ProSystem fx© Engagement

Deployment Planning Guide

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Chapter 1: Deployment Planning – Configuration

Introduction

The purpose of this document is to identify the key factors that influence the performance, reliability, and functionality of the Engagement application. This deployment guideline will help ensure the highest possible level of reliability, sustainability, performance, predictability, and end-user usability.

The target audiences for Engagement deployment are the firm administrators and managers who make business decisions and evaluate technology and network infrastructure.

Firms that are new to Engagement, as well as firms which are upgrading an existing installation, must plan their deployment strategy well in advance of installation day.

Key decisions during planning may require answers to some of the following questions:

- What is the hardware capacity that is needed to support the anticipated peak usage? Is there a need for additional hardware?
- Does your firm prefer data in a central location or data distributed across multiple offices?
- Is there already an infrastructure established between multiple offices, such as a WAN connection? Is there a need for such an infrastructure?
- Does your firm prefer that users access Engagement through a Terminal Services Application Server? If so, is there already an Application Server in place?
- Does your firm prefer to use Citrix with Terminal Services?
- How centralized would your firm prefer to manage workstation software installation and administration?
- Is SQL Server Express adequate? If not, does your firm already have SQL Server Standard or Enterprise licenses? If so, does your firm require additional licenses?
- Should your firm setup a Virtual Private Network?
- What roles and skill sets are necessary to deploy, support, and maintain Engagement?

This planning guide will provide some general guidance to new and existing customers in answering these questions and many more.

Chapter 1 describes five common deployment scenarios for Engagement Workpaper Management (WM) and the associated Office Servers:

- **Scenario 1:** Multi-Site Firm, WM Workstations, Distributed Office Servers
- **Scenario 2:** Multi-Site Firm, WM Workstations, Centralized Office Servers
- **Scenario 3:** Multi-Site Firm, WM via Terminal Services, Centralized Office Servers
- **Scenario 4:** Single-Site Firm, WM Workstations, Distributed Office Servers
- **Scenario 5:** Single-Site Firm, WM via Terminal Services

Subsequent chapters address the details of Server, Network, and Workstations deployment applicable to the scenarios above.

Engagement Office Servers host three basic categories of data:

- **Admin data**
  Firm information, staff properties and staff rights, licensing information, and client information
- **Central File Room data**
  Binders, workpaper properties, workpaper files, and notes
- **Central File Room workpaper files**

Engagement WM Workstations and WM Terminal Servers also host three basic categories of data:

- **Admin data**
  Firm information, staff properties and staff rights, licensing information, and client information
- **Local File Room data**
  Binders, workpaper properties, workpaper files, and notes
- **Local File Room workpaper files**

The data and files are synchronized between Office Servers and the WM Workstations or WM Terminal Servers.

Scenario 1: Multi-Site Firm, WM Workstations, Distributed Office Servers

The first scenario is a multi-site firm that has deployed a "Main" Office Server at the firm's main site and a "Secondary" Office Server at the other sites. The Central File Rooms are thus "distributed" across the firm. At each site, users run Workpaper Management on their WM workstations and synchronize Binders between Local File Rooms (on workstations) and Central File Rooms (on servers) via a high-speed Local Area Network (LAN).

While this configuration maximizes the speed at which Binders are synchronized, synchronization between offices is slower in the absence of a Wide Area Network (WAN). However, WAN synchronizations are still significantly slower than LAN synchronizations.

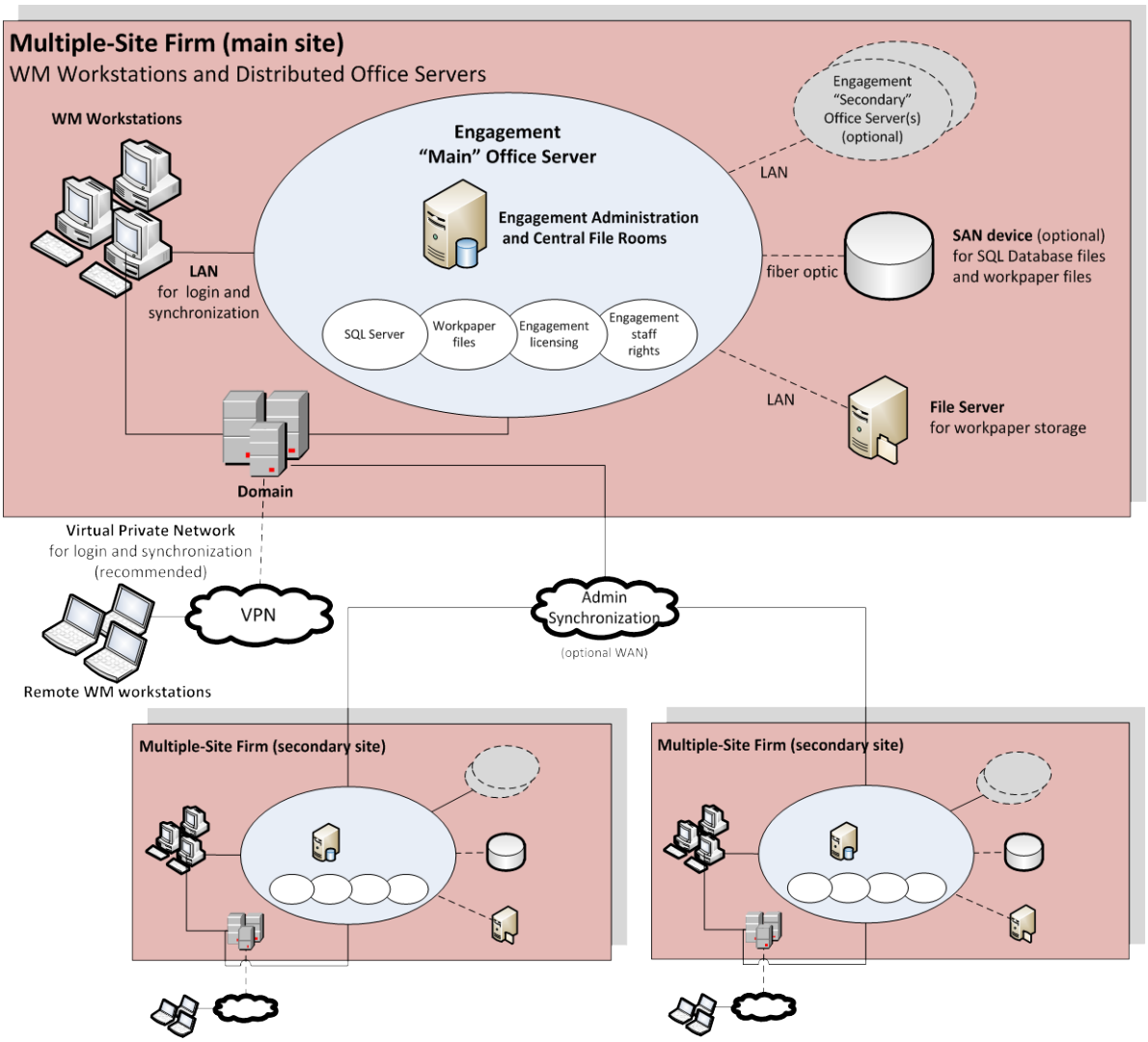

Figure 1 – Multi-Site Firm, WM Workstations, Distributed Office Servers

Optionally, Office Server performance is optimized by storing SQL database files and workpaper files on a SAN device connected to the server with a fiber optic cable.

