RMAN Performance Tuning

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Objectives

In this lecture, you will learn how to perform the following:

- Describe RMAN performance tuning analysis
- Enable asynchronous I/O for tapes and disks
- Understand backup strategy impact on RMAN performance
- Control RMAN multiplexing
- Describe level of multiplexing in RMAN
- Control RMAN backup overhead

About Performance Tuning Analysis

- The first step to investigate performance issues
- Performance issues usually caused by external components:
  - Load on disk system
  - Disk system I/O bandwidth
  - Database
  - Network bandwidth
  - MML Issues
- Performance measurement tools:
  - Disk and MML throughput
  - Database tuning tools

Network Speed and Throughput

Network Speed	Expected Throughput
1 Gbps	100 MB/s - 125 MB/s
2 Gbps FC	200 MB/s
8 Gbps FC	800 MB/s
10 Gbps	1 GB/sec - 1.25 GB/sec
40 Gbps	2.5 GB/s

A 1 TB data takes about 15 minutes to transfer through 10 Gbps network.

Backup Devices

- Devices with higher specifications, provide better performance
- Having more than one device improves significantly the backup and restore performance
- Backup devices are synchronous or asynchronous (common)
- Configuration settings are available for each device type

Enabling Asynchronous I/O For Tapes

- Asynchronous IO to tape can be simulated by setting the parameter **BACKUP_TAPE_IO_SLAVES** to true
  - When the parameter is set to true, the IO buffer is taken from SGA
  - When the parameter is set to false, the IO buffer is taken from PGA
- Tape buffer size can be set at channel configuration or allocation:

```
ALLOCATE CHANNEL c1 DEVICE TYPE SBT PARMS="blksize=262144,
ENV=(NB_ORA_CLASS=RMAN_oradb)"
```

- Monitoring IO throughput:
  - In case of synchronous IO: **V$BACKUP_SYNC_IO**
  - In case of asynchronous IO: **V$BACKUP_ASYNC_IO**

Enabling Asynchronous I/O For Disks

- Most modern platform supports asynchronous I/O for disks
- If not, it can be simulated by setting the parameter **`DBWR_IO_SLAVES`** to nonzero value.

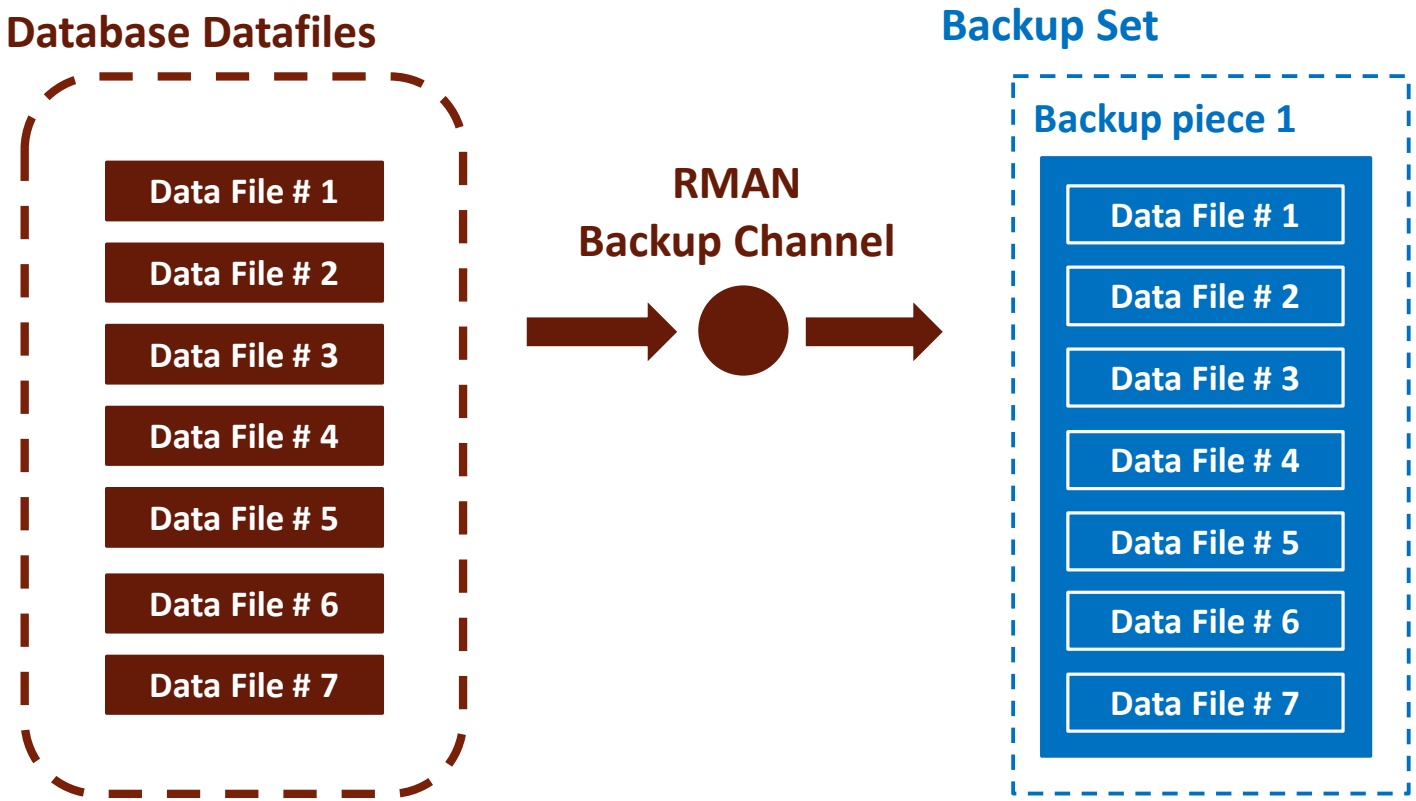
Backup Strategy and Configuration Influence

