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## SharePoint Design and Implementation - An Enterprise Architecture Solution

Zachary McKellar

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SHAREPOINT DESIGN AND IMPLEMENTATION:  
AN ENTERPRISE ARCHITECTURE SOLUTION

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A Project  
Presented to the  
Faculty of  
California State University,  
San Bernardino

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Science  
in  
Information Systems and Technology

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by  
Zachary McKellar  
March 2020

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Zachary McKellar  
March 2020

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## ABSTRACT

Having a solid enterprise architecture foundation is critical to the success and growth of a business. Considering the volatility of many industries, businesses must consistently grow, innovate, and advance their technology to ensure high availability of their products and systems. Seeing that projects fail more than they succeed, it stresses the importance of having a strong enterprise architecture (Schneider, 2020). With this said, it is imperative that a business creates a proper collaborative environment to ensure that all future implementations and developments within their environments are successful. Without these foundations, an enterprise will fail to grow.

This project provides an in-depth analysis of a Microsoft SharePoint implementation in a hospital. The intention was to create a collaborative environment that will support a project to replace their electronic healthcare system, referred to as an EHR system. In this scenario, the enterprise solution has already been implemented and maintained over the course of four months and is used daily. It was my responsibility to plan, implement, and maintain the system to ensure high availability of services. Information regarding the enterprise has been withheld to preserve their privacy.

The objectives of this project are to provide an overview of the organization, the importance of the EHR system in a hospital, possible enterprise solutions, and the overall implementation of the solution. It is important to

understand where the hospital was prior to deployment and how the solution has impacted their environment and EHR implementation. After fulfilling these objects, it will show how SharePoint can be a powerful tool in improving the enterprise architecture within an enterprise level environment. Furthermore, improving communication and collaboration for staff in the hospital.

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## CHAPTER ONE

### INTRODUCTION

#### Chapter Overview

Software implementations can put an abundance of stress on an enterprise, regardless of the size of the project (Schneider, 2020). If an implementation fails, it can be detrimental to the future growth of a business. The goal of this project is to show how an information system was implemented to assist in the success of vital software within a hospital. Before jumping into the logistics of the hospital, it's important to understand the problem, enterprise architecture, and their importance in the implementation and growth at the hospital. This chapter is going to focus on the relationship that these aspects have in the successful implementation of a new electronic health records system, or EHR system, in a hospital.

#### Problem Statement

Does providing an information system that provides a collaboration environment help improve the enterprise architecture within a business, or in this case a hospital? Will this enterprise solution assist in the EHR and future projects at the hospital? How will this system be implemented and affect the hospital?

### Why is this Important?

The proposed information system is going to promote a new way for collaboration, communication, and file sharing within the hospital. Currently, the hospital is going through an EHR implementation that is replacing the primary physician and patient tool within the hospital. In order to support the EHR project, Microsoft SharePoint 2019 has been implemented in the environment to provide a better collaboration tool to all members on this project. Considering that this EHR implementation is the most expensive and most resource intensive project that the hospital has undertaken, SharePoint is going to provide all employees and external vendors the necessary tools to effectively communicate and track tasks through the project life cycle. Furthermore, SharePoint is going to prove to be a powerful tool that will, not only serve this project, but will also support new projects and teams in the future. Another benefit of this implementation is that Office 365 is on the horizon for the hospital. Office 365 is going to introduce a new framework and utilization of SharePoint that will allow staff to further improve their workflows. Some of SharePoint's strengths will be explored later in this project, but for now its primary role is to establish a collaborative environment that will help improve the enterprise architecture of the hospital. In turn, this should improve the feasibility that the EHR implementation will be successful. My role in this project is to research the uses, implementation, and administration of SharePoint within the hospital that will provide the best end-user experience for those participating in the EHR project.

## Enterprise Architecture

Enterprise Architecture, referred to as EA, is a strategic analysis of an enterprise to align their information technology with their current and future business goals (White, 2018). Essentially, EA is taking an evaluation of an enterprises' current resources to gain information regarding the enterprise and see how they can assist them in achieving current and future goals. Over the development and growth of an enterprise, the mission and business goals can change based on many factors. If these factors influence the EA negatively, it can lead to project failures and slow down enterprise growth. As a result, future projects, goals and growth will continue to fail; so, it's important to establish and understand EA in its current state and see how it will assist in the success of a business. Below, some of the benefits of analyzing and improving EA are summarized (Bernard, 2012).

- Improves collaboration and communication within the enterprise.
- Allows the prioritization of projects and goals.
- Allows the assessment of the current state, resources, and goals of an enterprise in comparison to the enterprise goals.

To further elaborate, enterprise architecture is an assessment of all processes, systems, and technology and relates them to information within the enterprise. A business is comprised of various resources that allow information to be used. Each of these artifacts provide a different function and use in the day to day operations. Link Consulting provided a great illustration of these functions in

Figure 1.1 (Linkconsulting.com). To further understand their roles, they have been listed below.

- Information – Information that must be gathered or utilized in systems within an enterprise.
- Processes – Business processes or activities that are concluded or planned.
- Systems – Applications or information systems that allow processes to be completed.
- Technology – Physical hardware and infrastructure an enterprise has provided for employees.

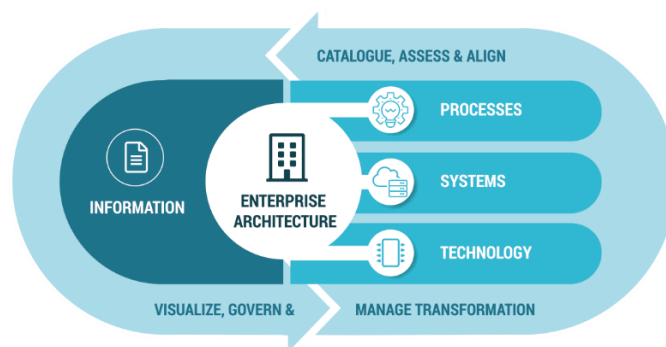


Figure 1.1 Alignments of components visualization

During the process of evaluating enterprise architecture, the above components must be documented. Once all information, processes, systems, and technology are catalogued, the enterprise can determine how their existing systems correlate to the enterprise goal. Lastly, a plan is created and implemented to meet the expectations of enterprise goals that are set. Another



great way how these attributes correlate to the future growth of an enterprise are in Figure 1.2 (Epignosis.info).

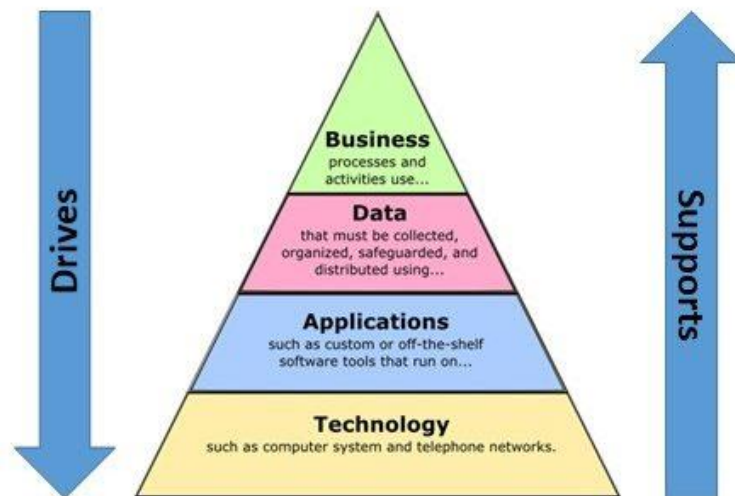


Figure 1.2 How enterprise architecture components support/drive an enterprise.

As you can see in Figure 1.2, technology provides the foundations to the enterprise and provides the necessary support of all the resources and components to support the business. On the contrary, as the business continues to grow, and it creates resources that must be used. Furthermore, as the business continues to grow, the technology must as well in order to keep this top down architecture stable. Seeing that EA plays a vital role as a foundation of an enterprise, it will be important to see how each of these components plays a role. As a result, this should further show why an enterprise solution was deployed to provide support for the EHR project. Next, an EA methodology is going to provide a framework that will support this implementation. Given the details in Figure 1.2,

The Open Group Architecture Framework, or TOGAF, methodology closely follows what is represented.

### Enterprise Architecture Model

TOGAF, is going to be used followed to increase the chances for success of the information system that is selected. As a result, it will help the enterprise align IT goals across all departments in order to successfully implement the software solution. In other words, it makes sure that all stakeholders are on the same page and all efforts are organized. With this said, it should increase the chances of success because all departments across the hospital will be working towards a well-organized and calculated goal.

There are a few classifications of architecture analyzed in TOGAF which were represented in Figure 1.2. These are as follows (White, 2018):

- Business – Overall business strategy, processes, and governance within an enterprise.
- Data – All information that is gathered or used in an enterprise. This includes the support and maintenance of this data.
- Application – Information or application systems that are used in day-to-day processes of an enterprise. Applications gather and utilize the data of a business.

- Technology – All required hardware and software that are maintained within an enterprise. This allows all other aspects of an enterprise to function.

These various types of architecture allow an enterprise to thrive. Without them, they will not function and cannot grow towards a business goal. In this case, the hospital's goal is to successfully implement a new EHR system.

Without the support of the proposed enterprise solution, communication may not be efficiently utilized. As a result, this will lead to the delay of the EHR implementation.

TOGAF provides an organized approach to software implementations (Pubs.opengroup.org, 2018). It requires extensive analysis, planning, and maintenance to ensure the success of an implementation. With this said, if enterprise solution is successfully deployed, it can provide further benefits to the hospital. Below is an example of the process TOGAF follows in software implementations (Pubs.opengroup.org, 2018).

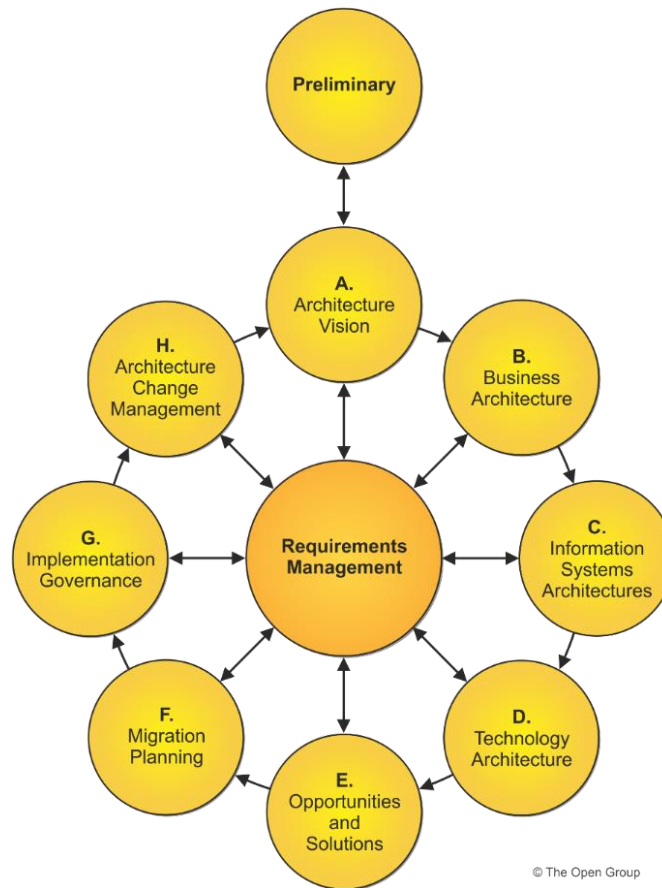


Figure 1.3 The Open Group Architecture Framework.

Figure 1.3 represents the process of the TOGAF framework. The great thing about using this framework is that it can be repeated for various projects and implementations. In this case, the hospital plans on using our enterprise solution to support the upcoming EHR project. If the architecture vision stays the same, all other aspects of the framework should remain the same. Furthermore, this can lead to an improved process for upcoming projects. These are the steps utilized in the TOGAF methodology (Pubs.opengroup.org, 2018).

- Preliminary Phase – Plans and preparations made prior to the implementation of a new project or system.
- Phase A: Architecture Vision – Defines the goals and values that the project or system will provide to the enterprise architecture.
- Phase B: Business Architecture – Defines the current state of the business and compares it to the enterprise goals.
- Phase C: Information Systems Architectures – Current enterprise information systems are analyzed to verify if they can support the enterprise goals.
- Phase D: Technology Architecture – Evaluates if the required resources are available to accomplish implementation.
- Phase E: Opportunities & Solutions – Determines if there are any current improvement opportunities and a goal is created to achieve them.
- Phase F: Migration Planning – Implementation planning for migration is created.
- Phase G: Implementation Governance – Governance is evaluated to verify it will support enterprise goals.
- Phase H: Architecture Change Management – Ensures that the project or system has been successfully deployed.

Essentially, TOGAF evaluates the current state of the enterprise and verifies if the project or solution will be properly supported. In the case of the

hospital, they currently need additional support to in order to achieve their goal of implementing a new EHR system. This is due to the fact they currently utilize older methods of sharing information that do not meet the needs of the EHR project. These details will be discussed in the upcoming chapter as the hospital is analyzed.

## CHAPTER TWO

### BACKGROUND AND ANALYSIS

#### Chapter Overview

After exploring the enterprise architecture and TOGAF, it's important to understand the enterprise and identify what types of problems this solution may resolve. This section will cover the different electronic health records (EHR) systems and what the enterprise decided to use as a solution. Then, we will cover the scope of the project because it is important to understand the project, scope, and what the potential impact on the environment will be. Lastly, it's important to illustrate enterprise solutions that were considered as a supporting system for this EHR project.

#### Enterprise Overview

Identifying information regarding the hospital is going to be preserved to maintain anonymity. Some of the identifying attributes listed will provide further insight into the size and complexity of the enterprise. This hospital is a level II trauma center with 500 beds that provides care to the community, neighboring departments, and jails in the area. Due to the diverse environment, it is imperative to have a wide range of systems and support to provide care for their patients. With this said, the hospital has roughly 5,000 employees spread across 50 internal departments. The staff supports over 10,000 devices across the

hospital and 4 off-site clinics that are within a 30-mile radius and three mobile facilities that serve the remaining unincorporated areas. Seeing the size of the hospital and their staff, it is important that the supporting EHR system provides a quality experience to all staff and patients. At this time, the hospital is preparing for an EHR system upgrade, which will be detailed in the upcoming section.

### Electronic Health Records Overview

Meditech has been the primary EHR provider for over 20 years at the hospital. Given the age of the system, Meditech does not necessarily meet the quality of standards that are set by competitors. The hospital compared Meditech to other EHR systems utilized in neighboring hospitals and counties in order to survey what systems were in use and see the quality of service they provide to their patients. The hospital's hope was to evaluate potential candidates for replacement based on the hospital, clinician, and patient needs.



