COCKPIT VERSION 9.0
IT CONSIDERATIONS

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Purpose of this document

This document is intended for use by IT administrators who need to understand everything involved with installing, maintaining, and administering Cognition’s Cockpit. In general, the details on how to perform specific tasks are not included here, but this document references any supplemental documentation that does include the necessary details. This document is useful for customers evaluating Cockpit for purchase, and is also useful to IT departments deploying Cockpit when already purchased.
Application Architecture

Cockpit is built on a development framework called the Knowledge Center™. The Knowledge Center framework allows for rapid development of enterprise-wide client-server applications. It uses an object database called ObjectStore® to store and manage the application data. The Knowledge Center framework provides an environment that allows for quick and flexible development. For applications that include many data interrelationships, the object database provides dramatically better performance compared to a traditional relational database. The figure shown below illustrates the components of a typical Knowledge Center application.
Configuration Requirements

ObjectStore Database
The ObjectStore database is the storage location for all persistent data for the application and for the application schema. Typical applications only use a single database, but an application can use any number of databases stored on any number of servers. Separate databases are commonly used to allow the database server to be positioned to provide high network bandwidth to the application servers that most frequently use the data. This is especially helpful when users are distributed across a wide area network (WAN) that may have some significant performance bottlenecks. The database storage can be separated into three segments:

Cockpit Logic: This is the application code built into the Knowledge Center framework. It is loaded into the Cockpit HTTPS server on the first user login, and cached there for performance until the server is restarted.

Cockpit Data: This is the data storage for all information created or entered into Cockpit. The data can be stored on one server or distributed across multiple servers.

Cockpit License Data: This is the license server database that determines how many concurrent users have access to Cockpit and any restrictions that may apply to these licenses. Restrictions can be part of the license provided from Cognition or can be added by local system administrators after the license is installed. Restrictions can include rules on when a license expires, which clients can access a license, which users can access a license, and whether a license can be checked out to a specific client. The license server also provides monitoring and reports of system usage.

Cockpit HTTPS Server
The HTTPS server provides all the information to run the application. This server can run on one or more computers. The HTTPS server runs all of the Cockpit application code, receives requests from the browser client, and provides responses back to the client. A browser client can connect directly to the HTTPS server, or can use a Load Balancing Service to distribute clients to multiple Cockpit HTTPS servers. The Cockpit HTTPS server supports both HTTP and HTTPS protocols; however, Cognition strongly recommends you use HTTPS to avoid information and passwords being passed to the server unencrypted.

Knowledge Center Client (KC Client)
This is the client program that a user runs to access the license server data, or in some rare cases may be used to administer or troubleshoot Cockpit. The client program can be run on a local computer or on a terminal server. It is sometimes known as a “thick client” because it requires significant resources on the machine where it runs, and it also requires significant network bandwidth to the ObjectStore server, where the KC client is only used for some Cockpit administrative tasks. Its resource usage is not an issue.
Web Browser Client

This is a web browser client, such as Internet Explorer or Chrome, which is used as the front end to Cockpit. All normal end user operations and administrative functions are accessed using a browser client. The browser client connects to the Cockpit HTTPS Server and provides all of the Cockpit functionality through a combination of HTTPS, active server pages, JavaScript, ActiveX controls, and a database query and scripting language. Cockpit version 7.3 supports Internet Explorer versions 8 and 9. Cockpit version 7.4 and later require Internet Explorer version 10 or 11, and version 9.0 supports Internet Explorer versions 10 and 11, plus Google Chrome (for Windows and Mac).

Configuration Requirements

The configuration requirements vary depending on which components of Cockpit are being used. Some of the more detailed analytical capabilities may require significant computational resources on the HTTPS server. In addition, the network bandwidth between the HTTPS server and ObjectStore server is critical as large volumes of data are transferred between the two.

Hardware Requirements

General

Currently, Cockpit only supports the Windows platform for the HTTPS and ObjectStore servers. ObjectStore does run on other operating systems, but the Knowledge Center installation includes only the Windows version. Requests for using ObjectStore on additional platforms require a custom configuration. The versions of Windows currently supported are shown below. These operating systems are supported both on physical hardware and using virtual workstations or servers. The Cockpit supports a MAC client running a Chrome browser.