If an optional Virtual Private Network (VPN) is configured at a site, remote users may connect to synchronize.

Scenario 2: Multi-Site Firm, WM Workstations, Centralized Office Servers

In the second scenario, there are also multiple sites, but only one site has an Office Server that is shared by all users at all sites.

This scenario minimizes server costs by eliminating the need for servers at all sites, except the main site. Because Workpaper Management is running on workstations, the server is stressed only by synchronization. Because synchronization of Binders typically occurs between sites, this configuration is most suitable when those sites are connected through a WAN.

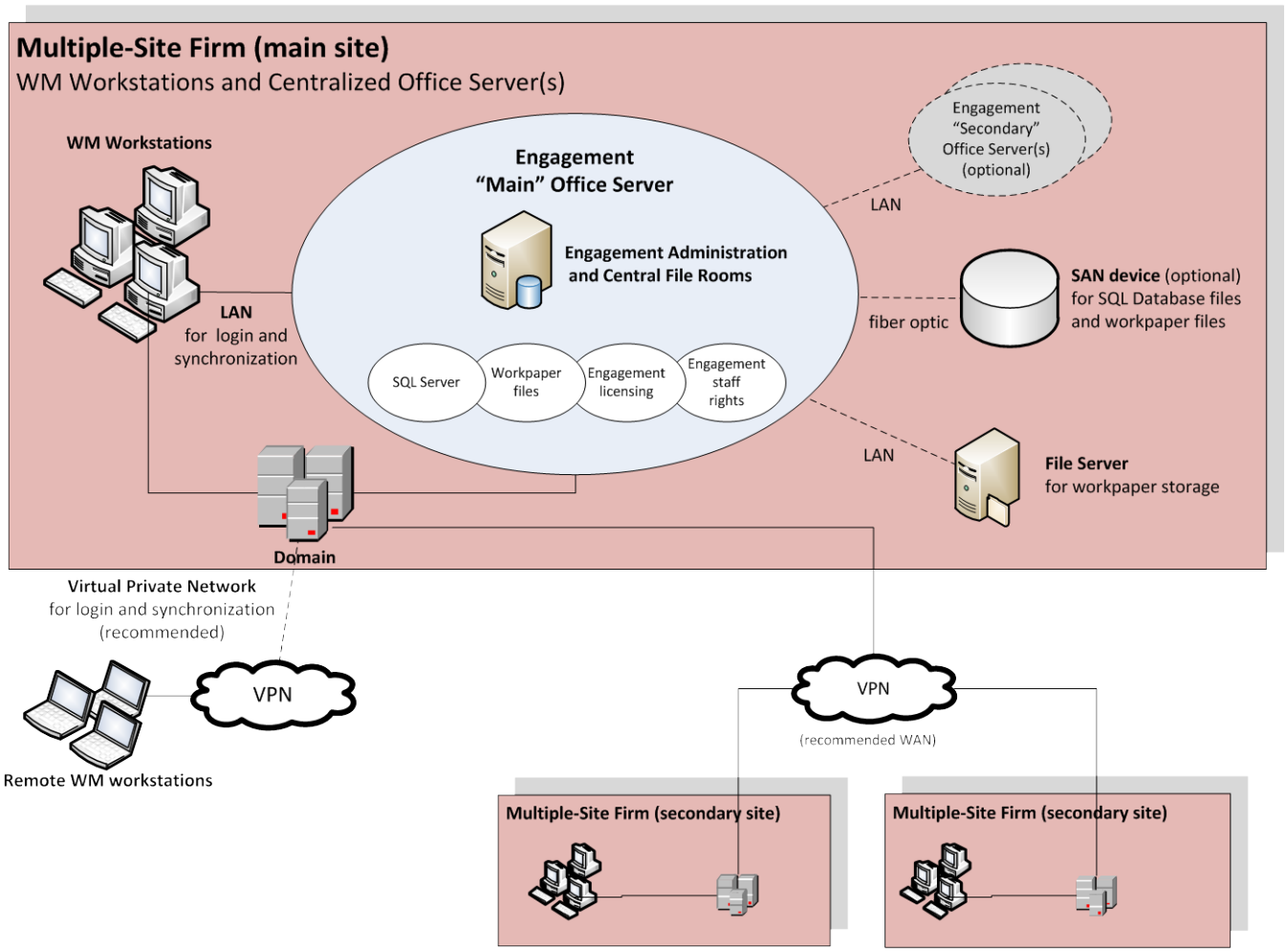

Figure 2 – Multi-Site Firm, WM Workstations, Centralized Office Servers

Scenario 3: Multi-Site Firm, WM via Terminal Services, Centralized Office Servers

The final multi-site configuration uses Terminal Services to provide Workpaper Management functionality to users. This requires an adequate investment in server hardware and software; however, the bandwidth requirement between offices is less significant than with Scenario 2. Usually the Terminal Services Database Module is installed on the same machine as the Administrator Module. In some cases, to boost performance it is necessary to split the installation of the Administrator module and the Terminal Services Database module.