Figure 2.1 Ambulatory electronic medical records ratings (Gleave, 2019).



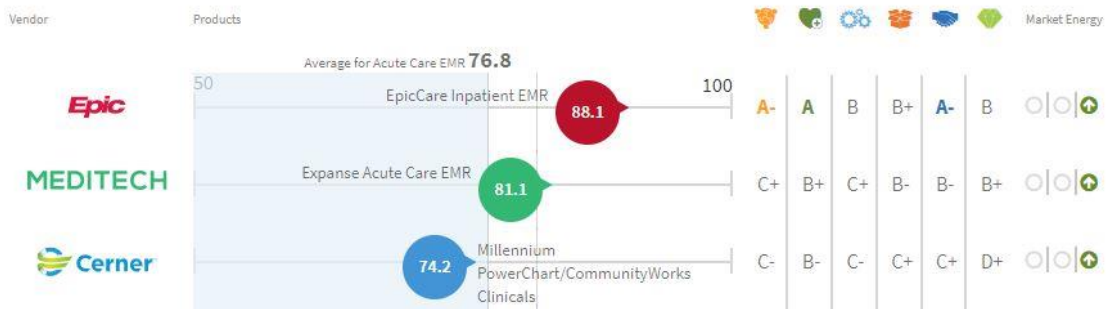


Figure 2.2 Acute Care electronic medical records ratings (Tate, 2019).

Figures 2.1 and 2.2 provide the EMR ratings for different types of EMR systems. These systems, Epic, Cerner, and Meditech, were the considered replacements of Meditech during this process.

Since systems can fail to adapt to the client’s needs, they will fail to provide full functionality and quality of life features to their customers. These types of ramifications will drive patients away because they will not get the care or information they require. Comparing Meditech to other systems, the hospital found that their patients did not have the ease of access, features, and availability that other systems provided. They were able to perform and get information required for daily processes, but it was below the standards of competing hospitals. The high availability and ease of access the competition provides allows them to provide better healthcare to their patients.

Given the ratings in figure 2.1 and 2.2, Epic was a primary candidate due to the features they provide to both the clinicians and the patients. Additionally, Epic provides further integrations into a variety of healthcare systems. Their upstanding reputation is further supported by the 58% market share they

currently have in relation to hospitals that support 500 beds (Roth, 2019). After talking with clinicians at neighboring hospitals, it was easy to see that Epic was going to be favored in the replacement of Meditech. After reviewing the facts and features that Epic provides, the hospital chose to pursue Epic as their EHR replacement. Seeing the cost, resource requirements, and scope of the project, it's important to select a proper solution to support the size of the Epic implementation.

### Enterprise Solutions

In its current state, the hospital currently utilizes file servers, email distribution groups, and shared calendars as their primary form of communication and collaboration. Given these circumstances and the ongoing Epic implementation, providing a more optimized and overall better way to communicate and collaborate would be beneficial. Based off these criteria, SharePoint was chosen to support the Epic implementation. One of the reasons is because it allows all users permitted to use SharePoint sites as a central hub for all files, calendars, and news pertaining to site. SharePoint is a great project management and collaboration tool that provides a variety of tools to ensure that users can communicate, assign and complete tasks, and ensure that the project delivers on time.

Figure 2.3 shows the most common and used project management tools

that are utilized during the process of a project. Based off these features, most can be integrated in SharePoint. The interesting thing regarding these is they can be further integrated with other Microsoft products, such as Microsoft Teams, Microsoft Project, and other Office 365 applications.

#### Most used project management software features

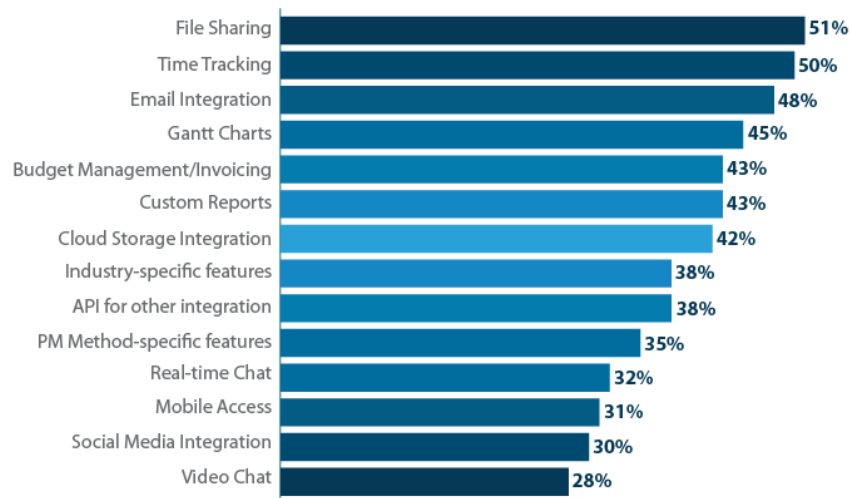


Figure 2.3 Features of project management tools (Cohen, 2019).

SharePoint will provide a powerful tool to carry out the current EHR implementation as well as future projects. SharePoint Server 2019 (On-Premises) and SharePoint 365 (SharePoint Online) are two versions that were taken into consideration for providing these services. It's important to understand their differences to determine which will serve as a better enterprise solution.

## SharePoint Server 2019

SharePoint Server 2019, also known as On-Premises, is Microsoft's standalone version of SharePoint that is hosted on-site. All maintenance, updates, change control, and security permissions are managed by local IT staff and through Active Directory (Bullock, 2019). In short, On-Premises provides more granular control and requires more staff to ensure that all features and access are available. Furthermore, it's beneficial to have stakeholders involved in the management of these sites. Additional advantages and disadvantages for utilizing an On-Premises configuration are listed below (Bullock, 2019).

### Advantages:

- + Servers are hosted on-site
- + Maintenance can be done by IT staff

### Disadvantages:

- Licensing costs more
- Requires more staff to maintain
- Scalability is limited to hardware
- Lost Office 365 features

Given these facts, SharePoint Server 2019 can still serve as a proper solution, but it typically costs more and requires more resources to maintain. In the hospital's case, resources that were given to support the servers will not be

an issue. As of now, they already own the Licensing required to stand up SharePoint. The next section will provide an overview of SharePoint 365.

### SharePoint Online

SharePoint Online, also referred to as SharePoint 365, provides additional features that are not available in the On-Premises version. Cloud services support the function and usage of SharePoint Online which allows for greater storage capabilities as well as a variety of ways to access and edit SharePoint sites (Bullock, 2019).

#### Advantages:

- + Easier site administration
- + Licensing costs are determined by flat rates
- + Supports OneDrive and various Office 365 applications
- + Integrated into Microsoft Teams

#### Disadvantages:

- Requires the environment to have Office 365 implemented
- Increased bandwidth

SharePoint requires more network bandwidth due to all the hosted sites and services being online. This requires a larger network infrastructure, but if an enterprise can do so, the features it offers are irreplaceable. Since everything is in the cloud, it allows users to have more access to sites and documents that are shared within the environment. Some of the additional features and

customizations also give the users a better experience when managing their sites. Lastly, the biggest benefit is the integration of Office 365 and other Microsoft products. An example is Microsoft Teams. Teams is the newest tool that will be replacing Skype for Business. The interesting thing about Teams is that it provides a mobile messaging solution. Another benefit is that you can embed a SharePoint site into a team, which allows the team to upload content to the site and communicate within their chat. This will solve the communication and collaboration problems the hospital is facing.

### Software Decision

Unfortunately, given the active directory structure and licensing of the hospital, they currently do not have the option to implement SharePoint Online. SharePoint Online requires Office 365 to be deployed and licensed within an enterprise. In their current state, they rely on an outside information services department to provide their active directory forest, Exchange, and licensing. In order to successfully implement Office 365, they must license all staff in order to provide complete access. In this case, SharePoint On-Premises will be selected for SharePoint Deployment, but future goals are to deploy Office 365 once the appropriate budget has been applied.

### Project Scope

Considering the size, cost, and impact Epic is going to have on the hospital, SharePoint will play a vital role in its implementation. The project scope

is going to provide a detailed overview of the SharePoint implementation in the hospital. This is going to provide some crucial details and identify the needs, requirements, and deliverables that will measure the success of the deployment.

### Project Description

SharePoint will provide an effective communication and collaboration environment to support the Epic EHR Implementation. Additionally, the goal is to create additional sites that will support hospital departments, project teams, and software implementations as needed.

### Project Participants

Participants are going to include the technology management team, Epic EHR project managers, and third-party vendors. SharePoint will provide a central hub for communications between Epic and the implementation team at the hospital.

1. Project managers – Includes the primary project manager and will receive and approve all deliverables of the SharePoint and Epic EHR projects.
2. Project members – Includes all users that will be accessing and working out of the SharePoint sites.
3. Information Technology Staff – Includes all members of the IT staff that are responsible for the maintenance and administration of the hardware and software used in the hospital.

4. Epic Vendors – Third-Party vendor that will oversee the Epic implementation at the hospital. Request additional features and information to be added to the SharePoint sites.
5. Administration – Hospital administration that will approve deliverables and oversee the progress within the hospital.
6. Department managers – Department managers oversee the variety of module and team deployments within SharePoint and Epic.

Primarily, the goal of the SharePoint project is to include all members that will be associated with the Epic implementation project. Their feedback and contributions will assist in providing ease of access tools to all future members and site deployments.

### Project Objectives

At a minimum, SharePoint and a few sites will be deployed to support the Epic EHR implementation. Deliverables for the SharePoint implementation are as follows:

1. SharePoint server deployment.
2. Create an Epic News SharePoint site.
3. Create an Epic Project SharePoint Site.
4. Create Active Directory groups to manage permissions.
5. Create documentation to train managers on the administration of SharePoint sites.



Once formal training and documentation have been complete, the SharePoint implementation project is complete.

### Project Deliverables

Deliverables for this project will be as follows:

1. Functional Epic News SharePoint site with a wiki of information regarding the Epic implementation.
2. Functional Epic Project SharePoint site that will have a project calendar, file library, tasks list, contact list, and alerting features.

### Project Constraints

The constraints of the SharePoint project relate to the hardware and technical requirements needed to facilitate deployment.

1. Servers – Servers must meet the minimum hardware requirements to optimally run SharePoint.
2. Storage – Appropriate amounts of storage must be provided for current and future deployments of SharePoint sites.
3. Network – The appropriate network bandwidth must exist to support additional network traffic from SharePoint.

In this case, all constraints must be met prior to SharePoint deployment. This is due to the high availability and optimization of the site collections created.

Without these constraints fulfilled, users will be unable to access and work out of SharePoint, which will cause workflow problems within the environment.

### Project Benefits

As previously mentioned, the goals of this project are to provide an improved collaborative experience for current and upcoming projects. The successful implementation of SharePoint will provide the following benefits:

1. Central hub for information and collaboration.
2. Site oriented file repositories that will allow members to share documents and information within the project team.
3. Improved communication for project members and staff at the hospital.
4. Improved task monitoring to ensure deliverables are completed on time.
5. Optimized workflow for future project completion.

Overall, SharePoint is going to improve the collaboration and communication aspects of the hospital's EA. This will improve the workflow for future projects and team collaborations by doing the following:

1. Additional hospital site templates that will be used to support department teams and future projects.
2. Final training documentation that correlates to the successful administration of SharePoint sites. For example, granting permissions, adding web parts, and managing site libraries.

This project will deliver high availability sites that can be utilized by all stakeholders. Following implementation, managers shall be able to manage their team sites with little IT involvement.

## CHAPTER THREE

### SHAREPOINT IMPLEMENTATION

#### Chapter Overview

This section is going to go over the decisions that were made regarding configuration during the implementation portion of SharePoint 2019 at the hospital. Something to note is the intention of SharePoint was to provide high availability to a collaborative environment for the EHR implementation and various teams within the hospital. Based off the hospital needs, it is important to implement a solution that will improve communications and file sharing during the duration of the Epic project. The decisions made reflect this and will be discussed throughout the upcoming chapter.

#### Server Configurations

SharePoint 2019 provides two different server configurations that both have advantages and disadvantages. They offer a single server configuration, that utilizes a single server, or a server farm, that utilizes a group of servers. Performance, scalability, and troubleshooting are the primary factors that are considered when making this decision. It's important to understand their differences so that they can be best aligned with the enterprise to provide the appropriate functions. The size of the hospital, number of users, and future play a large part in the configuration decision.

## Single SharePoint Server

A single SharePoint server proves beneficial in a smaller scale enterprise that requires less resources. Although it can support a larger enterprise, performance will begin to diminish as more users connect to a single server (Lee, 2019). Given the right circumstances, it can work well, but only if it is kept to the same scope over time. Figure 3.1 provides a good example of how the end users interact with the SharePoint server when they are accessing a SharePoint site. As you will see, all applications run on a single server which tends to overwork a single endpoint. Another caveat is that performance can vary based on the web applications and web parts that are programmed into site collections. If there are many users utilizing, for example, Word and Excel documents, resources are tied up on the server end to support this experience. Figure 3.1 will give examples of the types of applications and services that are running on a SharePoint server.

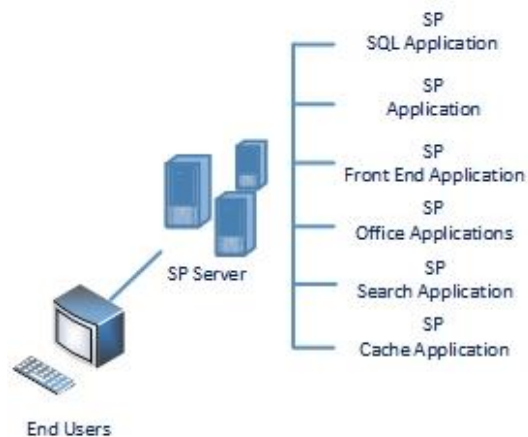


Figure 3.1 SharePoint single server configuration (Lee, 2019).

Given that there are six applications concurrently running and providing features on a SharePoint site, it can tie up resources that will affect performance. Some of the additional advantages and disadvantages of using this type of configuration have been provided below.

Advantages:

- + Requires less hardware
- + Has a single server to troubleshoot

Disadvantages:

- Typically requires a physical server
- Has a single point of failure
- Cannot sustain a large userbase
- Lack of scalability

As previously stated, a single server setup is optimal for a smaller scale enterprise or business that does not have a fluctuating userbase and set amount of site collections. As the userbase begins to grow and site collections are increased, resource requirements begin to increase. Given these facts, the hospital plans to use SharePoint for future projects and teams, which will require greater scalability and performance requirements. A SharePoint Server Farm will prove more beneficial given these forecasted uses and projects.

