System Requirements

centricminds®

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INTRODUCTION

CentricMinds is a browser-based Enterprise Content Management System (CMS) that empowers business people with intuitive and easy to use publishing and management tools. It has been developed to be easy to deploy and require minimal system resources. This document contains information to be used as a guide in determining the resources required to host CentricMinds.
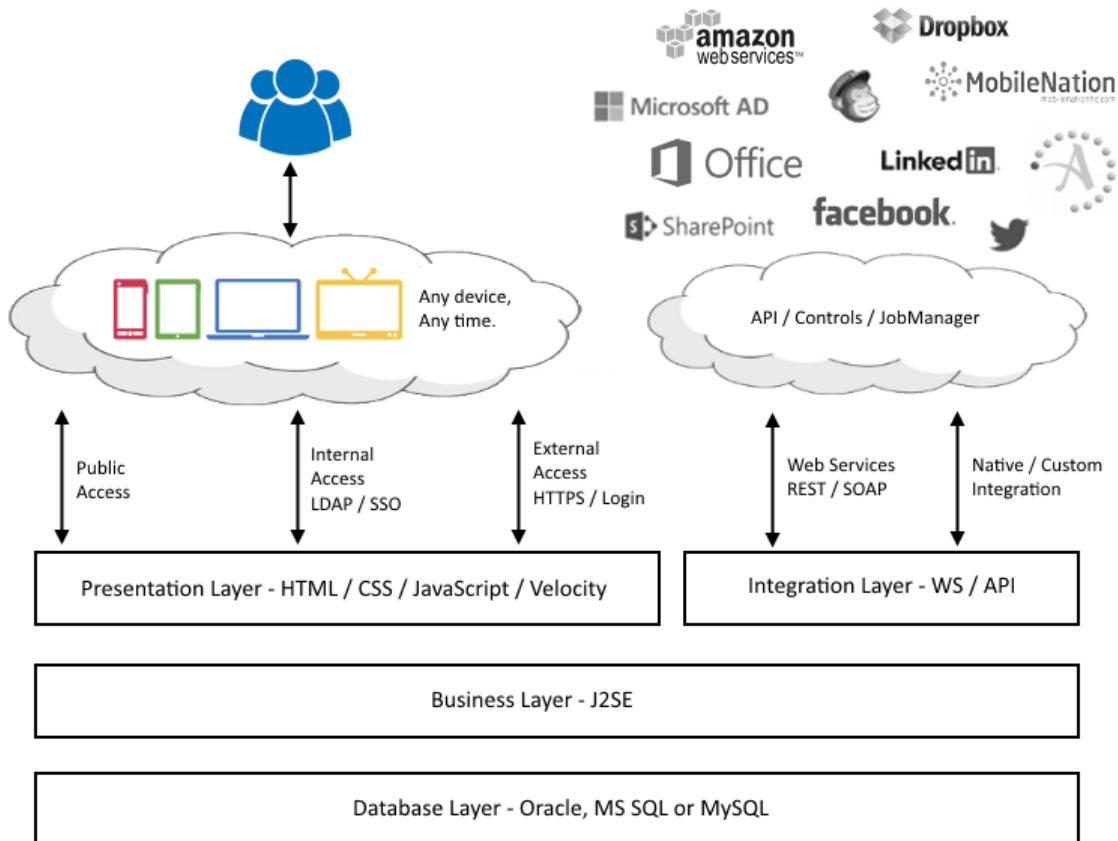
SUPPORTING SOFTWARE

The following sections provide information on the supporting software required and/or supported when deploying CentricMinds.

Operating System

As a Java web application, CentricMinds has been designed to run on any operating system. Below is a table providing an example of supported operating systems that have been used in production environments.

Operating System	Version / Distribution
Windows	Desktop (Dev): 7, 8, 8.1, 10 Server (Prod): 2003, 2003 R2, 2008, 2008 R2, 2012, 2012 R2, 2016
Linux	Red Hat (Red Hat Enterprise Linux, Fedora, CentOS, Amazon Linux) Debian (Debian, Ubuntu) Slackware Linux (S.u.S.E.)
Unix	Solaris 9, 10
AIX	AIX 5.3

Java Runtime / Development Kit

The requirement and version choice of the Java Development Kit (JDK) is dependent on the chosen application server (outlined on the next page). The following table outlines minimum JDK version requirements. **Oracle JDK version 1.8.x preferred**.

CentricMinds Version	Required JDK Version
1.0.0	1.4.x+
6.4.0	1.6.x+
7.8.0	1.7.x+

Application Server

As a Java application, CentricMinds has been designed to run on any Java application server (J2SE and/or J2EE). Below is a table providing an example of application servers that have been used in a production environment. **Apache Tomcat 8.5.x is preferred**.

Application Server	Version
Apache Tomcat	5.0.x, 5.5.x, 6.0.x, 7.0.x, 8.0.x, 8.5.x
Oracle GlassFish	2.0.x, 2.1.x, 3.1.x
JBoss	Application Server 4.2.x
Oracle OC4j	9i, 10g
BEA WebLogic	Server 8.1
IBM Websphere	Application Server 7, Community Edition 2.1

In addition, various additional configurations are also supported using the following web/application servers (typically in addition to one of the servers listed above):

Web Server	Version
Microsoft IIS	5.x, 6.x, 7.x, 8.x
Apache HTTP Server	2.x
NGINX	1.x

Database Server

The following table outlines the database servers supported by CentricMinds. **MySQL 5.7.x or MS SQL 2016 Standard is preferred.**

Database Server	Version
MySQL	5.0.x, 5.1.x, 5.6.x, 5.7.x (Community edition)
MariaDB	5.x, 10.x
Amazon Aurora	All
Microsoft SQL	2005, 2008, 2012, 2014, 2016 (Express, Web, Standard and Enterprise)
Oracle	9i, 10g, 11g

When using MS SQL, as of CentricMinds version 7.8.0, a minimum version of MS SQL 2012 is required.