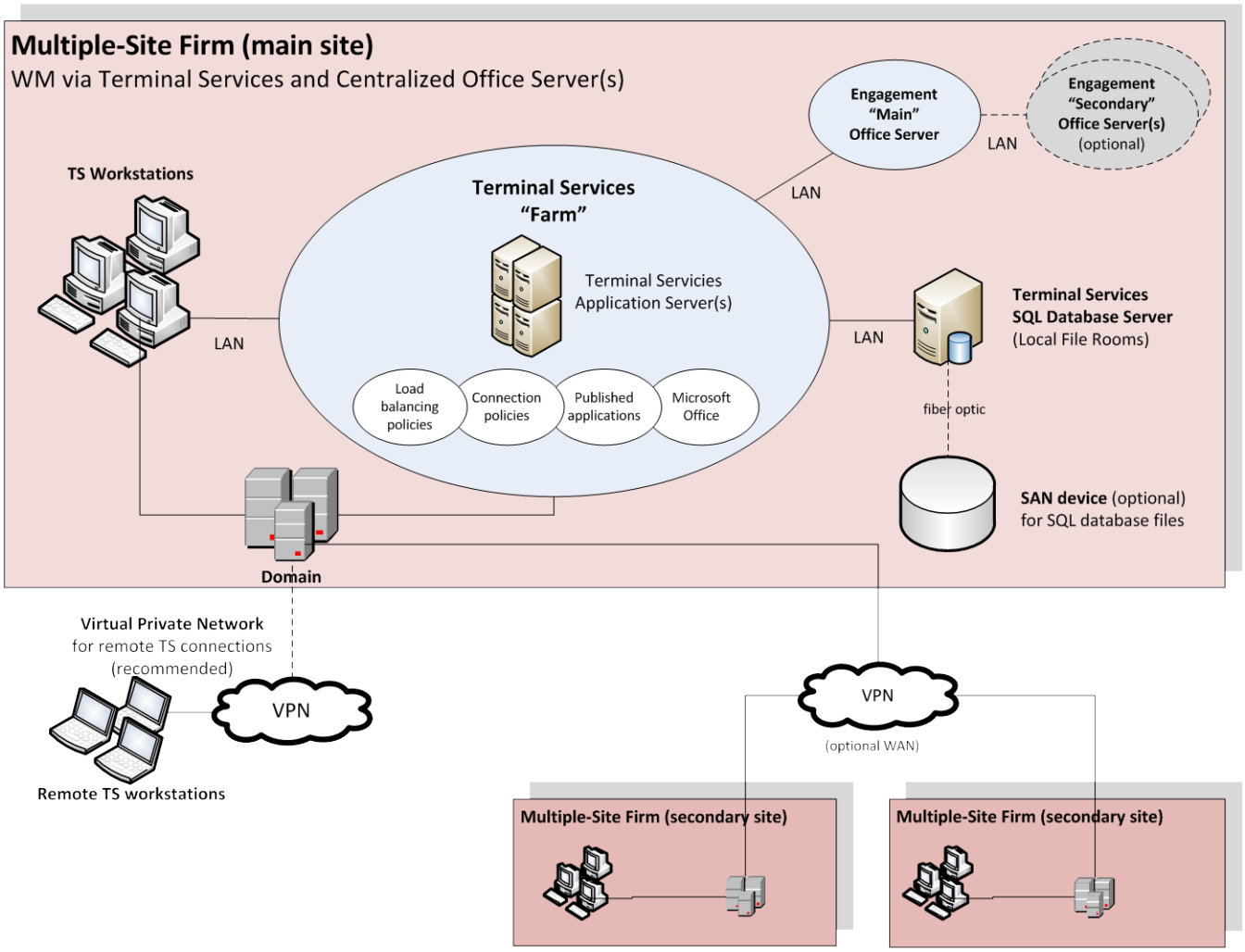

Figure 3 - Multi-Site Firm, WM via Terminal Services, Centralized Office Servers

Scenario 4: Single-Site Firm, WM Workstations

The single-site scenario for WM Workstations is identical to Scenario 1, but simpler due to the absence of secondary sites.

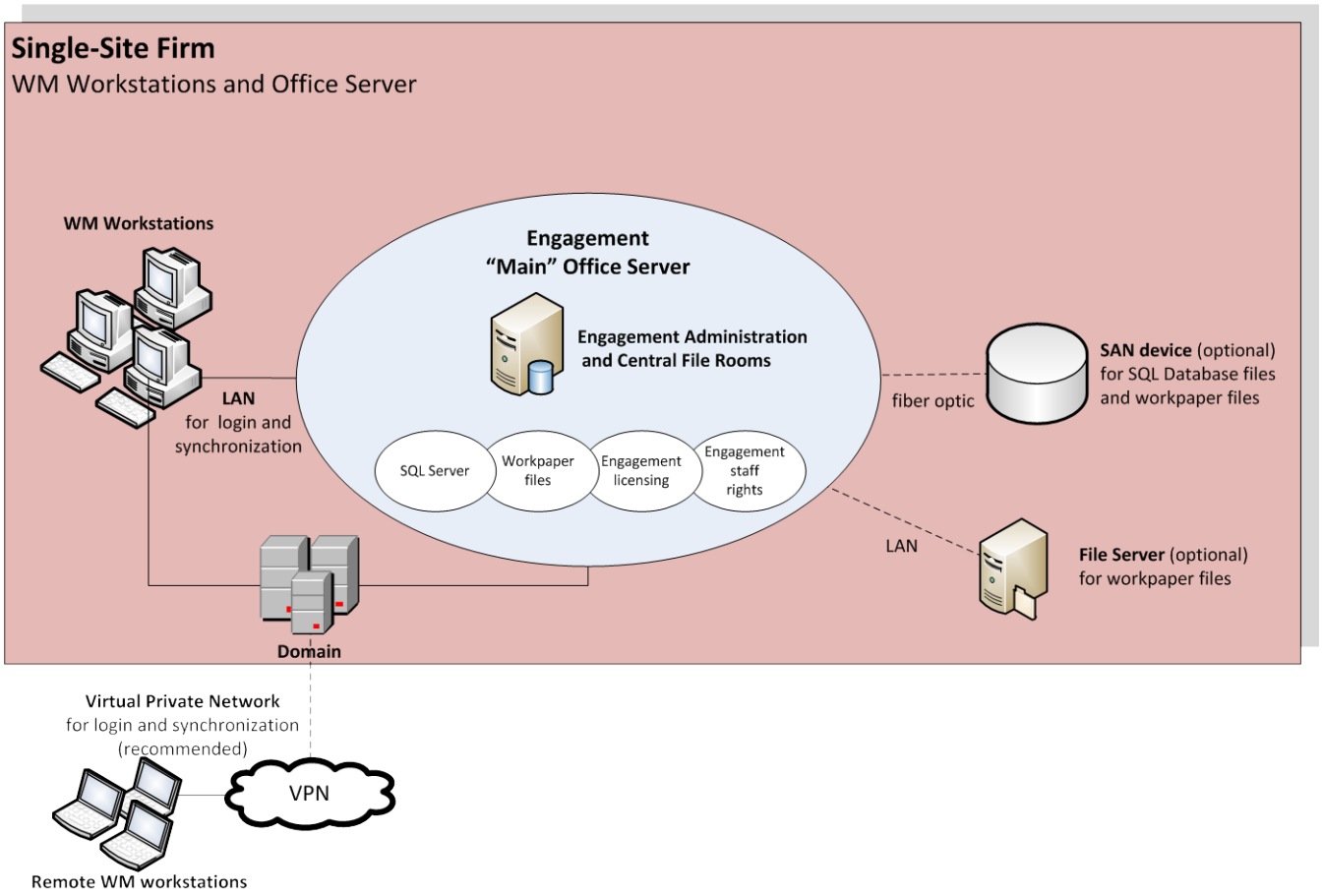

Figure 4- Single-Site Firm, WM Workstations

Scenario 5: Single-Site Firm, WM via Terminal Services

The single-site scenario for Terminal Services is identical to Scenario 3, but simpler due to the absence of secondary sites.