- Backup strategy has significant influence on backup time:
  - Incrementally updated backup
  - Incremental backup + BCT
- Use multisection with large datafiles
- Monitor the free disk space in the datafile location and backup device
  - Backup solutions need temporary disk space
  - RMAN does not resume a failed restored datafile. It deletes it and restores it again.

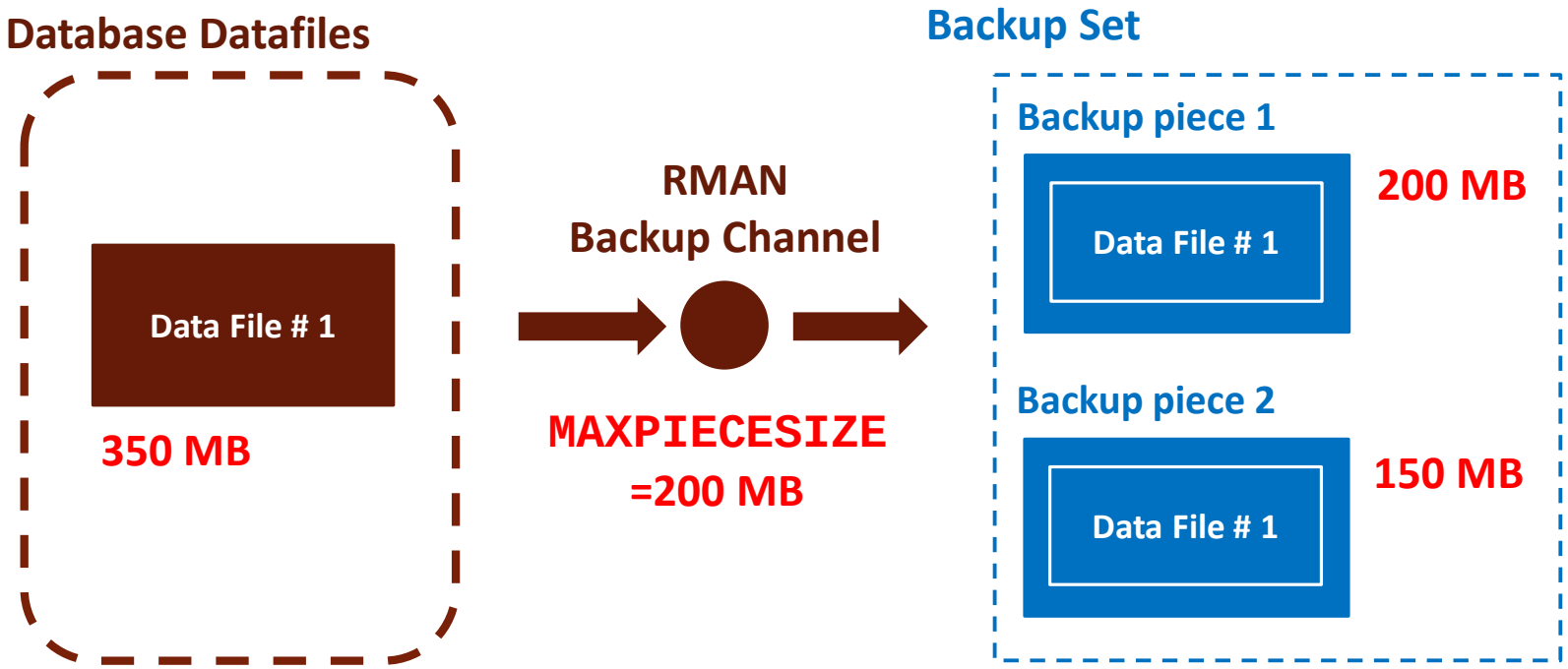
Parallelism in RMAN

- Is implemented by configuring or allocating multiple channels
- Configure number of channels that is equal to the number of backup devices
- No benefit on paralleling channels on the same device