Mail Server

CentricMinds requires the ability to use an outgoing SMTP Server for the sending of automated emails (e.g. workflow notifications, subscription newsletters etc.). There are no specific requirements of mail server type / version. CentricMinds provides global configuration for the mail host, port and its authentication details (if applicable).

CentricMinds also supports integration with mail servers for the purpose of features such as 'Lazy Workflow Approval', 'Message' importing and bounced email checking. This functionality only supports connection with the mail server through the IMAP protocol.

INFRASTRUCTURE

Overview

When deploying CentricMinds there are 3 key components:

1. **CentricMinds Application**

   The CentricMinds application is provided as a compressed package (either a ZIP or WAR file). It is deployed as a standard Java web application. The CentricMinds application must be deployed with no context root (i.e. /).

2. **CentricMinds Database**

   The CentricMinds database scripts are provided to create the required database structure. It also includes some example content and templates.

3. **CentricMinds JobManager**

   The CentricMinds JobManager is a background maintenance task. It is a multi-threaded task scheduler that is setup to run automatically / continuously. To assist in this setup there are scripts provided to install the JobManager as a service in Windows or as a shell script in Unix/Linux.

These components are highlighted in the simple high-level diagram below:
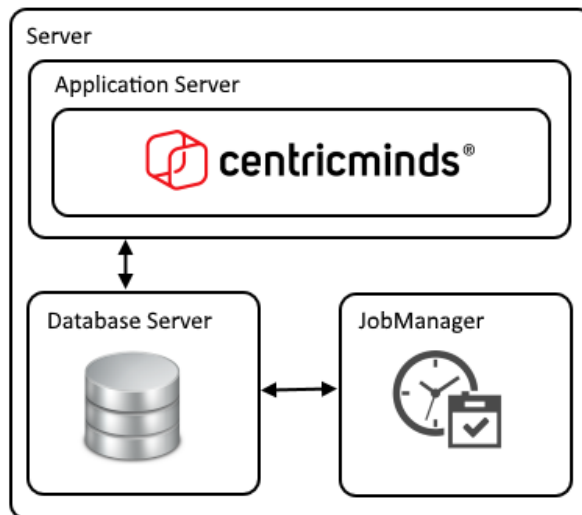
The CentricMinds application can typically be deployed by a user with minimal privileges. However, when setting up the CentricMinds JobManager as a Service or as a shell script that starts automatically, a user with Administrator privileges and/or root access is required to perform the initial install. Once deployed, the CentricMinds application and JobManager do not require administrator privileges and/or root access to run.

Cloud Hosting

It is very common for CentricMinds to be hosted by a hosting provider that provides Infrastructure as a Service (IaaS).

CentricMinds is actively supported using the following IaaS providers and their associated technologies / services:

- Amazon Web Services
- Microsoft Azure

In addition, many cloud hosting providers provide various Platform as a Service (PaaS) offerings. CentricMinds supports use of database hosting via PaaS. This includes use of:

- Amazon Web Services
    - o Amazon Relational Database Service (RDS)
- Microsoft Azure
    - o Azure SQL Database

Examples

Based on the information provided, the following examples can be used as a guide for CentricMinds deployment options.

Example Basic / Minimum System Requirements

Number of Servers	1
Operating Systems	Windows / Linux
CPU	1 Core
Memory	2Gb RAM
Application Server	Apache Tomcat 8.5.x
Database Server	MySQL 5.7.x
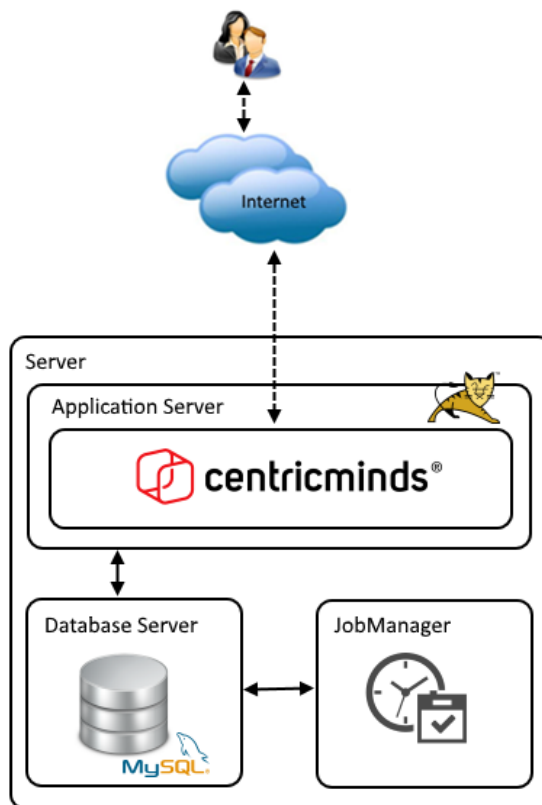
Example Recommended System Requirements

Number of Servers	2 (Virtualized)
Operating Systems	Windows / Linux – 64 bit
CPU	2+ Cores (per server)
Memory	4Gb+ RAM (per server)
Application Server	Apache Tomcat 8.5.x
Database Server	MySQL 5.7.x (On a separate server to the Application Server)
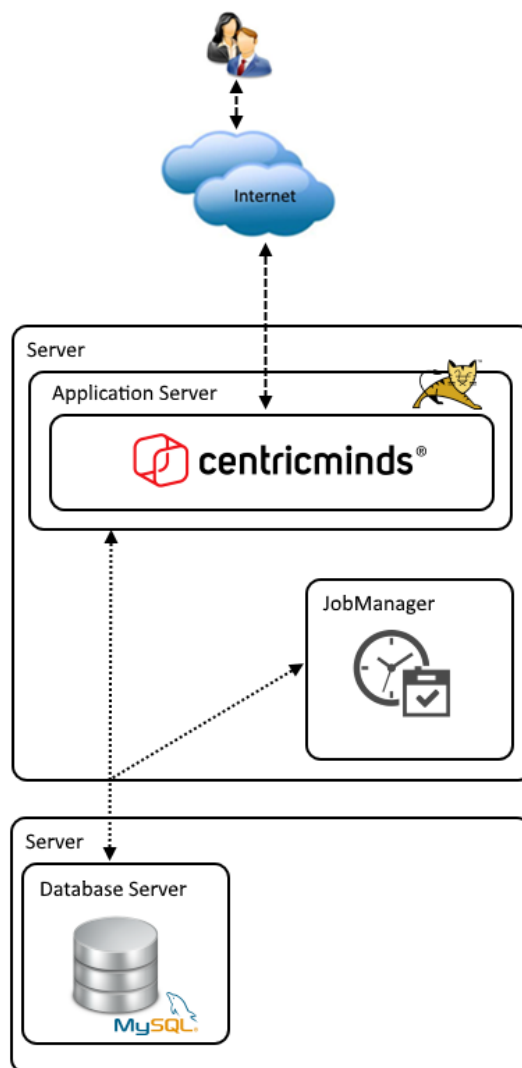
Example Cloud Hosted High Availability Solution (using Amazon Web Services)