## SharePoint Server Farm

The primary difference between a SharePoint Farm and a single server configuration is that the server farm is a collection of servers that are dedicated to a specific task or application (Lee, 2019). To further elaborate, a SharePoint Server Farm utilizes multiple servers with a single application installed on each. This provides many benefits for a larger enterprise, which works perfect given the size and function of the hospital.

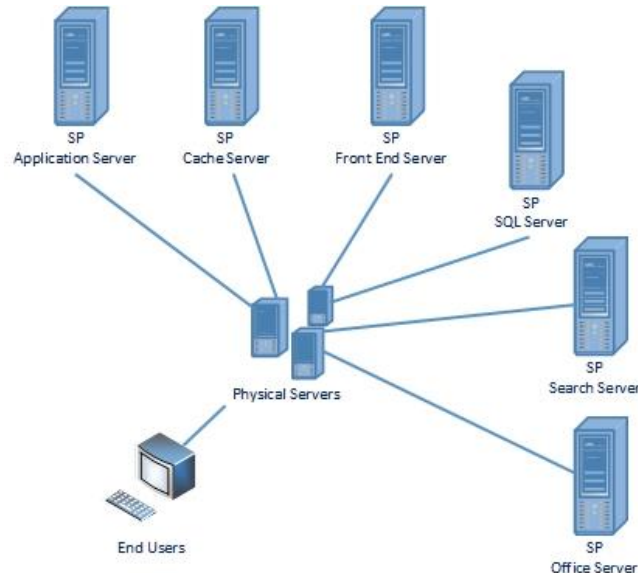


Figure 3.2 SharePoint farm configuration (Lee, 2019).

Figure 3.2 illustrates a SharePoint Farm configuration that utilizes six virtual machines on a physical server. This allows all tasks, operations, and services to be spread out across all servers. This ensures that the workload and utilized resources are utilized and distributed evenly, which leads to better performance.

Some of the advantages and disadvantages of using a server farm are listed below.

Advantages:

- + Offers great scalability
- + Offers load balancing
- + Supports a large userbase
- + Supports a large set of site collections

Disadvantages:

- Requires more resources
- Requires more troubleshooting due to applications being separated
- Requires more licensing

Given the requirements of the hospital, a SharePoint Server Farm will allow further growth, more site collections, and a larger user base. As SharePoint grows, resource usage increases and starts to hinder performance. The intention of this implementation is to provide high-availability and an efficient user experience and can be effectively done so using a farm configuration.

## Technical Documentation

To further understand the requirements of a SharePoint Farm configuration, system specs and requirements will be provided for all applications that SharePoint utilizes. Referring to Figure 3.2, this type of configuration



requires six virtual servers to be used in the deployment. This section is going to cover the system requirements for each of the virtual servers as well as the configuration and deployment of the servers.

### System Requirements and Functions

Below, you will find all system, prerequisite, and service requirements needed to complete a SharePoint installation. These settings must be configured and installed prior to installing SharePoint Server 2019 as many of the services it utilizes are dependent on them. All supporting installers are included in the SharePoint Server 2019 installation folders and must be ran on all instances of the SharePoint servers within the farm. Failure to do so can result in services not working, corrupt installations, and instability.

Provided are a list of the application servers and their function that are required for a SharePoint farm configuration (Docs.microsoft.com, 2010). It's important to note what each server role is, and the system requirements needed for each server. This will further illustrate load balancing and the pool of resources that the farm configuration has access to.

- SharePoint Application Server – The application server handles all key services for applications of the farm. This is a good place to run the administration console for a SharePoint Site Collection, which is known as Central Administration

- SharePoint SQL Server – SQL server that hosts the SharePoint database and all queries made. Any information regarding site apps, lists, libraries, users, or permissions are written to this SQL database.
- SharePoint Office Server – Supports all Office web applications on SharePoint. This enables Word, Excel, PowerPoint, and Visio to be used within document libraries.
- SharePoint Front End Server – Redirects user requests as users begin to access SharePoint sites. As you build more sites within a site collection, this will be useful when creating a central hub and shortcuts to other sites.
- SharePoint Cache Server – Allows information to be quickly cached and retrieved without querying SQL.
- SharePoint Search Server – Performs all site crawling which indexes all information and documents on SharePoint sites. Allows documents and other information to be searched with a SharePoint site.

Table 3.1 SharePoint Server Requirements (Plumley, 2018).

<b>Server</b>	<b>Processor</b>	<b>RAM</b>	<b>Disk Space</b>
Application	4 Core – 64 Bit	16 GB	80GB - Primary 100 GB - Secondary
SQL	4 Core – 64 Bit	16 GB	80GB - Primary 100 GB - Secondary

Front End	4 Core – 64 Bit	16 GB	80GB - Primary 100 GB - Secondary
Cache	4 Core – 64 Bit	16 GB	80GB - Primary 100 GB - Secondary
Search	4 Core – 64 Bit	16 GB	80GB - Primary 100 GB - Secondary

Table 3.1 shows the minimum system requirements for all SharePoint servers. When split up, each server has the listed resources available which will prevent bottlenecks in services. It is important to follow a naming scheme for your servers that appropriately identifies the function of the specific server. Here are examples of the naming scheme for the CSUSB SharePoint servers.

- CSUSB-SPAPP – Application server
- CSUSB-SPSQL – SQL server
- CSUSB-SPFEND – Front-end server
- CSUSB-SPCACHE – Cache server
- CSUSB-SPSEARCH – Search server

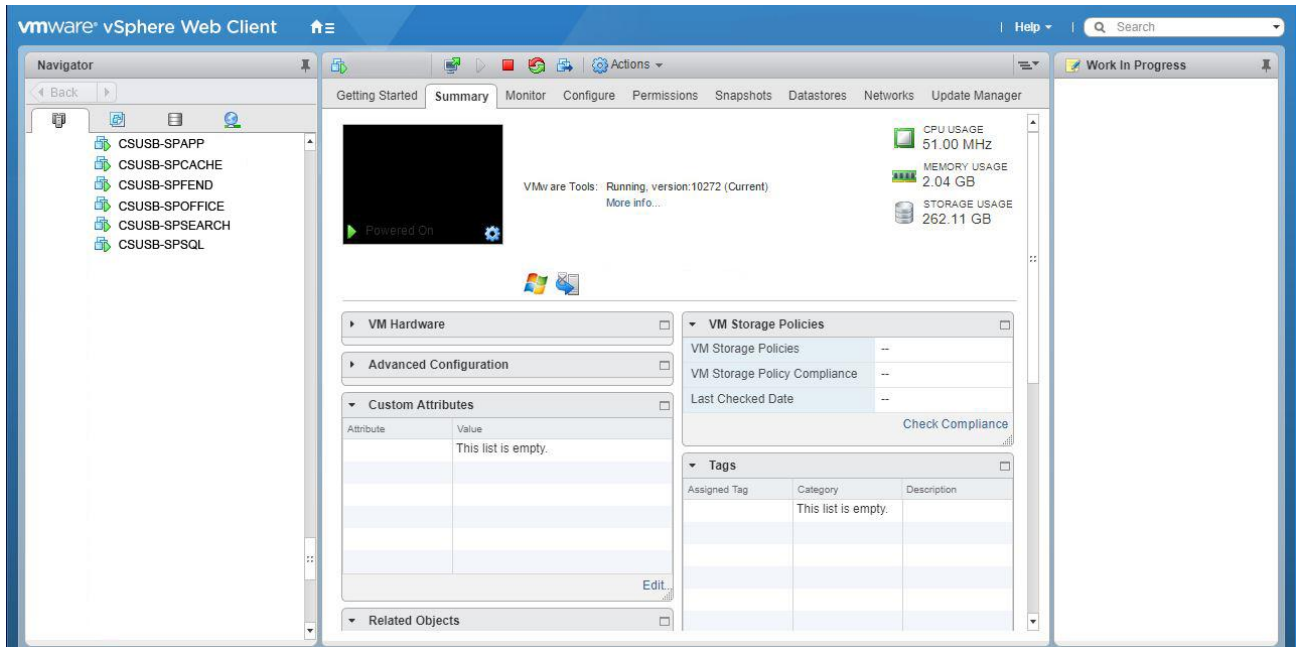


Figure 3.3 Virtual machine deployment in vSphere.

Figure 3.3 shows the deployment of all the SharePoint VMs used in this setup. The following section will provide the software and service required for the installation of SharePoint On-Premises.

### Prerequisite Software and Services

The following services and features must be installed or enabled per Microsoft's requirements (Plumley, 2018):

- Web Server (IIS) Role
- Microsoft SQL Server 2012 SP4
- Microsoft Sync Framework Runtime v1.0
- Microsoft .NET Framework 3.5

- Microsoft .NET Framework 4.7.2
- Microsoft WCF Data Services 5.6
- Microsoft Information Protection and Control Client 2.1
- Microsoft Sync Framework Runtime v1.0 SP1
- Cumulative Update Package 7 (KB3092423)
- Visual C++ Redistributable Package for Visual Studio 2012
- Visual C++ Redistributable Package for Visual Studio 2017

Once all the required software has been installed and enabled, SharePoint 2019 Server can be installed. SharePoint's installation and implementation will be covered in the upcoming sections of this chapter.

### Installation Guide - Prerequisites

This section is going to provide a comprehensive guide on installing the prerequisites for SharePoint On-Premises. It is assumed that the VMs have been set up with the appropriate specifications listed in Table 4.1. The steps for installation are provided below. Please note, these steps must be followed for each server in the farm configuration, excluding the Office Applications server. Microsoft documentation was referenced during this deployment (Plumley, 2018).

1. Log in to the server with an admin account or service account that will be used to manage SharePoint.
2. Mount the ISO file for SharePoint 2019. This will provide the necessary installers to require the prerequisites and SharePoint.

3. Open the mounted ISO drive and open the splash.html file. This will launch the SharePoint installation splash screen.

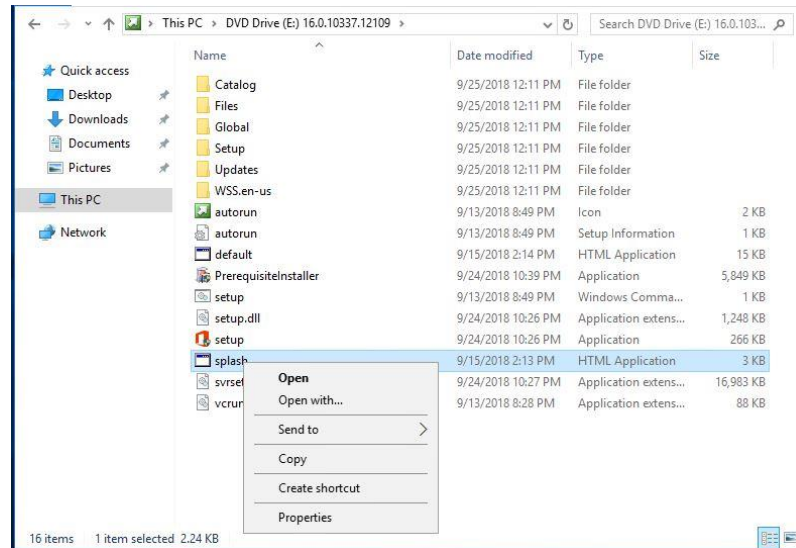


Figure 3.4 Shows the *splash.html* file.

4. The first step is to install the software prerequisites. Select Install software prerequisites.

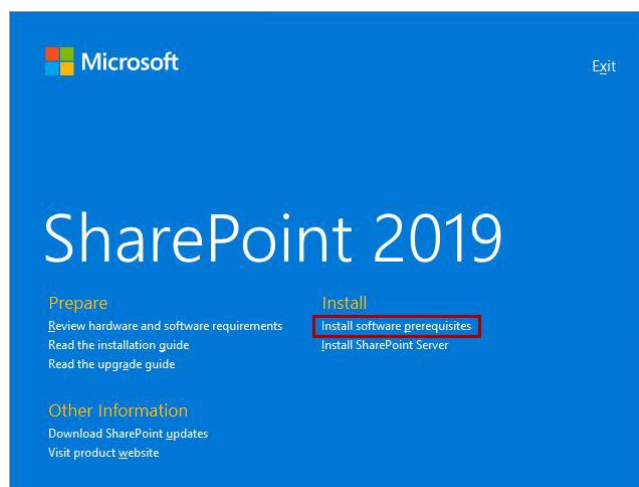


Figure 3.5 Install software prerequisites.

- a. Select Next and the installer will install all prerequisites.
- b. Once done, select Finish and the server will reboot.

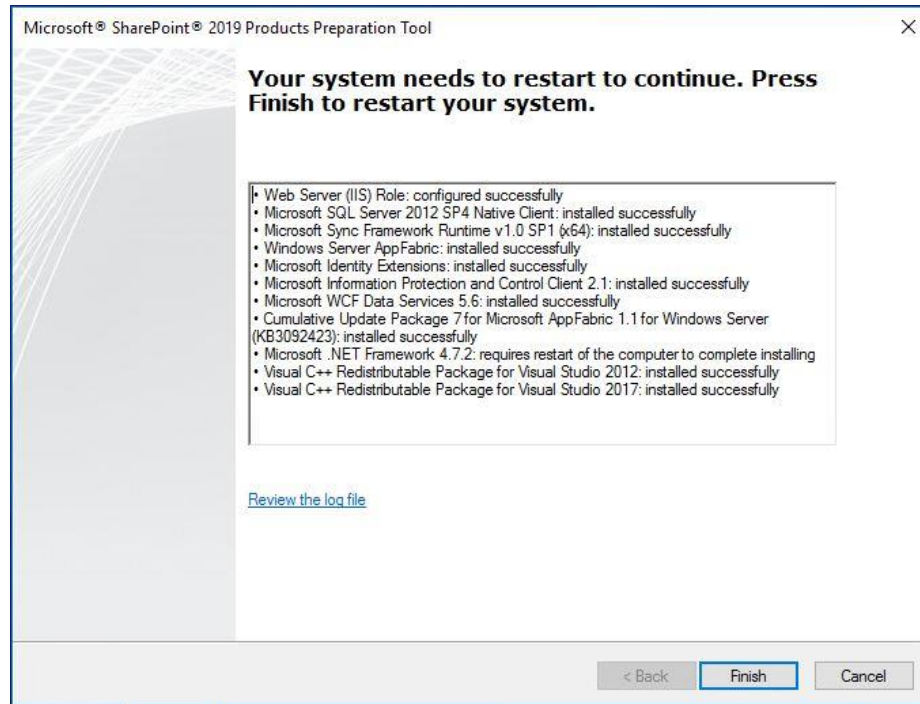


Figure 3.6 Installation complete.

