

Migration of Data and Applications in the Cloud

Migration of Data and Applications from SharePoint Server in SharePoint Online

Arian Kaçiu

Faculty of Computer Sciences and Engineering

UBT College

Pristina, Kosovo

e-mail:ak30369@ubt-uni.net

Edmond Jajaga

Faculty of Computer Sciences and Engineering

UBT College

Pristina, Kosovo

e-mail:edmond.jajaga@ubt-uni.net

Abstract—SharePoint Online (SPO) is a Microsoft cloud-based business collaboration platform that is very robust and dynamic. Organizations can deploy and manage SharePoint Server on-Premises or can use SharePoint Online with an Office 365 Enterprise subscription. The platform has been in the market for almost two decades and last year SharePoint hit 100 million active monthly users in the cloud. The platform has become larger in scale, richer in features, and is improving consistently. Thus, SharePoint migration has become even more important, especially migrating into its online version. The SharePoint support cycle changes when a new version is released, which affects also the support for various features. Namely, newly added features and functionalities somehow enforce one to upgrade/migrate to the new SharePoint version. This paper seeks to show the best practices on how to do the migration of the SharePoint platform from one version to another. Five SharePoint migration projects have been described to serve as a case study. Engaging users during the migration process resulted in easier adoption of the new environment by the users and more efficient work from developers' perspective. Moreover, the study identifies 'must have actions' and 'nice to have ones' within each phase in order to do the migration properly. In particular, content owners should be given a date when to finish the clean-up of old/unused data; if they do not do that properly or at all, then at least it should be requested from them to clean-up workflows, solutions, and pages which are not in use, in order to save the time while developing/recreating them.

Keywords-SharePoint; Data Migration; Cloud; SharePoint Online.

I. INTRODUCTION

SharePoint is a web-based collaborative platform that integrates with Microsoft Office [1]. SharePoint can be deployed and managed on-Premises (SharePoint Server 2019 is the latest version) or can be used Online with an Office 365 Enterprise subscription. It is also available in hybrid scenarios.

On the one hand, both platforms (SharePoint on-Premises and Online) include out of the box a bunch of collaboration, communication, document management and business processes modeling features; and on the other hand, they include the building blocks for many kinds of Modern Workplace solutions through a set of rich application

program interfaces (API) and extensibility mechanisms [2]. SharePoint can be used as a secure place to store, organize, share, and access information from any device [3]. Microsoft states that more than 200,000 organizations and 190 million people have SharePoint for intranets, team sites and content management [4].

Like any other application, platform, or framework, SharePoint is evolving continuously over the years. We have a new version of SharePoint on-Premises almost every three years. There can be many reasons, why one should upgrade to the latest versions of SharePoint; few of them are listed below [5]:

1. Support Cycle changes when Microsoft releases a new version – To do proper support we need a deep knowledge & understanding of SharePoint's features & functionalities and help from Microsoft support to keep it running smoothly [5]. At the end of mainstream support, Microsoft no longer issues product updates, only issues security patches. After the expiration of extended support, Microsoft stops issuing patches for that product, which makes that version a security liability to continue using [6]. In Table I, there are shown some version of SharePoint Server together with their Service Pack and the dates when Microsoft will stop supporting them.
2. Features may be deprecated, and additions do occur with new versions - Microsoft stops supporting various features with every new release. A feature can be deprecated in the immediate new version and completely removed in the subsequent versions [5]. The list of features and functionalities that have been discontinued or changed in the SharePoint versions 2013 [7], 2016 [8], and 2019 [9] and the workaround or replacement for them can be found for further reading in the references. There are two options to upgrade in SharePoint on-Premises: upgrade to the new next version, then to the other and so on or use third-party migration tools to upgrade to the desired new SharePoint server version or SharePoint Online.