Number of Servers	2 load balanced servers (EC2)
Operating Systems	Windows / Linux – 64 bit
CPU	2+ Cores (per EC2)
Memory	4Gb+ RAM (per EC2)
Application Server	Apache Tomcat 7.x
Database Server	Amazon RDS – MySQL or Aurora
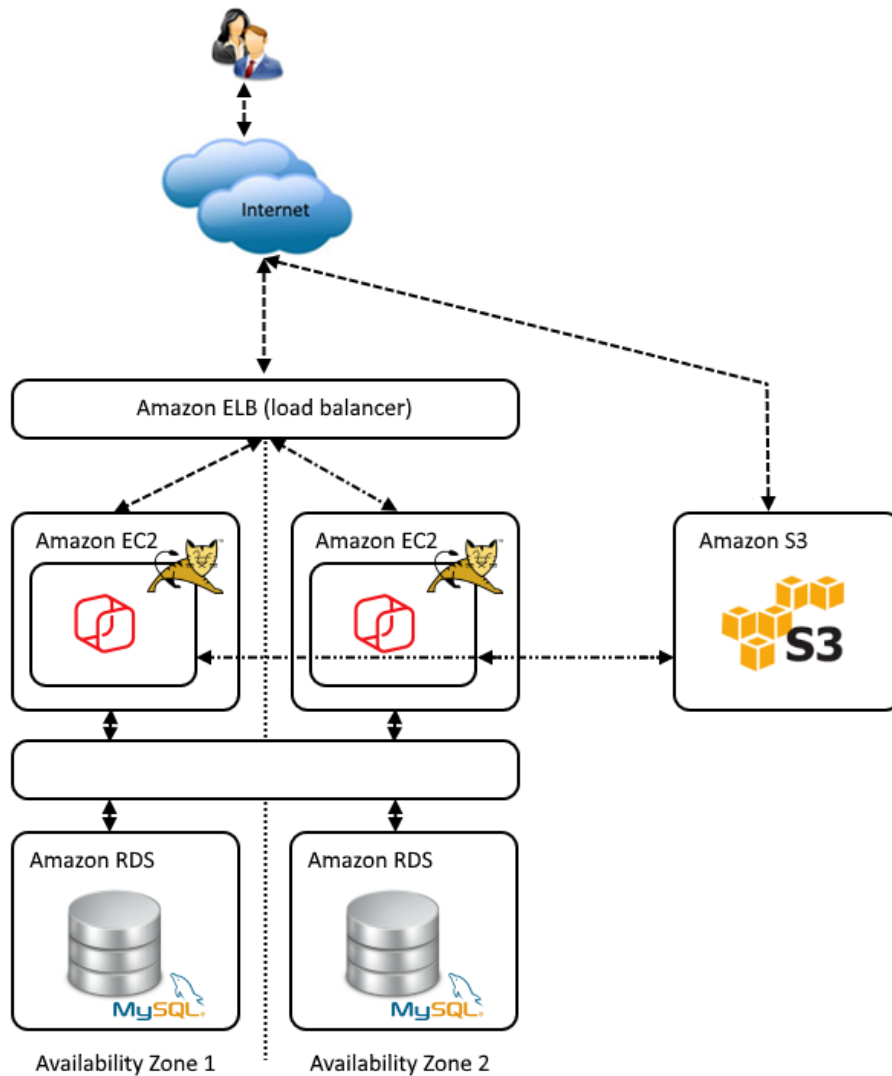
This solution provides high availability, failover and disaster recovery in one solution across multiple availability zones (physically and geographically distinct, independent infrastructure). Each component is briefly outlined below:

- **Web Server:** Amazon Elastic Compute Cloud (EC2) instances provide the basis for the web servers hosting the Admin Site (for site administration and authoring) and the Intranet / Internet Sites.

- **File Storage:** Amazon Simple Storage Service (S3) is used to provide highly available and distributed shared file storage. CentricMinds automatically manages publishing to, and retrieval from, S3. By storing files separate to the servers (EC2), additional servers can easily be added at any time (including automated scaling) to handle increases in site traffic.

- **Load Balancer:** Amazon Elastic Load Balancing (ELB) automatically distributes incoming web requests across multiple servers (EC2). It enables the ability to achieve high availability by seamlessly providing the required amount of load balancing capacity needed to distribute web requests.

- **Database:** Amazon Relational Database Service (RDS) Multi-AZ deployments provide enhanced availability and durability for Database (DB) Instances. Multi-AZ DB Instances automatically / synchronously replicate data to a standby instance in a different Availability Zone (AZ). Each AZ runs on its own physically distinct, independent infrastructure, and is engineered to be highly reliable. In case of an infrastructure failure (for example, instance crash, storage failure, or network disruption), Amazon RDS performs an automatic failover to the standby so that database operations can resume as soon as the failover is complete. Since the endpoint for your DB Instance remains the same after a failover, the site can resume database operation without the need for manual administrative intervention.

