y		Y	Y	Y	Operating system
Windows 7 Standard (64-bit) EN-US Locale	License required to be purchased by customer						Y				Required to host Illustrator processor - only if Artwork Producer is being deployed and the customer is using Illustrator templates
IIS 7.0 on Windows 2008 R2 (7.5.7600.16385)	Comes with Windows server	Y	Y	Y	Y			Y	Y	Y	Web server
MSMQ v. 5.0	Comes with Windows server	Y	Y	Y	Y			Y	Y	Y	Used for sending messages via queues by all modules in MOM
.NET Framework 3.51	Freely downloadable	Y	Y	Y	Y			Y	Y	Y	.NET required by application
MSXML 4.0	Freely downloadable	Y	Y	Y	Y						Required for XML processing. Used by all modules.
Microsoft SQLXML 4.0 SP1 (sqlxml.msi)	Redistributed via MOM Package	Y									Used by SQL Server / Express. Used for XML query output by Object Manager of MOM.
Microsoft SQL Server System CLR Types (SQLSysClrTypes.msi)	Redistributed via MOM Package	Y									Executing DB script files
Shared Management Objects (SharedManagementObjects.msi)	Redistributed via MOM Package	Y									Executing DB script files
Access Database Engine x64 (AccessDatabaseEngine_x64.exe)	Redistributed via MOM Package	Y	Y	Y							Reading Excel using OLE DB
Microsoft SQL Server 2008 R2 Standard version	License required to be purchased by customer					Y					Database for MOM
Media Streaming Server (windows Media Services 2008 Windows6.1-KB963697-x64.msu)	Comes with Windows server			Y							Required for streaming media
Adobe Acrobat IX or Adobe Acrobat X (10.0.0) - Standard version	Customer to buy		Y (if WebDAV is being used)						Y		Acrobat is required on the MS Office Processor. It is optional on the Web server, required only if WebDAV is used. (Note: If MOM Media annotations is not being used for approvals, a per user Adobe License for all users of approvals needs to be purchased)
Microsoft Visual C++ 2008 Redistributable Package (vcredist_x64.exe)	Redistributed via MOM Package	Y	Y	Y	Y		Y	Y	Y	Y	Executing C++ COM DLLs
Crystal Reports Basic for Visual Studio 2012 x64 RedistributablePackage	Redistributed via MOM Package	Y	Y								Required for Report generation
Microsoft Office Professional Plus 2010 x-64 (14.0.4763.1000)	License required to be purchased by customer								Y		Used for Consolidation of comments by approvals tasks and jobs and for import and export of Excel by all modules.
ImageMagick (ImageMagick-6.7.3-4-Q16-windows-x64-dll.exe)	Redistributed via MOM Package									Y	Used to generate previews and thumbnails for digital assets in dam.
ASP.NET State Service	Comes with .Net Framework		Y								Required along with .NET
Adobe Illustrator CS3/CS4(Required only if Artwork Producer is being deployed for the customer)	License required to be purchased by customer						Y				Used by Artwork Producer (Required only if Artwork Producer is being deployed for the customer and customer is using Illustrator templates)
Adobe InDesign CS 5.5 (Required only if Artwork Producer is being deployed for the customer)	License required to be purchased by customer							Y			Used by Artwork Producer (Required only if Artwork Producer is being deployed for the customer and customer is using InDesign templates)
Ghostscript ( <a href="http://ghostscript.com/releases/gs871w64.exe">http://ghostscript.com/releases/gs871w64.exe</a> )	Freely downloadable									Y	Used for media file processing by DAM along with ImageMagick

## User Machine Requirements

Users interact with SAS Marketing Operations Management through Web browsers, mail clients and FTP clients. Users do not have to install any proprietary or “fat client” software on their desktops.

- Browsers – Internet Explorer 8.0/9.0 (32-bit) (Windows), Safari 5.1.5 on OS Lion, Firefox 12.0 (Windows).
- Microsoft Office 2010 (64-bit version).
- Adobe Acrobat 8.0/9.0/9.3.2 Standard or Professional or Adobe Acrobat X Reader.
- Adobe Flash player 10.3.183.11 (for Flex-Based Dashboard channels).
- SAS Marketing Operations Management desktop utility (created using Adobe Air) for desktop cataloging of digital assets into the Marketing Operations Management Digital Library.
- Additional requirements: Microsoft Terminal Server (for remote connectivity and management of servers, mainly for administrators – optional).