RMAN Multiplexing



RMAN Multiplexing: MAXPIECESIZE

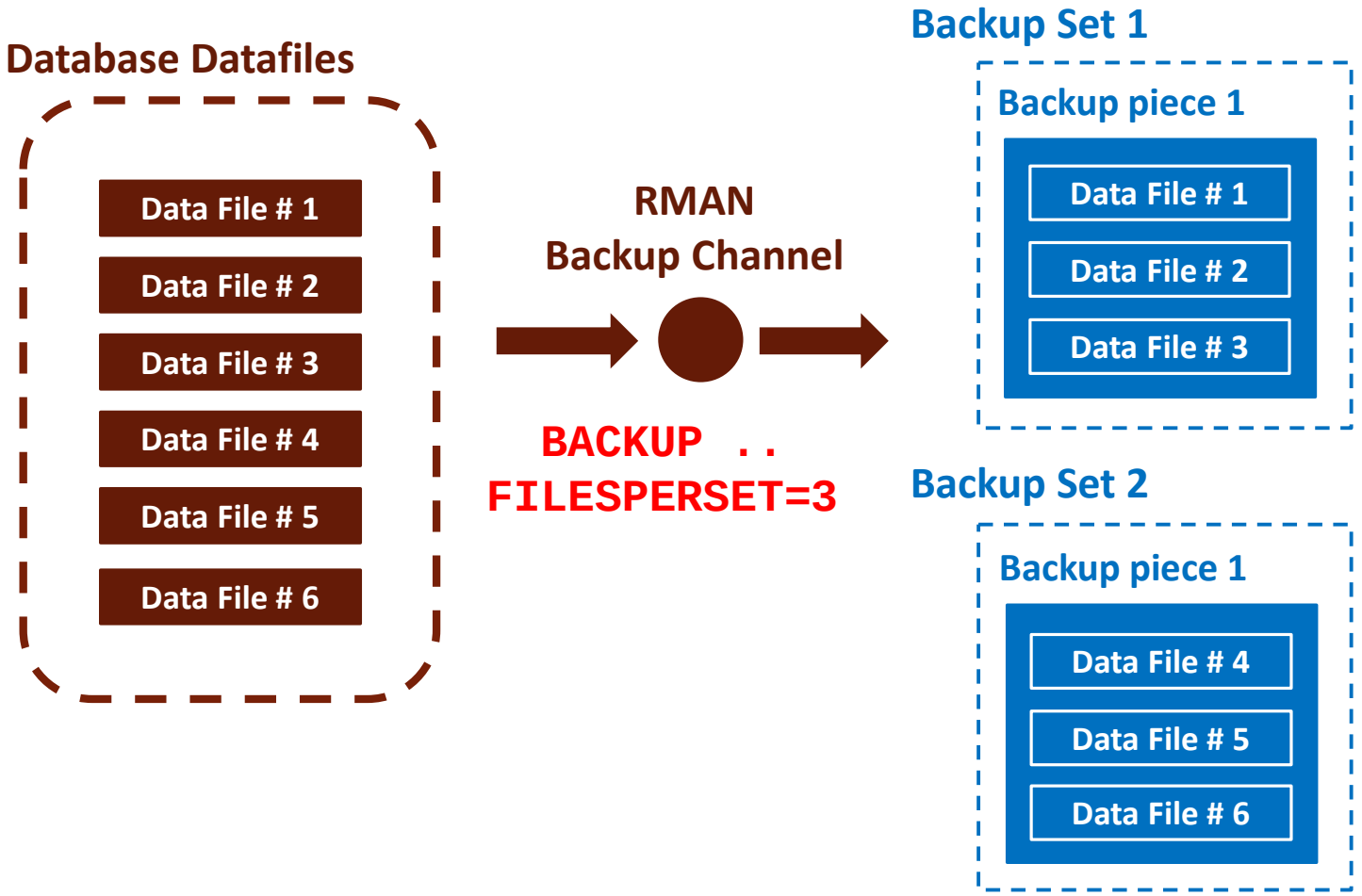


About MAXPIECESIZE Channel Parameter

- Specifies the maximum size of produces backup piece
- Possible usages:
  - Transfer large datafile that does not fit in a single storage drive
  - Transfer large datafile over network
  - To deal with operating system or file system limit on the file size

```
ALLOCATE CHANNEL c1 DEVICE TYPE DISK
                    MAXPIECESIZE 200M FORMAT '\u01\temp\%U.BAK';
```