For Cockpit version 9.0, Cockpit Server supports the following versions of Windows:

- Windows 2008 Server R2
- Windows 2012 Server
- Windows 2012 Server R2
- Windows 7
- Windows 8.1
- Windows 10

For Cockpit version 7.4 through 8.1, the Cockpit Server supports the following versions of Windows:

- Windows 2008 Server
- Windows 2008 Server R2
- Windows 2012 Server
Notes:

- Virtual environments using VMWare are supported for any of the above operating systems.
- Both 32 bit and 64 bit operating systems are supported.

Cockpit can be used for single users, or in deployments involving hundreds or thousands of users.

There is no upper limit to the number of users; however, hundreds of concurrent users may require multiple Cockpit HTTPS servers and may require separate database servers, and thousands of users will require multiple servers. Below are the specific requirements for each server type and some example configurations.

**ObjectStore Database Servers**

The most important requirements for the database server are disk space, disk I/O, and network bandwidth. Most of the work of the ObjectStore server is moving data so the disk, I/O speed, and network speed will have the most significant impact on the performance. The server should use SCSI drives, serial ATA drives, or solid state drives. Drive speeds should be at least 10,000 RPM. The bottom line is that the faster the drive speed, the faster your database access will be. Cognition has observed the best database performance using enterprise-level solid state drive technology. Drives can also be configured in RAID configurations to provide improved performance and redundancy. Cognition does not recommend NAS for enterprise-level database servers that need to support hundreds or thousands of concurrent users. NAS storage is acceptable for smaller installations, but the NFS protocol for NAS storage is not supported.

A typical database server for small installations will require at least 2 GB of disk space. For medium installations, the disk space requirements can easily reach 100 GB, and for large or enterprise-level installations, the requirements could reach a TB or more. The actual database size depends on the use of the application and the volume of data stored within the application. Where a database server can have many simultaneous HTTPS servers acting as clients, the total network bandwidth required by all the clients can be significant. A Gbit network is required between the HTTPS servers and the database server. The processor speed and memory of the database server is normally not an issue. At least 2 processor threads and at least 4 GB of memory are normally acceptable for small installations. For medium and large installations, at least 4 processor threads and additional memory will be required for acceptable performance of the server.

For small and medium installations, the ObjectStore server can be the same host as the HTTPS server. There is no need to use separate machines for the servers. For large installations, the ObjectStore server can be kept on the HTTPS server, but there will likely be some performance benefit to moving it to a separate host provided the network speed between the HTTPS server and the ObjectStore server is at least 1 Gbit. For large
installations with greater than 250 concurrent users, it is recommended that the ObjectStore and HTTPS servers be separate machines.

When sizing the ObjectStore server, you should use the following guidelines:

- At least one processor thread for every 20 concurrent users (minimum 2 threads is recommended)
- 2 GB of base memory plus 0.5 GB for 20 concurrent users
- Solid state drive for the database or 10k drives. Hot swappable RAID 1 configuration is recommended for minimum downtime in the event of a disk failure.
- 20 GB of disk space plus 1 GB of space for each Cockpit user (this user number is the total number of users with login access)

The total disk space and other requirements can vary based on how the Cockpit is utilized in an organization. These numbers are guidelines and Cognition recommends regular performance assessments of the servers to determine if any resource adjustments are required.

**HTTPS Servers**

The HTTPS server uses more resources per user than any other component. All data manipulation and computation Cockpit performs is done within the HTTPS server process. Each client connection to the HTTPS server is handled in a separate process, so multiple processors on the HTTPS server can have a significant impact on performance.

The resource requirements for an HTTPS server depend on the number of concurrent users accessing the server and what type of activities the users are performing. The following guidelines can be used for HTTPS server hardware requirements, but adjustments may be necessary based on the observed performance of the application:

- At least one processor thread for every five simultaneous users, up to 50 simultaneous users (at least two recommended for any installation)
- An additional processor thread for every 10 simultaneous users over 50
- 2 GB base memory plus 1 GB for every eight concurrent users
- 5 GB free disk space plus an additional 100 MB for each user

The number of users per core is a smaller number under 50 because these are likely to have a higher percentage of heavy Cockpit users and the load sharing tends to be less uniform. In installations over 50 concurrent users, you tend to see more lightweight users and better load sharing, and therefore can get more users per processor core. The number of users per core really needs to be assessed based on your expected usage, so please contact Cognition if you need help determining the ideal configuration for your server.

The disk space requirements are for the total number of users (not just simultaneous users) because the cached information remains even when the user logs out of the application. The network connection
requirement only applies if the database server is a different host. The HTTPS server and the database server are frequently the same host for installations of fewer than 250 users.

Below are recommended hardware configurations for 50, 250, and 2000 concurrent users.