## Hardware Requirements

Architectural Component	Minimum Storage Requirement	Minimum Hardware Recommendation
Application Server	150GB scalable	Dual-core or quad-core processor 8GB of RAM
Web Server	100GB	Dual-core or quad-core processor 8GB of RAM
Media Server	500GB scalable to 1TB	Dual-core or quad-core processor 8GB of RAM
Media Generator	100GB	Dual-core or quad-core processor 8GB of RAM
Cataloger	100GB	Dual-core or quad-core processor 8GB of RAM
Media Processor	100GB	Dual-core or quad-core processor 8GB of RAM

Here are some recommendations to consider while determining the configuration for a specific deployment:

- 1) The requirements mentioned above are generic product requirements. For specific customer requirements, please contact the SAS Marketing Operations Management Sizing Team (EEC department).
- 2) The above table gives the minimum hardware requirements for each of the servers. If multiple components are being deployed on the same machine, a more robust hardware configuration is recommended.
- 3) A database server (for SQL Server on Windows) is required. However, SAS does not have specific recommendations for this server or the database size.
- 4) The server where the file system resides needs to have a higher storage capacity. In the above table, the media server is shown as a high-storage configuration. In the case where a media server is not set up, the application server needs a high-storage configuration and must be scalable.
- 5) An improved hardware configuration is recommended for servers where large media processing happens, such as the cataloger, media processor and media generator.

## Deployment

The SAS Marketing Operations Management architecture facilitates the deployment of each architectural component on a separate or on the same machine. The deployment choice depends on many factors, including:

- Is it a DAM-centric deployment – i.e., is the system primarily being used to upload and download large numbers of digital assets?
- Is the amount of media processing large – i.e., is the system being used to generate large volumes of artwork?
- Is usage in terms of number of users too high – i.e., will the number of users working concurrently on the system be high?
- Is the system going to be accessed by users outside the network – i.e., are users geographically distributed and working remotely over the Web to access the system?

The following section explains some of the typical deployment scenarios and recommendations.

### Typical Deployment

A typical deployment of SAS Marketing Operations Management comprises:

- A cataloger on one machine.
- A Web server on a separate machine.
- An application server on a separate machine.
- A database server hosting the database.
- A media processor on one machine.

Note: This scenario could vary based on your specific environment, preferred security settings and firewall setups, etc.

For example, in some hosted environments, it is preferred that the Web server, media server and catalog server be located on the internal network segment as well. An Apache Server Reverse Web Proxy Farm sits in the DMZ, and a second firewall is set in between the DMZ and the internal network segment.

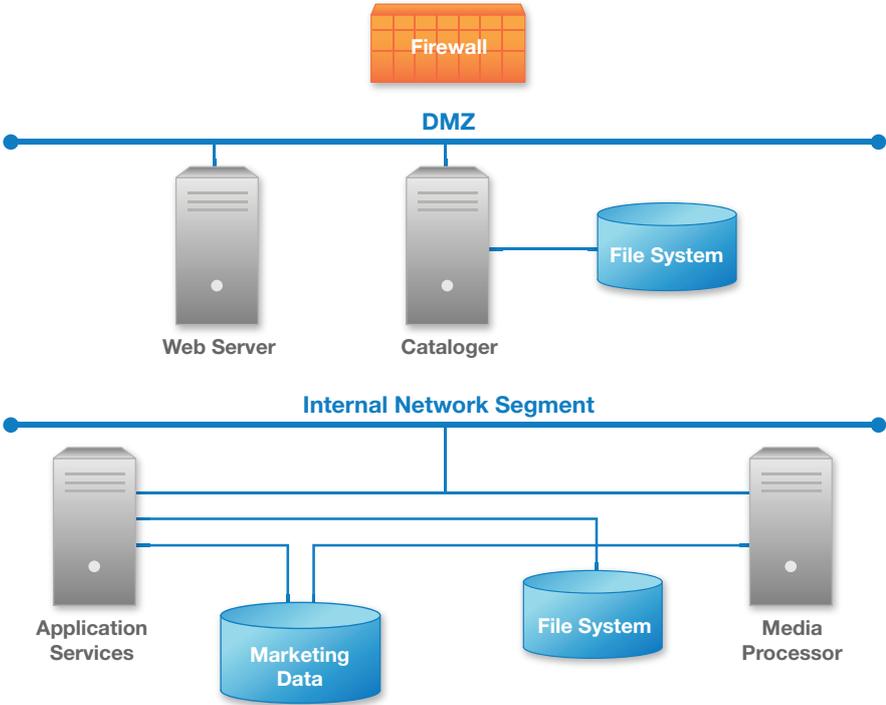


Figure 5: Typical SAS Marketing Operations Management deployment.

