

## İçindekiler Tablosu

Server 2016 Data Deduplication .....	1
Amaç .....	1
Hard Disk Dosya Yapıları .....	2
Data Deduplication Rolünün Eklenmesi .....	10
Uygulama .....	20
Sonuç .....	33

## DATA DEDUPLICATION

Datada meydana gelmiş duplicationların, datanın bütünlük (integrity) ve güvenilirliğine (fidelity) zarar gelmeden identify edilip ayıklanması demektir. Deduplication amacı, az bir space içerisinde mümkün olduğu kadar çok data barındırmaktır.

Data deduplication enable edildiği zaman arka planda şu işlemler gerçekleşir :

1. Disk üzerinde data küçük ve boyutları değişiklik gösterebilen chunk haline bölünür.
2. Aynı olan ya da duplicate chunklar belirlenir.
3. Redundant copyleri bir referans parity ile değiştirir. Ör.:4 tane aynı chunk varsa ilkini tutarak diğerlerini elimine eder ve yerlerine ilk chunk'a ilişkin referans bırakır.
4. Chunk'ları compress eder.


Avantajları:


1. Capacity optimization
2. Scale and performance: data deduplication genişletilebilir, kaynakların efektif kullanılmasına imkan sağlayan ve datayı bozmayan bir uygulamadır.

**AMAÇ :** Farklı dosya formatlarında deduplication işlemi yapmak













Bunun için öncelikle 3 adet yeni 5GB size'ında hard disk oluşturduk.

## Clone of W2016-MASTER

 Power on this virtual machine

 Edit virtual machine settings

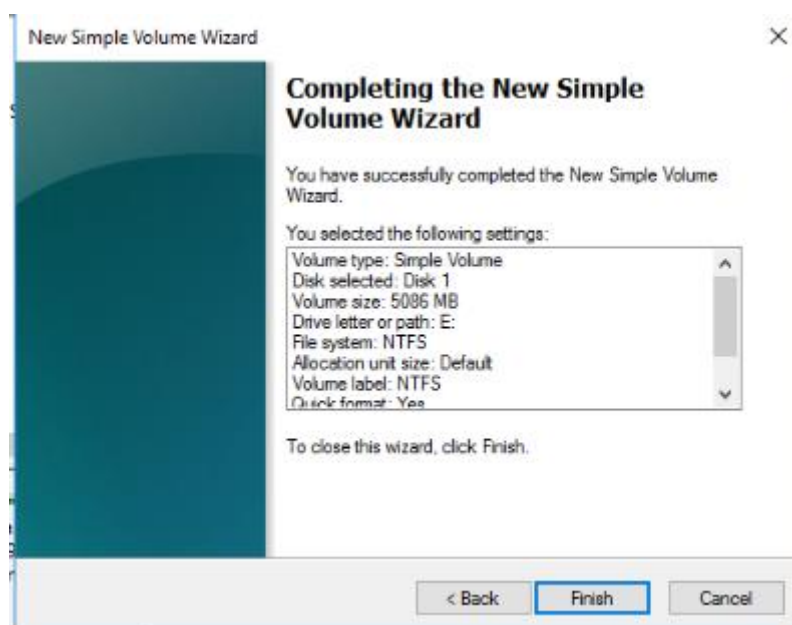
### ▼ Devices

	Memory	3.0 GB
	Processors	2
	Hard Disk (SCSI)	30 GB
	Hard Disk 2 (SCSI)	5 GB (Preallocate...
	Hard Disk 4 (SCSI)	5 GB (Preallocate...
	Hard Disk 3 (SCSI)	5 GB (Preallocate...
	CD/DVD (SATA)	Using file C:\Use...
	Network Adapter	Bridged (Autom...
	USB Controller	Present
	Sound Card	Auto detect
	Printer	Present
	Display	Auto detect

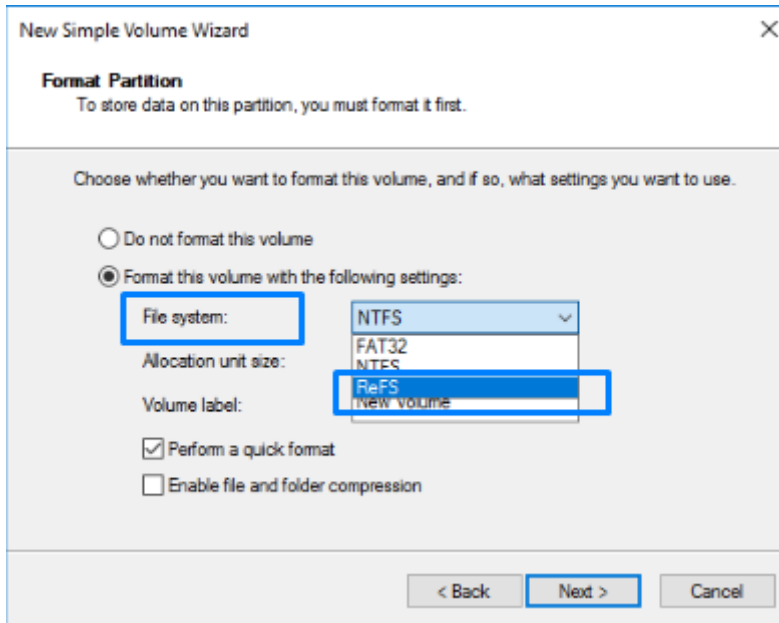
### ▼ Description

Type here to enter a description of this virtual machine.

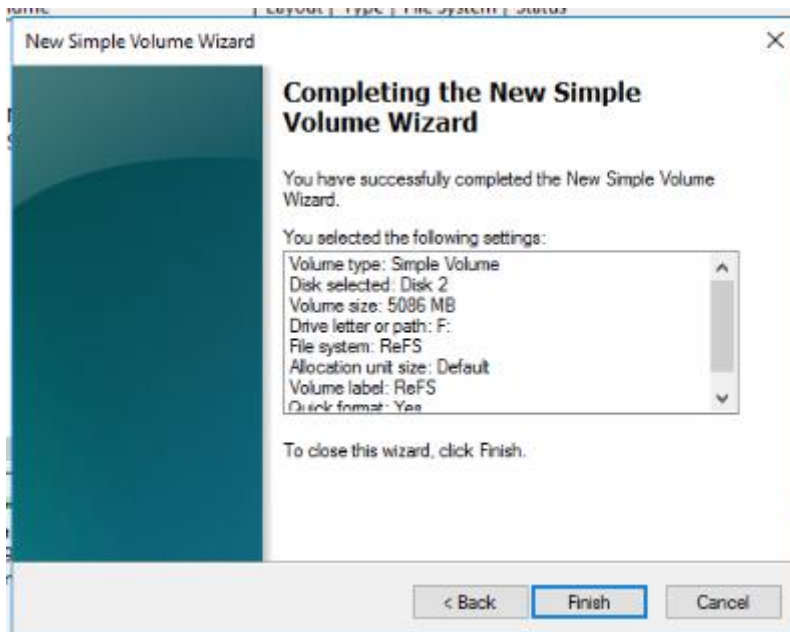
Disk 1'den Simple volume oluşturduk. Disk 1'in file systemini NTFS olarak belirledik.



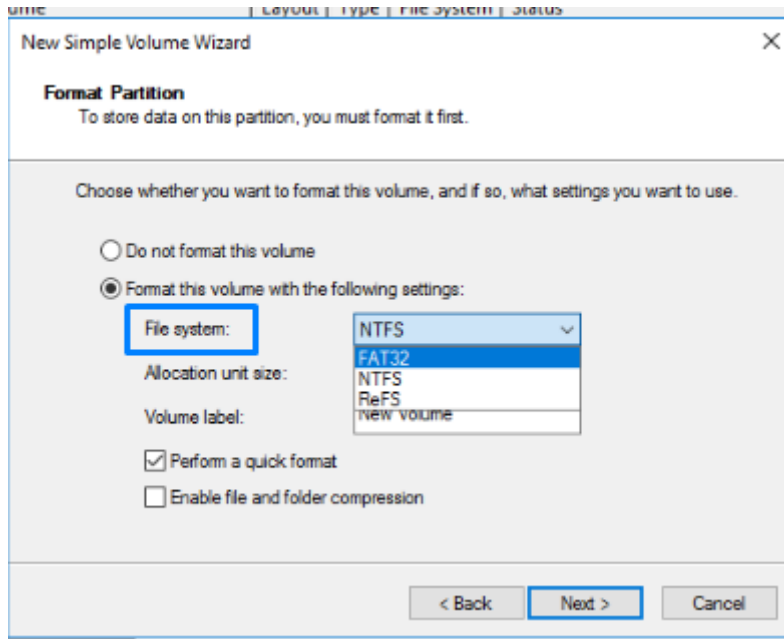
2.diskimizin file systemini ReFS olarak belirliyoruz, next tıklanır.



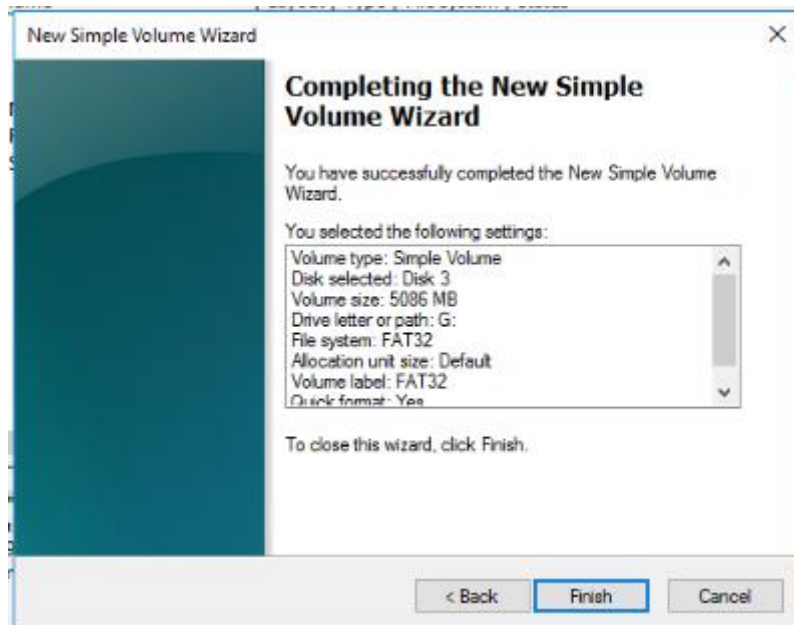
Disk 2'den Simple volume oluşturduk.