RMAN Multiplexing: FILESPERSET



About FILESPERSET Backup Parameter

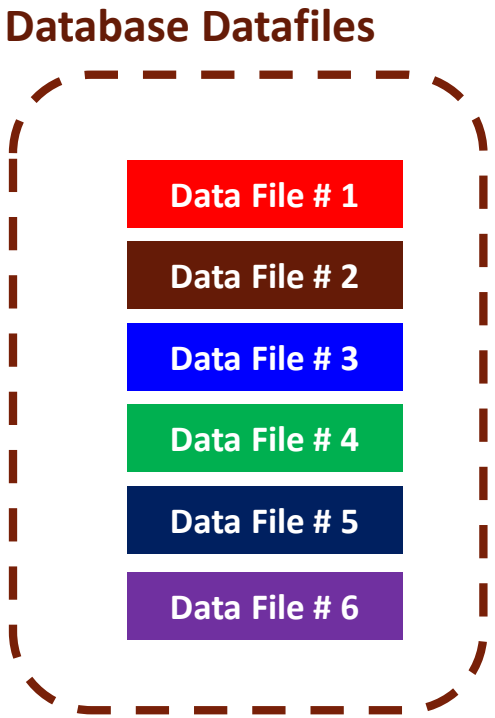
- Specifies the maximum number of datafiles to include in each backup set produced by the **BACKUP** command
- Defaults to 64
- Usage: faster recovery time when restoring a few datafiles

```
BACKUP DATAFILE 7,8 FILESPERSET 1 FORMAT '...';
```

- Other method of controlling what to include in backupsets:

```
BACKUP AS BACKUPSET (DATAFILE 3, 4, 5, 6, 7) (DATAFILE 8, 9);
```

RMAN Multiplexing: MAXOPENFILES



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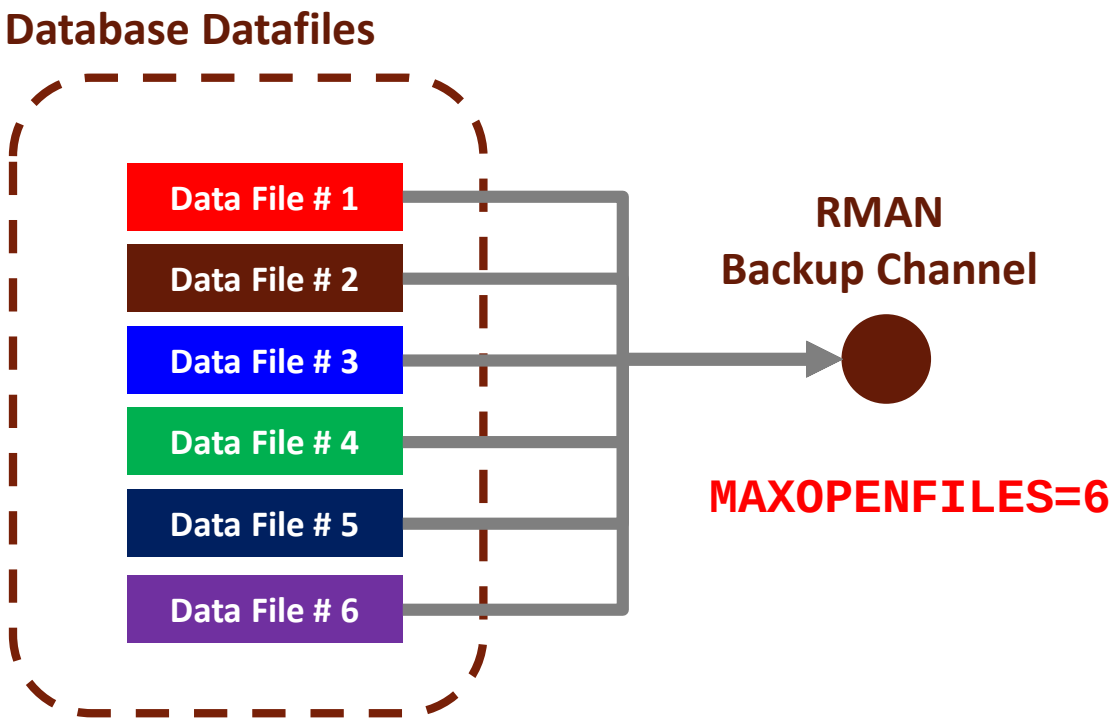