### DAM and Media Processing-Centric Deployment

If DAM is being used extensively, and the system is primarily being used to upload and download large numbers of digital assets, the deployment would comprise:

- A media server and cataloger on one machine.
- A Web server on one machine.
- An application server on one machine.
- A media processor and media generator on one machine.

Note: This scenario could also vary based on your specific environment and preferred security settings and firewall setups, etc., as mentioned in the previous scenario.

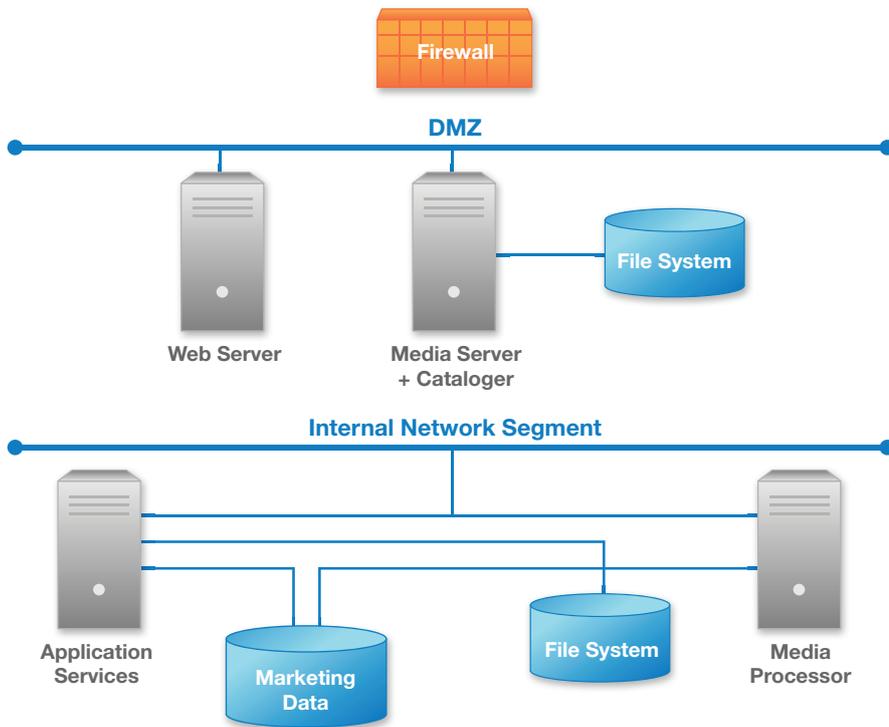


Figure 6: DAM-centric deployment.

### Deployment on a Virtual Machine Environment

SAS Marketing Operations Management can be deployed on an industry-standard virtualization platform, such as VMWare. SAS Marketing Operations Management works on such a virtualization environment with almost no performance degradation, subject to accurate configuration.