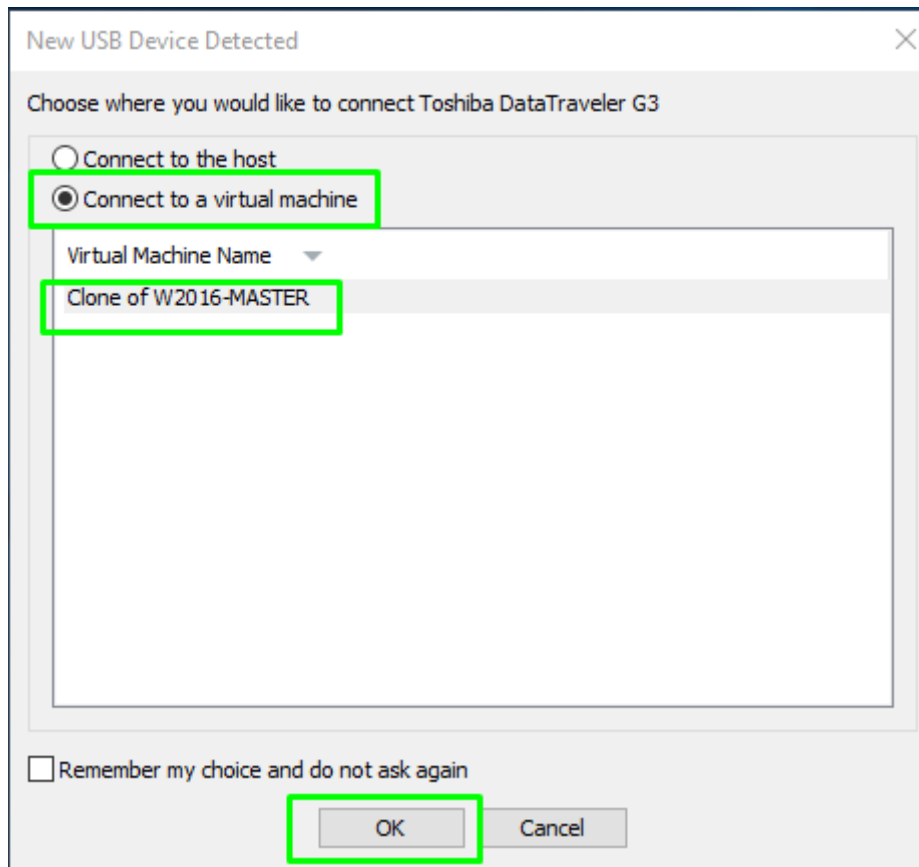
3.diskimizin file systemini FAT32 olarak belirliyoruz, next tıklanır



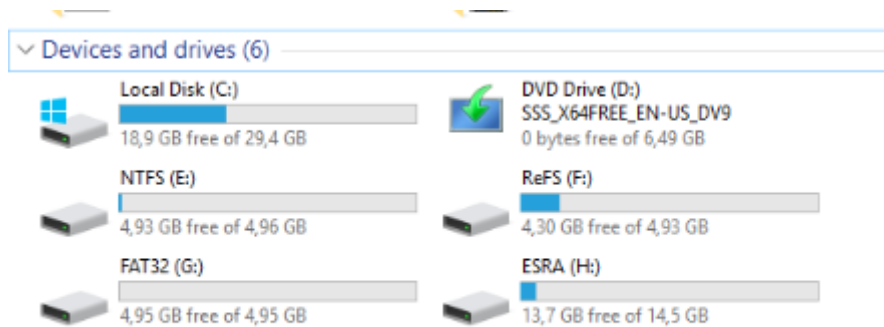
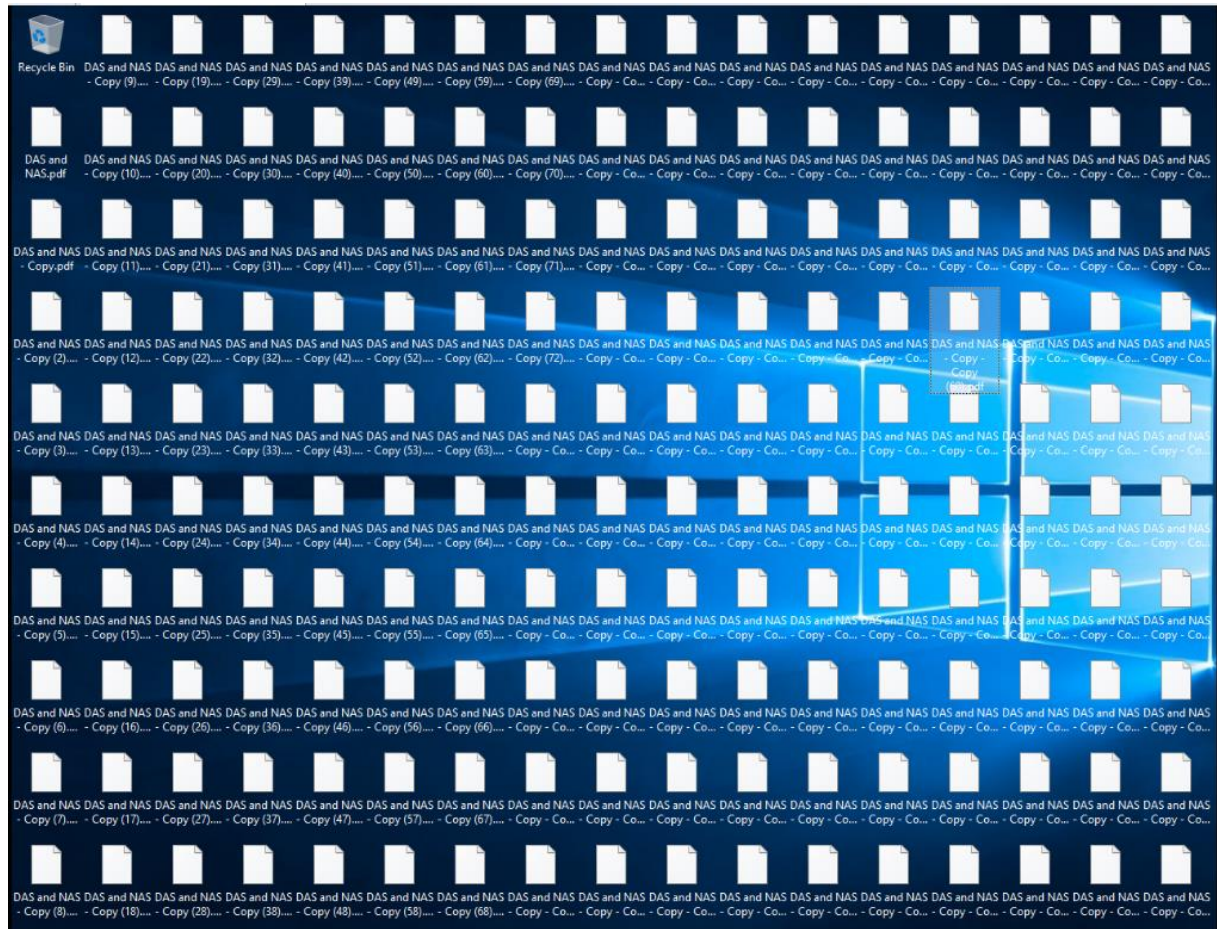
Disk 3'ten Simple volume oluşturduk.



USB cihazımızdan herhangi bir dosyayı almak istiyoruz. Disklerimizi virtual machine'e eklediğimiz için bağlantı yerimizi de USB Windows server 2016 seçiyoruz. OK tıklanır.



Herhangi bir dosyadan ekrana bir sürü kopyaladık.



Hepsinin için boş olduğu halde ReFS'in yönetici alanının daha fazla olduğunu görebiliriz. Şimdi aynı dosyadan kopyaladığımız bir belgeyi oluşturduğumuz hard disklerin (NTFS, ReFS ve FAT32) içine atalım.

File Explorer window showing the contents of the NTFS (E:) drive. The window title is "Drive Tools NTFS (E:)". The left sidebar shows the "This PC" view with various drives and folders. The main pane displays a list of 28 PDF files, all named "DAS and NAS - Copy - Copy (X).pdf", where X ranges from 2 to 28. All files have a date modified of 5.08.2019 19:18 and a size of 1,229 KB.

Left sidebar (This PC view):

- Quick access
  - Desktop
  - Downloads
  - Documents
  - Pictures
- This PC
  - ESRA (H:)
  - cisco
  - Microsoft 70-740 Ex
  - Sistem10
  - Yeni klasör
  - FAT32 (G:)
  - NTFS (E:)
  - ReFS (F:)
  - Network

Main pane (NTFS (E:)):

Name	Date modified	Type	Size
DAS and NAS - Copy - Copy (2).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (3).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (4).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (5).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (6).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (7).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (8).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (9).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (10).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (11).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (12).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (13).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (14).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (15).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (16).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (17).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (18).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (19).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (20).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (21).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (22).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (23).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (24).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (25).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (26).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (27).pdf	5.08.2019 19:18	PDF File	1,229 KB
DAS and NAS - Copy - Copy (28).pdf	5.08.2019 19:18	PDF File	1,229 KB

169 items



File Explorer window showing the contents of the ReFS (F:) drive. The window title is "ReFS (F:)" and the address bar shows "This PC > ReFS (F:)". The left sidebar shows the navigation pane with "This PC" selected. The main pane displays a list of 28 PDF files, all named "DAS and NAS - Copy - Copy (X).pdf", where X ranges from 2 to 28. All files have a date modified of 5.08.2019 19:18 and a size of 1.229 KB. The status bar at the bottom indicates "169 items".

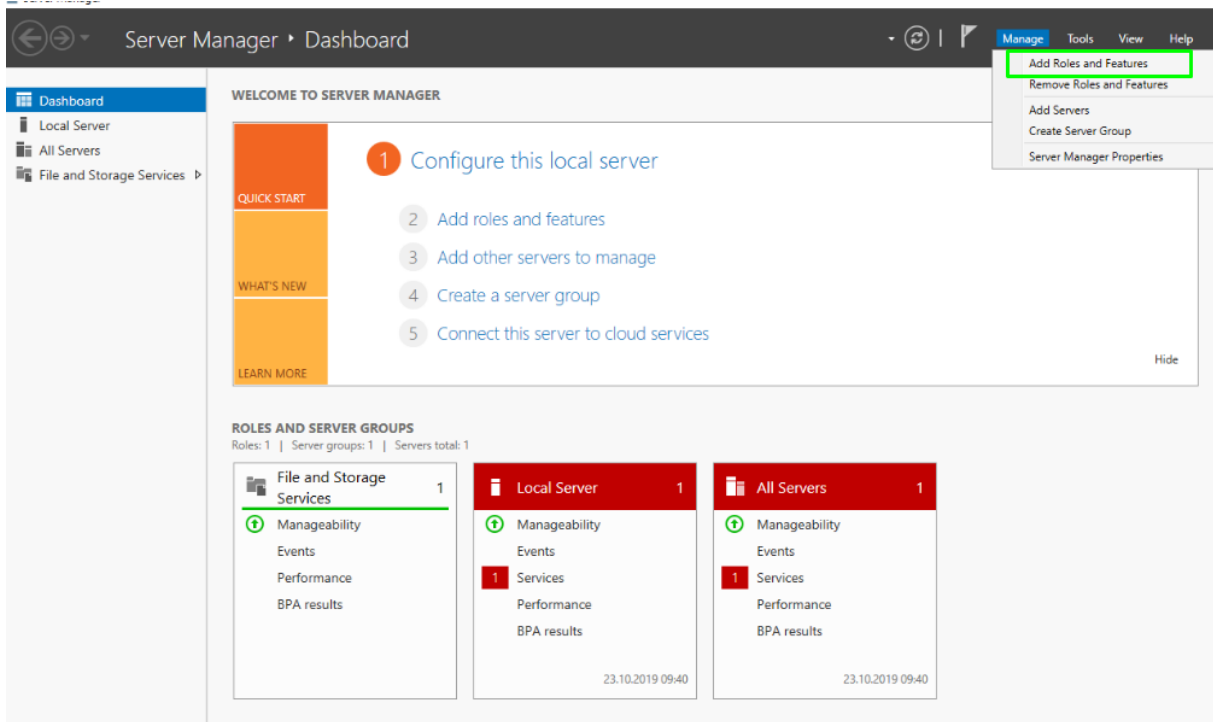
Name	Date modified	Type	Size
DAS and NAS - Copy - Copy (2).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (3).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (4).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (5).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (6).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (7).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (8).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (9).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (10).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (11).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (12).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (13).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (14).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (15).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (16).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (17).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (18).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (19).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (20).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (21).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (22).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (23).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (24).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (25).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (26).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (27).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (28).pdf	5.08.2019 19:18	PDF File	1.229 KB

File Explorer window showing the contents of the FAT32 (G:) drive. The window title is "FAT32 (G:)" and the address bar shows "This PC > FAT32 (G:)". The left sidebar shows the navigation pane with "This PC" selected. The main pane displays a list of files and folders.