Example Distributed Architecture Solution

Number of Servers	3 Servers
Operating Systems	Windows
Memory	4Gb+ RAM (per server)
Application Server	Apache Tomcat 8.5.x
Database Server	MS SQL

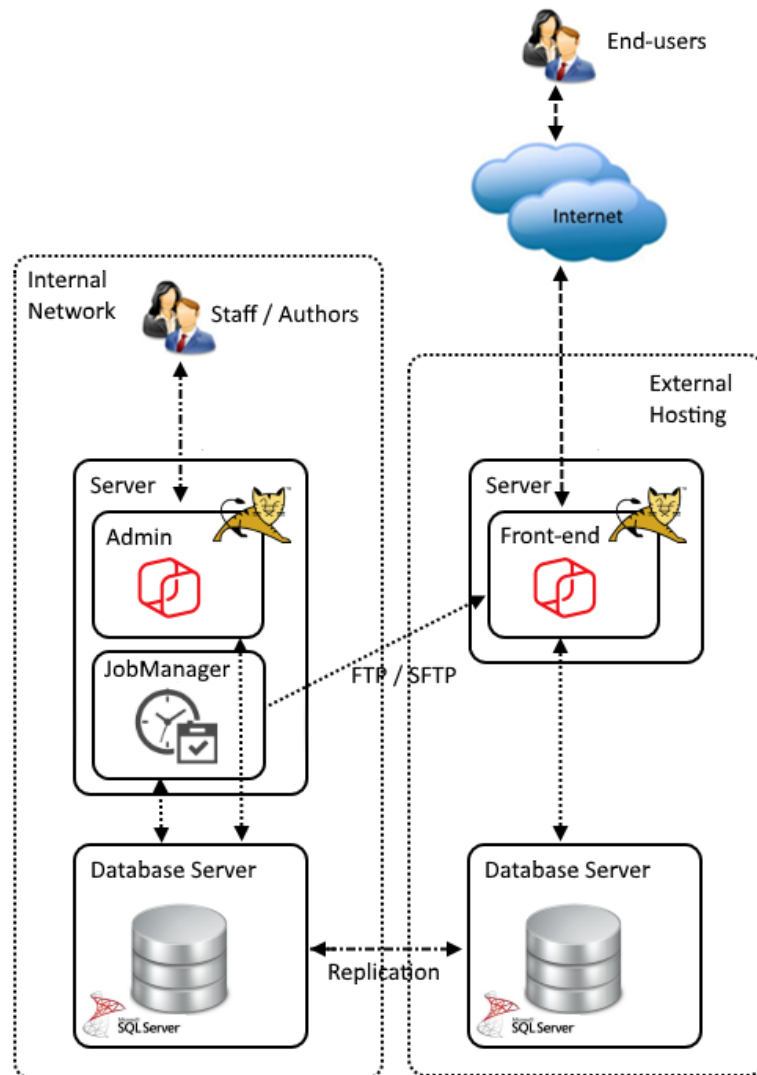This example outlines an approach often used by clients who wish to achieve a combination of internal authoring / management and external access (e.g. authors manage content / documents on an internally hosted server behind a firewall and chosen content / documents are published and accessible to users on an externally hosted server).

This can be achieved in various ways; in this example it has been achieved as follows:

- A single administration site is hosted on an internal server and provides authors with the ability to quickly manage locally hosted content. Authors have the ability to determine which content is published to any associated externally hosted servers (there can be one or more).

- The administration site read / writes information to an internal database server (e.g. in this case MS SQL Standard).

- An externally hosted server is configured to host one or more front-end sites (managed by the single internally hosted administration site).

- The externally hosted site reads information from a local database server (e.g. in this case MS SQL Express), which is a read-only real-time replication of the internally hosted database server.

- The externally hosted site writes information directly back to the internally hosted database server (occurs infrequently – e.g. if a user submits a form and the data is collected).

- Physical files (e.g. documents and images) are transferred automatically between servers using FTP or SFTP by the JobManager.

BROWSER SUPPORT

CentricMinds' primary user interface is an Internet browser (e.g. Internet Explorer etc.). Testing and support focuses on the following major browsers:

- **PC**
    - Internet Explorer 9,10,11
    - Microsoft Edge (latest version)
    - Chrome (latest version)
    - Firefox (latest version)
- **Mac**
    - Safari (latest version)
    - Chrome (latest version)
    - Firefox (latest version)
- **iOS**
    - iPhone (iOS 6+ e.g. on 4S,5,5S)
    - iPad (iOS 6+ e.g. on 3 & 4)
- **Android**
    - Phone (Android 4+)
    - Tablet (Android 4+)

Note: All versions of Windows Mobile or Blackberry are not tested / supported.

Browser support based on the key functional access is as follows:

- **Administration / Authoring:** All browsers noted above are supported however currently restricted to use on a device with suitable screen resolution (a minimum of 1024 x 768).

- **Front-end Site:** All browsers noted above are supported across all associated screen resolutions (through the use of a responsive template implementation).
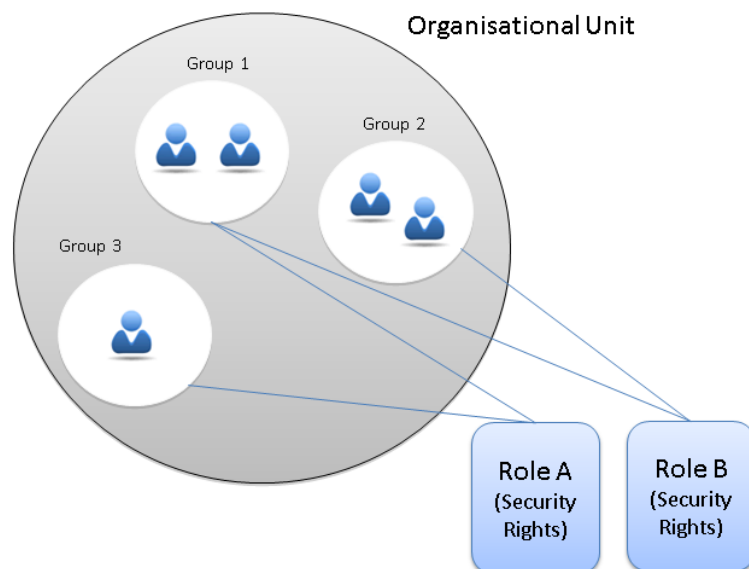
SECURITY

Overview

CentricMinds provides a comprehensive security model, which provides granular access control management across the CMS.