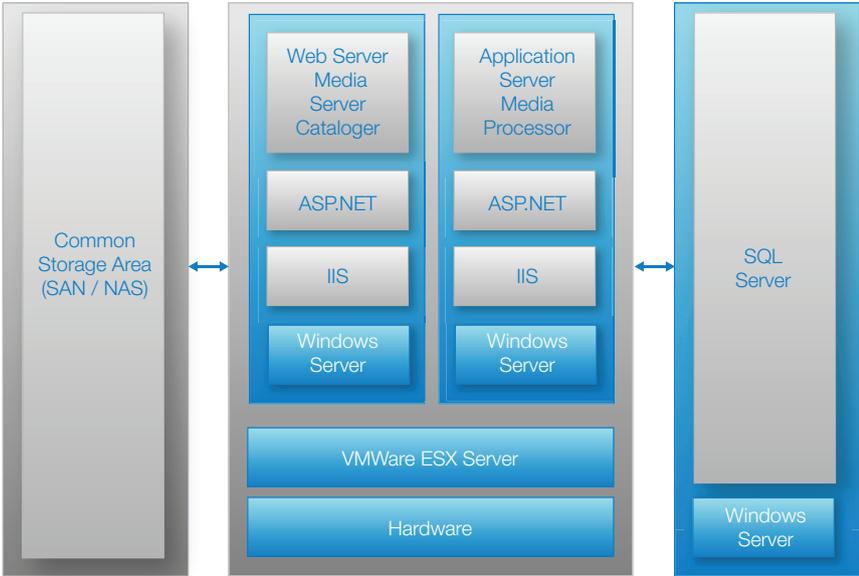


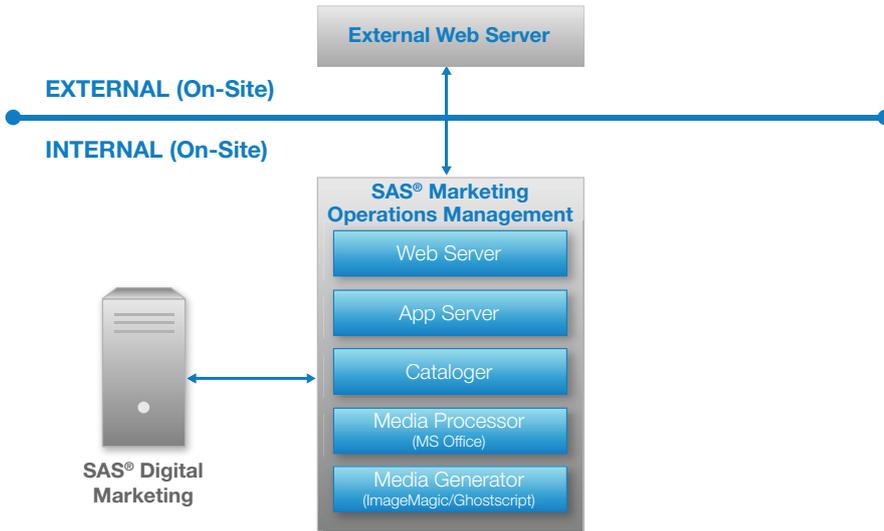
Figure 7: A sample virtual machine environment setup.

The above deployment is done on VMWare ESX Server, where two virtual machines have been created, and specific architectural components are deployed on each virtual machine. The capacity planning for each machine is done as per the requirement of the component. SAN or NAS can be used as a common storage area. SAS Marketing Operations Management is completely compatible with VMWare enabled virtualization technology with almost no degradation in performance.

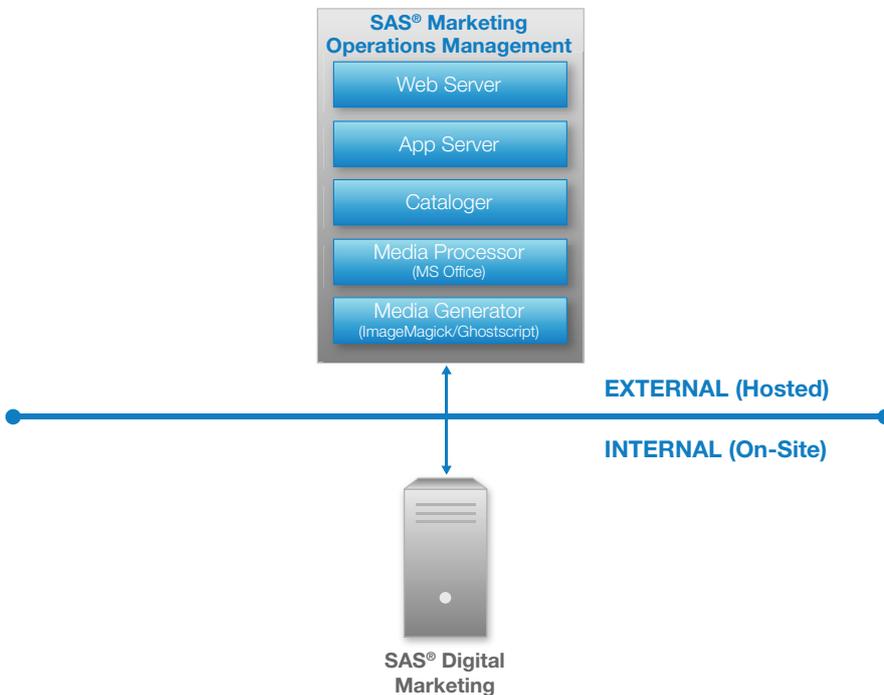
### Deployment with SAS® Digital Marketing