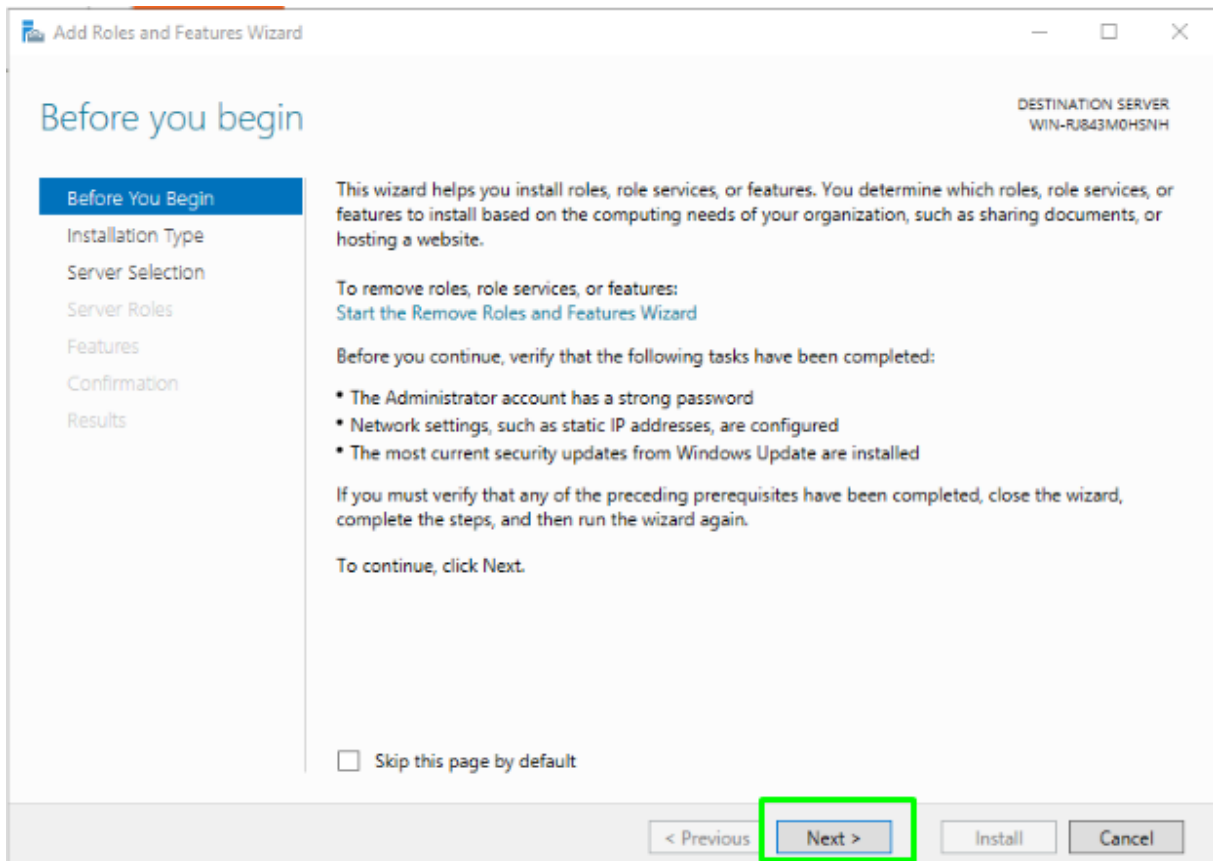
Name	Date modified	Type	Size
DAS and NAS - Copy - Copy (2).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (3).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (4).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (5).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (6).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (7).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (8).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (9).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (10).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (11).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (12).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (13).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (14).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (15).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (16).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (17).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (18).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (19).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (20).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (21).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (22).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (23).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (24).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (25).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (26).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (27).pdf	5.08.2019 19:18	PDF File	1.229 KB
DAS and NAS - Copy - Copy (28).pdf	5.08.2019 19:18	PDF File	1.229 KB

169 items

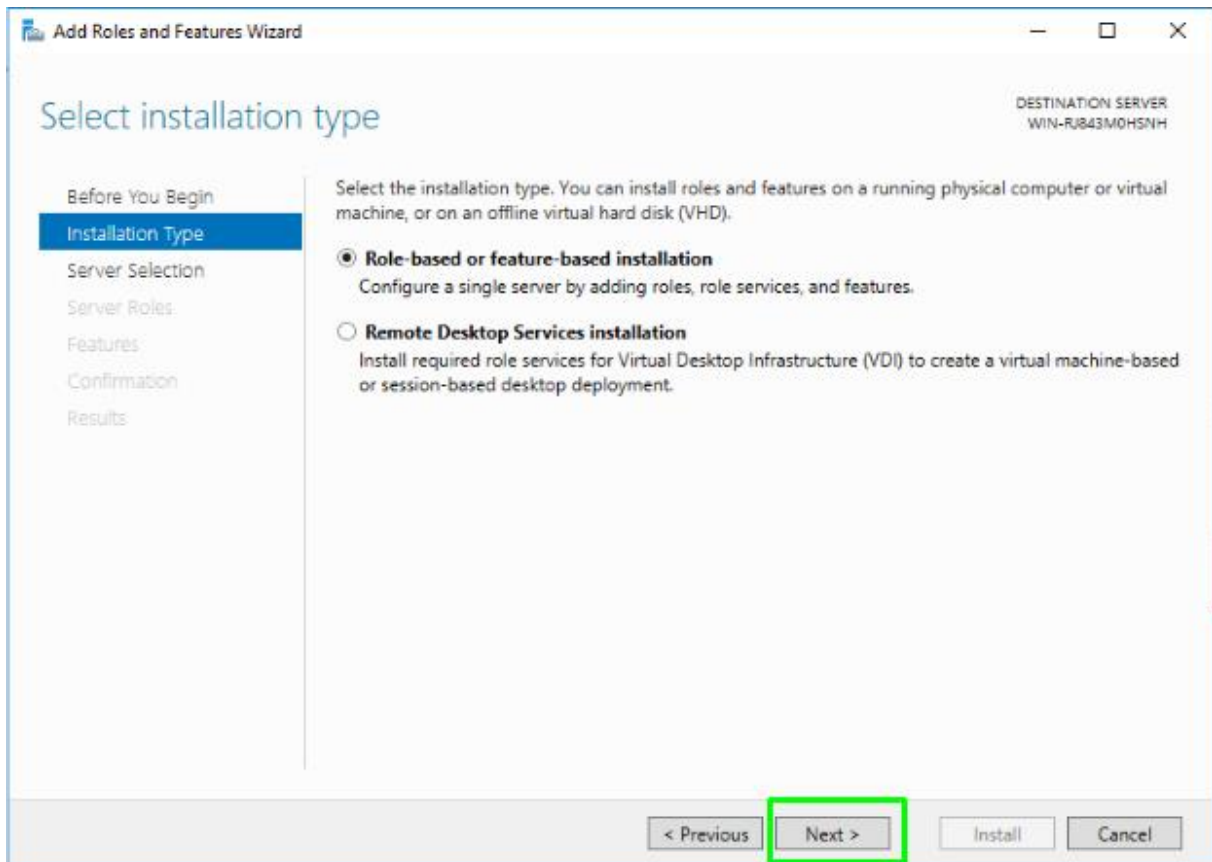
Server Manager açtıktan sonra, sağ üst köşeden click manage, add roles and features tıklanır.



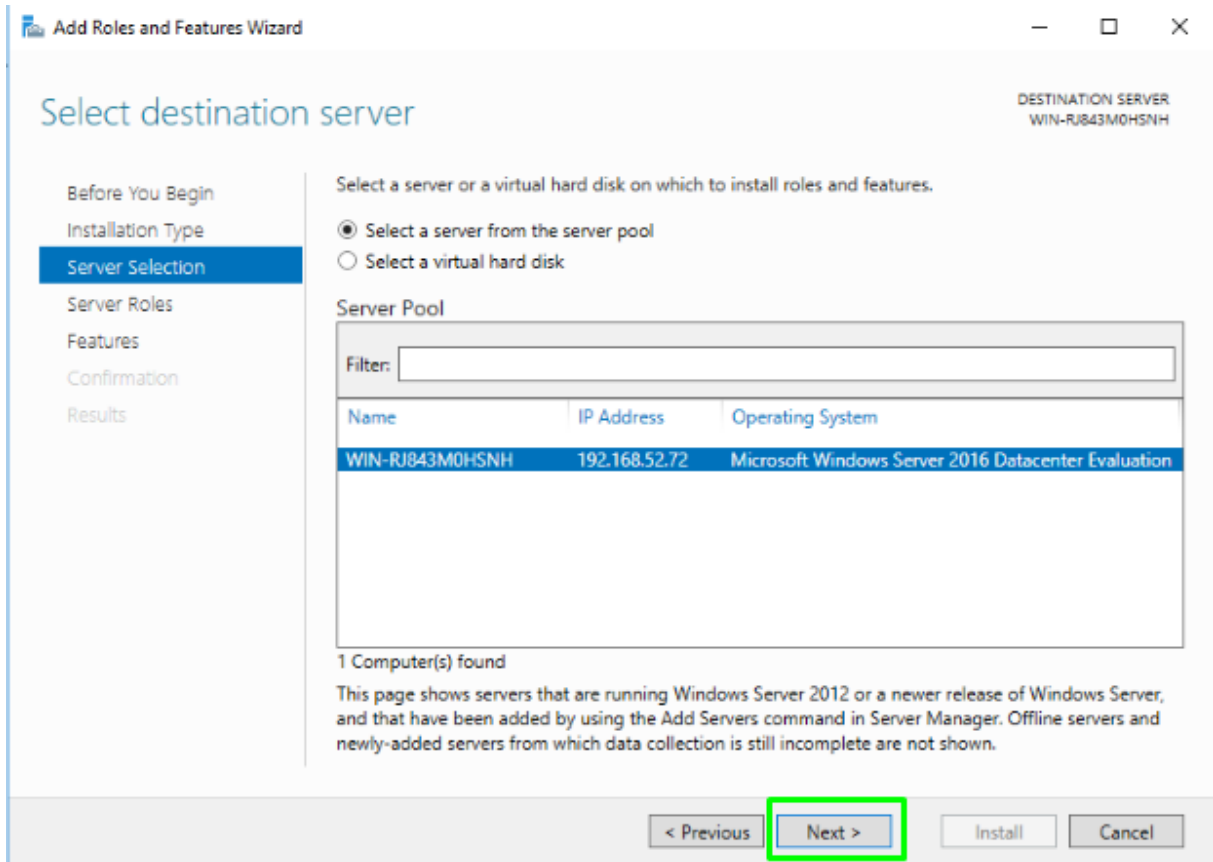
Before you begin ekranında next tıklanır.



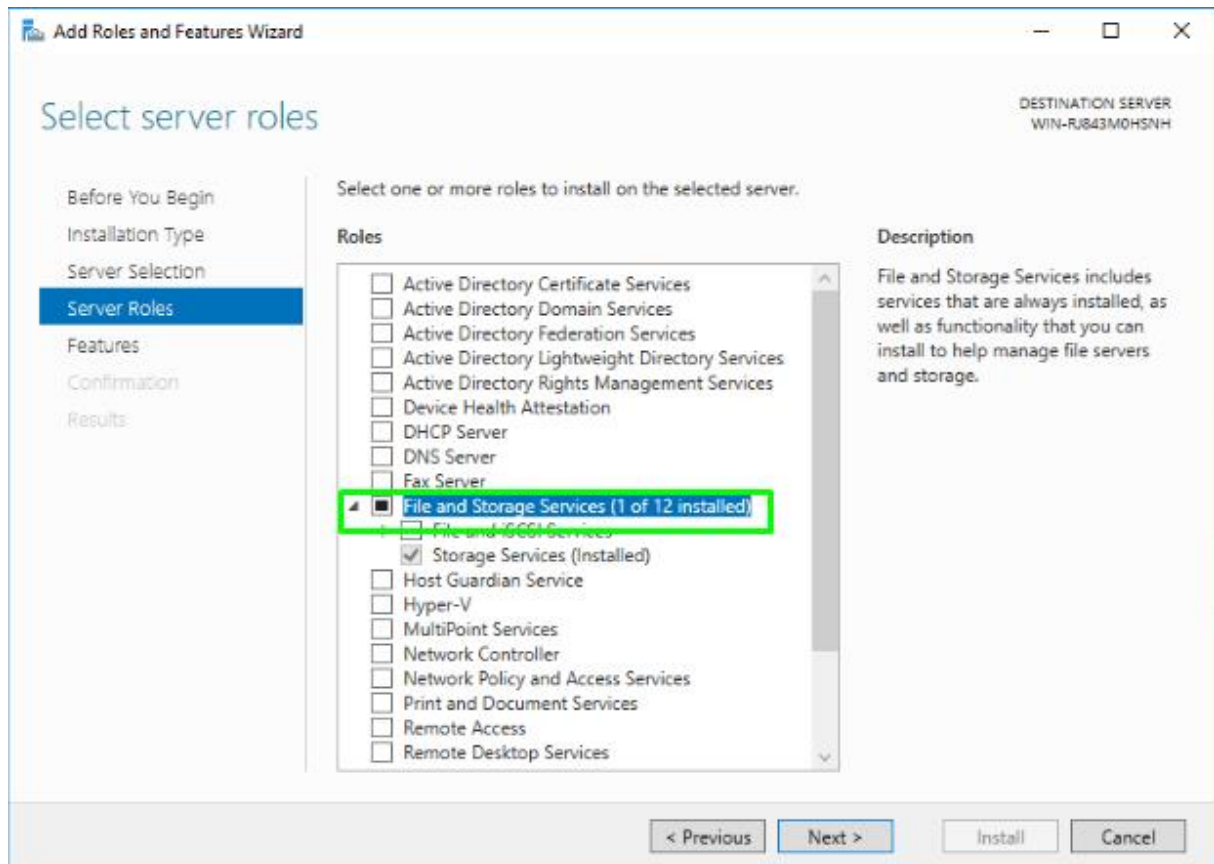
Select installation type ekranında, role-based or feature-based installation seçilir ve next tıklanır.