5. Following reboot, go back to the mounted ISO and open the splash.html file. On the SharePoint splash screen, select Install SharePoint Server.
  - a. After the Microsoft SharePoint Server 2019 window opens, it will ask to enter your product key. Input your SharePoint product key.
  - b. Select Continue next to the input box after typing in the product key.

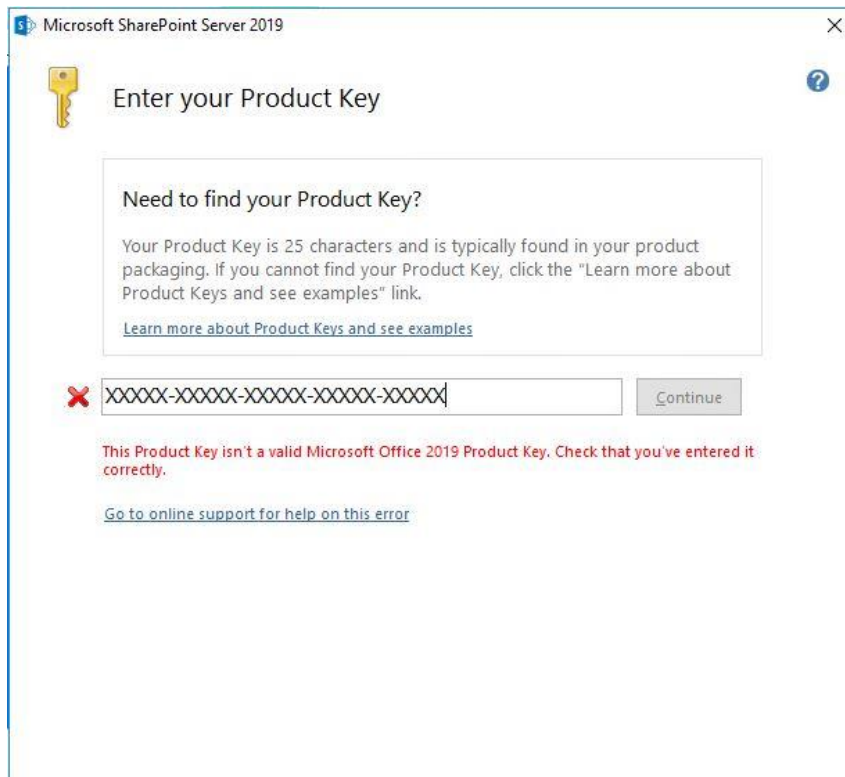


Figure 3.7 Product key window.

- c. Accept the terms of agreement and select Next.
- d. The following window will ask for the installation and data file paths.
  - i. The secondary drives for these VMs will be used for the file paths. (E:\Microsoft Office Servers)
  - ii. Alternatively, clicking Browse will allow you to select the location in a File Explorer window. One selected, select Install Now.



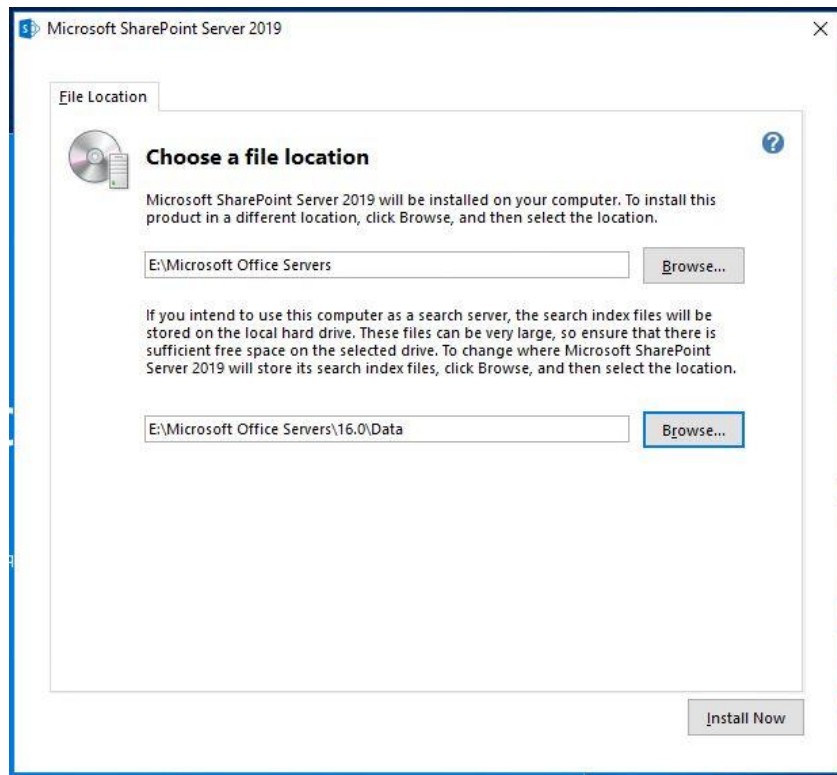


Figure 3.8 File location menu

- e. After the installation completes, uncheck Run the SharePoint Products Configuration Wizard box. This will be done later after the installation has been done on each server.

It's imperative that these steps must be completed on all servers prior to farm configuration. Failure to do so will not allow further configuration of the farm.

### Installation Guide – Farm Configuration

Farm configuration can continue after the VMs have been restarted and prerequisite installations are complete. This configuration allows the SharePoint site to communicate on the back end to provide site functionality. For this

configuration, the Application server must be the server that is configured first. As the installation progresses, the other servers will connect to an existing server farm, which will be explained in the following guide.

1. To start, log in to the Application Server with an admin account or service account that will be used to manage SharePoint.
2. From the Windows Start Menu, scroll down to Microsoft SharePoint 2019.
  - a. Right click on SharePoint 2019 Products Configuration and select Run as administrator.

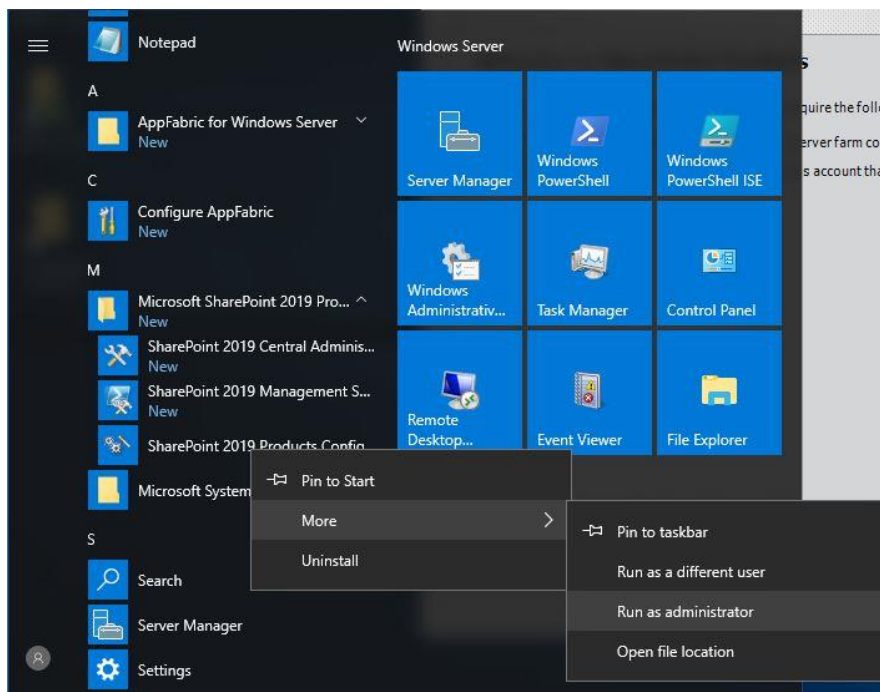


Figure 3.9 Start menu location.

- b. Select Next after the SharePoint Products Configuration Wizard opens.

- i. Services are going to be restarted during this process. Click Yes on the small pop-up to allow the wizard to authorize the restart.

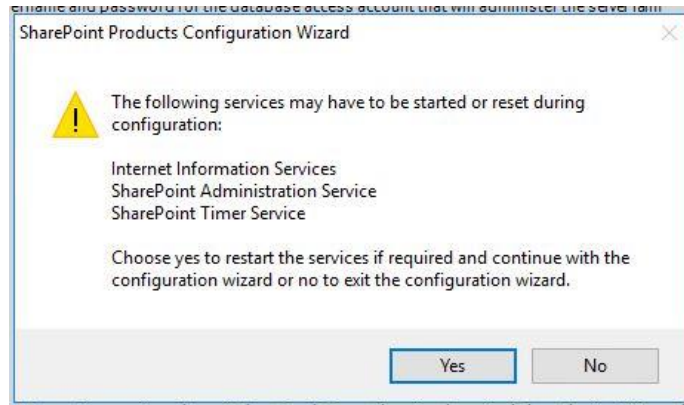


Figure 3.10 Restart services request window.

3. Once the Connect to a server farm window opens, select Create a new server farm and select next. The application server is going to be the initial server for our farm.

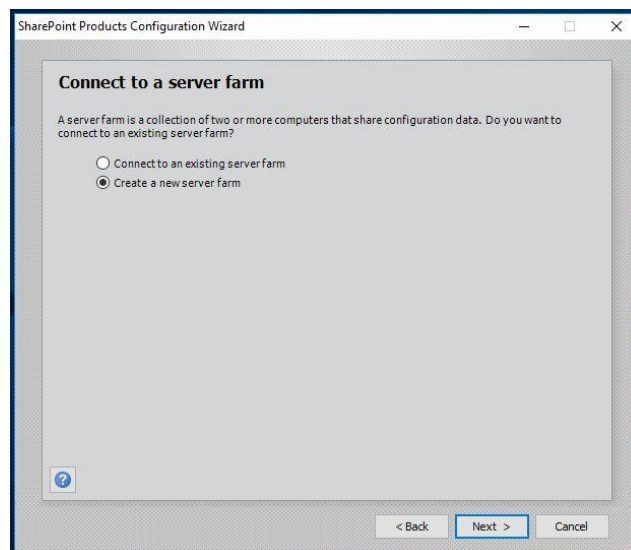


Figure 3.11 Create a new server farm

4. In the next window, it is requiring database information which includes the SQL server name, database name, and username. Fill in the appropriate information and select Next.
  - a. Database Server: Name of the SharePoint SQL Server.
    - i. For example: CSUSB-SPSQL
  - b. Database Name: Give the database a name.
    - i. For example: CSUSB SharePoint
  - c. Username: Domain Account that has database and admin access.
    - i. CSUSB\zmckellar

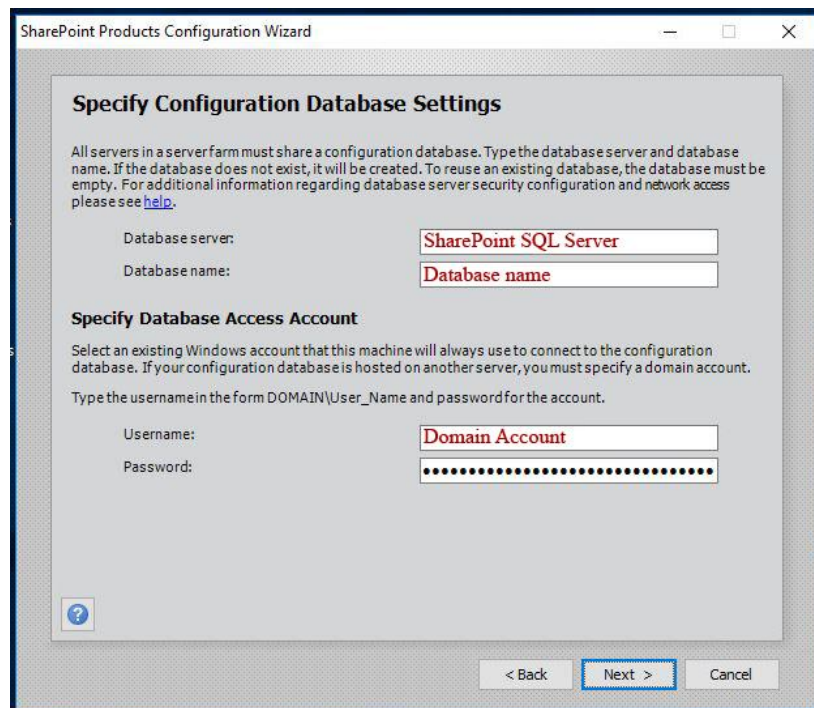


Figure 3.12 Configuration information window.

5. In the Specify Farm Security Settings window, a passphrase will need to be created that will be used across all farm servers. This passphrase allows additional farm servers to be added to the existing farm. Take note of the passphrase once it has been entered and confirmed.
  - a. After creating and confirming the passphrase, select Next to continue.
6. The next section is going to be unique for the rest of the farm configuration. It is asking to specify the server role. In each instance, the server the wizard is being run from is the role it will inherit for the farm.

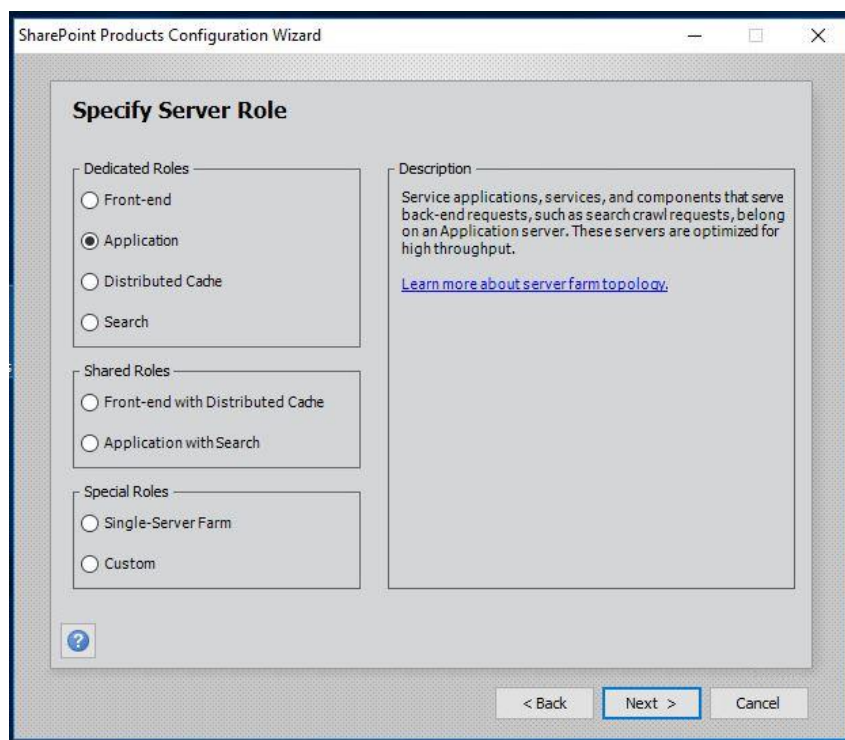


Figure 3.13 Role specification window.