If SAS Digital Marketing is set up along with SAS Marketing Operations Management, there are two potential scenarios to consider:

- Both SAS Marketing Operations Management and SAS Digital Marketing are installed on-site. In this case, there is a need to configure an external Web server, and the deployment could potentially look like this:



- SAS Marketing Operations Management is installed in a hosted environment, and SAS Digital Marketing is installed on-site. In this case, the deployment could potentially look like this:



## Multitenant Capability

The SAS Marketing Operations Management architecture supports the hosting of multiple tenants in a single installation. Different aspects concerning multitenant support are described below:

- Look and feel. Each tenant can have its own branding and login page conform to the corresponding corporate identity. This customization is possible by altering the style sheet and images. No code changes are needed.
- Tenant settings. Each tenant has its own settings for the email server, user account, password policies and application settings. The settings for each tenant are unique and do not interfere with other tenants.
- Data isolation. Data for different tenants resides in different databases and different locations in the file system. Different tenants hosted in a given installation do not have any visibility of each other's data.
- Scalability. Because of the SAS Marketing Operations Management scalable architecture, there is no limit on the number of tenants. Adding more Web servers, application servers and database servers helps achieve desired performance for any number of tenants that need to be supported.

## Application Security

Besides having a secure architecture, there are a number of security features that SAS Marketing Operations Management has, including:

### Account and Password Policies

Only authenticated users are allowed to access the application. In order to make the security of the application more robust, SAS Marketing Operations Management applies the following password policies:

- The number of characters for a password is configurable.
- Each password must contain a digit.
- Each password must contain at least one of the following characters:  
# @ ! \$ % ^ ? \_
- After a configurable number of failed login attempts, the user account is automatically locked. This deters brute force attacks to hack into user accounts. Auto-unlocking after a configurable duration is supported.

### URL and Password Encryption

SAS Marketing Operations Management ensures that all URLs are encrypted using a strong encryption algorithm. This makes it difficult for anyone to interpret the URL data.

## Secure Communication Channels

SAS Marketing Operations Management supports secure HTTPS or SSL protocols for communication with the Web server, as well as communication to an SMTP server over a secure channel. This ensures the encryption of data that is sent over the wire to deter malicious users from accessing data. In particular, it ensures that credentials entered for authentication are encrypted and not accessible to malicious users by merely intercepting message traffic.

## Termination of Abandoned Sessions

SAS Marketing Operations Management users can use sign-out interaction to terminate their sessions. If a user abandons a session by closing a browser window, the session is terminated automatically. This prevents any unauthorized entry from the user's machine if the user is not present.

## Masquerading

SAS Marketing Operations Management detects the use of links copied from one browser and pasted into another, and redirects to the login page in case of such events. This prevents malicious users from masquerading.

## Module Access Policy and Security Policy

SAS Marketing Operations Management has a rich way of managing users and classifying them into groups, as well as further classifying groups into subgroups. The administrator can define policies to enable or restrict user or group access to a particular module. Going a step further, the administrator can also enable or restrict interactions a user or group is able to perform within a particular module. Such fine-grain control is very essential while working with third-party vendors, and it provides them with only restricted access to the SAS Marketing Operations Management application.

## Auditing

Auditing is available as an essential function that helps the administrator keep track of users logging on and off. Auditing is also available for user actions performed in the Digital Asset Management module.

## About SAS

SAS is the leader in business analytics software and services, and the largest independent vendor in the business intelligence market. Through innovative solutions, SAS helps customers at more than 65,000 sites improve performance and deliver value by making better decisions faster. Since 1976 SAS has been giving customers around the world THE POWER TO KNOW®. For more information on SAS® Business Analytics software and services, visit [sas.com](http://sas.com).



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