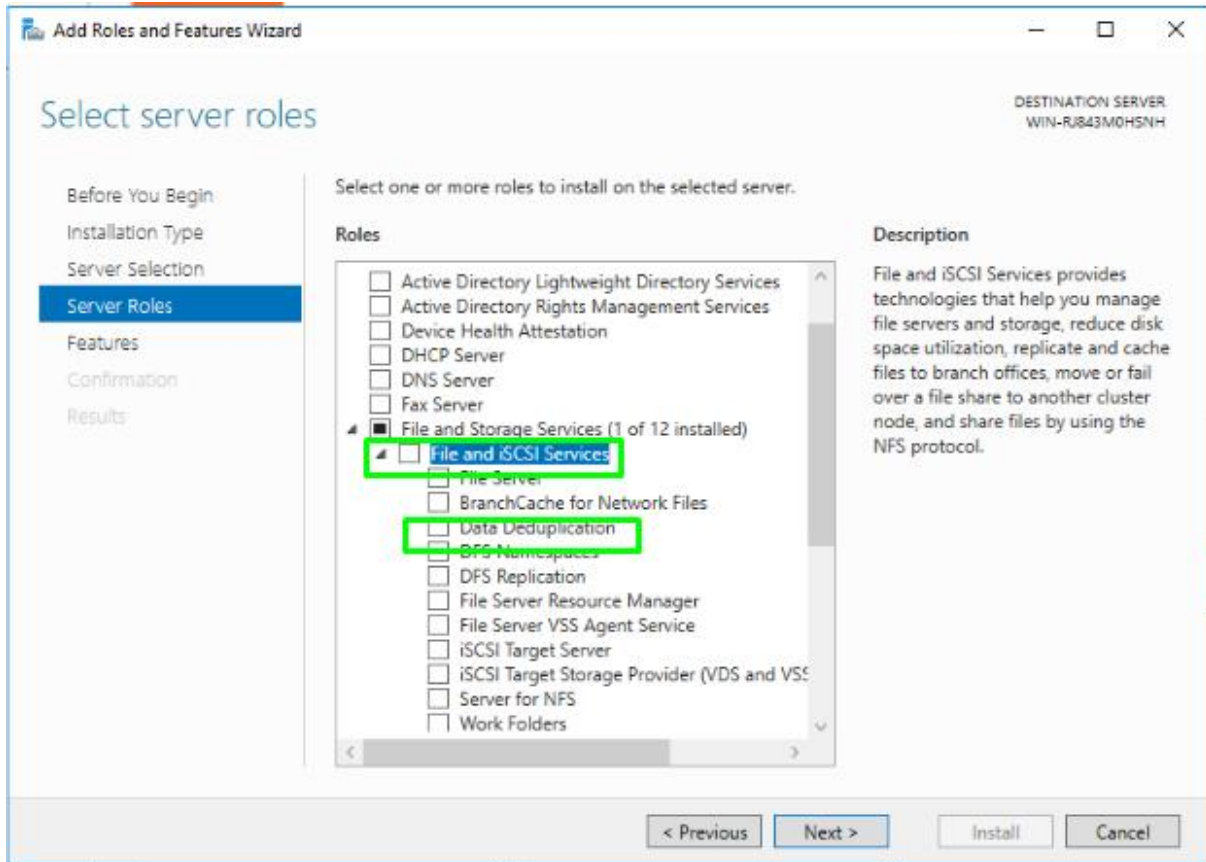
Select destination server ekranında, select a server from the server pool, bilgisayarımızı seçiyoruz ve next tıklanır.



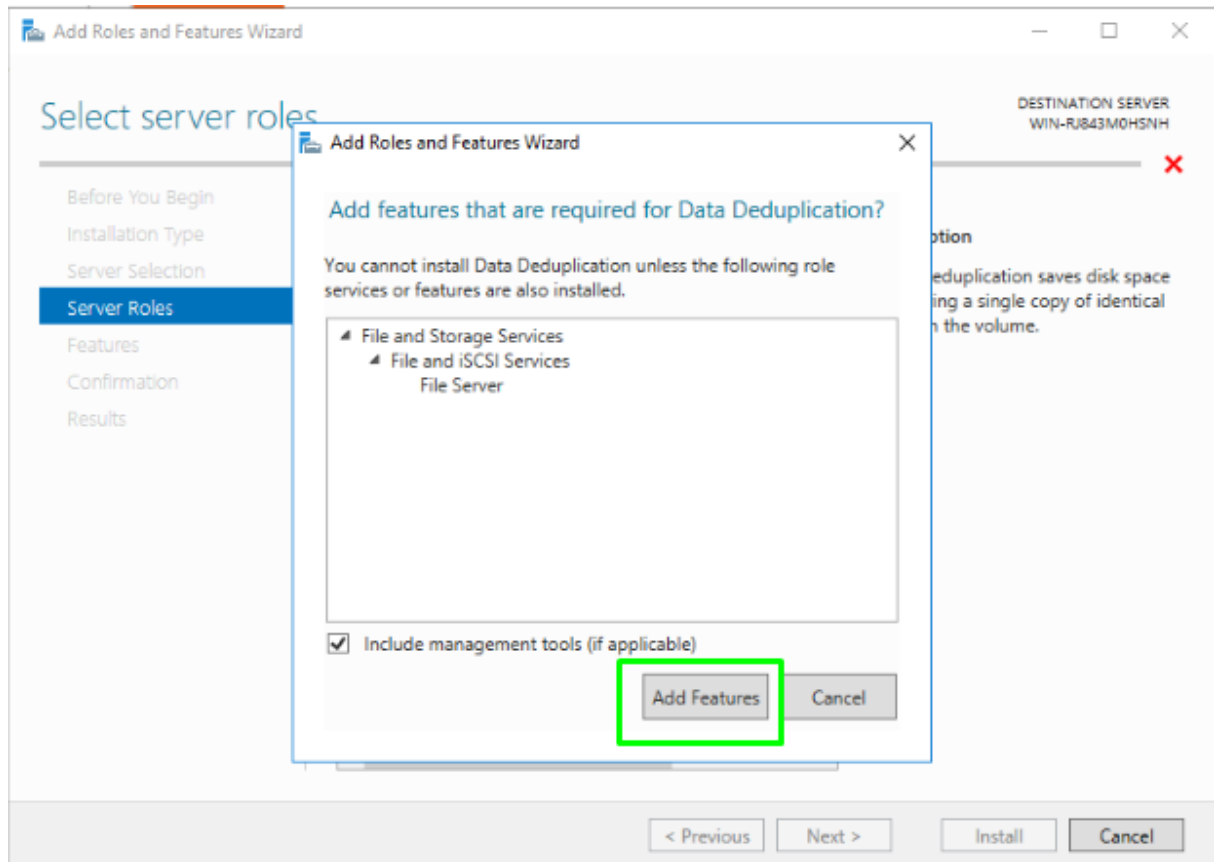
Select server roles ekranında, File and storage services checkbox seçilir.



Select server roles ekranında, File and iSCSI Services tıklanır ve altından data deduplication rolü seçilir.

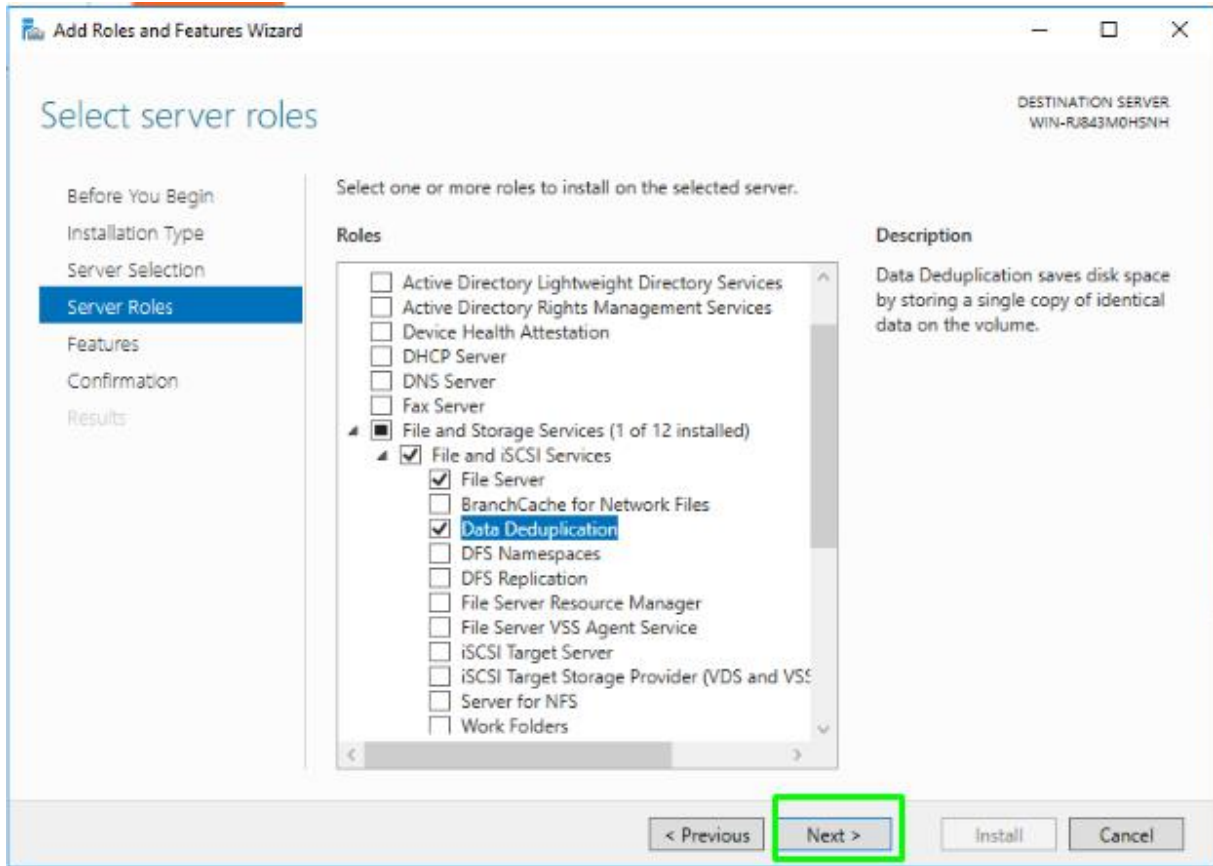


Açılan add roles and features wizard ekranında add features tıklanır.