7. Under the dedicated roles section, select Application and then Next.

- a. In this case, the reason why Application is selected is because the farm configuration wizard is being run on from application server. Each of the remaining servers are shown under the dedicated roles section.
  - i. CSUSB-SPFEND – Select Front-End.
  - ii. CSUSB-SPCACHE – Select Distributed Cache.
  - iii. CSUSB-SPSEARCH – Select Search.
8. In the next window, it is requesting a port number that will be used for all SharePoint sites within the site collection. Additionally, select NTLM as the authentication provider then select Next.

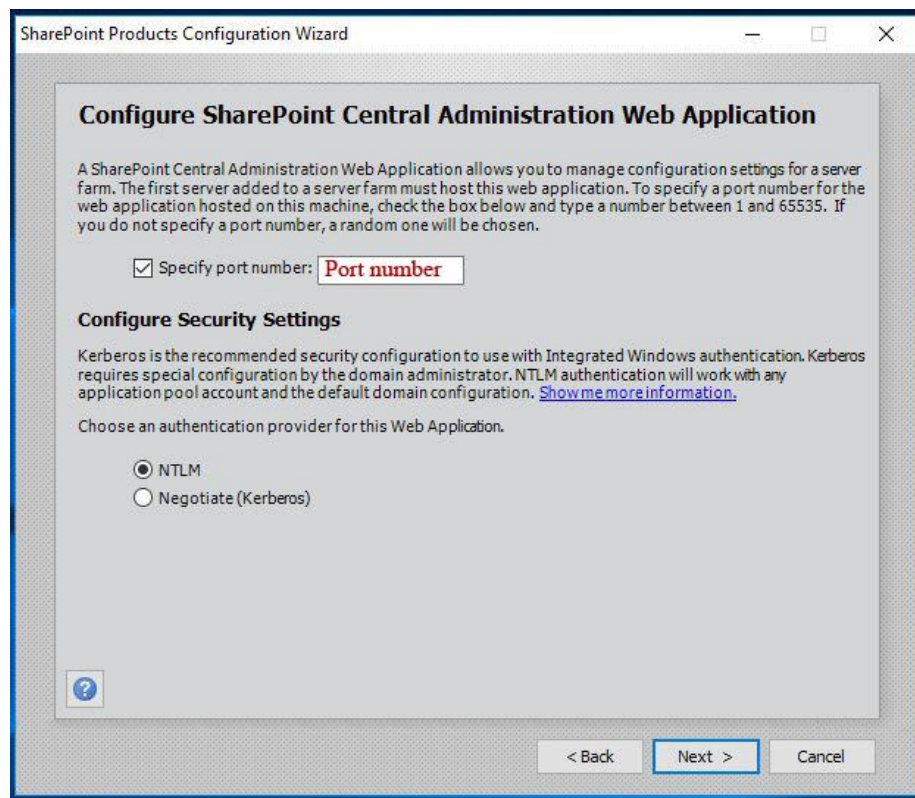


Figure 3.14 Port number assignment.

- a. Once a port number is selected, verify that it is added in the exclusions list on the enterprise firewall. If an exception is not made, users will be unable to connect to the site.
9. The last window is going to populate with the Database Server and Database name entered in the Database Information window.
- a. It's important to verify that the information is correct to ensure proper connectivity to the database server and SQL database. Additionally, the Central Administration URL is provided.

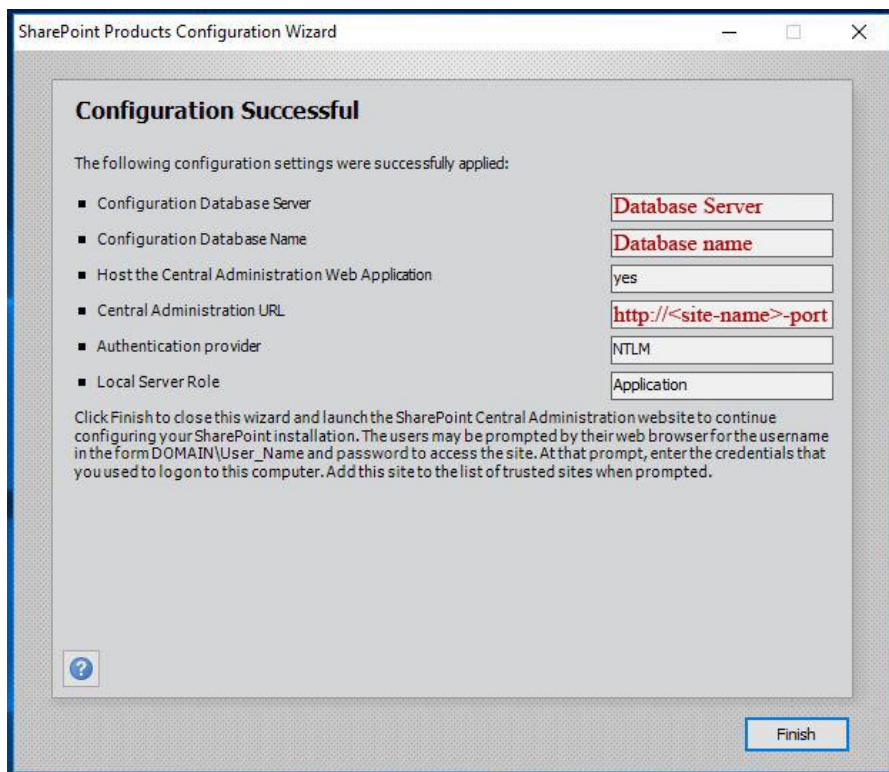


Figure 3.15 Configuration success window.

The Central Administration URL is used to access the SharePoint farm configuration. It is used to administer changes to the site collections and farm. In these menus, an administrator has access to start or stop services, add additional servers to the farm, and generate additional site collections, which are used to host various SharePoint sites.

b. Central Administration URL Example:

- i. <http://csusb-spapp:1919/>

After finishing the set-up, the Central Administration site can be accessed.

Installation Guide – Adding Additional Servers.

Following the first server configuration, all remaining application servers must be added to the farm. This section is going to cover the process of adding the server to allow the sites access to communicate with one another. These steps are similar to the previous section.

1. Log in to the next application server with an admin or service account.

There is not a required order for the remaining servers in this installation.

2. Following the installation of prerequisites from the last section, the configuration wizard should be installed on the server.
3. Right click on SharePoint 2019 Products Configuration and select Run as administrator.
4. After the Connect to a server farm window opens, select Connect to an existing farm.



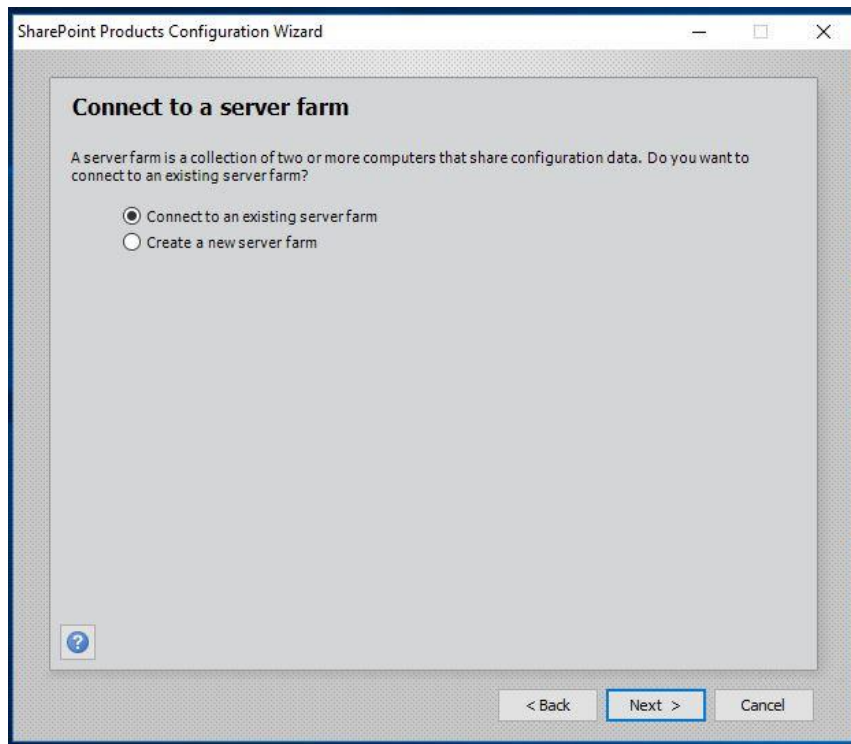


Figure 3.16 Connect to an existing farm.

- a. This option is going attach the remaining servers to the server farm.  
On the remaining servers, this process will need to be done.
5. Once again, select the dedicated role of the server. Ensure the appropriate server is assigned to the correct role and select Next.
  - a. CSUSB-SPFEND – Select Front-End.
  - b. CSUSB-SPCACHE – Select Distributed Cache.
  - c. CSUSB-SPSEARCH – Select Search.

6. In the next screen, input the SharePoint SQL Server name into the database server field and select, Retrieve Database Names.

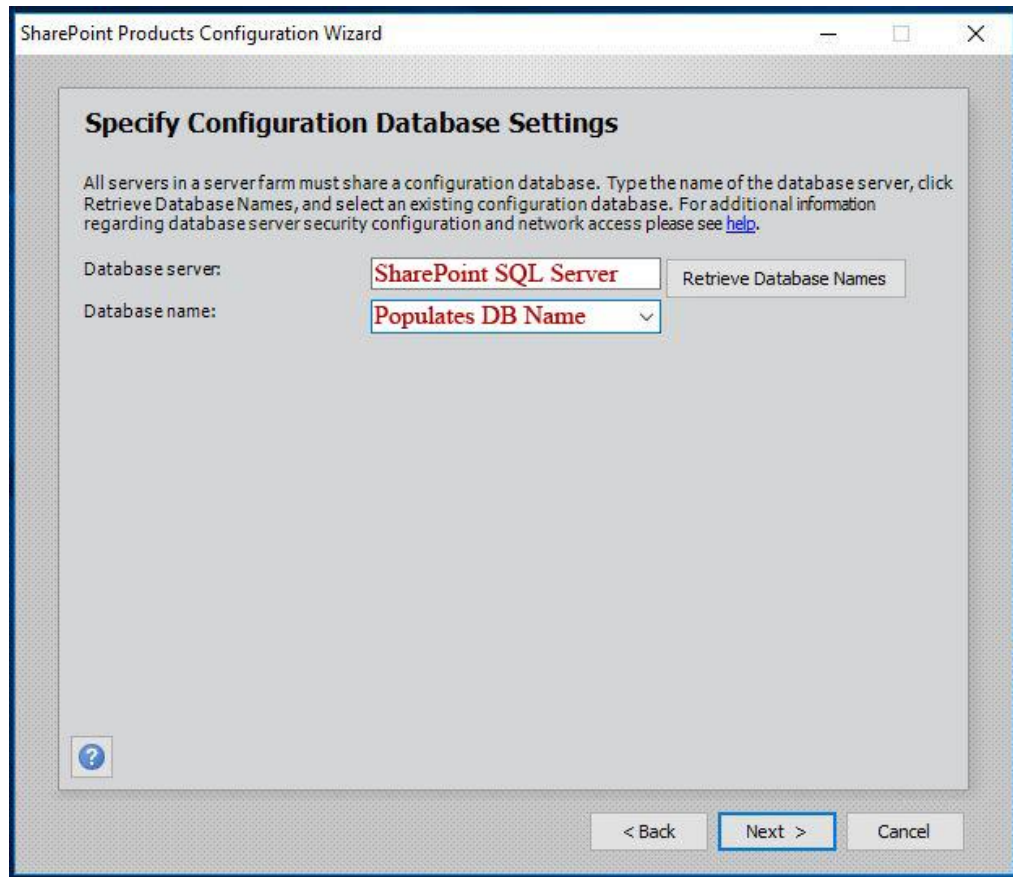


Figure 3.17 Retrieve the database name.

- a. The database name will populate the database name after it is retrieved.
7. The passphrase created in the application server setup will be required to complete the installation. After typing in the passphrase, select Next, and this will continue to the configuration successful window.

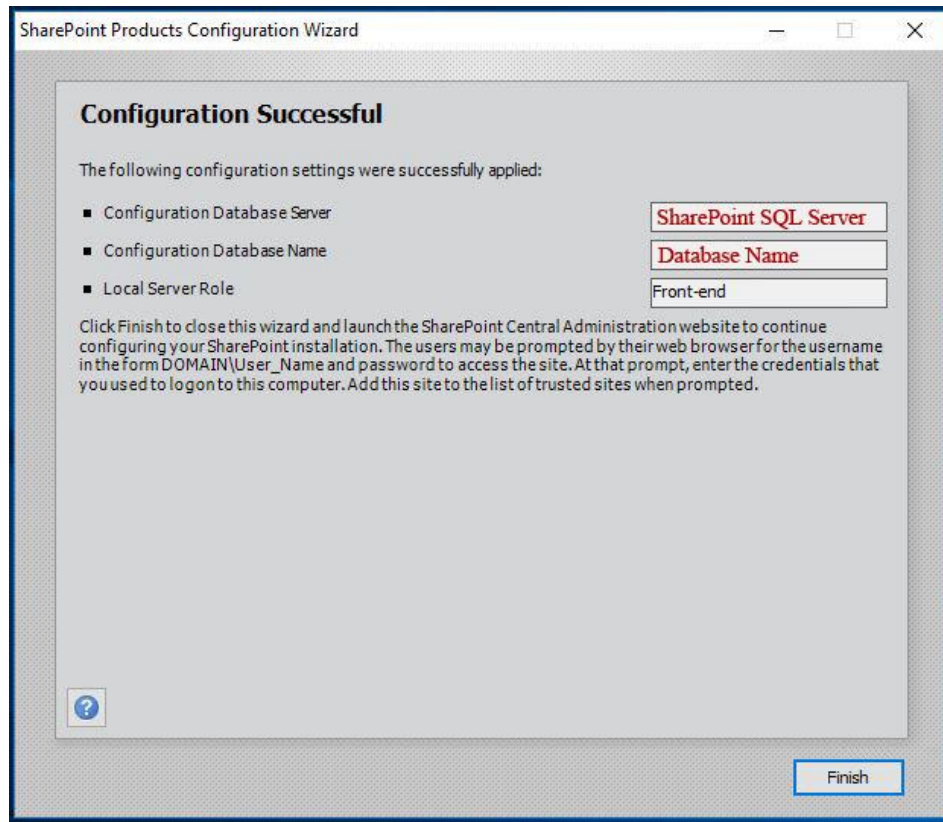


Figure 3.18 Successful configuration screen.