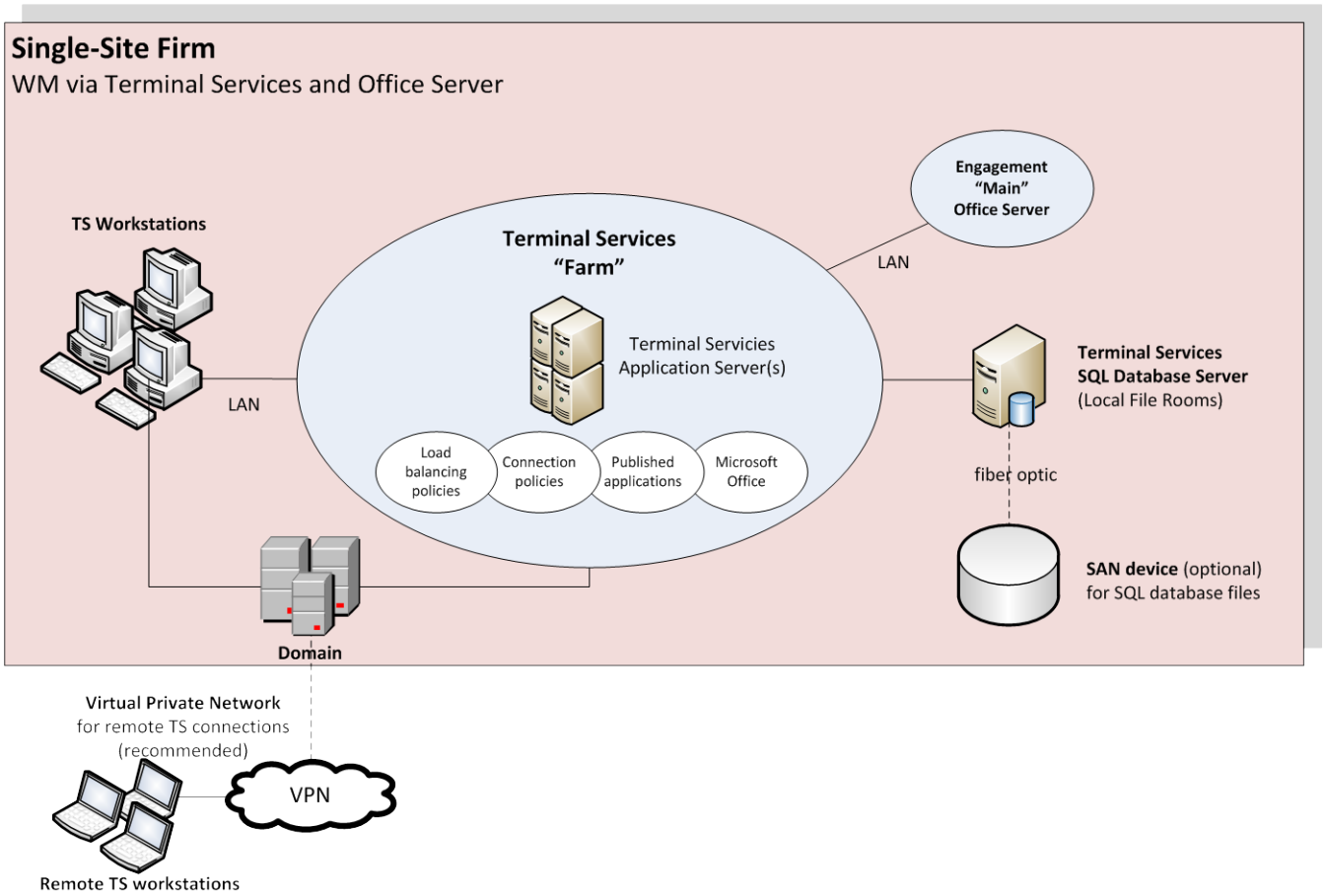

Figure 5 - Single-Site Firm, WM via Terminal Services

Other Scenarios

If none of the listed scenarios is adequate, then all parties involved need to work together to develop a sustainable, predictable, and reliable solution.

Summary of Deployment Scenario Recommendations

Deployment Configuration	Multiple-Site Firm: WM Workstations Distributed Office Servers	Multiple-Site Firm: WM Workstations Centralized Office Server(s)	Multiple-Site Firm: WM via Terminal Services Centralized Office Server(s)	Single-Site Firm: WM Workstations Centralized Office Server(s)	Single-Site Firm: WM via Terminal Services Centralized Office Server(s)
Main Office Server - central site	1	1	1	1	1
Secondary Office Servers - central site	~	~	~	~	~
Secondary Office Servers - other sites	1+	n/a	n/a	n/a	n/a
WAN for Admin synchronization	√	n/a	n/a	n/a	n/a
WAN for remote binder synchronization	~	√	n/a	n/a	n/a
VPN for remote Terminal Services	n/a	n/a	~	n/a	~
VPN for remote binder synchronization	√	√	n/a	√	n/a
WLAN (Wireless LAN) for workstations	~	~	~	~	~

Legend

√	Recommended
~	Optional
X	Not Recommended

Chapter 2: Deployment Planning – Servers

The main types of servers that are implemented with Engagement are a Database Server, a File Server, and an optional Terminal Server. Key factors in deployment of these servers include the Microsoft Windows version, available RAM, number of CPUs, Microsoft SQL Server edition, and the roles and responsibilities of the IT staff supporting these servers. A final consideration is whether to have a File Server or a SAN Device. Some of these considerations vary considerably based on the firm size and the number of users. Please see the chart in this chapter for recommendations.

Database Server Overview

Microsoft SQL Server is the database engine used by Engagement. In this section, we describe some of the factors in deciding how to deploy SQL Server with Engagement.

Microsoft SQL Express vs. Microsoft SQL Server Standard or Enterprise

Microsoft SQL Express is installed and set up with little effort by the firm, but it has limited resources and is not recommended for use with more robust environments. For recommendations on specific environments, please see the chart at the end of the chapter. Therefore, Microsoft SQL Server Standard or Enterprise editions are recommended as the best choice for deploying SQL Server. Appendix A - SQL Server Express Edition has more information on this topic.

Microsoft SQL Server (X86) with AWE vs. Microsoft SQL Server (x64)

Microsoft SQL Server (x86) only supports 2GB of RAM by default. This is due to the 4GB of virtual address space limitation of SQL Server 32-bit. The x64 version of Microsoft SQL server does not have this limitation. If for any reason there is a constraint that prevents installing Microsoft SQL Server (x64), it is still possible for Microsoft SQL Server (x86) to utilize more than 2GB of RAM by enabling the AWE option. However, the maximum RAM SQL utilizes with AWE enabled depends on how much memory is supported by the corresponding operating system that is running SQL Server.

Due to the limitations and complexity of implementing AWE, it is recommended that Microsoft SQL Server (x64) be installed for Enterprise solutions. Appendix A - SQL Server (x64) vs. SQL Server (x86) with AWE enabled contains additional information for the firm DBA on this topic.

File Servers Overview

Implementing a File Server may assist with space usage, redundancy, and in some cases performance. Engagement allows the physical files for a Central File Room on a network location. A common device used for this implementation is a SAN device. Both of these hardware choices are optional but have many advantages if implemented.

SAN vs. File Server

Both the SAN device and the File Server provide redundancy and help with disk space usage. SAN devices typically provide better performance than the File Server when connected via a fiber channel. For this reason, a SAN Device with fiber channel is recommended for Enterprise solutions.

SQL

The SAN device is used to store the SQL Databases and physical files for the Central File Room (CFR) to minimize the latency created from disk I/O with these files. The SAN Device must be configured and recognized as a local drive for Microsoft SQL Server to function correctly.

Physical Files
For physical file storage of the CFR workpapers, if the drive is configured as a local drive, similar to the configuration for using the SAN device as previously mention, a UNC path is not necessary. Physical files that are located on a File Server network require a UNC path.

Microsoft Windows Server

While still fully supported, Microsoft Windows Server 2003 is an aging product and Mainstream support from Microsoft for this product ended on 7/13/10. Microsoft Windows Server 2008 Standard Edition (x86) is limited to only 4 GB of RAM. The Enterprise Edition supports up to 64 GB of RAM. Microsoft Windows Server 2008 R2 does not have an (x86) version and the Standard edition has a limit of 32 GB of RAM. PAE technology allows for the (x86) versions to have large memory support and is enabled after a few steps. Microsoft will not release another (x86) server version of a server operating system.

For these reasons, we recommend either Microsoft Windows Server 2008 (x64) or Microsoft Windows Server 2008 R2 (x64) as the base operating system for all servers. The following three links have more information from Microsoft on RAM Limitations, PAE, and 64-Bit Computing.

Note: Microsoft Small Business server is not recommended.