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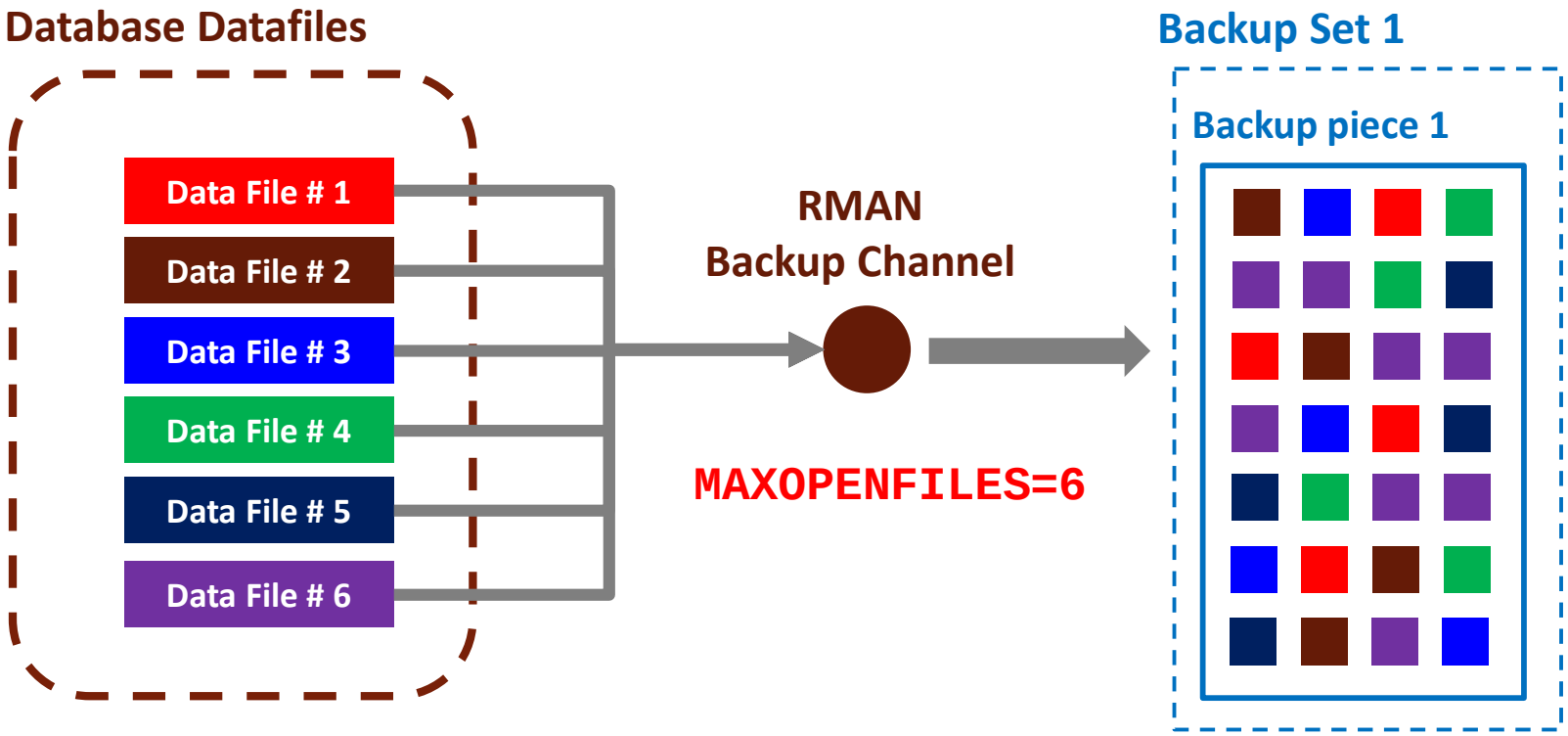

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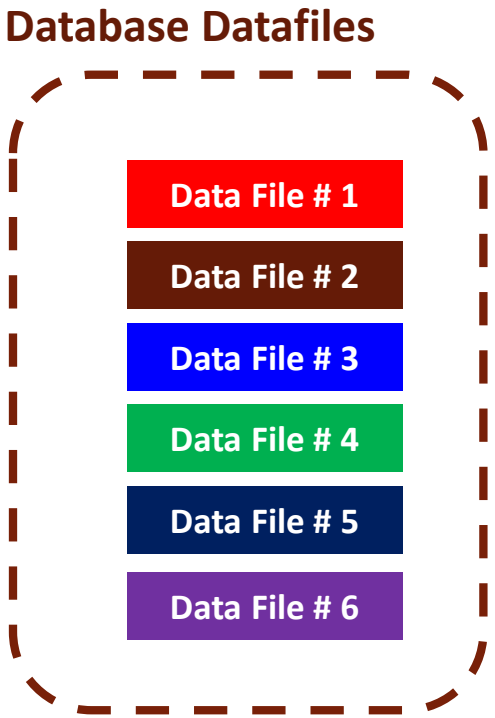