- a. A successful configuration will display the SQL server name, database name, and the role that was selected. Once this happens, select Finish to conclude the installation.
  - i. Please note, this will need to be repeated on the remaining servers.
8. In order to confirm that the servers have been successfully added to the server farm, log in to the application server and go to Central Administration.

- a. This was the URL that was provided earlier during the initial SharePoint installation.
  - i. Central Administration: <http://csusb-spapp:1919/>
- b. From the home screen on Central Administration, look under the Systems Settings menu and open Manage servers in this farm.
- c. If the servers were successfully added, the server name will populate the red areas with the appropriate server names.

The screenshot displays the 'Servers in Farm' page in SharePoint Central Administration. On the left is a navigation menu with options like 'Application Management', 'System Settings', and 'Monitoring'. The main content area shows 'Farm Information' with details such as 'Configuration database version: 16.0.10337.12109' and 'Configuration database server: SharePoint SQL Server'. Below this is a table listing the servers in the farm.

Server	SharePoint Products Installed	Role	Compliant	Services Running	Status	Remove Server
<b>Application Server</b>	Microsoft SharePoint Server 2019	Application	Yes	Central Administration Microsoft SharePoint Foundation Incoming E-Mail Microsoft SharePoint Foundation Web Application Microsoft SharePoint Foundation Workflow Timer Service	No Action Required	Remove Server
<b>Cache Server</b>	Microsoft SharePoint Server 2019	Distributed Cache	Yes	Distributed Cache	No Action Required	Remove Server
<b>Front-End Server</b>	Microsoft SharePoint Server 2019	Front-end	Yes	Microsoft SharePoint Foundation Web Application	No Action Required	Remove Server
<b>SQL Server</b>		External		Microsoft SharePoint Foundation Database	No Action Required	Remove Server
<b>Search Server</b>	Microsoft SharePoint Server 2019	Search	Yes	Search Host Controller Service Search Query and Site Settings Service SharePoint Server Search	No Action Required	Remove Server

Figure 3.19 Central Administration farm view.

At this point, SharePoint has been successfully deployed. Some of the tasks that follow are to set up user permissions for access, a backup schedule, and crawl settings that will be used to index the files and key terms on the SharePoint site. Following deployment, the functionality of the Epic site was stable, and the hospital began to build a userbase of roughly 30 members over

one site collection. Over a span of a month, the Epic SharePoint site supports 200 users concurrently. Additionally, an informational site was created and shared with all employees in the hospital in order to provide communication, updates, and news regarding the Epic Implementation.

## CHAPTER FOUR

### POST DEPLOYMENT

#### Chapter Overview

Following installation, some unknown troubleshooting and integration took place to accommodate additional features that the project managers wanted. These were not originally planned for within the project scope, but these tasks were important to provide functionality to the Epic SharePoint site. Below, these challenges will be provided with a resolution to the problem. Following that, an evaluation of the current state of the SharePoint implementation will be provided.

#### Installation Challenges

As previously mentioned, some of the challenges that were faced were outside of the original project scope. When the SharePoint site was originally talked about, there were not many defined functions of the site beyond having a central file repository, calendar, and informational section. Once more users began to use the site, functional requests were made that would provide some additional features to the site. These requests are as follows:

- Office Online – Provides users with the option to Check In/Out and edit documents in a document library. Additionally, they allow the users with the options to edit with Office Online within the web browser or within the standalone application.

1. In order to provide Office Online functions, a Windows Server 2012 R2 or 2016 VM must be dedicated. This server cannot have SharePoint installed on it due to the requirements for the server (Wac, 2017).

Table 4.1 Office Application Server Requirement (Wac, 2017).

Server	Processor	RAM	Disk Space
Office Apps (Optional)	4 Core – 64 Bit	16 GB	80GB - Primary

2. Software Requirements:
  - a. Microsoft .NET Framework 4.7.2
  - b. Visual C++ Redistributable Package for Visual Studio 2013
  - c. Visual C++ Redistributable Package for Visual Studio 2015
  - d. Web Server (IIS)
  - e. Ink and Handwriting Services
3. After installing the required software, download Office Online Server.
4. Start the setup.exe file downloaded.
5. Accept the terms of agreement and select Continue.
6. Choose the installation location and select Install Now.
7. After it finishes installing, select Close.

8. Now that the software has been installed, a few commands need to be ran in PowerShell in order to enable the server farm configuration and protocol it will use. In this case, our servers are using HTTP.
  - a. Still on the Office Application Server, run PowerShell as administrator and enter the following command:
    - b. `Import-Module OfficeWebApps`
9. This command imports the Office Web application configuration which allows it to be added to the server farm (Jithin, 2018).
  - a. `New-OfficeWebAppsFarm -InternalURL http://CSUSB-SPOffice - AllowHttp -EditingEnabled`
10. Assigns the Office Web apps to the server farm.
11. After entering these commands, close PowerShell and open Internet Explorer.
  - a. Enter the following site to test that the Office Online Servers are working.
  - b. `http://CSUSB-SPOffice/hosting/discovery`



```

<?xml version="1.0" encoding="UTF-8"?>
- <wopi-discovery>
  - <net-zone name="internal-https">
    - <app name="Excel" checkLicense="true"
      faviconUri="https://oos.contoso.com/x/_layouts/images/FavIcon_Excel.ico">
      <action name="view" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        <ui=UI_LLCC&><rs=DC_LLCC&>" default="true" ext="ods"/>
      <action name="view" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        <ui=UI_LLCC&><rs=DC_LLCC&>" default="true" ext="xls"/>
      <action name="view" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        <ui=UI_LLCC&><rs=DC_LLCC&>" default="true" ext="xlsb"/>
      <action name="view" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        <ui=UI_LLCC&><rs=DC_LLCC&>" default="true" ext="xlsm"/>
      <action name="view" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        <ui=UI_LLCC&><rs=DC_LLCC&>" default="true" ext="xlsx"/>
      <action name="edit" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        edit=1&<ui=UI_LLCC&><rs=DC_LLCC&>" ext="ods" requires="update"/>
      <action name="edit" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        edit=1&<ui=UI_LLCC&><rs=DC_LLCC&>" ext="xlsb" requires="update"/>
      <action name="edit" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        edit=1&<ui=UI_LLCC&><rs=DC_LLCC&>" ext="xlsm" requires="update"/>
      <action name="edit" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        edit=1&<ui=UI_LLCC&><rs=DC_LLCC&>" ext="xlsx" requires="update"/>
      <action name="editnew" urlsrc="https://oos.contoso.com/x/_layouts/xlviewerinternal.aspx?
        edit=1&new=1&<ui=UI_LLCC&><rs=DC_LLCC&>" ext="xlsx" requires="update"/>
      <action name="interactivepreview" urlsrc="https://oos.contoso.com/x/_layouts/xlpreview.aspx?
        <ui=UI_LLCC&><rs=DC_LLCC&>" ext="xlsb"/>
      <action name="interactivepreview" urlsrc="https://oos.contoso.com/x/_layouts/xlpreview.aspx?
        <ui=UI_LLCC&><rs=DC_LLCC&>" ext="xlsm"/>
    
```

Figure 4.1 Office Online test (Jithin, 2018).

12. If the webpage returns similar results as Figure 4.1, then the configuration was successful.
13. The last step of this process is to log on to the Applications SharePoint server as an administrator or the service account.
14. After logging in, go to the start menu, and under Microsoft SharePoint 2019, open SharePoint 2019 Management Shell as an administrator.
15. In the Management Shell, enter the following:
  - a. New-SPWOPIBinding -ServerName CSUSB-SPApp - AllowHTTP
16. Once complete, close the Management Shell and your Office Online applications should now work.

17. This can be tested by going to Central Administration, under the Systems Settings menu and open Manage servers in this farm.

- SMTP Settings – Sends emails to users when SharePoint interacts with users. For example, sites are shared, permissions are granted, tasks are assigned, etc.
  1. In Central Administration, go to System Settings.
  2. Under Email and Text Messages (SMS) select Configure Outgoing Emails.
  3. In this menu, provide the SMTP server the enterprise uses, and email address notifications will come from.

Warning: This page is not encrypted for secure communication. User names, passwords, and any other information will be sent in clear text. For more information, contact your administrator.

Mail Settings

Specify the SMTP mail server to use for Microsoft SharePoint Foundation e-mail-based notifications for alerts, invitations, and administrator notifications. Personalize the **From address** and **Reply-to address**.

Outbound SMTP server:

Outbound SMTP server port:

From address:

Reply-to address:

Character set:

Mail Security

Specify the authentication credentials Microsoft SharePoint Foundation will use to connect to the SMTP mail server. If the SMTP mail server doesn't require authentication, select **Anonymous**.

**Note:** You must set an application credential key on each server in the farm before specifying credentials. [Learn about configuring e-mail settings.](#)

Set **Use TLS connection encryption** to Yes to require Microsoft SharePoint Foundation to establish an encrypted connection to the SMTP mail server before sending e-mail. If this is set to Yes and an encrypted connection can't be established, no e-mails will be sent.

SMTP server authentication:  
 Anonymous  
 Authenticated

User name

Password

Use TLS connection encryption:  
 Yes  No

Figure 4.2 SMTP settings

- Office Visio Support – Gives access to Visio support that allows users to view, open, and edit Visio documents within the SharePoint site.
  1. Log in to the SharePoint Central Administration website.
  2. Under the Application Management section, select Manage service applications.
  3. On the top left of the screen, select New and then select Visio Graphics Service from the drop-down menu.
  4. Choose Use an existing application pool to add this service to.
    - a. By default, when a new instance of SharePoint Server is installed, there will be one application pool.
  5. Verify that the Create a Visio Graphics Service Applications Proxy is checked, then select Ok.

	Name	Type	Status
Central Administration			
Application Management	Application Discovery and Load Balancer Service Application	Application Discovery and Load Balancer Service Application	Started
System Settings	Application Discovery and Load Balancer Service Application	Application Discovery and Load Balancer Service Application Proxy	Started
Monitoring	Application Management	App Management Service Application	Started
Backup and Restore	Application Management	App Management Service Application Proxy	Started
Security	Search Administration Web Service for Search Service Application	Search Administration Web Service Application	Started
Upgrade and Migration	Search Service Application	Search Service Application	Started
General Application Settings	Search Service Application	Search Service Application Proxy	Started
Apps	Security Token Service Application	Security Token Service Application	Started
Office 365	User Profile Service	User Profile Service Application	Started
Configuration Wizards	User Profile Service	User Profile Service Application Proxy	Started
	Visio Graphics Service	Visio Graphics Service Application	Started
	Connection to Visio Graphics Service	Visio Graphics Service Application Proxy	Started
	WSS_UsageApplication	Usage and Health Data Collection Service Application	Started
	WSS_UsageApplication	Usage and Health Data Collection Proxy	Stopped
	Workflow Service Application Proxy	Workflow Service Application Proxy	Started

Figure 4.3 SharePoint services list. Note the status on the right.

6. Verify that the services have started in the Services window. To test, go to a document library and open a Visio Document to verify it works.
- Versioning Control – Creates versions of edited files and allows managers to approve changes prior to the document being published. Also allows for the manager to revert to a previous version.
    1. Versioning control can be enabled in different libraries within a SharePoint site. The administrator can enable versioning, determine how many versions that need to be kept, as well as require documents to be checked out prior to editing.
      - a. These options allow documents to be restored to a previous version and provide an audit log of who has edited a document.
    2. Navigate to the document library you wish to add versioning to.
    3. In the library, near the top right of the screen select the settings menu.
      - a. This is displayed as a gear icon.
      - b. Select Library settings.
    4. In the library settings, select Versioning settings.

**Content Approval**  
Specify whether new items or changes to existing items should remain in a draft state until they have been approved. [Learn about requiring approval.](#)

**Document Version History**  
Specify whether a version is created each time you edit a file in this document library. [Learn about versions.](#)

**Draft Item Security**  
Drafts are minor versions or items which have not been approved. Specify which users should be able to view drafts in this document library. [Learn about specifying who can view and edit drafts.](#)

**Require Check Out**  
Specify whether users must check out documents before making changes in this document library. [Learn about requiring check out.](#)

Require content approval for submitted items?  
 Yes  No

Create a version each time you edit a file in this document library?  
 No versioning  
 Create major versions  
 Example: 1, 2, 3, 4  
 Create major and minor (draft) versions  
 Example: 1.0, 1.1, 1.2, 2.0

Optionally limit the number of versions to retain:  
 Keep the following number of major versions:  
  
 Keep drafts for the following number of major versions:

Who should see draft items in this document library?  
 Any user who can read items  
 Only users who can edit items  
 Only users who can approve items (and the author of the item)

Require documents to be checked out before they can be edited?  
 Yes  No

OK Cancel

Figure 4.4 Versioning settings.

5. Adjust the settings as needed. If versioning needs to be enabled, select Create major versions and specify the number of versions.
  - a. Select Ok when all settings have been applied.
- Shared Calendar – Creates a shared calendar that can be used to schedule meetings and inform users of important deadlines. This can be linked to Outlook emails.

Having a central share calendar is important as it can be used to keep track of all things going on within a project. Considering that all users working on a project will need to track their meetings and progress to meet deadlines, providing a single calendar for all project members will improve time management.

1. Navigate to the SharePoint site home screen.
2. Near the top right of the screen select the settings menu which is displayed as a gear icon.
  - a. Select Add an app.
  - b. This menu provides a list of applications that can be added to a SharePoint site.
3. Select Calendar from the list.
  - a. After confirming the change, the site should navigate to the calendar.
4. User permissions can be changed to permit managers editing access, members read access, etc.
  - a. It's important to lock down a SharePoint calendar due to the amount of traffic a site may have.
5. An interesting feature is that these calendars can be linked to an Outlook email.
  - a. When done, the calendar will open as an addition calendar for a user in Outlook.

6. To do so, from the calendar page, navigate to the top left portion of the ribbon and select Calendar.

a. In this ribbon menu, users can select Connect to Outlook.