50 Concurrent Users

HTTPS and Database Server on a single host with:

- Windows Server 2012 R2 – 64 bit
- 16 logical processor cores
- 12 GB of memory
- Two 1 TB SSD enterprise drives in a RAID 1 configuration

250 Concurrent Users

HTTPS and Database Server on a single host with:

- Windows Server 2012 R2 – 64 bit
- 48 logical processor cores
- 48 GB of memory
- Two sets of 1 TB SSD enterprise drives in a RAID 1 configuration

2000 Concurrent Users

For this configuration, we recommend 4 HTTPS servers and a database server connected on a network with a minimum 1 Gbit bandwidth. The HTTPS servers should be placed behind a load balancer to distribute the client connections to the 4 servers. Each HTTPS server should be configured as follows:

- Windows Server 2012 R2 – 64 bit
- 64 logical processor cores
- 64 GB of memory
- Two 1 TB SSD enterprise drives in a RAID 1 configuration

The database server should be configured as follows:

- Windows Server 2012 R2 – 64 bit
- 64 logical processor cores
- 64 GB of memory
- Two 2 TB SSD enterprise drives in a RAID 1 configuration
Client Computers
The client computer only runs Internet Explorer or Chrome, but the processor and memory usage within the browser can be significant. The client computer should be at least a 2 GHz machine with four logical threads and at least 4 GB of physical memory.

DocStorage Folder
The HTTPS server needs to have write access to a document storage folder that is set up at the time of the Cockpit installation. This is most commonly stored on the HTTPS server and must be included as part of your server backups. The size requirements for document storage are very dependent on the types of files and documents you will be storing in Cockpit. If videos and images are being stored, a small number of users can still easily consume 100 GB of storage. A large installation with large files like videos can consume terabytes of storage. We recommend you discuss what kind of files you will be storing and plan accordingly. You can easily add more space and move the document storage folder if necessary.

Special considerations are required for the document storage folder if you will be using multiple HTTPS servers. Each HTTPS server requires write access to the folder. The Cockpit HTTPS server runs as a Windows service and by default this service will not have access to network storage. If using multiple HTTPS servers, the service needs to be configured to run using a service account that has network access to the document storage folder. Consult the Cockpit Wiki for more details on configuring the HTTPS server to use a service account.

Browser Requirements
Currently the following browser versions are supported with Cockpit 7.4 and later:

- Internet Explorer Version 11.x
- Internet Explorer Version 10.x
- Google Chrome (for Cockpit 9.0 and later)

The browser must also have the following ActiveX controls and add-ons installed for IE only (they are not supported in Chrome):

- Cognition Portal Helper ActiveX control
- Cognition FlexEdit ActiveX control
- Cognition Application Helper ActiveX control

The main login page of Cockpit includes a browser test that ensures the above components are properly installed in the browser. If the user access does not allow installation of ActiveX controls, an administrator must log in and click on this link to install the controls. Once the controls have been installed, they are available to all users on the client computer. Cognition recommends you set up the Microsoft ActiveX installer...
service to allow for easy installation of the ActiveX controls. Consult the Cognition Wiki for more information on configuring the ActiveX Installer Service.

**Networking Requirements and Bandwidth**

Cognition’s Cockpit normally stores considerable amounts of data, and access to this data at runtime requires significant network bandwidth. A 1 Gbit bandwidth should be available between the HTTPS server and database server.

The required bandwidth between the browser clients and the HTTPS server will also vary depending on the type of usage. For most users, typical DSL-type speed of 3 Mbits download and 768 Kbits upload are normally sufficient, but will be noticeably slower than a connection of 10 Mbit or better. Cockpit should function with even slower network performance, but some activities may be noticeably slower. As with any browser access, the latency time may also significantly impact the performance. If there is any significant lag time for the HTTPS server to respond to the browser client, this will cause sluggish behavior when using Cockpit. Cockpit does allow the user to store any type of files within its database. If a user plans to upload or download any large files, a higher network bandwidth may be required.

