

# Retention and consolidation

Scheduling full, incremental and differential images as part of a regular backup cycle is essential for optimising the use of available storage space, protecting your computer from sudden failure and giving you the ability to recover historical data.

## Retention types

Retention and consolidation of full, differential and incremental backups combined with deletion logic maintains backup set integrity by ensuring the backup chain is never broken.

The following are examples to show how retention rules operate on your backup sets....

### Full backup retention

In Full backup retention, a specified number, or age, of full backups are retained. When full backups are purged, the entire backup set is also deleted.

**F = Full**  
**D = Differential**  
**I = Incremental**

```
M T W T F   M T W T F   M T W T F   M T W T F   M T W T F   M T W
F I I I I   D I I I I   D I I I I   D I I I I   D I I I I   F I I
```

e.g, Retain 1 Full backup.

After retention, the entire previous backup set is deleted

```
M T W T F   M T W T F   M T W T F   M T W T F   M T W T F   M T W
F I I I I   D I I I I   D I I I I   D I I I I   D I I I I   F I I
```

### Differential retention

Specify a number of differential backups to retain by age or number,

```
M T W T F   M T W T F   M T W T F   M T W T F   M T W T F   M T W
F I I I I   D I I I I   D I I I I   D I I I I   D I I I I   F I I
```

For example, Retain 2 differential backups.

After retention, the most recent 2 differential backups are retained. Incremental backups that are linked to previous differential backups are deleted along with the deleted differentials.

```
M T W T F   M T W T F   M T W T F   M T W T F   M T W T F   M T W
F I I I I   D I I I I   D I I I I   D I I I I   D I I I I   F I I
```

### Incremental retention

Specify the number of incremental backups to retain. If by deleting an incremental the backup chain is broken this causes consolidation of the oldest retained Incremental.

```
M T W T F   M T W T F   M T W T F   M T W T F   M T W T F   M T W
F I I I I   D I I I I   D I I I I   D I I I I   D I I I I   F I I
```

For example, Retain 4 incremental backups.

After retention, the most recent 4 incremental backups are retained. The oldest retained incremental is not be valid on its own as it requires the previous 2 incremental backups to complete the chain. To ensure backup integrity the 2 older incremental backups are consolidated with it to create a new incremental backup.

```
M T W T F   M T W T F   M T W T F   M T W T F   M T W T F   M T W
F I I I I   D I I I I   D I I I I   D I I I I   D I I I I   F I I
                                     --->I I F I I
```

## Synthetic Full / Incrementals forever

Incrementals forever optimises backup space and time by only ever creating a single full backup. After this, incremental backups are created forever and, once the specified number of incremental backups is reached, Macrium Reflect consolidates the incremental backup into a new 'synthetic' full backup. This is also known as a Synthetic Full backup.

For example, Incrementals forever with retain 4 incrementals. For the first week,

```
M T W T F
F I I I I
```

The next Monday, to retain 4 Incrementals, the Full is consolidated with the first incremental to create a new Synthetic Full.

```
M T W T F M
F I I I I I
->F I I I I
```

On Tuesday the consolidation step is repeated again on the next incremental image.

```
M T W T F M T
  F I I I I I
  -->F I I I I I
```

This process is repeated forever. After the first Full only Incremental backups are required.

Consolidation is performed non destructively and 'In Place'. Therefore, very little additional disk space is required during consolidation and failed consolidations will automatically revert to the pre-consolidation state. For example, a consolidation could fail mid process due to a hardware malfunction such as a dropped network connection. In this circumstance the consolidation would automatically begin again the next time the backup is run without any loss of backup integrity.

## Backup Plans

Backups schedules and retention rules are saved in a **Backup Plan** with each backup definition. You can even define your own **Backup Plan Templates** for easy reuse. The following are default templates:

### Grandfather, Father, Son.

Daily Incremental ("**Son**"), weekly Differential ("**Father**"), and monthly Full ("**Grandfather**") backups. Retention for each backup type can be set based on data history and space requirements. e.g,

Backup Type	Schedule	Retention
Monthly Full Backup	Run on the 1st Monday of every month	26 Weeks
Weekly Diff Backup	Run on every Monday (except 1st Monday)	4 Weeks
Daily Inc	Run Tues, Wed, Thu, Fri	14 Days

### Differential Backup Set

A Full backup is created periodically followed by daily Differential backups.

Backup Type	Schedule	Retention
Monthly Full Backup	Run on the 1st Monday of every month	26 Weeks
Daily Diff Backup	Run on Mon, Tues, Wed, Thu, Fri (except 1st Monday)	30 Days

### Incremental Backup Set

A Full backup is created periodically followed by daily Incremental backups.

Backup Type	Schedule	Retention
Monthly Full Backup	Run on the 1st Monday of every month	26 Weeks

Daily Inc Backup	Run on Mon, Tues, Wed, Thu, Fri (except 1st Monday)	30 Days
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### Incrementals Forever

An initial Full backup is created followed by daily Incremental backups.

Backup Type	Schedule	Retention
Initial Full Backup	Initially created when the first Incremental is scheduled to be created	A Synthetic Full is created after the first 30 Incrementals
Daily Inc Backup	Run Every Mon, Tues, Wed, Thu Fri	30

### Related articles

- [Logging file changes for Incremental and Differential Images](#)
- [Retention and consolidation](#)
- [Scheduling backups](#)
- [Scheduling](#)
- [Creating desktop shortcuts for full, incremental and differential backups](#)