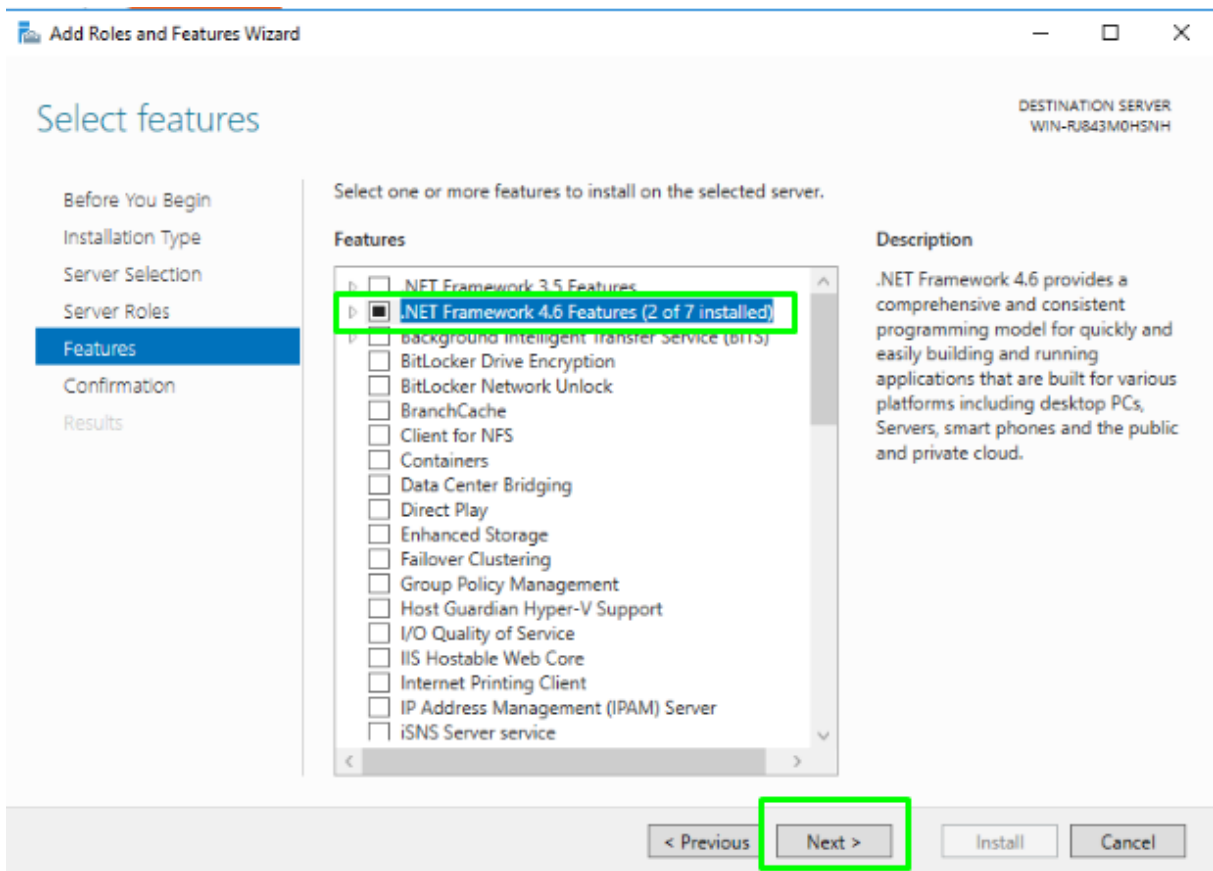




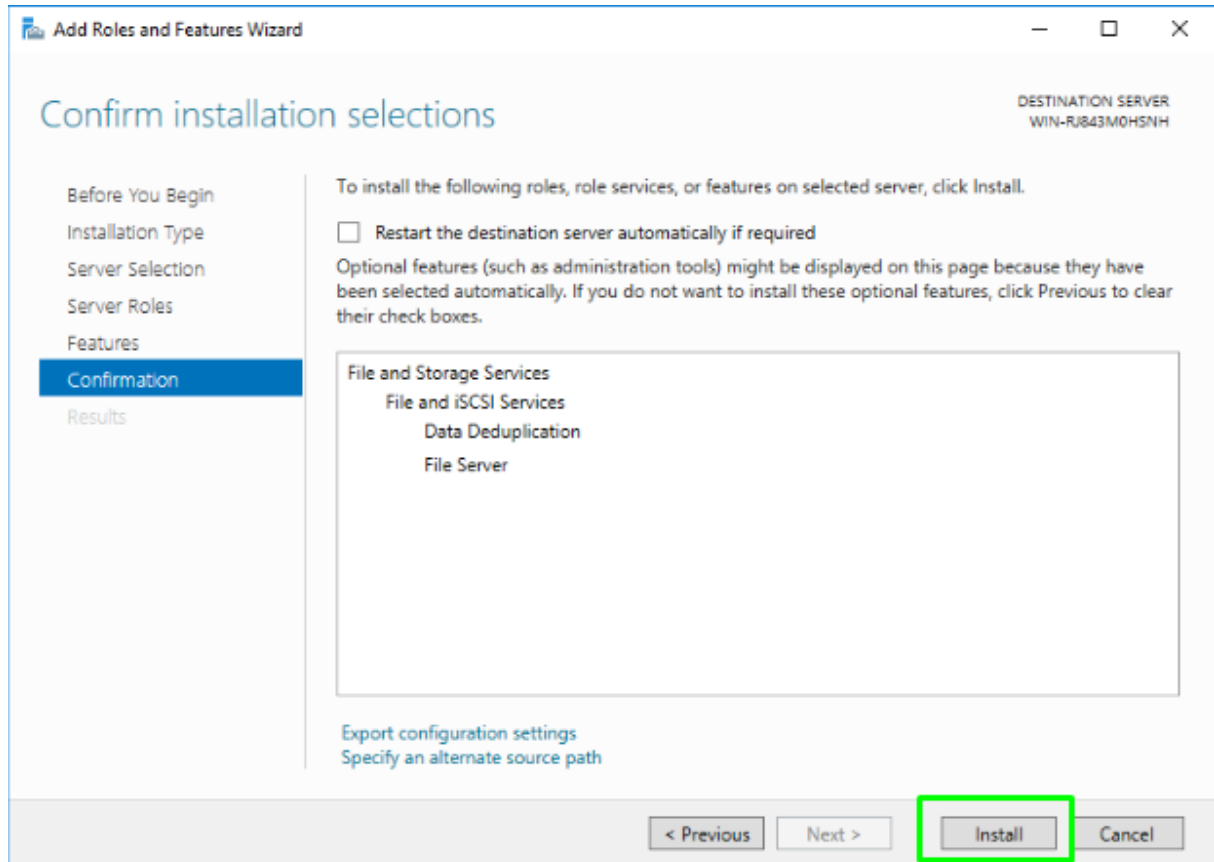
Select server roles ekranında, data deduplication rolünün seçildiğini görüyoruz ve next tıklanarak devam edilir.



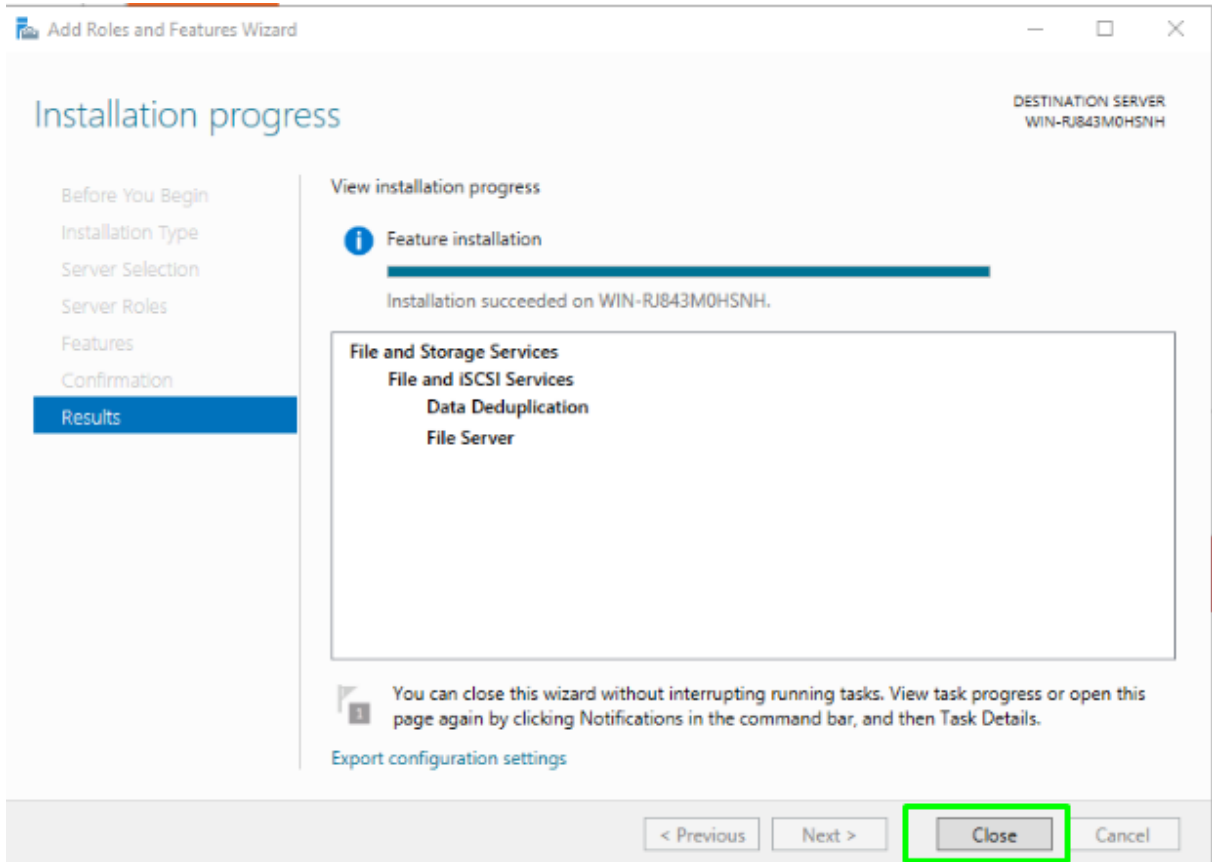
Select features ekranında next tıklanarak devam edilir. .NET Framework 4.6 Features otomatik olarak seçilmiş halde gelir.



Confirm installation selections ekranından install tıklanarak kurulum başlatılır.



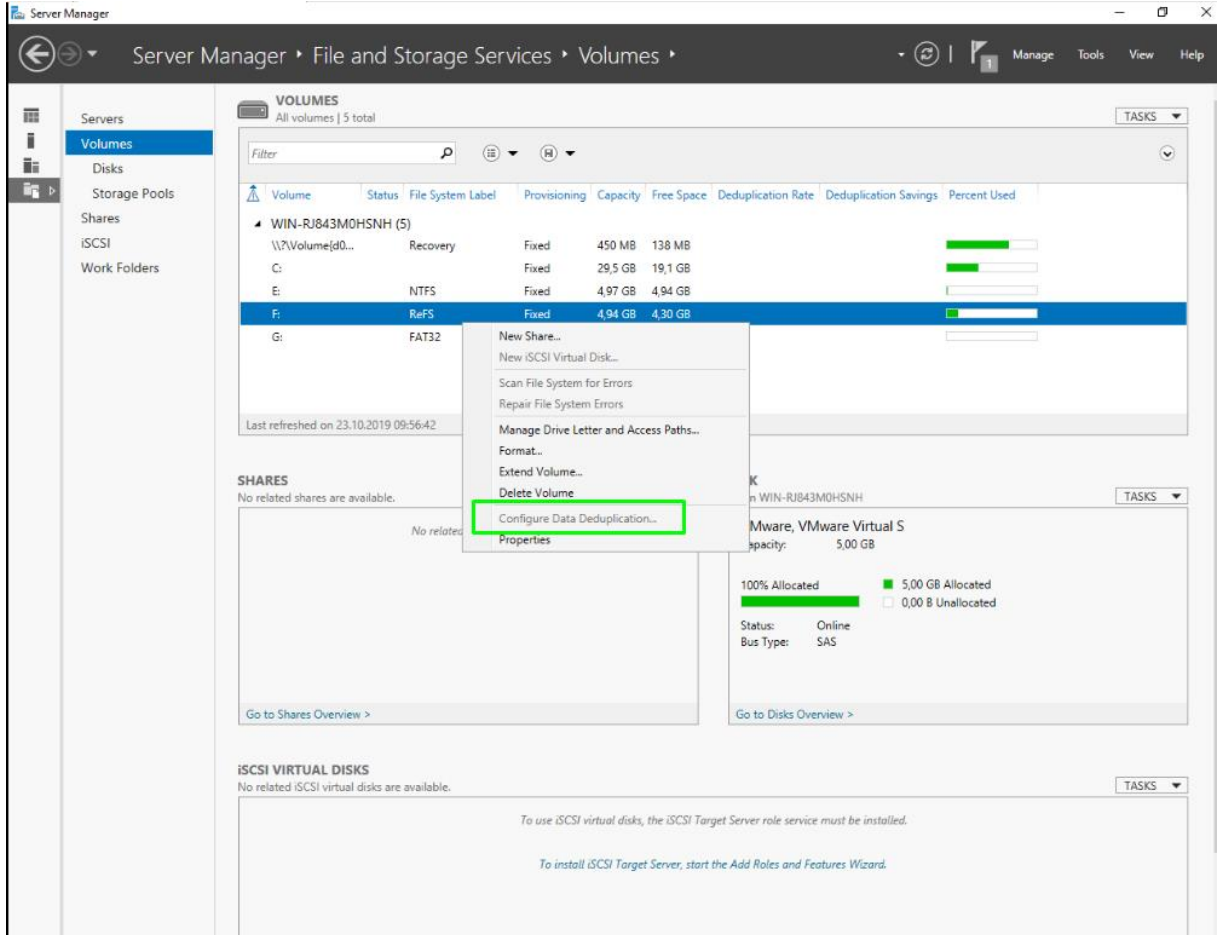
Kurulum başarıyla tamamlandıktan sonra close tıklanarak ekran kapatılır.