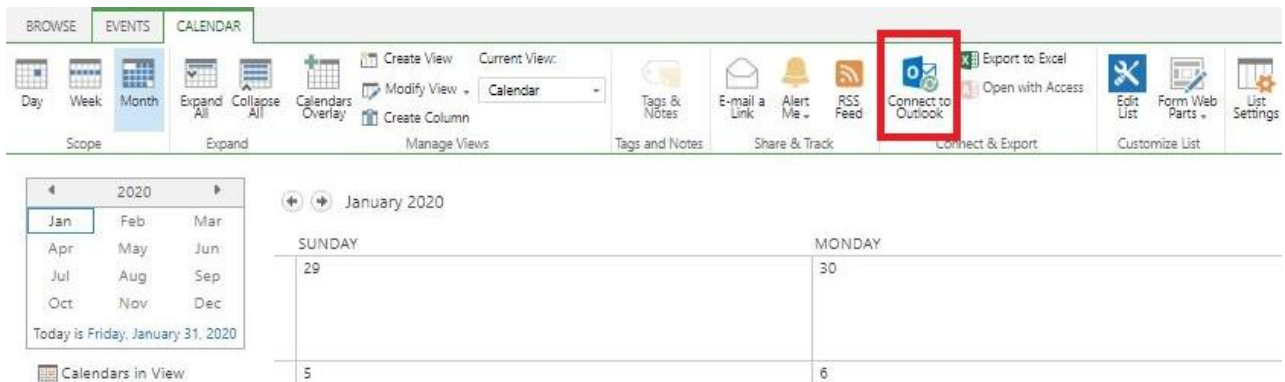


Figure 4.5 Connect to Outlook option in the Calendar Ribbon.

b. Please note, this option is workstation based and will require a user to connect to Outlook on new workstations.

- Search and Find File – After setting up a crawl schedule to index the SharePoint site, Search and Find a File allow the user to find and search for documents and key terms.

In order to Search and Find Files within SharePoint sites, a site crawl must be scheduled. This indexes the entire site and includes all documents, names, key terms, and text within a SharePoint site. There are a few ways to set up schedules. It can be done in increments, which span a few hours apart. Alternatively, it can be done outside the working window to reduce any impact it may have on the environment.

1. Connect to the Central Administration site for the SharePoint Site.
2. Under the Application Management menu, select Manage Service Applications.
3. From this menu, select the Search Service Application.
4. On the left-hand column under the Crawling section, select Content Sources. Select New Content Source to create a new crawling schedule.

Central Administration

Farm Search Administration

Search Administration

- Diagnostics
- Crawl Log
- Crawl Health Reports
- Query Health Reports
- Usage Reports

Crawling

- Content Sources
- Crawl Rules
- Server Name Mappings
- File Types
- Index, Reset
- Pause/Resume
- Crawler Impact Rules

Queries and Results

- Authoritative Pages
- Result Sources
- Query Rules
- Query Client Types
- Search Schema
- Query Suggestions
- Search Dictionaries
- Search Result Removal

Use this page to add a content source.

\* Indicates a required field.

**Name**

Type a name to describe this content source.

Name: \*

**Content Source Type**

Select what type of content will be crawled.

Note: This cannot be changed after this content source is created because other settings depend on it.

Select the type of content to be crawled:

- SharePoint Sites
- Web Sites
- File Shares
- Exchange Public Folders
- Line of Business Data
- Custom Repository

**Start Addresses**

Type the URLs from which the search system should start crawling.

This includes all SharePoint Server sites and Microsoft SharePoint Foundation sites.

Type start addresses below (one per line): \*

Example:  
http://intranetsite

**Crawl Settings**

Specify the behavior for crawling this type of content.

Selecting to crawl everything under the hostname will also crawl all the SharePoint Sites in the server.

Caution: After you select crawl settings for a SharePoint content source, you cannot change crawling behavior unless you re-create the content source. Verify that you select the option that best suits your needs.

Select crawling behavior for all start addresses in this content source:

- Crawl everything under the hostname for each start address
- Only crawl the Site Collection of each start address

**Crawl Schedules**

Select the crawl schedules for this content source.

Continuous Crawl is a special type of crawl that eliminates the need to create incremental crawl schedules and will seamlessly work with the content source to provide maximum freshness. Please Note: Once enabled, you will not be able to pause or stop continuous crawl. You will only have the option of disabling continuous crawl.

- Enable Continuous Crawls
- Enable Incremental Crawls

Incremental Crawl

None

Create schedule

Full Crawl

None

Create schedule

**Content Source Priority**

Select what the priority of this content source should be. The Crawl system will prioritize the processing of 'High' priority content sources over 'Normal' priority content sources.

Select the priority for this content source:

Normal

Figure 4.6 Crawl scheduling settings.



5. Figure 4.6 shows the options when creating a schedule crawl.

Multiple sites can be selected for a given schedule. Administrators also have the option to create multiple schedules for various sites.

- Group Permissions / Site Libraries – Create groups to disable site libraries based on user permissions. Provides easier management for libraries and users that can see and access them.

When creating groups, it's important to be mindful of the groups that will be accessing documents. For example, a site library will consist of managers, normal users, and potentially part-time or volunteer employees. Knowing this, they will all have varying access to things. Access should be restricted based on the roles these users will have throughout a project.

- User Notifications / Tasks and Documents – A workflow is a sequence of events that do a specific action when a requirement is met. In this case, a workflow needed to be created to notify users when tasks or documents were assigned to them. In this case, SharePoint Designer 2013 will be used to create the workflow.

SharePoint Designer is a useful tool that gives further control and access while modifying SharePoint sites. Unfortunately, it is not provided with the installation of the server but can be downloaded and installed. They allow the designer to program modifications into a site using HTML and Java. Additionally, it allows the designer to access features on the site in a variety of submenus.

1. Download and Install SharePoint Designer 2013 from the following:

- a. <https://www.microsoft.com/en-us/download/details.aspx?id=35491>
  - b. SharePoint Designer 2013 is the most recent version. It is compatible with SharePoint 2016 and 2019.
2. Once installed, open the application and open your SharePoint Site.
- a. Select Open Site then select your SharePoint Site.

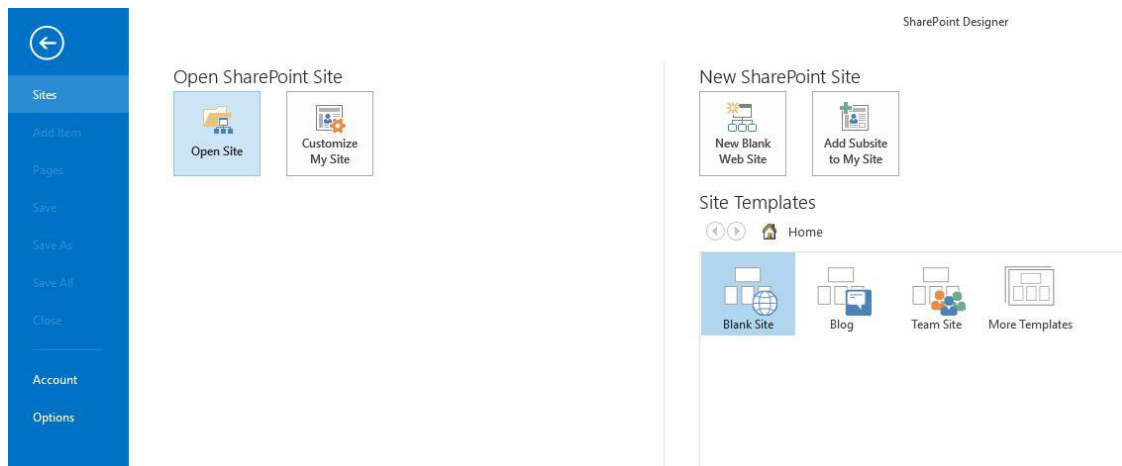


Figure 4.7 SharePoint Designer home page.

- b. After the site opens, you will be given information regarding the site.
3. On the top ribbon, workflows can be created to process actions throughout the site.
- a. In this case, the Workflow will be applied to the tasks list.

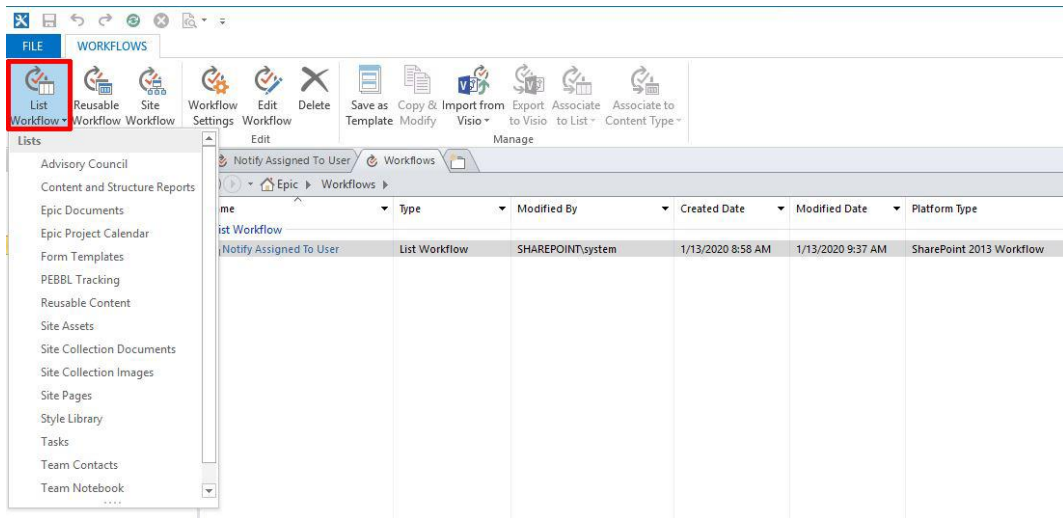


Figure 4.8 List workflow selection.

- b. On the ribbon, select List Workflow and choose the library it will be applied to.
  - c. Give the workflow an appropriate name and select Ok.
4. The next portion of the setup is going to define the criteria that needs to be met to process the workflow.

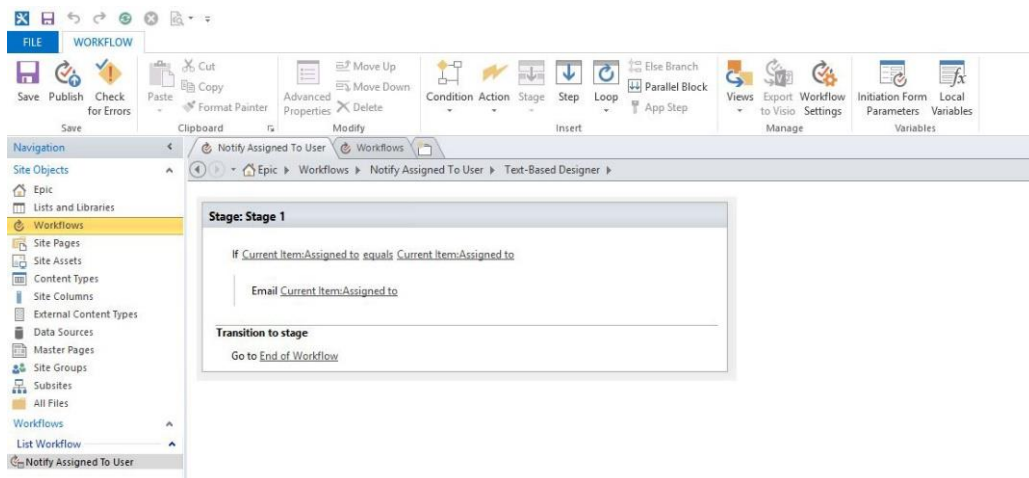


Figure 4.9 Workflow settings.

- a. If an item has a user assigned to a task or document, then it will email the currently assigned user.
- b. Selecting the Email Current Item:Assigned to section allows the email notification to be customized.

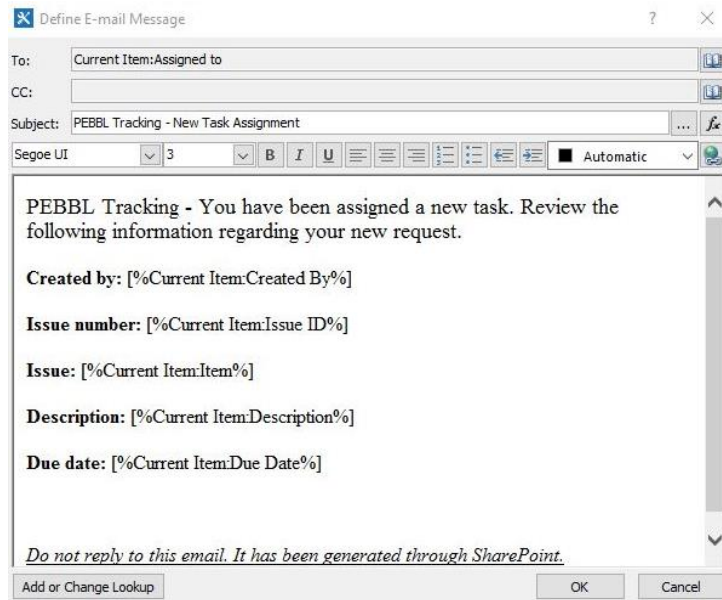


Figure 4.10 Customized email notification.

5. Once complete, on the top ribbon, select Save.
  - a. This saves the workflow.
6. Next, select Check for Errors.
  - a. This checks to see if there are any sequence errors in the workflow.
7. Lastly, select Publish.

- a. This publishes the workflow to the SharePoint site. The function can only be tested after publishing the website.

After saving and publishing these changes, any time a user is assigned a task within this task list, they will receive an email with the information that was defined in the settings.

These challenges required research and testing to implement them into the SharePoint site usage. As a result, these provided additional functionality to the users. As the project has progressed, alternative workflows and functions will be discovered.

## CHAPTER FIVE

### CONCLUSION

#### Chapter Overview

The focus of this chapter is to conclude the overall implementation and give an overview of the learning outcomes and where the SharePoint Implementation and EHR implementation are. It will also provide the impact SharePoint has had on the hospital as well as its current uses.

#### Learning Outcomes

These were some of the challenges that were faced following the deployment of SharePoint. The project managers wanted to have additional features and tools implemented within the site however, it was difficult to gauge what is possible in SharePoint on-premises as it is not heavily documented. Furthermore, SharePoint Online is primarily in use due to the cloud capabilities and Office 365 integration. Considering that most features are included in SharePoint Online setup, work arounds had to be researched to allow functions like those requested. In some cases, features that were requested were unavailable as they are cloud only options. At this point, solutions and integrations are being implemented as they come up.

Looking back, there were a few things that could have made this implementation easier. These are as follows:

- More open communications between the project managers and the IT Department.

When originally approached about this implementation, I was explained that my role was primarily to get the SharePoint Servers implemented for future use. There was really no set deadline, or what my roles would be after deployment. Following the deployment, project managers would approach me for access and inquiries about sites that were not communicated or requested for. Additionally, features were not requested until they were needed which led to needing extra time to research solutions. Overall, the original communicated role and what I ended up doing were completely different.

- Predetermined groups and appropriate permissions.

While working with the project managers, planning groups and permissions were not created prior to deployment. Managers requested to have admin control over the SharePoint sites, which is not bad, but it led to unknown permissions being granted. Soon, users began to inherit unknown permissions as their access was not communicated. After re-creating permissions, a plan was set in place on any future authorizations for users.