Hardware Considerations

RAM, CPUs (or cores on the CPUs), and the file storage have the biggest impact on performance. For the database server, the highest performance is achieved when RAM is equal to the size of all the databases simultaneously loaded into memory to avoid swapping from the hard disk. However, this is not always practical. A Microsoft whitepaper on best practices for Microsoft SQL Server 2008 R2 data warehousing is located here. The whitepaper explains, in some cases, only 20% of the data is being accessed. The exact minimum amount of RAM will vary depending on firm usage. The recommendations in this guide are for optimal performance.

The base recommendation for the larger more robust servers is to have anywhere from 32 GB of RAM to 64 GB of RAM. For application servers, Engagement, Microsoft SQL Server, and Microsoft Office are used. The recommendation amount of RAM for application servers is 32 GB of RAM and a maximum of 20 users per server.

Indications of a bottleneck of CPU utilization are when CPU utilization is constantly over 80% and servers with high usage are operating with less than 24 cores. In addition, x64 processors are required to install the x64 versions of Microsoft Windows Server 2008 and Windows Server 2008 R2 as previously recommended.

Too much disk I/O is expensive, so preventing or minimizing the impact of when heavy disk I/O actually does happen is important. SAN devices are a good solution for this aspect and are recommended for systems with over 250 connected users. More details on monitoring the hardware and performance considerations are in Chapter 4 and Appendix A.

Firm IT Staff Roles and Responsibilities

Certain roles and skill sets within the firm are necessary for Engagement to perform optimally:

- **System Engineer for Windows Servers -** Assist in the design, testing, and implementation stages of Windows Projects. This role should have working knowledge of Microsoft Windows operating systems, Active Directory, DNS, Terminal Services and Group Policy.

- **Network Engineer –** Install, configure, and maintain network services and devices.

- **SQL DBA or Database Administrator –** Install, configure, and maintain the machines with Microsoft SQL Server. This would include monitoring the performance, making any tuning adjustments, and performing backup processes. Chapter 4 and Appendix A include specific details on this role.

- **Storage Management Engineer –** Plan, setup, and administer file servers and SAN devices.

- **Security Analyst –** Implement and maintain the firm's security policies, which include Engagement, the services, SQL, Firewalls, and ports.

- **Deskside Technician** – Install Engagement on laptops and workstations, diagnose end user issues, and establish network connectivity.

- **Desktop Engineer** - Share some of the same responsibilities as the Deskside Technician, except this role is responsible for physically setting up the system. The Desktop Engineer may also test hardware and software to see if it fits the firm's needs. This role would also be responsible for performing an Active Directory Push of the installation.

These roles help design the initial setup and provide ongoing maintenance of the environment. Staff with these skills would do any troubleshooting or performance tuning. The configuration and complexity of your firm's network and database structures will determine the types of roles and skill levels required. A single IT staff may perform one or more of the roles depending on their skill set.

Virtualization

The virtual machine must meet the same system requirements for Engagement as a physical machine. Please consult with your virtualization vendor for specific recommendations.

We do not recommend virtualization of SQL server. This is the best practice we adhere to in our own production data center environment. We use virtual SQL servers in our development and test environments but never in a production environment.

Engagement Office Server Recommendations

This chart contains recommendations in regards to deploying Engagement Office Servers, also known as the Administrator module. The Office Servers are both Database Servers and File Servers. This chart shows the different considerations, including SQL Server, File Storage, and architecture.

	200+ Users per Office Server	41 - 200 Users per Office Server	< 40 Users per Office Server
Office Servers			
Hardware			
RAM	32+ GB	8-32 GB	4-8 GB
Processors - total cores	8+ cores	2-8 cores	2-4 cores
x64 processor	√		
x86 processor	X		~
Microsoft Windows			
Microsoft Windows Server 2008 (R2)	√		
Microsoft Windows Server 2008	√		
Microsoft Windows Server 2003	X		
Microsoft Small Business Server	X		
Microsoft SQL Server			
Microsoft SQL Server 2008 Enterprise	√	~	~
Microsoft SQL Server 2008 Standard	√		~
Microsoft SQL Server 2008 Express	X		~
Microsoft SQL Server 2005	X		
x64 Editions	√		
x86 Editions	X		~
Storage			
SAN storage for SQL database files	√	√	~
SAN storage for CFR workpapers	√	√	~
LAN file server for CFR workpapers	X	~	

Legend

√	Recommended
~	Optional
X	Not Recommended

Engagement Office Server Worksheet

The following worksheet provides recommendations for the installation of the Office Servers, including some of the optional components from the chart on the previous page.

# of Servers	Recommendations	Firm Choice
# of Servers	1+	
Hardware		
Amount of Ram	4-32 GBs	
# of Processor Cores	2-8 Cores	
Architecture Chosen	x64	
Microsoft Windows		
Version and Edition of Windows Chosen	Microsoft Windows Server 2008 or Microsoft Windows Server 2008 R2	
Terminal Services Database Server Part of Domain	Yes / No	
Microsoft SQL Server		
Version of SQL Server Chosen	Microsoft SQL Server 2008	
Edition of SQL Chosen	Express/ Standard / Enterprise	
Architecture Chosen	x86 or x64	
File Storage		
SAN Device	Yes / No	
Rights to Folders Setup	Yes / No	
Part of Domain	Yes / No	

Terminal Servers

Terminal Servers, although optional, allow for the use of the application server / database server topology. A few typical scenarios are generally chosen for this section. Refer to Chapter 1 for more details on Terminal Services, more specifically Scenario 3 and Scenario 5.

Engagement Terminal Services Client Overview

Application servers, dedicated for application files and no user data, are sometimes part of a farm. Engagement will install on any machine with the Terminal Services Role installed. These machines link to the database server with Engagement Terminal Services Database. The Terminal Services Client Module requires Microsoft Office already installed.

Terminal Services Client Recommendations

This chart contains recommendations in regards to deploying Engagement on Terminal Services. We start with the recommendation of 20 users per Terminal Server, and then show recommendations for operating systems, Microsoft Office, and hardware. Please see Chapter 3 – Microsoft Office for more details on the recommendations for Microsoft Office.

	200+ Users per TS Farm	41 - 200 Users per TS Farm	< 40 Users per TS Farm
Terminal Services Application Servers			
Peak Users			
Application servers	10+	2-15	1-2
Peak users per application server	20 users		10-20 Users
Hardware			
RAM	16+ GB		8-16 GB
Processors - total cores	8-16 cores		4-8 cores
x64 processor	√		
x86 processor	X		
Microsoft Windows			
Microsoft Windows Server 2008 (R2)	√		
Microsoft Windows Server 2008	√		
Microsoft Windows Server 2003	X		
Microsoft Small Business Server	X		
Microsoft Office			
Microsoft Office 2010	√		
Microsoft Office 2007	√		
Microsoft Office 2003	X		

Legend

√	Recommended
~	Optional
X	Not Recommended

Terminal Services Client Worksheet

The following worksheet provides recommendations for the installation of Engagement Terminal Services Client, including some of the optional components from the chart on the previous page.