TABLE I. SHAREPOINT PRODUCT LIFECYCLE SUPPORT [10]

Products Released	Lifecycle Start Date	Mainstream Support End Date	Extended Support End Date
SharePoint 2007 SP3	25/10/2011	09/10/2012	10/10/2017
SharePoint 2010 SP2	23/07/2013	13/10/2015	13/10/2020
SharePoint 2013	09/01/2013	Not Applicable	Not Applicable
SharePoint 2013 SP1	25/02/2014	10/04/2018	11/04/2023
SharePoint 2016	01/05/2016	13/07/2021	14/07/2026
SharePoint 2019	22/10/2018	09/01/2024	14/07/2026

3. One important thing is that when Microsoft releases the new features in any version like SharePoint 2016 or 2019, those features are already tested and are used in Office 365 for several years. SPO/Office 365 includes some distinguishing features [5]. Firstly, SharePoint farms are hosted in Microsoft’s cloud infrastructure and Microsoft applies security patches and pushes platform updates. Secondly, Office 365 has committed to 99.9% availability in their Service Level Agreement (SLA) and the cloud version receives more new features [5]. Finally, SPO is licensed on a per-user basis and can be purchased as a standalone service or as part of an Office 365 plan.

SharePoint on-Premises has some notable features. Firstly, SharePoint farms are hosted within the organization, the organization’s IT is responsible for everything like patches, updates, etc. and also maintaining the Active Directory Domain Services on-Premises. Lastly, licensing is done buying Client Access Licenses (CALs) for either each device or person accessing the SharePoint server [5].

As with other data migration projects, the most important things in SharePoint migrations are planning and analysis. Based on [11], the following steps should be carefully taken into account before and during the migration process:

- Make a detailed inventory of the environment – this helps us to make better decisions and estimates on the effort of the migration. We should have an inventory list of whole structure like site collections, sites, and lists, custom solutions, workflows, pages, users, and groups used retention policies, permissions, large lists or libraries, lists with lookup columns/dependencies to other lists and User Interface (UI) customizations (JavaScript, altered menus, etc.). Nice to have is an inventory

list of content types, records, site columns, user alerts, and branding.

- Clean up the old environment - Contact the site/content owners and ask them to do this before the migration starts. They must find and delete unused and duplicated content; break large site collections into multiple site collections; promote large sites into site collections, review and reorganize very large lists. Removing “orphaned users”, empty SharePoint groups, unwanted versions and reorganizing lists and libraries with too many columns would be nice too.
- Prepare the destination environment –We must take the time to plan and structure a new home according to the new requirements/needs. It is nice to redesign the landing page if the stakeholders agree with this.
- Communicate with users – Users should be informed about migration before starting it, downtime planned, estimated timeline, the reason for the change and the value for them and possible changes in the environments.
- Start the migration – We must choose the appropriate site template, map SharePoint groups, migrate one by one Site Collection according to the plan, review the migration report/log file and fix the issues, redesign/recreate pages to modern ones and workflows and solutions.
- Post migration – We have to make sure that everything was migrated successfully, test all workflows, check user permissions, set access to read-only/remove in the old SharePoint and redirect users to the new one.

In Section 2 we will explain in details five case studies and the approach used during these migrations. In Section 3 we have a discussion part, where we have discussed lessons learned from these migrations, some critical pitfalls that one must be aware before the migration, comparing the migration methods used here and also what happens when the size is way bigger than the largest size of our case study. In section 4 we have the conclusion, where we have explained the steps for successful migration process, the finding of this paper and also the future works.

II. CASE STUDIES

As a case study, we have used five SharePoint migration projects with which we had experience in the past. The first two are completed in Cactus Company in Pristina and the others in McKesson Europe AG in Stuttgart for three McKesson Business Units: McKesson UK, Admenta – Italy, and Lloydsapotek – Sweden. In the context of versions, one of them is from SharePoint Server 2007 to SharePoint Server 2010 and the other four from SharePoint Server to SharePoint Online.