**Firewall Requirements**

The communication between the HTTPS server and the database server, application server, or license server all require the use of specific TCP/IP ports. This communication occurs both from the HTTPS servers to the database servers, and from the database servers back to the HTTPS server. Any computer with a local firewall installed should always allow connections to the ObjectStore server and ObjectStore cache manager. Normally this is done by configuring the firewall to allow connections to the server and cache manager programs. These two programs can be found in the ObjectStore installation directory. By default this directory is:

- C:\Program Files (x86)\Cognition\ObjectStore\Bin

The two programs to set exceptions for are:

- osserver.exe
- oscmgr6.exe

Connections need to be allowed to these programs on both the HTTPS server and database server if they are separate machines.
If the HTTPS server and any of the database servers have an internet firewall between them, the firewall must be configured to pass specific ports. The ports used are:

**51025** – Used for communication from the HTTPS server to the ObjectStore server.

**51050** – Used for communication from the ObjectStore server back to the HTTPS server.

**51041** – Used for communication from the HTTPS server to the ObjectStore cache manager.

**51031** – Used for communication from the ObjectStore server to the ObjectStore cache manager.

The specific port numbers can be customized using a configuration file; however, the configuration changes must be made on all client and server machines. Also, the same rules apply for a Knowledge Center client and for the HTTPS server.

Normally, the browser clients communicate with the HTTP server on port 80 or port 443 if using HTTPS; however, this port is configurable using the KC Web Portal control panel. If port 443 or any other port is used, you must have firewall rules that allow the browser clients to communicate with the HTTPS server on that port.

In addition to the initial port used to log into Cockpit, the login session is redirected to a separate slave server on a different port. By default, these ports start at 51100, but this is also configurable using the KC Web Portal control panel. It is important that any firewalls between the web browser client and the HTTPS server allow connections on these ports.
Installation Procedures

Cockpit and its components are normally installed using a single installation program. Which components are installed depends on the installation type. The possible installation types are defined below. It is also possible to install each component separately and create the Cockpit domain using the Knowledge Center administration tool.

Installation Components

This section describes the possible installation components and when they are required.

ObjectStore

ObjectStore is the database server used to store all application data. It needs to be installed on any host that is acting as a database server or an HTTPS server. It is required on the HTTPS servers because it is used to cache data locally for performance benefits. In addition to the ObjectStore server, this component also includes backup and administration utilities to manage the ObjectStore database.

RawFS Options

The ObjectStore data is stored in a “raw file system” (RawFS).

The installation creates the RawFS as a single file because this requires no additional configuration of the computer.

Administrator Privilege

The ObjectStore component and the KC Web Portal are the only installation components that require administrator privilege to complete the installation. This privilege is required because ObjectStore and the web portal each install a system service, which can only be done by an administrator.

Knowledge Center

The Knowledge Center is the application framework required to run the application. This component must be installed on any HTTPS server and database server. The Knowledge Center installation is run as part of the Cockpit installation.

Cockpit Domain

The Cockpit domain is installed on a specific ObjectStore server. In order to provide improved performance, the domain can then be released to multiple servers, but this is not common. The standard single installation program supports installation of the Cockpit domain on a single host and server. Support for additional servers requires local customization. When a KC client or the HTTPS server runs, the user must specify or configure the host where the Cockpit domain has been installed. Cockpit consists of two versions of the domain: “Development Server” and “Production Server.” The development server is only used for installing, developing, or customizing the application. The production server is used for creation of real production data by end users.
License Server

The license server is a domain similar to the Cockpit domain, but its purpose is to manage the licenses associated with one or more applications. A single license server can serve one or more Cockpit domains and can be on the same host or a different host as the Cockpit domains.

Web Portal Files

The web portal files are a root web directory accessed by the HTTPS server when a browser makes a connection. These files are typically installed into a PortalSource directory within the Knowledge Center installation folder. An alternate location can be chosen during the installation if desired.

Update Considerations

Updates that are done with the single installation program will update components only if a newer version is available. Typically, the Cockpit domain and Portal Files are updated most frequently, the Knowledge Center less frequently, and ObjectStore gets the fewest updates. As only the ObjectStore installation typically requires an administrator, most updates can be done without administrator access. Each Cockpit domain is password protected and can only be updated using the correct password. ObjectStore and Knowledge Center updates must be done on the machine where the software is currently loaded, but Cockpit domain updates can be done remotely.

Installation Types

The installation type is chosen when using a single installation program. Once the installation type is selected, all of the components required for the selected type are installed. The current installation type is remembered so that upgrades can be completed without knowing the previously selected installation type; however, it is also possible to change the installation type during an upgrade.

Full Server

A full server installation includes all components on the same host. It can be used as a standalone machine to run the application, or it can be accessed by other clients to run the application.

Application Server

An application server installation includes a Knowledge Center client and the Cockpit domain. The license server and HTTPS server are on different hosts. The Cockpit server can be configured to use one or more license servers. This machine is the ObjectStore server for Cockpit data. In large installations, it is typically a separate machine from the HTTPS server component described below.