Users are classified in the system based on their function, namely:

- Site Users (read-only access)

- Authors / Approvers (read & write access)

- Organizational Unit Managers

- Global Administrators

These Users are then organized into Groups, where the rights of a Group are defined by the Role(s) that are associated with it. This approach provides the ability to grant or deny permissions to many Users at one time. The security settings defined for a Role are applied to all members of that Role.

This example demonstrates:

- Multiple groups with-in an organizational unit (there is no limit to the number of organizational units and/or groups).

- Users associated with groups (there is no limit to the number of users).

- Roles defining security rights are associated with groups (in this case Group 1 receives an aggregate of rights in both Role A and Role B).

A User can authenticate to CentricMinds either by logging into the public or administration site. The rights a user inherits from their group, and any rights groups they belong to, are aggregated and cached for the session in the form of a Java security object. When a user attempts to access any resource (this includes assets such as pages, files, images, text items etc. on the public site and authoring functions on the administration site) CentricMinds ensures that sufficient rights are available in this Java security object. In the event that a user does not have sufficient rights, the user will be notified and restricted from access. The Java security object is maintained for the length of the session (which is configurable). When the session times-out the user will be notified and directed to the login page. Access to any secure resources will be denied until a successful login has been performed.

Secure Communication

CentricMinds supports (and recommends) the use of Secure Sockets Layer (SSL) to enable secure communication between client browsers and the web server (browsing in HTTPS).

LDAP Integration

CentricMinds provides two key points of integration with an LDAP compliant data source (e.g. Microsoft Active Directory):

- **User Sync:** A background tasks that connects to and sync's user information from LDAP into CentricMinds (based on a defined position with-in LDAP or a desired search criteria). The sync adds, updates and/or deletes user accounts with-in CentricMinds as needed.

- **Authentication:** When an individual user attempts to authenticate to CentricMinds, that authentication can be performed against LDAP. After successful authentication, a sync of that individual user's information is performed.

During a synchronization of a user's information into CentricMinds, the following is supported:

- **User details:** Retrieving standard user information such as username, first name, last name, email address, phone number, mobile number, date of birth and manager.

- **Group associations:** Retrieving group associations from LDAP and creating and associating groups with the same name with-in CentricMinds.

- **Additional details:** Retrieving additional / custom information and associating it as metadata associated with the user.

This has made it possible for organizations to use LDAP as a 'source of truth' for user information and provide access to CMS content in a structured and automated way. It has also made it possible to

support user personalization and automated subscription and/or notifications, by matching content-based metadata against synchronized user metadata.

When configuring CentricMinds for LDAP, the following native options are available (together with their typical associated AD attribute names):

CentricMinds Configuration	AD Attribute
First Name	givenName
Last Name	sn
Username	sAMAccountName
Phone Number	telephoneNumber
Mobile Number	Mobile
Email	Mail
Security Groups	memberOf
Manager	manager
Photo	thumbnailPhoto

Authentication

CentricMinds provides a flexible authentication model, which includes support for the following approaches:

- **Traditional Authentication:** CentricMinds provides 'out of the box' support for the internal storage of user accounts and their associated authentication. User information is stored within the CentricMinds database.

- **LDAP Authentication:** CentricMinds provides 'out of the box' support for authentication with a LDAP compliant data source (e.g. Microsoft Active Directory). The data source will remain the 'source of truth' and all authentication attempts via the CMS will include communication and verification with the data source. Information (included security group and role associations) is synchronized and used by the CMS.

- **Mixed Mode Authentication:** A combination of Traditional and LDAP Authentication; which first tests against an LDAP compliant data source (e.g. Microsoft Active Directory) followed by an authentication attempt against the CMS (in the event that the LDAP authentication fails). This provides the ability to support internal authentication of staff, but also support

authentication of external users (who do not have an LDAP account) as needed. This brings greater flexibility in supporting user authentication across varying target audiences.

- **External Authentication:** CentricMinds also provides the ability to perform authentication against external systems (via HTTPS requests) or external databases (via direct data querying).

Single Sign On

CentricMinds provides support for Single sign-on (SSO); an approach to access control across multiple, related, but independent software systems. With this approach a user logs in once and gains access to all systems without being prompted to log in again for each of them.

- **SSO Basic:** The CMS supports a basic approach to SSO using the browser's ability (via NTMLv2 or Negotiate) to retrieve the username of the user currently logged into Windows (i.e. within a domain). When the site is accessed, the user will be silently logged into the CMS via their windows user account. This protocol / approach passes a secure token from the user's client computer to the domain controller to confirm the user is logged in. This negotiation occurs before any access to the site is granted (ensuring the user is suitably authenticated before any access to content is provided). This functionality is restricted to those on a windows device, logged into the domain and using a suitable browser (for example, Internet Explorer) which has the Intranet included in the 'Intranet Zone' of its security settings. All other users will be prompted by the browser for their username / password (in which they would enter their usual domain login details and can choose to save that login).

- **SSO Advanced:** The CMS supports an advanced approach to SSO (which will work with all browsers) and makes use of Microsoft Active Directory Federation Services (ADFS). When the Intranet is accessed, a secure ADFS token is checked for authentication information; if one exists, the user will be silently logged into the CMS, if one does not exist, the user will be directed to login via ADFS and then passed back accordingly.
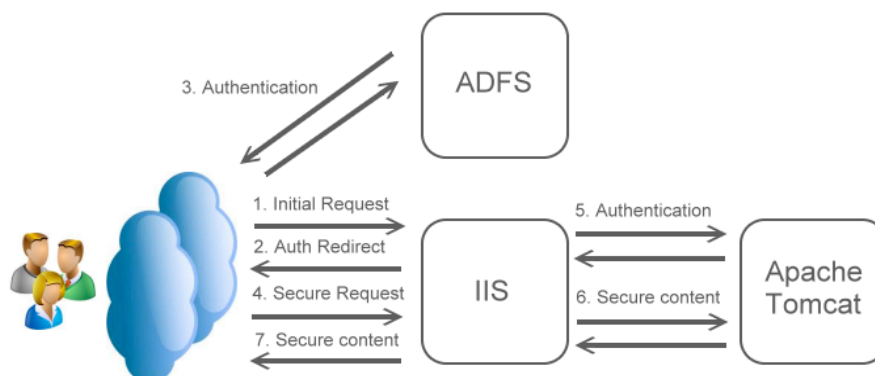
To address security concerns of SSO and the transmission of user credentials; it is recommended that

communication is secured through HTTPS access to the site only and to only provide SSO to users accessing the site securely (e.g. through a VPN if the site is hosted externally).