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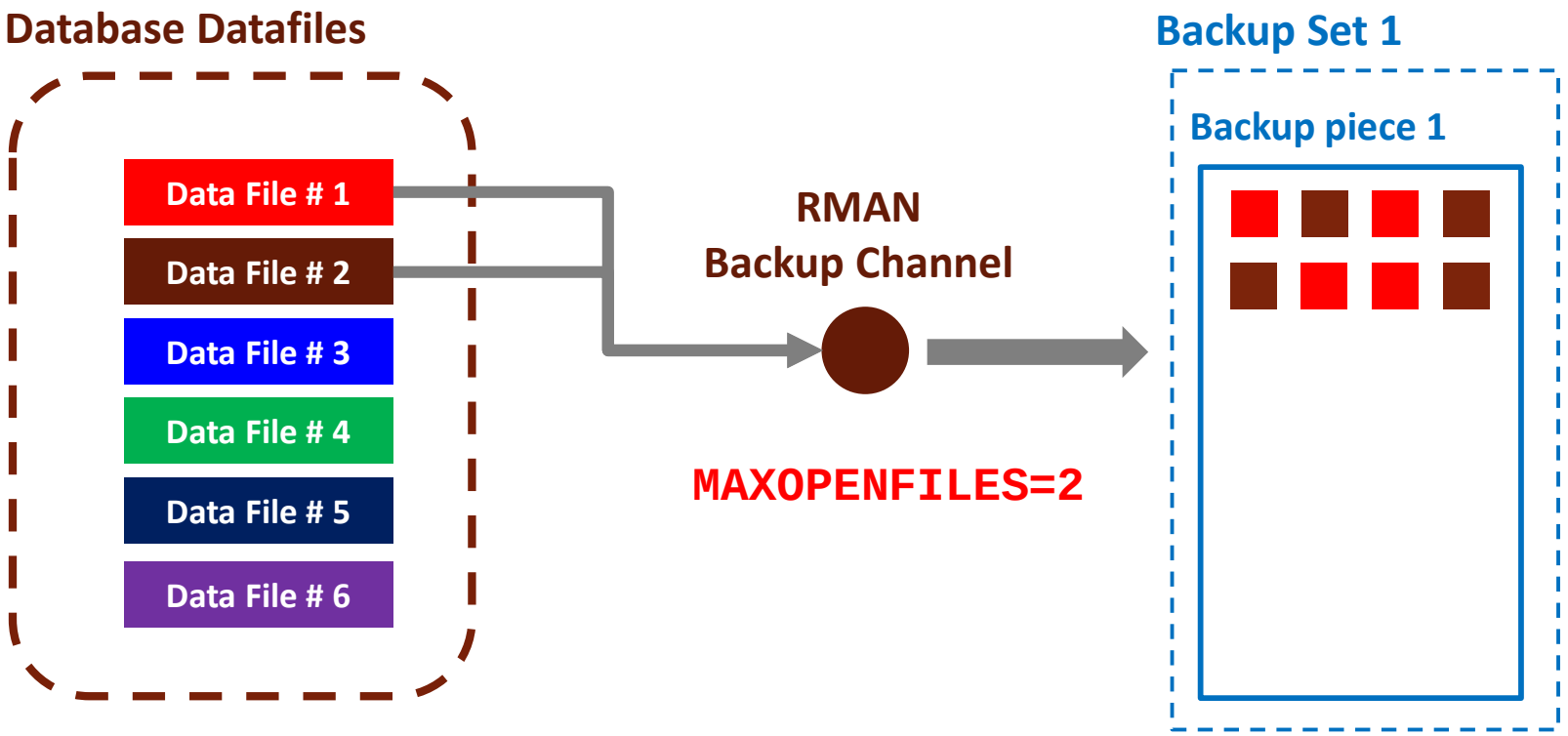