Server manager > file and storage services > volumes

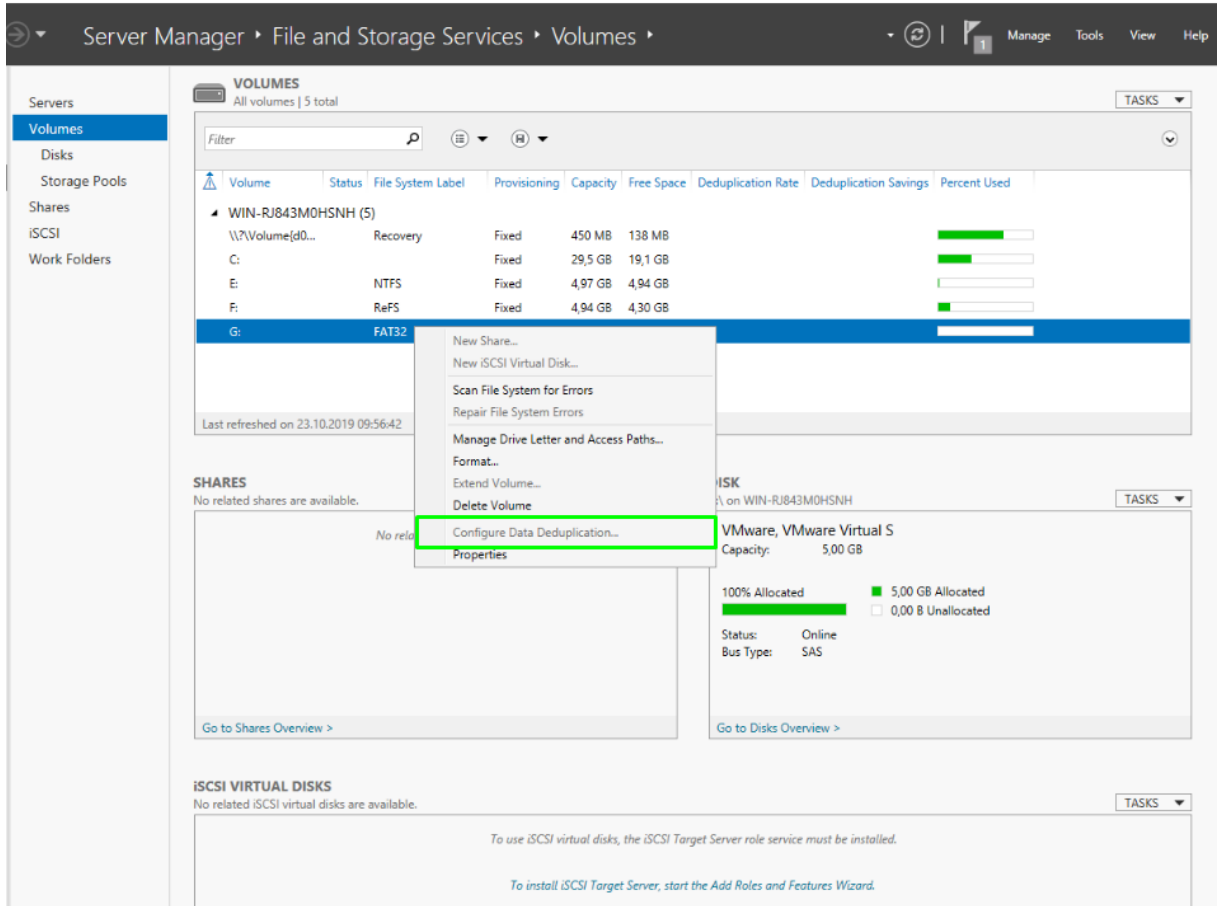
Select ReFS dosya formatı, sağ tık, configure data deduplication seçemiyoruz.

Çünkü ReFS dosya formatı data deduplication desteklemiyor.

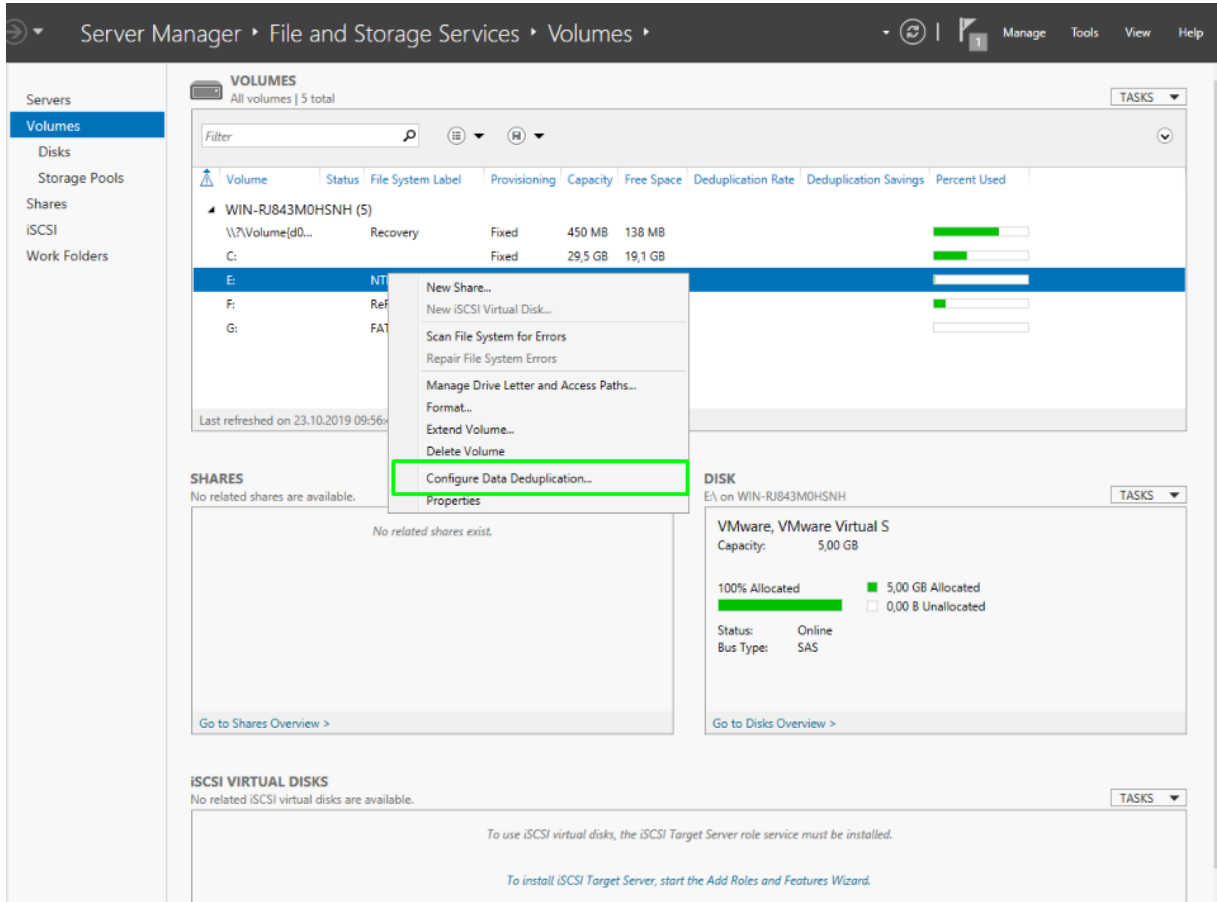


Select FAT32, sağ tık, configure data deduplication seçemiyoruz.

Çünkü FAT32 dosya formatı da data deduplication desteklemiyor.



Select NTFS, sağ tık, configure data deduplication



Yalnızca NTFS dosya formatı data deduplication destekliyor.

Ya da volemes > disks kısmından disklerimizi tek tek seçip yapabiliriz.

The screenshot displays the Windows Storage Spaces management console. The left sidebar shows the navigation menu with 'Disks' selected. The main area is divided into three sections: DISKS, VOLUMES, and STORAGE POOL.

**DISKS**  
All disks | 4 total

Number	Virtual Disk	Status	Capacity	Unallocated	Partition	Read Only	Clustered	Subsystem	Bus Type	Name
WIN-RJ843M0HSNH (4)										
0		Online	30,0 GB	0,00 B	GPT				SAS	VMware, VMware Virt...
1		Online	5,00 GB	0,00 B	GPT				SAS	VMware, VMware Virt...
2		Online	5,00 GB	0,00 B	GPT				SAS	VMware, VMware Virt...
3		Online	5,00 GB	0,00 B	GPT				SAS	VMware, VMware Virt...

Last refreshed on 23.10.2019 10:34:07

**VOLUMES**  
Related Volumes | 1 total

Volume	Status	Provisioning	Capacity	Free Space	Deduplication Rate
WIN-RJ843M0HSNH (1)					
G:	Fixed		4,96 GB	4,96 GB	

[Go to Volumes Overview >](#)

**STORAGE POOL**  
VMware, VMware Virtual S on WIN-RJ843M0HSNH

No related storage pool exists.

[Go to Storage Pools Overview >](#)

G: FAT32 dosya formatındadır.

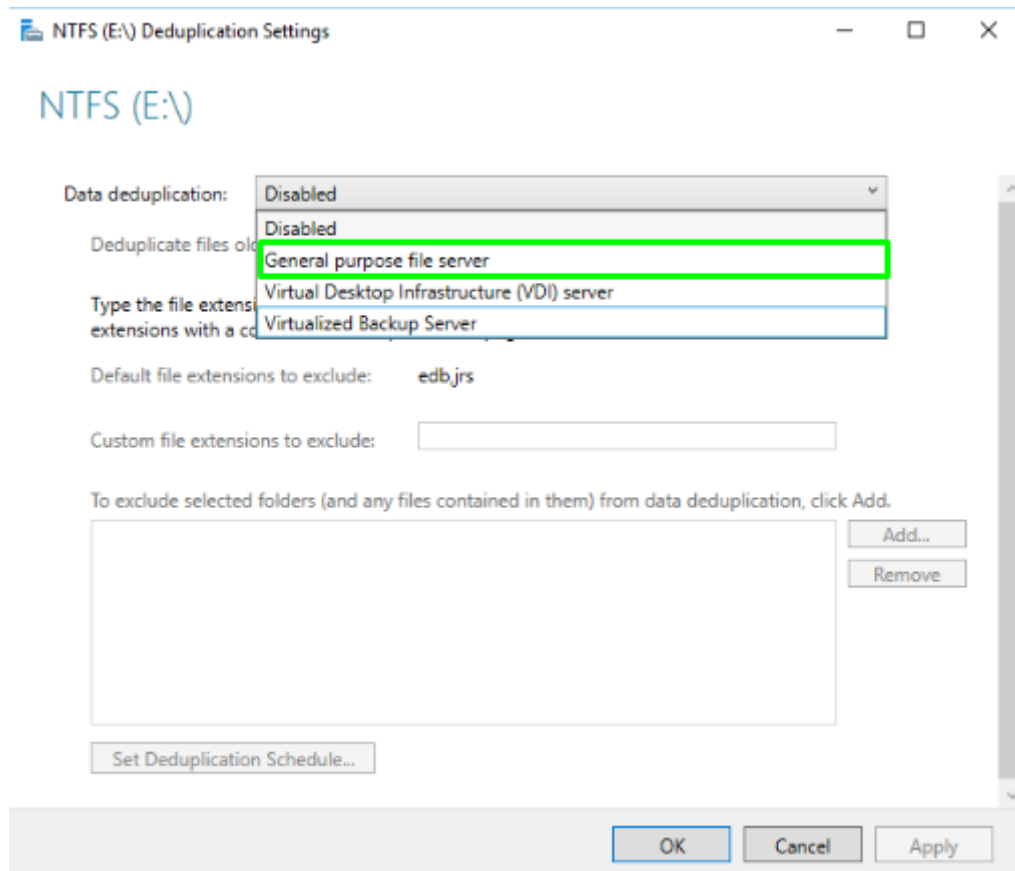
F: ReFS formatındadır.