VPN Implementation

When CentricMinds is hosted externally (e.g. with-in Amazon Web Services), to use an LDAP source such as Microsoft Active Directory (AD) as a source of user information and authentication, the server hosting the site needs to have access to that AD (which is typically hosted internally). Also, to enable Single Sign On (SSO), the server also needs to be a member of the Windows domain, which the AD is associated with. As a result, firewall / routing rules need to be updated to allow access and a VPN or secure connectivity established to allow the server to be a member of the Windows domain. To establish a VPN between the external hosting (using Amazon Web Services as an example), the following activities are required:

- Setup of the AWS Virtual Private Cloud / Gateway

- Configuration of the AWS security / access

- Configuration of the internal security / access

- Configuration of the internal Customer Gateway

- Setup of the VPN

The following diagram provides a high level over of the resulting configuration:
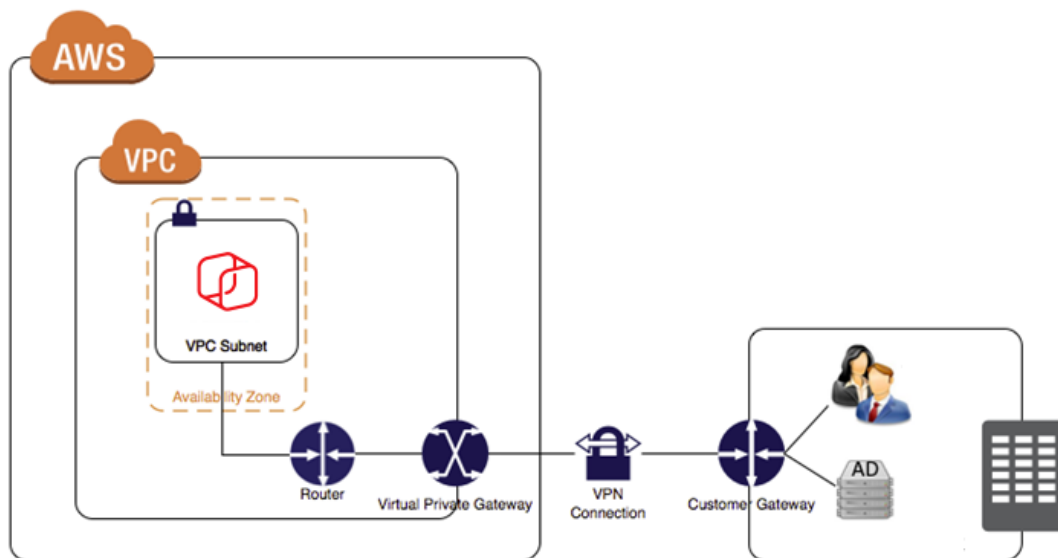
Further information is available via:

- http://docs.aws.amazon.com/AmazonVPC/latest/NetworkAdminGuide/Welcome.html
- http://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/VPC_VPN.html

Multi-factor Authentication

CentricMinds supports multi-factor authentication as an approach to provide enhanced security for external user access. This is achieved through the use of Time-based One-time Password (TOPT) in addition to the user's username and password. This approach uses a client implementation / app to provide the user with an additional one-time password which uses a secure algorithm based on specification RFC 6238. This is the same authentication approach used by providers such as Amazon and Google. The user experience includes:

- Administration

    o Typically, users will install a client app on their smartphone that provides them with the TOPT when required. For example, they may install Google Authenticator (a freely available and compliant client app).

    o Through the CentricMinds User Repository, administrators will configure multi-factor authentication for a given user account and provide the associated user with a key to enter in their client app.

- Authentication

    o When attempting to browse to the Intranet, the user will be provided with a login form. The form will contain three fields; Username, Password and Key.

    o The user will enter their username / password (domain credentials), and lookup (e.g. the user will open the authentication app and be provided with a new six to eight digit TOTP) and enter their key.

Security Testing

Ongoing and rigorous penetration testing is performed against CentricMinds. This has included the use of independent testers (e.g. Dimension Data, KPMG, Sense of Security and HackLabs (all independently)) to perform penetration testing in areas such as Access Control, Data Validation, Password Policies, Cross Site Scripting, SQL Injection, Cryptography, Data Storage etc. CentricMinds supports various approaches to mitigating risk / vulnerabilities including the use of many practices / filters provided by Open Web Application Security Project (OWASP), for example the use of the CSRFGuard to mitigate the risk of Cross-Site Request Forgery (CSRF) attacks.

INTEGRATION

Overview

CentricMinds provides a flexible and extensible solution framework though making available both its own API and the ability to directly integrate with other products and APIs.

CentricMinds API

CentricMinds provides a comprehensive API which can be accessed / used through various approaches. These include:

1. **Web Services:** CentricMinds provides comprehensive read/write access to content stored in, and published by, the CMS. This includes both a traditional SOAP API (supported for many years and comprehensive in functionality) and a new REST API (new to the CMS and expanding in functionality over time).

2. **Controls / Widgets:** CentricMinds provides a comprehensive range of 'out of the box' controls (including some focussed on interacting with external systems and/or data sources) and also the ability to create your own advanced controls (through 'custom' controls and the Java programming language).

3. **Templates / Layouts:** CentricMinds provides the ability for full control over the presentation and interaction of data / functionality provided by controls. This includes scripting support (Apache Velocity templates / scripting and JavaScript etc.).