A. Upgrade/Migrate SharePoint Server 2007 to SharePoint Server 2010

There are two basic upgrade approaches for the upgrade from SharePoint Server 2007 to SharePoint Server 2010: in-place upgrade and database attach upgrade. An in-place upgrade is used to upgrade all Microsoft SharePoint sites on the same hardware. A database attach upgrade is used to move the content to a new farm or new hardware. One can also combine these two types of the upgrade in hybrid approaches that reduce downtime during an upgrade [12].

There were more than 30 site collections in the old SharePoint 2007 Intranet and the first thing was getting approval from the content owner and delete the unused site collections and move some of the data from different site collections to a new one named Archive. The other 12 frequently-used site collections were prepared for the upgrade. Then database attach upgrade was used with the following steps:

1. Run the Pre-Upgrade Check command in stsadm on the SharePoint 2007 Server to identify and fix the potential upgrade issues before upgrade
2. Set up and configure a new SharePoint Server 2010 farm. Then transfer all customizations to the new farm and tests the environment.
3. Detach the content databases from the old Office SharePoint Server 2007 farm.
4. Attach the content databases to the new farm and upgrade the content.
5. Confirmation that the upgrade has finished successfully and then configures the new farm to start serving requests at the new URL.

B. Migrate of SharePoint Server 2010 to SharePoint Online

The manual migration process, in this case, was performed with the following order:

- First, we created a similar structure of the Intranet including Site Collections
- Then the sites were saved as templates and then moved over to SharePoint Online to the appropriate site collections
- Then the lists/libraries were saved as templates and then moved over to SharePoint Online to the appropriate site collections/sites
- Some of the libraries the documents were moved from the old into the new environment using the explorer view
- Then the forms developed in InfoPath 2010 were moved to SPO by first changing the connection strings in the form
- Workflows have been exported to Visio and then import in the new site and then the config files were modified. Since SharePoint Designer does not provide a direct way to move list workflows and we could not use third-party tools, we used the above way of migrating them by manually changing the config.xml files between the sites [13].

C. Migrate of SharePoint Server 2013 to SharePoint Online

ShareGate Desktop third party application was used to make the move to SharePoint Online seamless, without impacting the users regardless of how complex the migration project was. It provides a user-friendly interface and it is cost-effective. ShareGate, with its intuitive features, helps to prepare, execute, and validate the data migration whether one is migrating an entire environment or just a few lists [14].

C1. Migration of Swedish Intranet

Swedish Intranet is mainly used to share news and documents with pharmacies. An overview of the Swedish Intranet Inventory is depicted in Figure 1. The Intranet consisted of one site collection with eight sites. The total size was 2.46 GB. There were eight sites with custom master pages, and nine custom features in five of them. The number of checked-out files was nine in six libraries.

Firstly, content owners have been informed to clean up old/unused data from the old environment until a specific date. In order to make it a little bit easier for them, two specific reports in Excel with Unused Documents and Unused Lists for more than 6 months were sent to them. New SharePoint Online Site was created and then the initial content migration was done, from the old one into the new environment. After the initial migration, some issues were found and immediately were fixed. Moreover, all the pages on the new environment were recreated to new modern ones. On the Intranet landing page Newsfeed capability was heavily used to communicate with pharmacies. Since the Newsfeed is not available in the new Office 365 tenants it was decided to use Yammer instead of it. Links in the Top Navigation were also recreated.

After finishing all the above tasks, the end-users were informed that the old Intranet will be set to Read Only for all the users on a specific date and they should update bookmarks in their browsers. After this notification, the site was set to Read Only and a visible banner on the landing page with the PowerShell script and then the final migration has been done. A similar approach can be achieved by setting the site as Read Only in Central Admin and adding a banner on the site landing page with SharePoint Designer, editing page, or a content editor web part.

The visible banner was set on the old Intranet landing page informing the users that the migration is done to the new Intranet. Link to the new Intranet was also present and the information whom to contact if they encounter any error or have any issues using the new version.