E: NTFS dosya formatındadır.

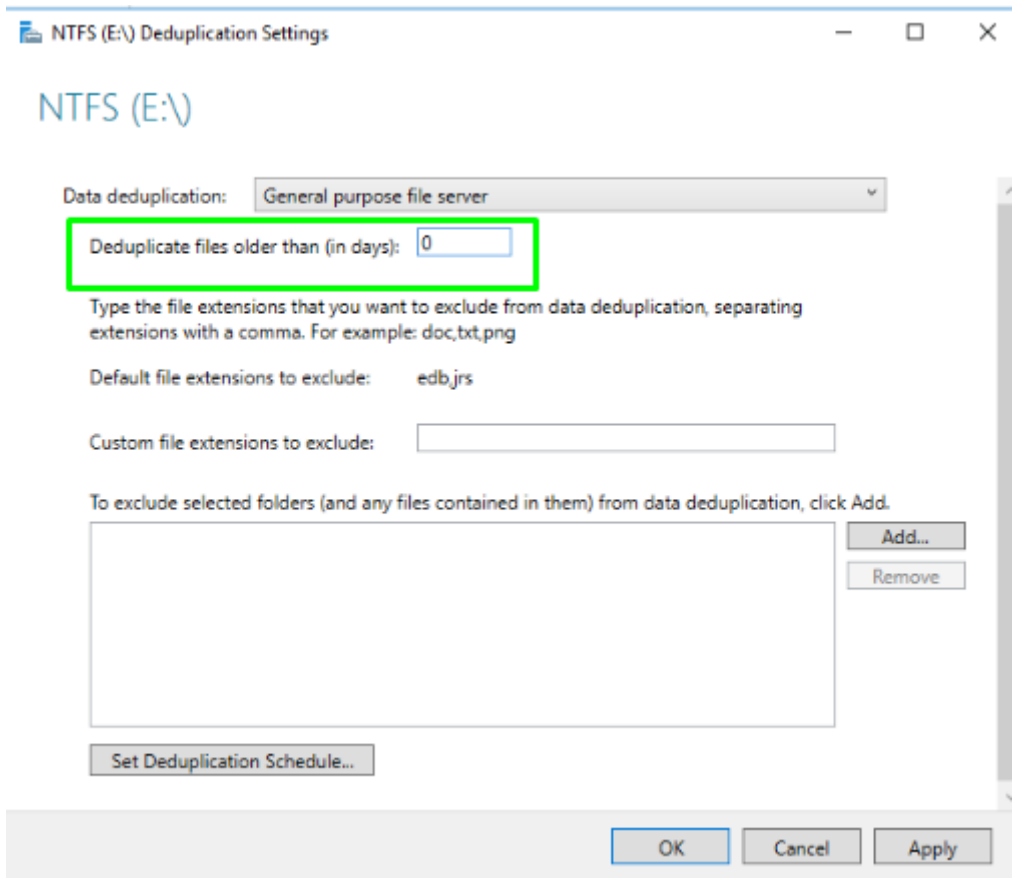
Disks kısmından yalnızca E: dosyasını data deduplication yapabileceğimizi görürüz.



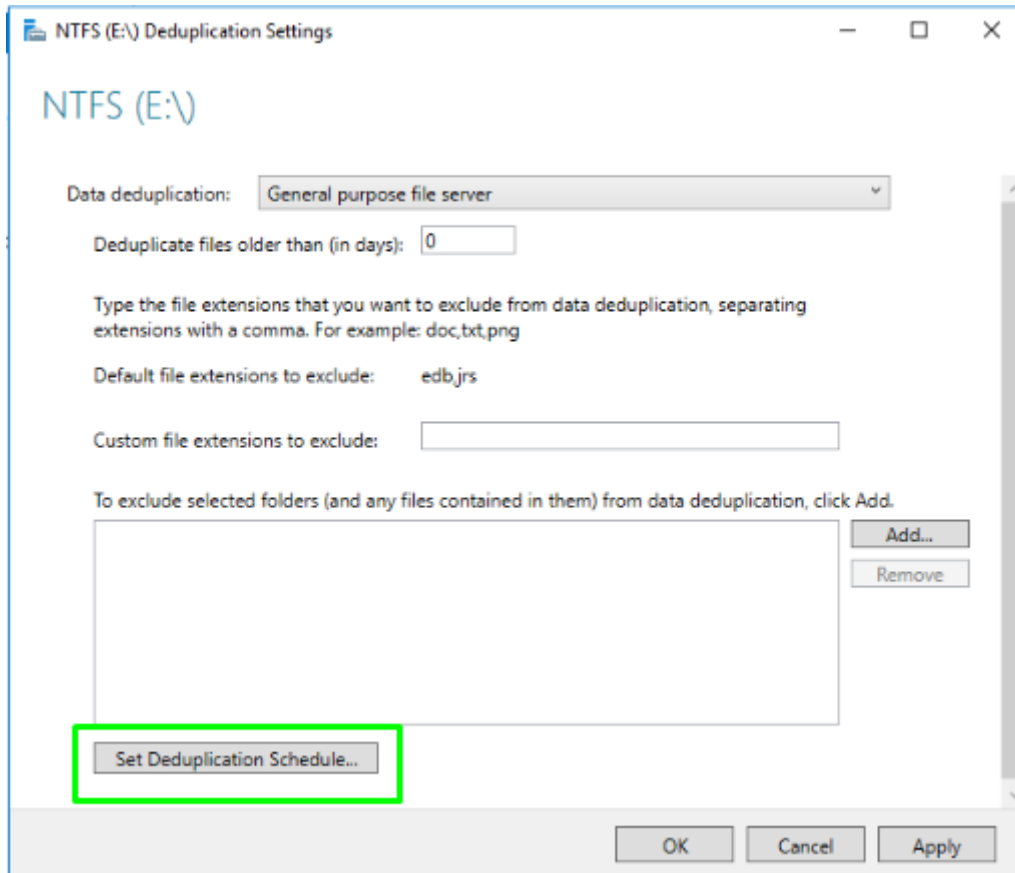
Data deduplication, general purpose file server seçilir, apply tıklanır ve ardından OK tıklanır.



Dosyayı deduplicate kaç günde bir taraması gerektiğini seçiyoruz. Burada biz 0 gün olarak girdik apply tıklanır ve ardından OK tıklanır.



Set deduplication schedule tıklanır.



Enable throughput optimization check box tıklanır.

WIN-RJ843M0HSNH Deduplication Schedule

## WIN-RJ843M0HSNH

☒ Enable background optimization

Regularly run data deduplication at low priority and pause data deduplication when the system is busy to minimize the impact on system performance.

☐ Enable throughput optimization

During the specified hours, run data deduplication at normal priority and consume the resources required to maximize performance.

Days of the week: ☒ Pazartesi ☒ Salı ☒ Çarşamba ☒ Perşembe  
☒ Cuma ☒ Cumartesi ☒ Pazar

Start time: 10:45

Duration (in hours): 6

☐ Create a second schedule for throughput optimization

During the specified hours, run data deduplication at normal priority and consume the resources required to maximize performance.

Days of the week: ☒ Pazartesi ☒ Salı ☒ Çarşamba ☒ Perşembe  
☒ Cuma ☒ Cumartesi ☒ Pazar

Start time: 09:00

Duration (in hours): 8

OK Cancel Apply

Ardından başlangıç saatini ve devam süresini belirliyoruz. Apply tıklanır ardından OK tıklanır.

WIN-RJ843M0HSNH Deduplication Schedule

## WIN-RJ843M0HSNH

☒ Enable background optimization

Regularly run data deduplication at low priority and pause data deduplication when the system is busy to minimize the impact on system performance.

☒ Enable throughput optimization

During the specified hours, run data deduplication at normal priority and consume the resources required to maximize performance.

Days of the week: ☒ Pazartesi ☒ Salı ☒ Çarşamba ☒ Perşembe  
☒ Cuma ☒ Cumartesi ☒ Pazar

Start time: 10:45

Duration (in hours): 2

☐ Create a second schedule for throughput optimization

During the specified hours, run data deduplication at normal priority and consume the resources required to maximize performance.

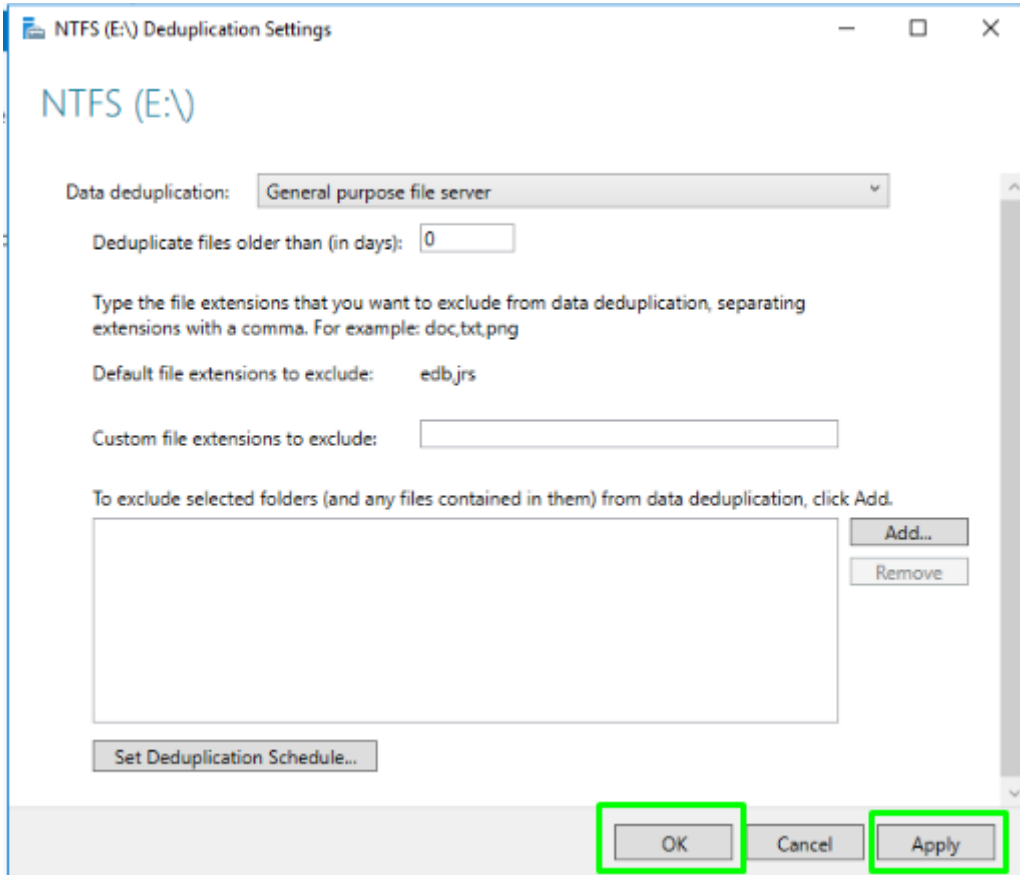
Days of the week: ☒ Pazartesi ☒ Salı ☒ Çarşamba ☒ Perşembe  
☒ Cuma ☒ Cumartesi ☒ Pazar

Start time: 09:00

Duration (in hours): 8

OK Cancel Apply

Önce apply tıklanır ardından OK tıklanır.