4. **Feeds:** CentricMinds provides the ability to retrieve external feeds (RSS, XML, iCAL etc.) and use the data accordingly. When syncing iCAL feeds, the data can also be used to sync / create events with-in the CentricMinds Event Repository. It also provides the ability to generate feeds based on CMS managed content for use by external systems.

CentricMinds Office Add-in

The CentricMinds Office Add-in allows users to access and author content managed with-in CentricMinds directly from with-in Microsoft Office (e.g. Word, Excel, Outlook etc.).

The Office Add-in supports Office 2007, 2010, 2013 and 2016.

Administrative privileges are required to install the Office Add-in (e.g. right click on the installer and choose to 'Run as administrator').

Third Party Integration

CentricMinds has been used extensively in the implementation of solutions that require working with and/or the integration of, multiple software products and/or data sources. Some specific examples of CentricMinds integration or data sources / protocols used for production solutions include:

- **APIs / Products**
    - Microsoft Office (native DMS Client Tools Application)
    - Microsoft Active Directory (authentication / user sync)
    - Microsoft Active Directory Federation Services (authentication)
    - Microsoft SharePoint (content & document sync'ing / migration)
    - MoveX ERP (content sync'ing / user profile sync)
    - Autonomy iManage DMS (document sync'ing / migration)
    - Hummingbird DM5 DMS (document sync'ing / migration)
    - Google Analytics (advanced statistics tracking / reporting)
    - Google Maps (advanced mapping / location services)
    - ConnX HR System (content sync'ing / user profile sync)
    - Docusign (document signing)
    - Hubspot (data pushing)
    - Infusionsoft (data pushing)
    - Zapier (data pushing / action triggers)
- **Video Services**
    - Vimeo
    - YouTube
    - Buto
    - Wistia
- **XML**
    - RSS (content syndication – in and out)
    - KML (mapping – in and out)
- **Web Services**
    - REST (API – in and out)
    - SOAP (API – in and out)
- **Databases**
    - MS SQL
    - MySQL
    - MariaDB
    - Amazon Aurora

- o   Oracle

- o   IBM DB2

- o   Flat Files / Spread Sheets (CSV data)

- **External / Shared File Storage**

  - o   Dropbox

  - o   Amazon S3

- **Messaging**

  - o   Email Outbound / Inbound

  - o   SMS

  - o   MailChimp (Email Fulfillment)

  - o   Campaign Monitor (Email Fulfillment)

- **Social Media**

  - o   Facebook (publishing and/or display content)

  - o   Twitter (publishing and/or display content)

  - o   LinkedIn (publishing and/or display content)

- **Payment Gateways**

  - o   eWay

  - o   IP Payments

  - o   PIN Payments

  - o   SecurePay

  - o   Westpac PayWay

Users submitting Forms that are created/managed with-in CentricMinds is often a point at which integration with a third-party solution is required. CentricMinds Forms currently support direct integration with the following third-party solutions. In addition, it supports the ability to implement custom JavaScript on form submission (thus opening a range of integration options).

- Docusign (user's signing a document with-in Docusign in conjunction with submitting the form)
- Hubspot (pushing form submission data to Hubspot)
- Infusionsoft (pushing form submission data to Infusionsoft)

BACKUP PROCEDURES

When performing a backup of CentricMinds, there are 2 key components:

1. **CentricMinds Application:** The CentricMinds application, once deployed, is a single folder on the server. This entire folder should be backed up. This folder will include various subfolders, including those, which store all physical files that have been uploaded into the CentricMinds repositories (i.e. documents, images, templates, style sheets etc.).

2. **CentricMinds Database:** The CentricMinds database also requires backup. The database contains all information related to content managed by the CentricMinds application. This includes site pages, content, version history, metadata, security rights etc. The database does not contain a copy of the physical files uploaded to the repositories (i.e. documents, images, templates, style sheets etc.) but it does contain information about them (i.e. version history, metadata etc.).

The size of the CentricMinds application and its database will grow according to the frequency and amount of content authored. As an indication of the physical size of the CentricMinds application, the following table provides a guide based on current production deployments:

| Scenario	Application	Database
Initial Install	250 MB	5 MB
Standard Install – 1st Year	500 MB	200 MB
Standard Install – 2nd Year	430 MB	280 MB
Large Install – 1st Year	1 GB	600 MB
Large Install – 2nd Year	3 GB	1.5 GB