- Set deadlines on the implementation of SharePoint and sites.

During this deployment, there were not set dates on when SharePoint needed to be up and running. Unfortunately, these were requested on an as needed basis which meant that I would not have much time between the site request and the creation of the site. This made my other roles and responsibilities as an

information systems analyst difficult as I would need to re-prioritize addition projects on a weekly basis. Although I was able to deliver all sites and features on times, it required additional time to plan and research solutions.

- Predetermined plans on future sites and functionality of the SharePoint sites.

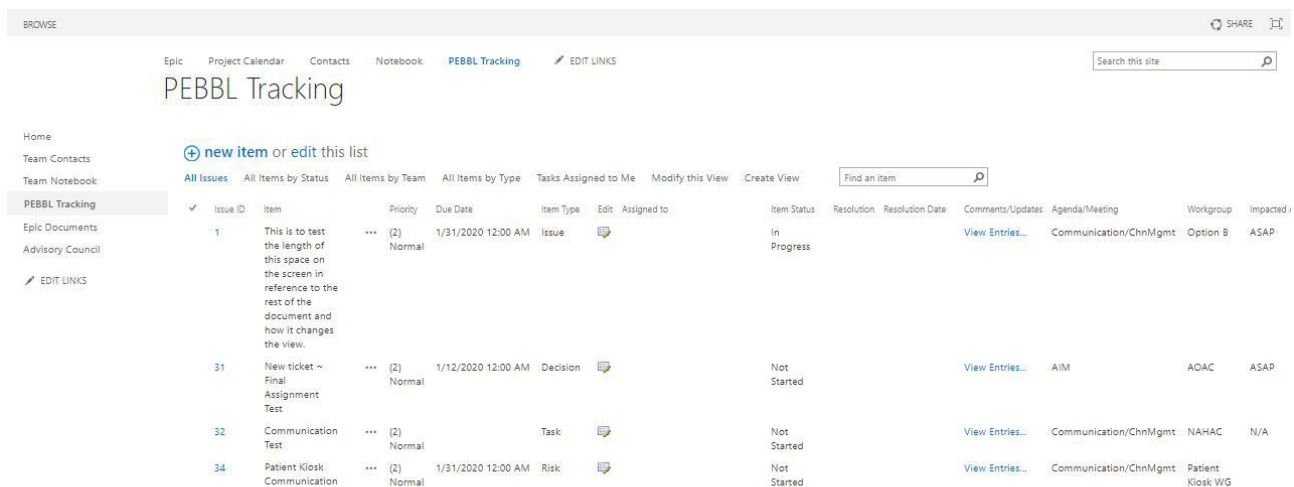
Once again, there were no planned sites or site features. When originally planning, the EHR project team requested one site to support the Epic EHR implementation. This quickly grew to three sites, which changed the scope of the userbase and access per site. After these were deployed, site features and additional information were requested as most of the project team and site managers did not have any prior experience within SharePoint. As requests came in, I would have to rush to find solutions. As SharePoint usage increased, it became difficult to find solutions in a timely manner. Additionally, it was difficult to find time to train users on the usage and management of the sites.

In this situation, I was fortunate to have administrator and server rights in the environment which made it easier to work on troubleshooting problems and implementing solutions. This project stressed the importance of having open communication amongst the team, communication with the users, deadlines, and plans for future support or maintenance. Overall, this implementation helped me bolster my time management and administration skills.



## Project Status

SharePoint has been successfully deployed within the environment and is currently hosting a few sites. As additional users and groups are included in the Epic implementation, groups and permissions are being created to facilitate access. The Epic project is projected to span over 2 years, so SharePoint is going to prove to be a vital tool for its integration. In the meantime, some of the upcoming goals are to have a public facing website that will allow easier access to 3<sup>rd</sup> parties during the duration of the project. Below, examples of the SharePoint sites are provided to show some of its uses.



Issue ID	Item	Priority	Due Date	Item Type	Item Status	Resolution	Resolution Date	Comments/Updates	Agenda/Meeting	Workgroup	Impacted
1	This is to test the length of this space on the screen in reference to the rest of the document and how it changes the view.	Normal (2)	1/31/2020 12:00 AM	Issue	In Progress			View Entries...	Communication/ChnMgmt	Option B	ASAP
31	New ticket ~ Final Assignment Test	Normal (2)	1/12/2020 12:00 AM	Decision	Not Started			View Entries...	AIM	AOAC	ASAP
32	Communication Test	Normal (2)		Task	Not Started			View Entries...	Communication/ChnMgmt	NAHAC	N/A
34	Patient Kiosk Communication	Normal (2)	1/31/2020 12:00 AM	Risk	Not Started			View Entries...	Communication/ChnMgmt	Patient Kiosk WG	

Figure 5.1 List used for monitoring tasks.

Figure 5.1 shows a task tracking system that is in use. Additional filters were created and given to all users. A workflow was created to notify users when a task is assigned to them.

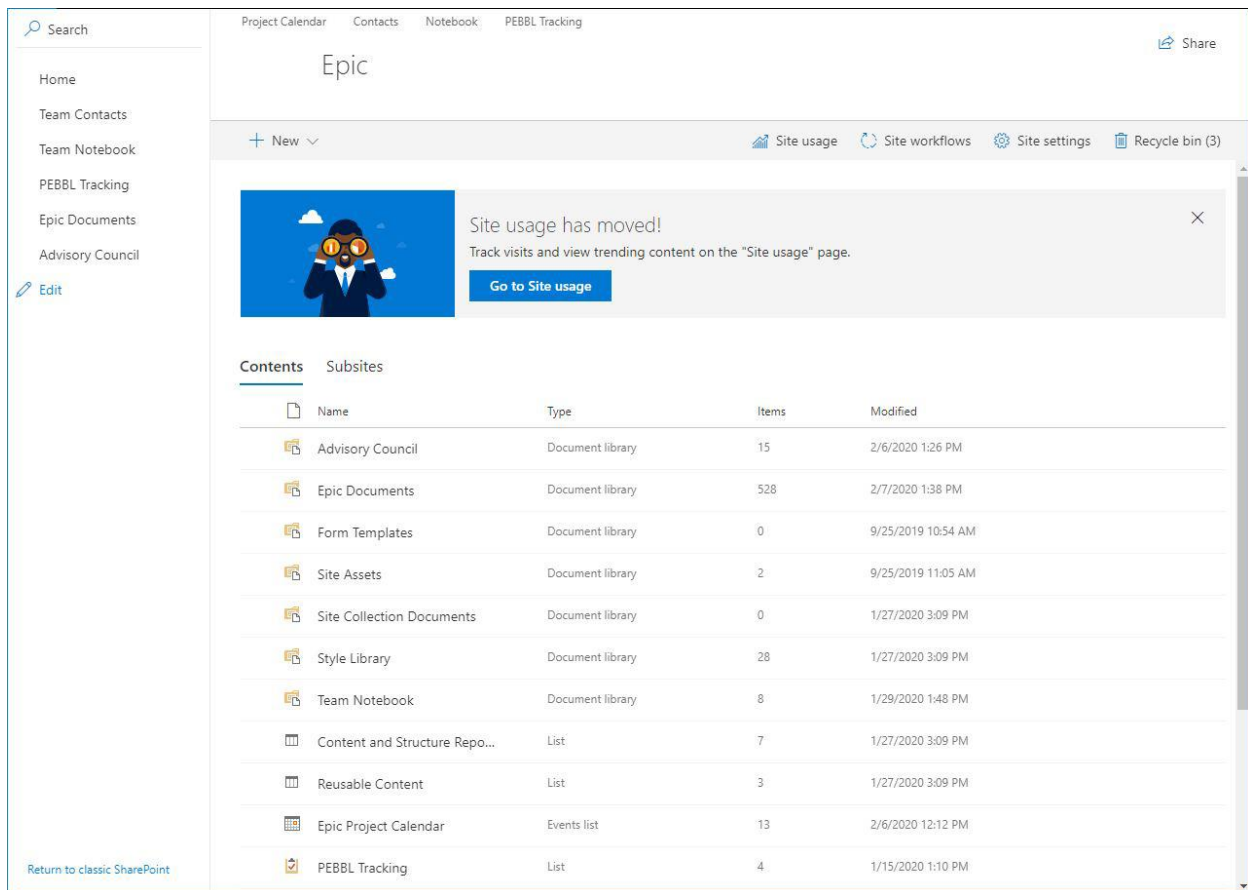


Figure 5.2 Site Contents list.

Figure 5.2 shows all contents of the SharePoint site. This catalogues the assets and artifacts that users are accessing. Different libraries have been set up to prepare for further growth on the site.

- Forms are going to be used to allow users to fill out templated documents, participate in surveys, and provide required information for tasks.
- The Team Notebook will allow the project managers to notate meetings and track notes using OneNote. This will allow them to collaborate in real time throughout the duration of the project.

- Epic Project Calendar – Scheduled appointments are shared and displayed to users that have access to the page. Allows the managers to add/update the calendar.

Moving forward, additional libraries, features, and workflows are going to be created to facilitate the needs of the project. Once Office 365 gets implemented into the environment, the hospital will be able to add optimized web parts and features that will make the overall user experience more enjoyable. With the further integration of Office products, SharePoint will continue to improve the EA at the hospital.

### Conclusion

In conclusion, this project provides a detailed overview on the deployment of SharePoint within a hospital. As previously stated, it is going to be used to support the current Epic EHR implementation and future projects that begin. With this said, this overview should provide the incite and tools necessary to successfully deploy SharePoint within any environment. Moving forward, this will serve as a solid foundation for future projects and software implementations in an enterprise environment.

The successful implementation of SharePoint has improved communication and collaboration within the hospital. Given its qualities and tools, the stakeholders agree that it will server current and future benefits to the hospital. Rather than having to schedule meetings and communicate with

participants individually, SharePoint has provided a central hub of information to push forward. As a result, meetings were reduced to once every two weeks from having 3-4 meetings every week. Overall, this experience has shown the importance of facilitating an environment that collaborates and communicates efficiently. If more enterprises were to adopt this ideology, project would fail less.

APPENDIX A  
ACRONYMS AND ABBREVIATIONS

<b>AD</b>	Active Directory
<b>EA</b>	Enterprise Architecture
<b>EHR</b>	Electronic Health Records
<b>EMR</b>	Electronic Medical Records
<b>GB</b>	Gigabytes
<b>IT</b>	Information Technology
<b>ISO</b>	Computer Image File
<b>MB</b>	Megabytes
<b>OS</b>	Operating System
<b>RAM</b>	Random Access Memory
<b>TOGAF</b>	The Open Group Architecture Framework
<b>VM</b>	Virtual Machine

## BIBLIOGRAPHY

- Bernard, S. A. (2012). *An Introduction to Enterprise Architecture* (3rd ed.).  
Bloomington, IN: Authorhouse.
- Bullock, S., & Bullock, S. (2019, May 16). SharePoint Online vs. SharePoint On-Premises: What You NEED to Know. Retrieved December 12, 2019, from <http://www.avepoint.com/blog/sharepoint-hybrid/sharepoint-online-sharepoint-on-premises/>
- Cohen, H. (2019, February 7). Project Management Statistics: 45 Stats You Can't Ignore. Retrieved December 13, 2019, from <http://www.workamajig.com/blog/project-management-statistics>
- Coray, T. (2019). Acute Care EMR All Software Product Ranking Comparison. Retrieved January 6, 2020, from <https://klasresearch.com/compare/acute-care-emr/10>
- Daniel, D. (2007, March 31). The Rising Importance of the Enterprise Architect. Retrieved February 13, 2020, from <http://www.cio.com/article/2439397/the-rising-importance-of-the-enterprise-architect.html>
- Epignosis. (2017, October 24). Fat Bottomed Strategies make the Enterprise Go Round. Retrieved January 9, 2020, from <http://www.epignosis.info/mps-ea/fat-bottomed-strategies-make-the-enterprise-go-round/>.
- Fuller, M. A., George, J. F., Valacich, J. S., & Christoph, S. (2019). *Information Systems Project Management: A Process Approach* (2nd ed.). Prospect Press.

- Gleave, A. (2019). Ambulatory EMR All Software Product Ranking Comparison. Retrieved January 24, 2020, from <https://klasresearch.com/compare/ambulatory-emr/3>
- Jithin, J. (2018, March 1). OOS Integration with SharePoint Server 2013/2016. Retrieved December 13, 2019, from <https://docs.microsoft.com/en-us/archive/blogs/jjoseph/oos-integration-with-sharepoint-server-20132016>
- Lee, E. (2019, October 3). What Are SharePoint Farms and How Does SharePoint Architecture Work? Retrieved from <http://www.avepoint.com/blog/sharepoint-hybrid/sharepoint-architecture/>.
- Link Consulting. (n.d.). Enterprise Architecture (EA). Retrieved February 13, 2020, from <http://www.linkconsulting.com/what-we-do/products/atlas8/enterprise-architecture-ea/>.
- Microsoft. (2015, January 19). Glossary for SharePoint 2010. Retrieved February 2, 2020, from [https://docs.microsoft.com/en-us/previous-versions/office/developer/sharepoint-2010/ee556558\(v=office.14\)?redirectedfrom=MSDN](https://docs.microsoft.com/en-us/previous-versions/office/developer/sharepoint-2010/ee556558(v=office.14)?redirectedfrom=MSDN)
- Plumley, M. (2015, July 5). Configure Visio Services. Retrieved December 16, 2019, from <https://docs.microsoft.com/en-us/sharepoint/administration/configure-visio-services>
- Plumley, M. (2018, July 23). Hardware and software requirements for SharePoint Server 2019. Retrieved from <https://docs.microsoft.com/en-us/sharepoint/install/hardware-and-software-requirements-2019>



- Roth, M. (2019, April 30). In EMR Market Share Wars, Epic and Cerner Triumph Yet Again. Retrieved January 6, 2020, from <http://www.healthleadersmedia.com/innovation/emr-market-share-wars-epic-and-erner-triumph-yet-again>
- The Open Group. (2018). Welcome to the TOGAF® Standard, Version 9.2, a standard of The Open Group. Retrieved January 14, 2020, from <https://pubs.opengroup.org/architecture/togaf9-doc/arch/index.html>
- Wac, S. (2017, May 11). Deploy Office Online Server. Retrieved January 17, 2019, from <https://docs.microsoft.com/en-us/officeonlineserver/deploy-office-online-server>
- White, S. K. (2018, August 10). What is TOGAF? An enterprise architecture methodology for business. Retrieved January 14, 2019, from <http://www.cio.com/article/3251707/what-is-togaf-an-enterprise-architecture-methodology-for-business.html>