Peak Users	Recommendations	Firm Choice
# of Application Servers	NA	
# of Peak Users / Server	No more than 20	
Hardware		
Amount of Ram	8-16+ GB's	
# of Processor Cores	4-16 Cores	
Architecture Chosen	x64	
Microsoft Windows		
Version and Edition of Windows Chosen	Microsoft Windows Server 2008 or Microsoft Windows Server 2008 R2	
Terminal Services Database Server Part of Domain	Yes / No	
Microsoft Office Version		
Version of Microsoft Office Chosen	Microsoft Office 2010 or Microsoft Office 2007	

Terminal Services Database Overview

Microsoft SQL Server and the prerequisites for SQL are installed first on these servers. This type of server is considered both a database server and a File Server as it contains both the physical files, such as Microsoft Excel and Microsoft Word, and the Engagement database files.

Terminal Services Database Recommendations

This chart contains recommendations in regards to deploying the Engagement Terminal Services Database. This module is used in conjunction with one or many Engagement Terminal Services Client installations. The recommendations are for Microsoft Windows, Microsoft SQL Server, file storage, and hardware.

Terminal Services App Database Servers	200+ Users per Terminal Services farm	41 - 200 Users per Terminal Services farm	< 40 Users per Terminal Services farm
# of Servers			
# of SQL Servers	1		
Hardware			
RAM	32+ GB	8-32 GB	4-8 GB
Processors - total cores	8+ cores	4-8 cores	2-4 cores
x64 processor	√		
x86 processor	X		
Microsoft Windows			
Microsoft Windows Server 2008 (R2)	√		
Microsoft Windows Server 2008	√		
Microsoft Windows Server 2003	X		
Microsoft Small Business Server	X		
Microsoft SQL Server			
Microsoft SQL Server 2008 Enterprise	√	√	~
Microsoft SQL Server 2008 Standard	~	√	√
Microsoft SQL Server 2008 Express	X		~
Microsoft SQL Server 2005	X		
x64 Editions	√		
x86 Editions	X		~
File Storage			
SAN storage for SQL Server	√	√	~

Legend

√	Recommended
~	Optional
X	Not Recommended

Terminal Services Database Worksheet

The following worksheet provides recommendations for the installation of the Engagement Terminal Services Database, including some of the optional components from the chart on the previous page.

Architecture Chosen	x64

Microsoft Windows

Version and Edition of Windows Chosen	Microsoft Windows Server 2008 or Microsoft Windows Server 2008 R2
Terminal Services Database Server Part of Domain	Yes / No

Microsoft SQL Server

Version of SQL Server Chosen	Microsoft SQL Server 2008
Edition of SQL Chosen	Express/ Standard / Enterprise
Architecture Chosen	x86 or x64

File Storage

SAN Device	Yes / No
Rights to Folders Setup	Yes / No
Part of Domain	Yes / No

Summary

Various hardware and software choices are made prior to deploying Engagement. The server choices include operating system, amount of RAM, number of processors, and infrastructure. The choices are based on the role of the server as well as the usage. Several recommendations exist as a starting point, such as 64-Bit operating systems, the use of Microsoft Standard or Enterprise Edition of SQL Server, and SAN Devices for larger firms. As stated in Chapter 1, a few scenarios are generally chosen based on the firm's needs.

Chapter 3: Deployment Planning – Workstations

Overview

In an Enterprise environment, deploying Engagement means deploying the application to possibly hundreds of workstations. This factor alone warrants planning the deployment of these workstations. This chapter also covers Microsoft Windows, Microsoft Office, Microsoft SQL Server, installation, security, use of a File Server, hardware considerations, and the roles of the IT staff.

Microsoft Windows

While still fully supported within Engagement, Microsoft Windows XP is an aging product that does not provide many of the new features and benefits of Microsoft Windows 7. Mainstream support for Windows XP ended on 04/14/2009. Windows 7 is recommended for the operating system choice on workstations. A few of Microsoft Windows 7 features include Bitlocker, performance improvements over Vista, and (X64) support for larger amounts of memory. See the Microsoft Windows 7 site for more information.

Microsoft Office

While still fully supported within Engagement, Microsoft Office 2003 is an aging product that does not provide many of the new features and benefits of Microsoft Office 2007 and Microsoft Office 2010. To take advantage of features, such as the latest Office task-oriented ribbon interface, greater document capacity, and new customization features, we recommend customers upgrade to Microsoft Office 2007 or Microsoft Office 2010. In addition to the new Microsoft Office features, Knowledge Coach requires Microsoft Office 2007 or Microsoft Office 2010. Also, mainstream support for Microsoft Office 2003 ended on 04/14/2009. Please see the Microsoft Office site for more information.

Microsoft SQL Server

For workstations, Microsoft SQL Express is recommended. Microsoft Standard or Enterprise edition are only necessary for servers. Microsoft SQL Server 2008 is recommended.

Hardware Considerations

RAM, CPUs (or cores on the CPUs), and the hard disk have the biggest impact on performance. As stated in the Office Server section of Chapter 2, Engagement uses Microsoft Office and Microsoft SQL Server, so the system needs enough memory to run all of these applications along with other applications used by your firm. The recommendation for a workstation is 4 GB of RAM.

An indication of a possible hardware bottleneck is when CPU utilization is constantly over 80%. A duo core or quad core processor is recommended. More details on monitoring the hardware and performance considerations are in Chapter 4 and Appendix A.

Installation

Engagement has several prerequisites before installation. The most important of these is a Microsoft SQL Server. For workstations, Microsoft SQL Express is easily installed from the Engagement DVD and is already configured through the installer. Microsoft SQL Express is not the only requirement, however. The ProSystem *fx* Engagement Installation Guide lists what other components are required prior to installing Engagement.

Active Directory Push

Once all of the prerequisites are installed on the workstations, Active Directory can be used to push out the Engagement MSI installer. By using this method, possibly several hundred machines can be updated at the same time. Refer to the ProSystem *fx* Engagement Installation Guide for more detailed instructions.

Security

Encryption, user rights, firewalls, virus scanning, script blocking, and Windows service packs are common forms of protection against security breaches. Microsoft Office also has its own set of security restrictions. If the restrictions on this software are not managed correctly, some functionality inside Engagement is blocked. The Installation Guide under Appendix C has detailed information on these concerns.

Use of File Server – Network Template Storage

As previously stated in Chapter 2, a File Server is beneficial to your firm. Engagement utilizes several different types of templates. These templates are used for the creation of new Binders, workpapers, account groupings, and trial balances. These templates are created and stored locally by default but are sometimes placed on a network location, if desired. If these templates are moved to the network, they are only accessible when the workstations have access to that location. If the workstations leave the office, they will need the templates locally.

Engagement Workpaper Management Recommendations

This chart contains recommendations in regards to deploying the Engagement Workpaper Management, including recommendation on hardware, Microsoft Office, Microsoft Windows, and Microsoft SQL Server.

	WM Workstation
Workstations	
Hardware	
RAM	4+ GB
Processors - total cores	2+
x64 processor	√
x86 processor	√
Microsoft Windows	
Microsoft Windows 7	√
Microsoft Windows Vista	X
Microsoft Windows XP	~
Microsoft SQL Server	
Microsoft SQL Server 2008 Express	√
Microsoft SQL Server 2005 Express	X
Microsoft Office	
Microsoft Office 2010	√
Microsoft Office 2007	√
Microsoft Office 2003	X

Legend	
√	Recommended
~	Optional
X	Not Recommended

Engagement Workpaper Management Worksheet

The following worksheet includes considerations for deploying the workstations, also known as the Workpaper Management module.