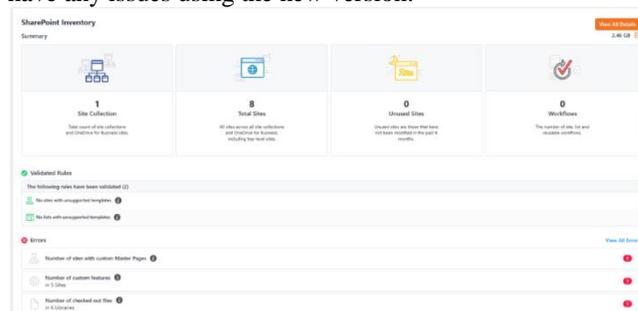


Figure 1. Swedish Intranet Inventory

C2. Migration of Italian Intranet

An overview of the Italian Intranet Inventory is depicted in Figure 2. It consists of one site collection with four sites. The total size was 4.80 GB and there were 21 workflows. There were five custom features in four sites. The number of checked-out files was 84 in 14 libraries.

Since Italian Intranet had similarities with the Swedish one, we followed the same approach during the migration except that Italian Intranet had a huge number of workflows that needed to be migrated/recreated. Also, it was decided that the Workflow history list will be migrated only as an ‘archive’ list and the running instances of workflows will not be migrated. All the items on the lists were workflows were attached were migrated before migrating workflows.

Workflows were migrated from the old to the new environment using ShareGate tool by stopping first the list workflows from starting when the new item is created or modified, and publish them in the old environment. Then the workflows were migrated from the old to the new Intranet and the actions were rebuilt in the new workflows which were not migrated because they were not supported in Nintex Online. Then the conditions to start the workflow were changed to be the same as in the old Intranet and the new workflows were published. Lastly, the content owners were asked to test the workflows.

After finishing all workflows, communication has been done to the end-users, old Intranet was set to Read Only and the final content incremental migration has been done. The banner was set on the old Intranet to inform users about the changes and the new URL of the new environment.

C3. Migration of UK Intranet

UK Intranet is mainly used to share news and documents with all participants and for managing documents within different departments/projects there. As illustrated in Figure 3, the UK Intranet consisted of 30 site collections with 95 sites. The total size was 65.40 GB. There were 14 sites with custom master pages, and 55 custom features in 42 sites. The number of checked-out files was 43 in 19 libraries.

Here we have used a different approach compared with the previous migration of Intranets. It was decided first migrating only the root site collection into the new SPO site

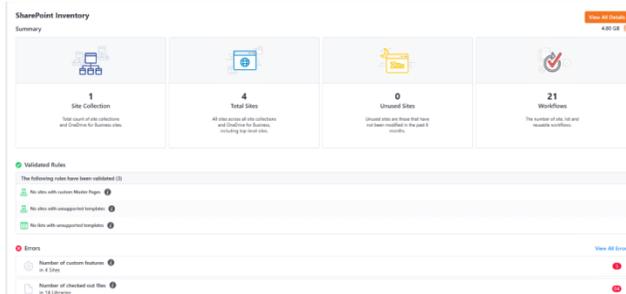


Figure 2. Italian Intranet Inventory

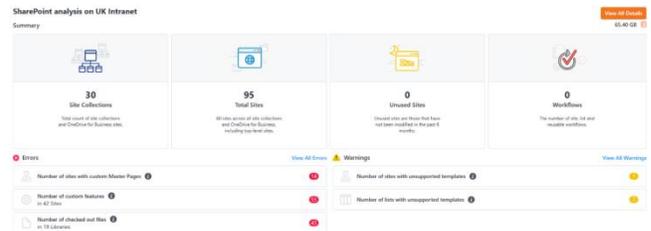


Figure 3. UK Intranet Inventory

and then to go live with this site. All the links to the other site collections in the new site were pointing to the old site collections. Then the other site collections have been migrated one by one and after that, the links in the root site to that specific site collection have been updated. Before going live with this solution, the following things were previously done:

- An initial communication has been sent to all users to inform that migration of their Intranet will start.
- The content owners have been informed to clean up old/unused data from the old environment.
- All the news articles of the actual year were created in new modern pages since previously ones were as the blog posts which is not supported in modern sites
- Training to the communication team was done and a manual was delivered on how to create news articles with modern pages
- The old root site collection was migrated to the new separated site collection
- The new root site collection was used to hold only the news part and some subsites
- IIS redirect was used to redirect users from the old to the new UK Intranet
- The new banner was added to the new root site collection to inform the users about the migration

A new page for the migration plan was created to inform users about timescales and support contact. A report was viewed on the page with the information about when the migration will start and end for each site collections/sites. Also, chart and pie graphics were added with information on how many site collections or sites were migrated and how many others are waiting for. The information on this page was updated frequently when new sites/site collections were migrated and the rows on Excel report were set to green for the migrated ones.

The migration of the site collections was done one by one. Using the script, the site was set to Read Only for 1-3 business days based on the predefined schedule/plan, and banner was added to inform the users that the migration is ongoing in that area. Then the migration started and all the pages on the new site collection were recreated to modern ones. After the migration of the site was finished the banner was changed to the migration is finished and the new URL was there. Since there were lots of pages in each site/site collection we have used a ModernizingPages [15] PowerShell script to do the conversion between the classic pages to the modern ones, and then redo the web parts which were not migrated properly. The description of the code is shown below.

```

$user = "ak30369@ubt-uni.net"
1. $cred = Get-Credential -UserName $user
2. Connect-PnPOnline -Url https://ubt.sharepoint.com/sites/hr/ -Credentials $cred
3. $pages = Get-PnPListItem -List sitepages
4. foreach ($page in $pages)
5. { Write-Host "Modernizing" $page.FieldValues["FileLeafRef"] "..."}
6. $modernPage = ConvertTo-PnPClientSidePage -Identity $page.FieldValues["FileLeafRef"] -Overwrite Write-Host "Done" -ForegroundColor Green}

```

Code from lines 1-3 will prompt for password and creates a context for the other PowerShell commands to use. Code in line 4 will get all the pages in the library named "SitePages". Code in line 5 will iterate over all pages which are saved on variable \$pages. Finally, code from lines 6-7 will create a modern version for the classic pages, which will be saved to Site Pages library and named to ex. Migrated_Home.aspx.

After finishing all the site collections based on the migration plan, another final communication was sent to the users to inform them that their Intranet migration is done, and they should ask the Local Support Desk team about any issue.

III. DISCUSSIONS

SharePoint Online is a cloud-based service that helps organizations share and manage content, knowledge, and applications to empower teamwork, quickly find information, and seamlessly collaborate across the organization [16]. Capabilities of SharePoint have expanded greatly from the original 2001 version to SharePoint 2019 and SharePoint Online. SharePoint support cycle changes when Microsoft releases a new version, which affects also the support for various features by Microsoft. Because of this and the coming of new features and functionalities with the new version, there is a must to upgrade/migrate to the new SharePoint version. There are two options to upgrade in SharePoint on-Premises, move through each version as one upgrade or use third-party migration tools to upgrade to the desired version directly and to SharePoint Online. Moving forward, Microsoft will continue its focus on SharePoint Online/Office 365 to make it available and useful for organizations of every shape and size. Office 365 has some distinguishing features. Firstly, SharePoint farms are hosted in Microsoft's cloud infrastructure and Microsoft applies security patches and pushes platform updates. Secondly, Office 365 has committed to 99.9% availability in its service level agreement (SLA) and the cloud version receives more new features. Lastly, some features will never be available on-Premises: Microsoft Graph, Delve, Power Automate, and Power Apps.