STRESS TESTS

As outlined above, CentricMinds has been designed and developed to be lightweight and optimized for performance. It requires little system resources as illustrated by its minimum system requirements. Suitable tools available for performing stress tests include:
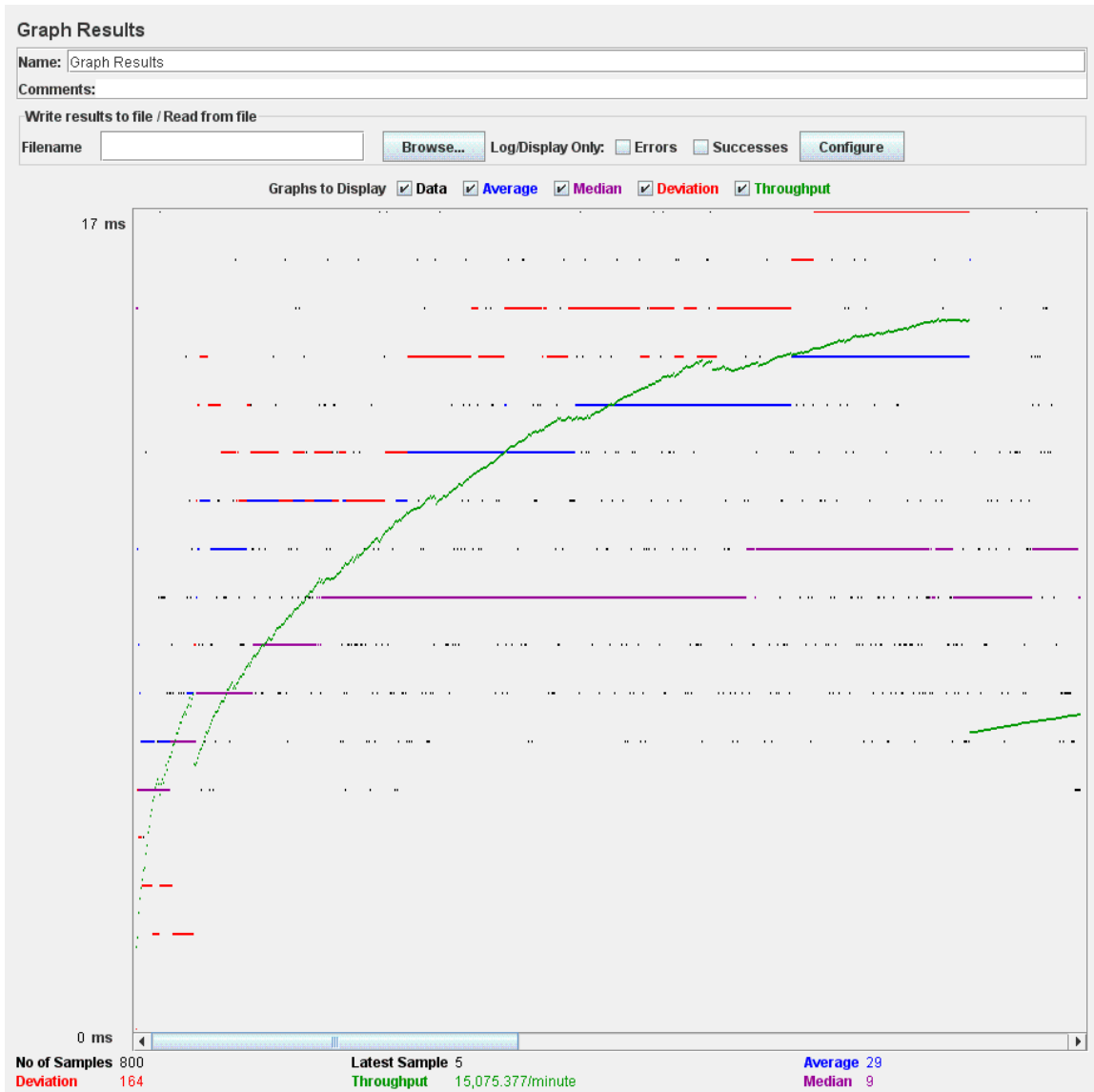
- **Apache JMeter** (http://jakarta.apache.org/jmeter/)

- **Sun Faban** (http://faban.org/)

The following example stress tests have been performed using Apache JMeter to demonstrate CentricMinds ability to be responsive under load.

Threads (users): 5, Ramp-Up Period (seconds): 1, Loop Count: 150, Samples: 750
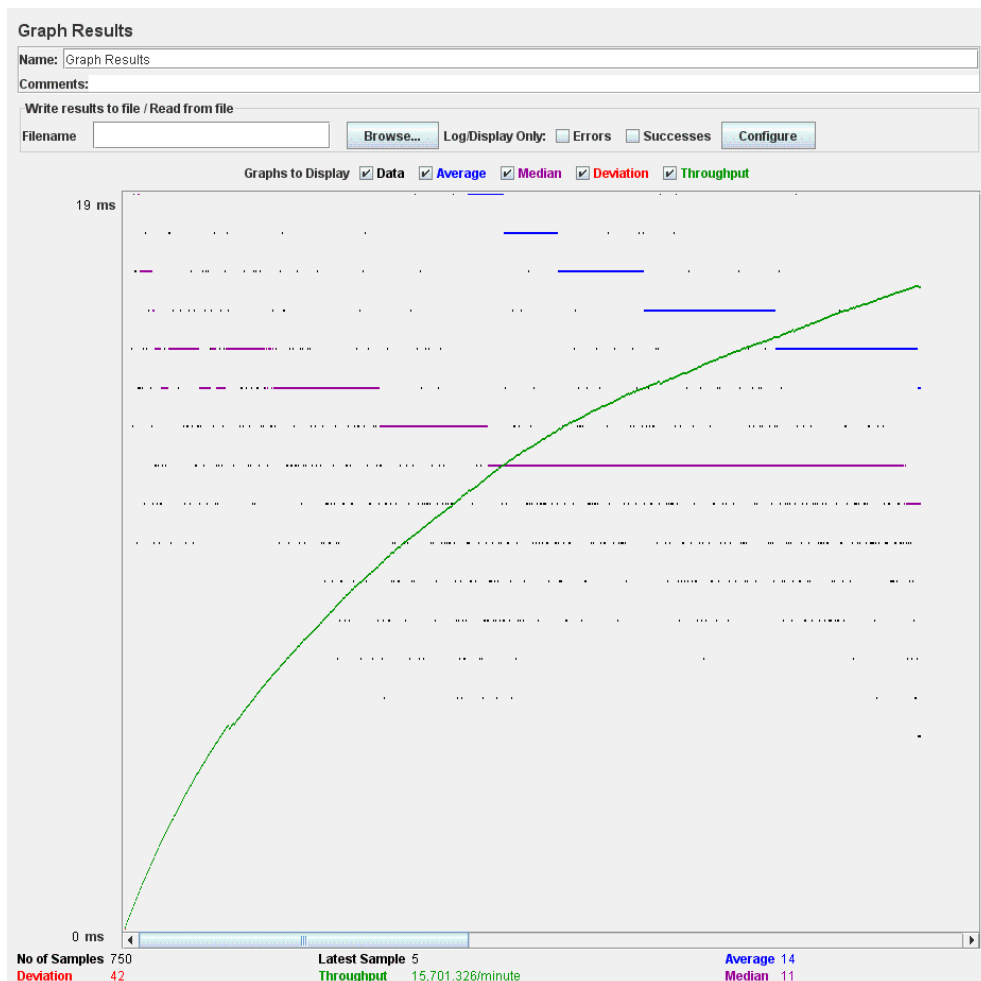
Threads (users): 20, Ramp-Up Period (seconds): 1, Loop Count: 40, Samples: 800

Threads (users): 100, Ramp-Up Period (seconds): 1, Loop Count: 7, Samples: 700