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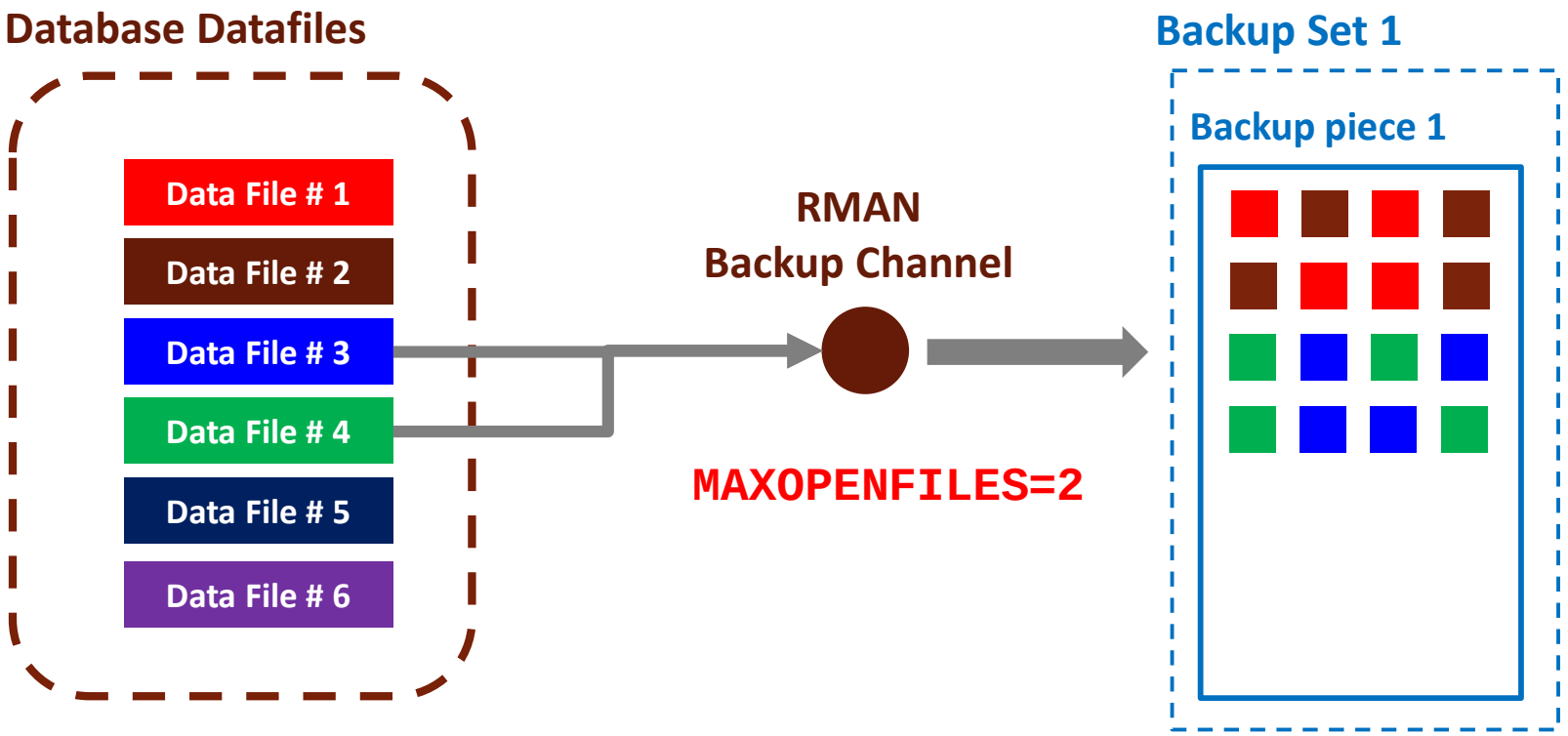