After a specified period that the migration has been completed, one should lock the old Intranet to enforce users who still use it in Read-Only mode to switch to the new migrated Intranet. Probably users will complain that they do not have access but they can be informed that they were accessing the old Intranet and they should use the new one in the appropriate URL that is going to be shared with them.

As it is explained in a blog [17], it is always required that the migrations to be of the highest quality and often must balance costs and time while defining their migration roadmap. The lack of resources adds another layer of complexity to the migration process. During our experience with many projects, we found that there is a tendency to take an inexpensive approach, whereby data is directly transferred to the new environment, without much analysis or clean-up. While this may be a relatively inexpensive way to balance the two important parameters of cost and time, it is certainly not the most efficient way. There are some critical pitfalls one must be aware of before upgrading or migrating to a new SharePoint environment [17]:

- *SharePoint Upgrade is the responsibility only of the IT team.* All stakeholders should be consulted, and a consensus emerges regarding the SharePoint roadmap of an organization [17].
- *To migrate, we need only a source and a destination environment.* The new environment must support all the components present in the current environment [17].
- *Consider compatibility requirements of third-party applications' integration.* Before starting with any migration, one must check for the compatibility of all third-party tools with the new environment. Eventually, one should update the tools to a version that is more compatible with the new environment [17].
- *Scatter information.* A SharePoint migration team must map all the information with the relevant metadata. The right set of documents must be identified, along with their versions to be transferred to the destination [17].
- *No documentation of the current legacy system.* Documentation should contain an overview of the architectural and system considerations, with web parts & external data sources. The document should provide also details of all previous migrations or SharePoint upgrade experiences, along with the type of approach used to migrate [17].

External sharing. Users in SharePoint Online can share sites, folders, and individual documents with anyone, who has a Microsoft Account linked to their corporate e-mail address. There is also the possibility to generate Guest Links, which allow Read or Edit permissions to be granted without requiring authentication while allowing the Guest Links to be revoked at any time.

Stay up to date, always. Users of the online version are privileged to get early updates on new releases upgrades than those who use SharePoint On-Premises. Moreover, some features might not be available for the on-Premises at all.

TABLE II. INVENTORY OF INTRANETS

Intranet Projects	Data in Numbers				
	Size in GB	Site Collections	Sites	Workflows	Custom features
UK	65.40	30	95	0	55
Italian	4.80	1	4	21	5
Swedish	2.46	1	8	0	9

In Table II, there are shown inventories of the Intranets’ contents, from the three last projects before migration took place. Comparing migration method of the Italian and Swedish Intranet with the UK, we have found that the migration pattern we followed in the UK case proved to be the best one. Giving the users direct access to the new Intranet (SPO) at the initial stage of the migration project resulted in more engagement and adoption by the users. Addressing issues appearing in early stages resulted in a smoother migration process, which to the best of our knowledge has not been considered by other related works.

If the total size is way bigger than the largest size of our case studies (65.4GB) or much more workflows or sites are to be migrated, then it will require more time, planning and efforts. Also, we have to keep in mind that the migration performance can be affected by network infrastructure, file size, migration time, and throttling.

IV. CONCLUSION

The migration of data and applications on the cloud outlines one of the most important processes after each application version publishing. A summary of the recommended steps needed for a successful migration process includes the following [11]:

1. Make a detailed inventory of the environment
2. Clean up the old environment
3. Prepare the destination environment
4. Communicate with users
5. Start the migration
6. Post- migration

Content owners should be given a date when to finish the clean-up of old/unused data; if they do not do it properly or at all, then at least we should request from them to clean-up workflows, pages and, solutions which are not used, to save our time while recreating them. The findings in this paper show that in order to have a smoother migration and better users’ adoption one should engage users with the new environment as earlier as possible during the migration process.. An insight into user experience with the migration process would be understood by conducting a questionnaire, which is planned as per future works. Other future works include recommendations regarding the custom code solutions and modernization of other customizations and applications to get them ready for migration to SPO.

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