Hardware	Recommendations	Firm Choice
Amount of Ram	4+ GBs	
# of Processor Cores	2+	
Architecture Chosen	x64 /x86	
Microsoft Windows		
Version and Edition of Windows Chosen	Microsoft Windows Server 2008 or Microsoft Windows Server 2008 R2	
Terminal Services Database Server Part of Domain	Yes / No	
Microsoft SQL Server		
Version of SQL Server Chosen	Microsoft SQL Server 2008	
Edition of SQL Chosen	Express	
Architecture Chosen	x86	
Microsoft Office Version		
Version of Microsoft Office Chosen	Microsoft Office 2010 or Microsoft Office 2007	

Chapter 4: Ongoing Monitoring and Upgrade Considerations

Monitoring the Servers

Monitoring the health of the machines using Engagement is essential to ensure the best performance is achieved and to determine when an upgrade is necessary. There are three basic areas to monitor, RAM usage, CPU usage, and disk I/O. Disk I/O is one of the slowest functions on a system and heavy disk I/O will affect performance. Several counters are setup to monitor the disk I/O. A SAN device with fiber channels is also used to help performance with heavy disk I/O.

RAM will contribute to disk I/O if there is memory pressure; monitoring the memory usage is recommended. Consider that Microsoft SQL Server is a memory intensive application and by default will use as much memory as the operating system will allow. The final consideration for hardware is the processor. If the usage is constantly over 80%, an upgrade might be necessary. Monitoring the process at the same time as the RAM is ideal.

Consider all of the topics in this Chapter to create a clear picture of future hardware and software requirements. The counters help determine if more RAM is needed, more processing power is needed, or if the disk is too slow. Appendix A has some detailed information on exactly what to monitor and when to upgrade.

Database Backup and Health Check

Data integrity to the firm is important and the Engagement Backup Restore assists the firm in this manner. The utility has a built-in health check for each of the SQL databases and will mark both the log file and the backup file with "Failed –"appended to the name in the case of an unsuccessful backup. The firm must create a Microsoft Windows scheduled task for this utility to perform these backups on a nightly basis. The utility will not backup the physical workpaper files. This is done by a separate task or 3rd party software. It is possible to use other backup techniques but Engagement Backup Restore allows for single Binder restoration. Appendix A has more details on this topic.

Bin Maintenance

By default, Bin maintenance tasks are scheduled to run on a nightly basis. It is important to monitor the result of each run on a daily basis to make sure all steps are executed successfully. This will help to ensure sufficient database space is used in each Bin and the database statistics are up-to-date. Pay special attention to the Bin diagnostics report, which is only available the first time an administrator logs in to the Office Server after each nightly task is run. It is recommended to avoid overlap among different Engagement nightly tasks, and between an Engagement nightly task and other nightly tasks, such as Windows updates.

Disk Space Usage

Make sure the disk drives hosting the database files have sufficient disk space for the database files to grow. Checking the location of the physical files is also recommended. At minimum, both tasks should be performed on a weekly basis.

Disk Fragmentation

Since disk fragmentation may have significant impact on performance, it is recommended to monitor the disk fragmentation on the hard drives hosting the Engagement SQL .mdf and .ldf files on a weekly basis, and if significant numbers of fragments are detected, defragmentation of the hard drive level should be performed.

Appendix A: Database Administration

As an important role for the Engagement software operation, the SQL DBA will be responsible for performing a list of tasks, either on a period-by-period basis or based on requests/needs. There are two types of SQL deployment that need to be closely monitored, the Office Server and the Citrix/Terminal Services SQL Server both of which are SQL Servers.

Database Backup and Health Check

One of the most important tasks for a DBA is to perform successful database backups on a regular basis.

At the very minimum, a full backup and health check should be performed on every Office Server on a daily basis. The Engagement Backup Restore utility helps to make this easier and includes a built-in health check feature. The SQL DBA should create a nightly task to run the Engagement Backup Restore utility, ideally allocating a dedicated window on the server for this task to run. The SQL DBA should be monitoring the status of this task, reviewing the log of the utility on a daily basis to make sure a successful backup was performed, and ensuring all databases remain in optimal health. For large firms, as the number of Bin databases grows too large, it may take a longer time to perform full backup on a nightly basis. Therefore, you may need to monitor this closely to find out if the current window allocated for backup is sufficient for the task to run. If not, reschedule the task for a different time when a longer window is available.

Important! Make sure to save the backup files into a different drive other than the one hosting the database .mdf and .ldf files. If the files are on the same drive, a single point of disk failure could result in the loss of both the production drive and the backups.

Note: The Backup Restore utility does not backup any of the Terminal Services Databases.

SQL Server Jobs

By default, the SQL Agent for Engagement SQL instance is disabled. If for any reason this needs to be turned on and some SQL tasks need to be added, it is important to make sure these SQL tasks do not have significant impact either on the run time process during the day or any nightly tasks set to run for the Engagement databases.

Database Statistics

Statistics update is essential to the performance of SQL Server. The update of statistics is part of the Bin Maintenance nightly tasks. It is recommended to monitor and make sure the update step is executed successfully on a daily basis to ensure the statistics are always up-to-date.

Index Fragmentation

Index fragmentation is monitored by running the “Index Physical Statistics” report from Microsoft SQL Management studio. If it is determined some indexes are highly fragmented, it is recommended to perform index rebuild or defragmentation based on the type of fragmentation during the weekend. Microsoft explains fragmentation here.

Transaction Log File Growth

The transaction log files, also known as .ldf files, are the files that track transactions during the data modification operations. As Engagement databases are created on the SQL instances, the corresponding .ldf files are set to

not grow. It is recommended to keep monitoring these files on a weekly basis to make sure they do not grow to a significantly larger size or span over the hard drives. Typically, if the size of an .ldf file is larger than 1 GB, it is an indication the truncation process is not running properly. It is recommended to manually truncate the log and shrink the log file.

Hardware Performance

It is important to know how the hardware is currently performing for Engagement operations. Since there are so many factors affecting the hardware performance, it is good practice to monitor performance of the main resources to determine if there is any bottleneck on the current hardware. Monitoring the following three areas is ideal:

1) CPU
2) Memory
3) Disk I/O

In some cases, it is necessary to monitor network utilization and performance.

It is recommended to monitor the hardware performance on a monthly basis. It is also a best practice to monitor performance for a period of time, for instance, from morning to evening, or during peak hours of the day. The following sections include details on what to measure and the tools that are available.

Hardware Performance Indicators

CPU

Two indicators help to determine whether there is any CPU pressure:

1) **% CPU time** – If CPU usage is frequently above 80%, it is an indication of CPU pressure. This is an indication that a hardware upgrade of the CPU may increase performance. To monitor this, set up a trace in Performance Monitor to capture the value in the **Processor:% Processor Time** counter by sampling the data every 10 seconds for peak hours or for the entire day.
2) **Number of Tasks waiting to run** – This number indicates how many runnable tasks are waiting for the CPU. A frequent observation of a non-zero value of this number or a high value is an indication of a CPU bottleneck. To obtain the value, reference the result under the "runnable_tasks_count" column from the following query:

```
select
   scheduler_id,
   current_tasks_count,
   runnable_tasks_count
from
   sys.dm_os_schedulers
where
   scheduler_id < 255
```

To monitor this, you may write a script to run this query repeatedly every 10 seconds in Microsoft SQL Management Studio and save the results in a table.