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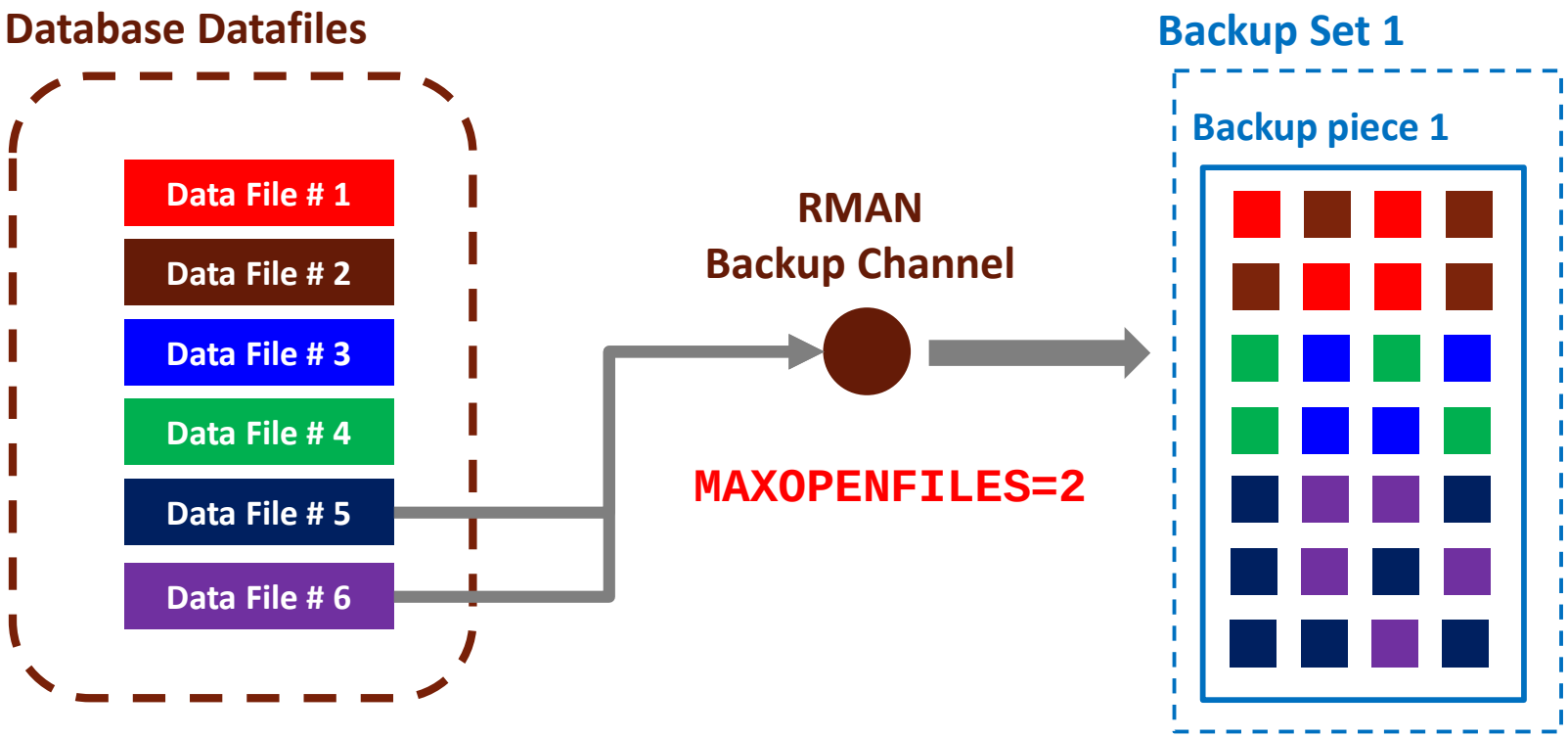

About MAXOPENFILES Channel Parameter

- Controls the maximum number of input files that a **BACKUP** command can have open at any given time
- Default is 8

```
CONFIGURE CHANNEL 1 DEVICE TYPE DISK MAXOPENFILES 3
FORMAT '...';
```

```
ALLOCATE CHANNEL c1 DEVICE TYPE DISK MAXOPENFILES 1;
```

About Level of Multiplexing

- The number of input files simultaneously read and then written into the same backup piece
- Is the minimum of **`MAXOPENFILES`** and the number of files in each backup set (**`FILESPERSET`**)
- Example: if you back up 50 data files with one channel and **`FILESPERSET`** equals to 50, level of multiplexing is eight

Note: backupset of datafile with multisection option does not get multiplexed

Reducing Backup Overhead

- Sometimes you aim at making backup with less resources
- In **BACKUP** command, use **DURATION** .. **MINIMIZE LOAD**:

```
BACKUP DURATION 4:00 MINIMIZE LOAD
 DATABASE FILESPERSET 1;
```

- To prevent RMAN from issuing an error when a backup partially completes:

```
BACKUP DURATION 4:00 MINIMIZE LOAD PARTIAL
 DATABASE FILESPERSET 1;
```

- Not recommended for backups to tape drives

Multi-cycle Full Backup

- When large databases cannot be backed up within a single backup window (midnight to 7:00 am), you can make RAMN divide a full backup across multiple windows:

```
BACKUP DATABASE NOT BACKED UP SINCE 'SYSDATE-3'
DURATION 07:00 PARTIAL MINIMIZE TIME;
```

  - Attempt to complete the full backup within 7 hours (**07:00**)
  - Exit normally after 7 hours (**PARTIAL**)
  - Next day, backup the last file not backed up in the previous backup cycle (**NOT BACKED UP SINCE 'SYSDATE-3'**)
  - The entire database can be backed up over the course of 3 days

Summary

In this lecture, you should have learnt how to perform the following:

- Describe RMAN performance tuning analysis
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- Control RMAN multiplexing
- Describe level of multiplexing in RMAN
- Control RMAN backup overhead