License Server

A license server installation includes the license server domain and a KC client, but does not include any Cockpit domains.
**Web Server (HTTPS)**
A web or HTTPS server installation includes the KC components and Cockpit web portal files necessary for the computer to act as an HTTPS server for Cockpit data. The HTTPS server can be configured to obtain the Cockpit application data and the license data from other hosts.

**Standalone Server**
A standalone server installation is the same as a full server, but is listed separately during the installation for users that are installing Cockpit to be used on a single machine. This is typically used by a single user on a desktop computer or laptop.

**Other Installation Issues**
As described in the sections above, most KC applications include an automated installation that installs all of the required components based on the selected installation type. The automated installation determines the current components and versions, and then performs any necessary updates. The person installing, however, does need to know the administrative (“root”) password to each existing domain in order to complete the update process.

**Installation Media**
The installation be downloaded from Cognition’s website. The downloaded format is provided as a zip.

**Installing Multiple Applications**
Your site may be using more than one Knowledge Center application. In this situation, it is possible to install multiple applications on the same application server. When using each application, it is important to use the KC client version that is compatible with the application. In a situation where the applications require different KC client versions, it is possible to load both versions on the same computer. The files for the second version must be manually installed onto the computer. If the applications use different versions of ObjectStore, generally the latest version should be used and should be compatible with both applications.
User Management

Cockpit supports a simple user name and password authentication mechanism, or can be configured to use a corporate LDAP or Windows Active Directory server.

Persons and Groups

KC applications provide for both persons (e.g. users) and groups to manage access, workflow, contact information, etc. The person information contains the contact information and login information if the person is also a user (allowed to log into the application). Groups are provided as a method to organize persons or users. A group can contain any number of persons or groups.

Privileging

Cockpit provides privileging at the application level and at the object level. Examples of some of the application system privileges include:

- Administrator
- Create Project
- Configuration (used to allow creation or editing of site configurations)

In addition, privileges can be added to objects (or items) such as projects, documents, etc. The common object level privileges include:

- View
- Modify
- Delete

In some cases, more specific object privileges may be provided such as:

- Project Admin
- Attach Document
- Can Approve

User and License Activity Monitoring

The license server provides the ability to monitor and generate reports on application usage. The information monitored includes:

- User name
- Date and time of the login
- Date and time of the logout
- How much of the logged in time is idle time
- Number of failed logins and why
• What client the login came from

Several default reports are provided, and this information can easily be used to create custom reports. Refer to the License Server Admin Guide for more details.
Backup Considerations

There are several methods to create backups of data within Knowledge Center applications. The best method depends on the purpose of the backup and how much information needs to be backed up.

ObjectStore Backup Utilities

These are the lowest level backup utilities. They provide the most flexibility and should be part of any automated backup procedures. They can be used to back up the database weekly, daily, or even minute-by-minute. The scripts described in the following section make use of these ObjectStore utilities but provide an easy-to-configure automated backup.

Domain Backup Scripts

A set of Perl scripts have been developed that make it easy to set up automated backups of a domain. These scripts use the ObjectStore backup utilities to perform the actual backups. The scripts allow for weekly full backups and daily incremental backups. They also provide the ability to archive old backup and log files for a specific period of time. The latest version of the backup utilities and installation documentation can be downloaded from the Cognition web site at: KC Backup Utility.

The documentation in the zip file includes step-by-step instructions on how to setup the backup scripts.

This is the recommended method to back up the database as it provides easy automation and only backs up the required data. Using the ObjectStore scripts manually will also back up temporary data stored in the database that is not required for a restoration.

Important Note: Making a backup of the ObjectStore RawFS file will not work. This file is constantly opened for write access and will be in an inconsistent state due to data that is cached in memory. You will not be able to recover lost data from a backup of the RawFS.

Backing Up Domain Data Manually

The Knowledge Center Admin tool provides a method to back up all the domain data to a file. This method is the easiest method for moving data from one domain to a new domain that can be on the same host or a different host. The backup file is an XML file. Some disadvantages of this method are:

- The backup file can be very large because of the verbose nature of XML.
- The time to export and import the data can be considerable because of the cost to translate to and from the XML format.
- It is difficult to automate this capability so it is not useful for automated backups.

Application Level Backup Options

Most Knowledge Center applications provide a method to back up specific portions of the data in an application domain. For example, if an application organizes the data by project, there will typically be a
mechanism to export the project to and import the project from a file. There are also other import/export capabilities for user lists, group lists, and tables of data.