Data deduplication rate ve deduplication savings kısmından bakabiliriz.

The screenshot shows the Windows Server Manager interface. The left sidebar has 'Volumes' selected. The main area is divided into three sections: VOLUMES, SHARES, and DISK.

**VOLUMES**  
All volumes | 5 total

Volume	Status	File System Label	Provisioning	Capacity	Free Space	Deduplication Rate	Deduplication Savings	Percent Used
WIN-RJ843M0HSNH (5)								
\\?.Volume{d0...	Recovery		Fixed	450 MB	138 MB			
C:			Fixed	29,5 GB	19,1 GB			
E:		NTFS	Fixed	4,97 GB	4,94 GB	0%	0,00 B	
F:		ReFS	Fixed	4,94 GB	4,30 GB			
G:		FAT32	Fixed	4,96 GB	4,96 GB			

Last refreshed on 23.10.2019 10:34:07

**SHARES**  
No related shares are available.

**DISK**  
E:\ on WIN-RJ843M0HSNH

VMware, VMware Virtual S  
Capacity: 5,00 GB

100% Allocated  
5,00 GB Allocated  
0,00 B Unallocated

Status: Online  
Bus Type: SAS

This screenshot shows the 'VOLUMES' section of the Windows Server Manager after a refresh. The table below shows the current state of the volumes.

Volume	Status	File System Label	Provisioning	Capacity	Free Space	Deduplication Rate	Deduplication Savings	Percent Used
WIN-RJ843M0HSNH (5)								
\\?.Volume{d0...	Recovery		Fixed	450 MB	138 MB			
C:			Fixed	29,5 GB	19,1 GB			
E:		NTFS	Fixed	4,97 GB	4,94 GB	0%	0,00 B	
F:		ReFS	Fixed	4,94 GB	4,30 GB			
G:		FAT32	Fixed	4,96 GB	4,96 GB			

Last refreshed on 23.10.2019 10:34:07

Volumes kısmından sağ tıklayıp refresh yaptıktan sonra,

Volume	Status	File System Label	Provisioning	Capacity	Free Space	Deduplication Rate	Deduplication Savings	Percent Used
WIN-RJ843M0HSNH (5)								
\\7\Volume[d0...	Recovery		Fixed	450 MB	138 MB			
C:			Fixed	29,5 GB	19,1 GB			
E:	NTFS	Fixed		4,97 GB	4,81 GB	55%	200 MB	
F:	ReFS	Fixed		4,94 GB	4,10 GB			
G:	FAT32	Fixed		4,96 GB	4,76 GB			

Last refreshed on 23.10.2019 10:46:08

Dosyanın içerisinde %55 lik rate ile data deduplication yaparak, 200Mb'lık bir alan kazanıyor.

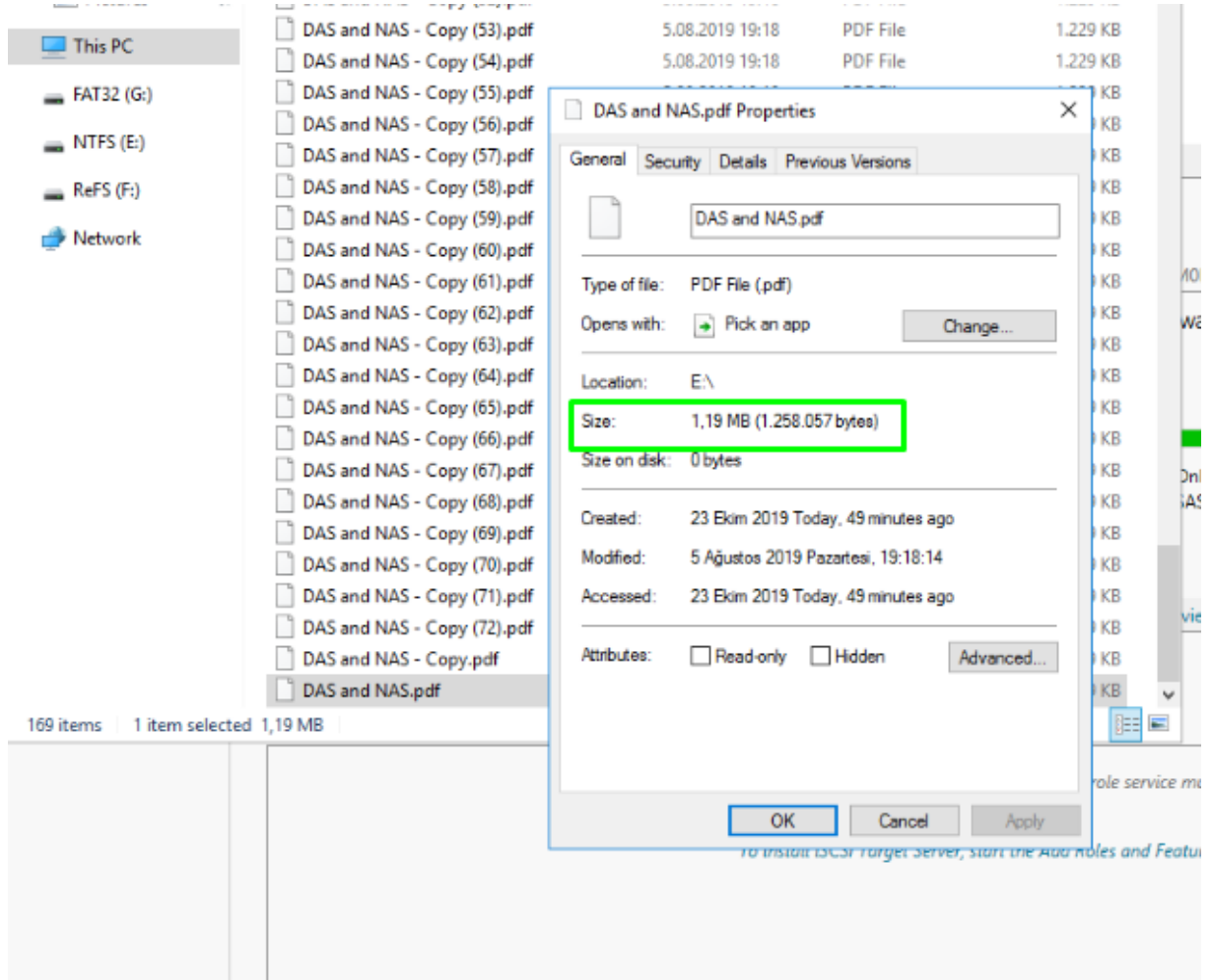
The screenshot shows a Windows File Explorer window displaying a folder named 'This PC > NTFS (E:)'. The folder contains 169 items, all of which are PDF files. A 'Properties' window is open for a selected file, showing the following details:

- Name: DAS and NAS - Copy - Copy (9).pdf, ...
- Type: All of type PDF File
- Location: All in E:\
- Size: 202 MB (212.611.633 bytes)
- Size on disk: 0 bytes
- Attributes: ☐ Read-only, ☐ Hidden

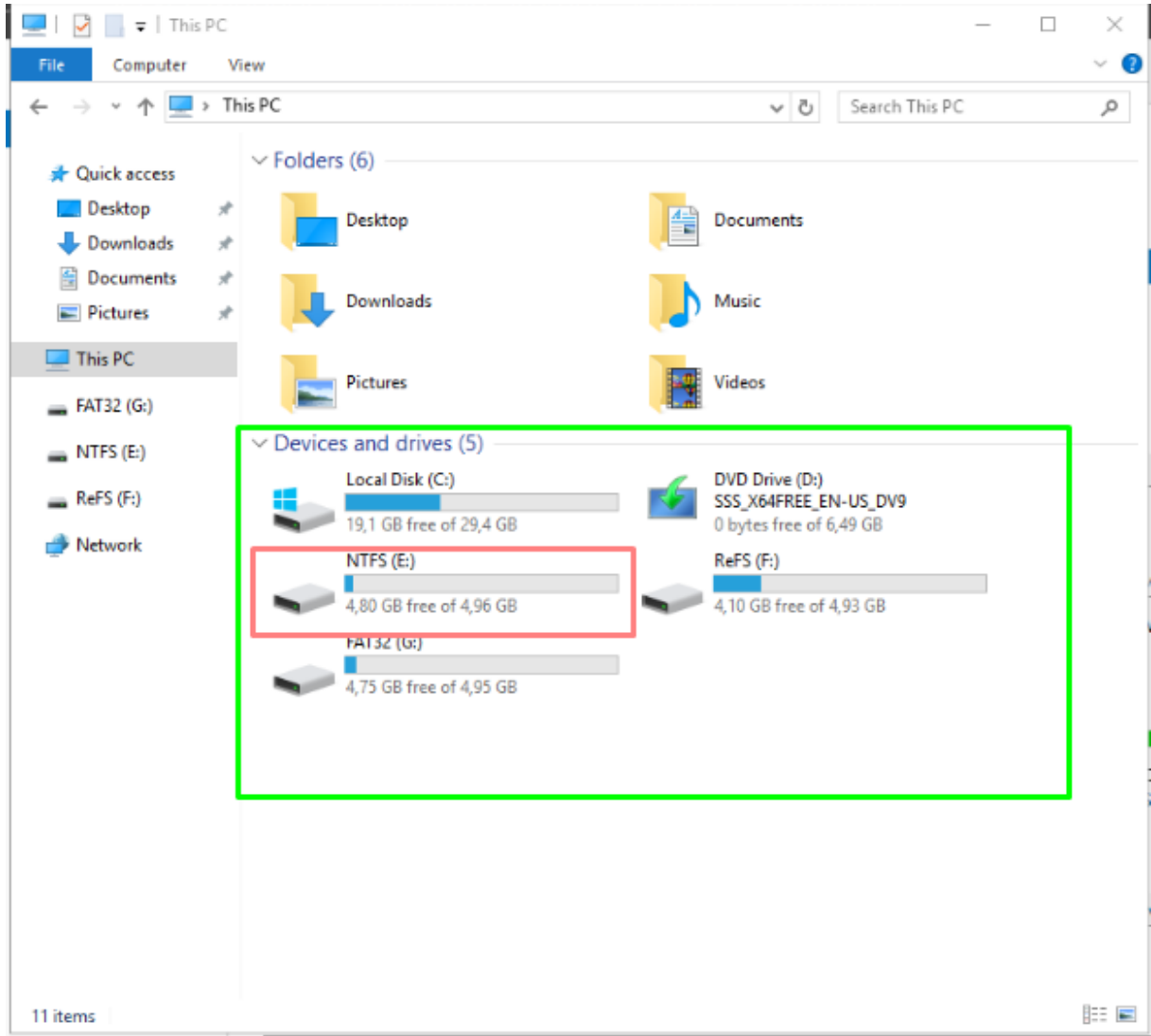
In the background, a table from the previous image is visible, showing deduplication statistics for various volumes. A green box highlights the '200 MB' value in the 'Deduplication Savings' column for the 'E:' volume.

Kopyaladığımız dosyaların toplam boyutu 202MB, ve data deduplicationda saving yapacağı alan 200 MB, buradan tek dosyanın bir boyutunun 2 MB olduğunu anlayabiliriz.





Bir dosyanın boyutu 1.19 MB olduğunu yukarıda görebiliriz.



**SONUÇ :** FAT32 ve ReFS'te data deduplication yapamadığımız için 200MBlık bir alan kazanamadık, başlangıçta dosya boyutu 4,95GB iken şu an içerisindeki dosyalarla birlikte 4,75GB'a düştü. Bu şekilde de kontrol yapabiliriz.

NTFS'te data deduplication yaptığı için başlangıçta 4,93GB'lık alandan 200MB yer kazanarak 4,80GB kullanmış olduk.

Dosya sayısı değişmez iken kapladıkları alan azalıyor. Copylerin içine referans koyuyor, biz herhangi bir copyi açsak bile arka planda yalnızca bir orijinal dosya var, ona yönlendiriyor ve biz onu görüyoruz.