This value is also available under the column "SOS_SCHEDULER_YIELD" in the Performance Dashboard report –

Wait category.

Memory

The following three indicators help to determine whether there is memory pressure:

- **Buffer Cache Hit Ratio** – This value indicates when SQL needs to visit a particular page of data and determine how often it finds the data in the cache. If this value is frequently below 99%, this is an indication that a hardware upgrade of the memory may increase performance. This value is obtained from Performance monitor → SQL Server: **Buffer Manager** object → **Buffer Cache Hit Ratio** counter. It is also available in Performance Dashboard.
- **Page Life Expectancy** – This value indicates how long a page stays in memory, if it often below 300, then it indicates more memory could help to improve the performance. This value is available in Performance monitor → SQL Server: **Buffer Manager** object → **Page Life Expectancy** counter.
- **Page reads/Sec** – This number indicates the frequency for which the SQL Server needs to go to disk to visit a desired page data. If this value goes above 80, it is an indication of memory pressure. This number is obtained from Performance monitor → SQL Server: **Buffer Manager Object →Page reads/Sec** counter.

To monitor the memory pressure, simply add the above counters to the same task as stated above with the CPU Counters.

Disk I/O

The following three indicators help to determine the health of disk I/O:

- **Ave Disk Sec/Read** – This value indicates how long it takes to fulfill one read request by the hard drive. The ideal value is 0.005 second. A value under 0.010 second is also acceptable. However, if it is frequent to see more than 0.010 second in this counter, it is an indication the hard drive throughput is not sufficient. This value is available in **Performance Monitor→ PhysicalDisk Object→ Ave Disk Sec/Read** counter. The overall statistics values are also available in Performance Dashboard.
- **Ave Disk Sec/Write** – This value indicates how long it takes to fulfill one write request by the hard drive. The ideal value is 0.005 second. A value under 0.010 second is also acceptable. However, if it is frequent to see more than 0.010 second in this counter, it is an indication the hard drive throughput is not sufficient. This value is available in **Performance Monitor→ PhysicalDisk Object→ Ave Disk Sec/Write** counter**.** The overall statistics values are also available in Performance Dashboard.
- **Ave Disk Queue Length** – This value indicates how many tasks are waiting for the hard drive to perform a disk I/O. A frequent observation of values higher than 1 is an indication of I/O pressure. This value is available as a counter in **Performance Monitor→ PhysicalDisk Object→ Avg. Disk Queue Length**. The overall statistics values are also available in Performance Dashboard.

To monitor the disk I/O, simply add the above counters to the same task as stated above with the CPU Counters.

Tools Available for Hardware Performance Monitoring

Performance Monitor

This tool is ideal for contiguous monitoring of resources for a period of time, for instance, during peak hours or for an entire day of operations. Since scheduled tasks are used to collect data on an interval basis, the performance monitor helps to provide the SQL DBA a good indication of how the hardware resources are utilized. All the desired indicators are available as counters under different categories.

Performance Dashboard Reports for SQL Server

This tool provides a quick overview on performance-related facts for the current moment. It requires no set up and is easy to use. It is useful to help diagnose a known performance issue on the SQL server and help to analyze the hardware performance bottleneck for a given moment. It also will provide data to help analyze software bottleneck, such as blocking.

Trouble Shooting Performance Issues

To diagnose a known performance issue, do the following:

1) Try to reproduce the issue. If the issue is reproduced, as the process is run on the user's machine, launch the performance Dashboard report from SQL management studio.
2) Detect if there is any CPU bottleneck.
3) Detect if there is any memory pressure present.
4) Detect if there is any disk I/O bottleneck.
5) Detect if there is any blocking present – either software or hardware.
6) Document any findings. If it is determined there are hardware-related issues, upgrade the corresponding resource, if possible: otherwise, contact Engagement support for more help.

SQL Server (x64) vs. SQL Server (x86) with AWE Enabled

If the firm decides to use Standard Edition or Enterprise Edition of SQL Server, it is recommended your firm install Microsoft SQL Server (x64) on (x64) operating systems, so the usage of RAM grows unlimited as more RAM is added to the box. Microsoft SQL Server (x86) only supports 2GB of RAM by default. This is due to a limit of 4GB of virtual address space of SQL Server (x86).

If for any reason, there is a constraint preventing the use of Microsoft SQL Server (x64), it is still possible for Microsoft SQL Server (x86) to utilize more than 2GB of RAM by enabling the AWE option. However, the maximum RAM SQL utilizes with AWE enabled depends on how much memory is supported by the corresponding operating system that is running SQL Server. For instance, if SQL Server is running on Microsoft SQL Server (x86)of Windows Server 2008 Enterprise Edition (x86), since this operating system only supports up to 64GB of RAM, the maximum memory SQL utilizes is no more than 62GB. For information about the supported size of memory for different operating systems, please refer to the corresponding hyperlink in the following document:

http://msdn.microsoft.com/en-us/library/aa366778%28v=vs.85%29.aspx

To enable AWE on the Microsoft SQL Server (x86), please refer to following document:

http://msdn.microsoft.com/en-us/library/ms190961.aspx

SQL Server Editions

Consider the following factors when choosing a SQL Server edition:

- SQL instance on Office Server vs. SQL Instance Citrix Server
- Number of concurrent users
- Overall data volume on the SQL server
- Number of processors to support

Other factors to consider:

- Capability of online re-indexing
- Performance with parallel processing features

SQL Server Express Edition

Due to the limit on RAM (1 GB) and CPU (1 Processor), this edition is not appropriate for a Terminal Services environment.

SQL Server Standard Edition vs. Enterprise Edition

Both Standard Edition and Enterprise Edition support maximum size of RAM available in the corresponding operating system. However, Standard Edition only supports up to 4 processors. Hence, the quickest way to determine whether Enterprise Edition is necessary is to verify how many processors are required to run on the SQL box. If it is determined more than 4 processors are necessary for a particular environment, Enterprise Edition is the only option for the server. To determine how many processors are necessary, it usually involves monitoring of resource usage on the current hardware configuration, and then determining whether adding processors would help improve the performance. For more details on this topic, see the Hardware Performance Indicators section in this appendix.

Although some of the features provided in Enterprise Edition are not required or not currently supported by Engagement databases, there are few nice features, such as online re-indexing and more parallel processing capabilities. These will help improve the performance over a sustained period. Please consider these factors when choosing between SQL editions.

For feature and resource limit comparisons among the above editions, please refer to the following document in details:

http://www.microsoft.com/sqlserver/2008/en/us/editions-compare.aspx

Appendix B: Additional Resources

Additional resources that will help with the evaluation and deployment of Engagement:

Engagement Documentation

- Engagement Installation Guide
- ProSystem *fx* Engagement Customer Support

Training

- Training and Consulting

Microsoft

- Terminal Services Deployment Guide
- Product Life Cycle
- Large Memory Support for Windows Server 2003
- Microsoft 64-Bit Computing
- Infrastructure Planning and Design – SQL Server
- Infrastructure Planning and Design – Terminal Services
- SQL Server 2008 R2 – Best Practices for Data Warehousing
- SQL Server 2005 Technical Articles – Storage Top 10 Best Practices
- Identifying SQL Server 2005 Performance Issues
- Microsoft SQL Server Edition Comparison
- Troubleshooting Performance Problems in SQL Server 2008