22. Strokovno srečanje SIOUG

SIOUG 2017

Arhitektura Oracle in SQL Server
podatkovnih zbirk iz vidika restavriranja podatkov

Urh Srečnik <urh.srecnik@abakus.si>

ORACLE Certified Professional
Oracle Database 12*c* Administrator

ORACLE Certified Associate
Java SE 8 Programmer

AS Abakus As na disku.

ORACLE Gold Partner
Specialized
Oracle Database

Abakus Plus d.o.o.

- History
  - From 1992
  - ~20 employees
- Applications
  - Special
  - Document Management System
  - Newspaper Distribution
  - Flight Information System
- Oracle Database:
  - ARBITER - the ultimate audit trail tool
  - APPM – Abakus Plus Performance and Monitoring Tool

- Services
  - OS & Network Administration
  - DBA, Programming
- Hardware
  - Servers, SAN Storage, firewalls
  - Backup Server
- Infrastructure
  - > 20 years of experience with High Availability on GNU/Linux.

Abakus
As na disku.


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Letališče Jožeta Pučnika Ljubljana


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SLOVENIJE


BUTAN PLIN
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MILENIJUM
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NLB Vita
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MESTNA OBČINA KOPER
COMUNE CITTÀ DI CAPODISTRIA


gea


Mercator
TelekomSlovenije


MERKUR


LASERLINE


ZAVOD ZA
ŠPORT RS
PLANICA


RAM 2


KONTROLA
ZRAČNEGA
PROMETA
SLOVENIJE


jata emona
LJUBLJANA


ISKRATEL


iskra
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strojegradnja


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ISD


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DISTRIBUCIJSKEGA OMREŽJA Z
ELEKTRIČNO ENERGIJO


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CHALLENGE OF PROFESSIONALS


BERNARDIN GROUP
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Bančništvo na Ljubezniv Oseben Način


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DELO PRODAJA


datalab
Spremenite podatke v dobiček!


Sava
TRADE


GOODYEAR DUNLOP
SAVA TIRES


Abakus
As na disku.

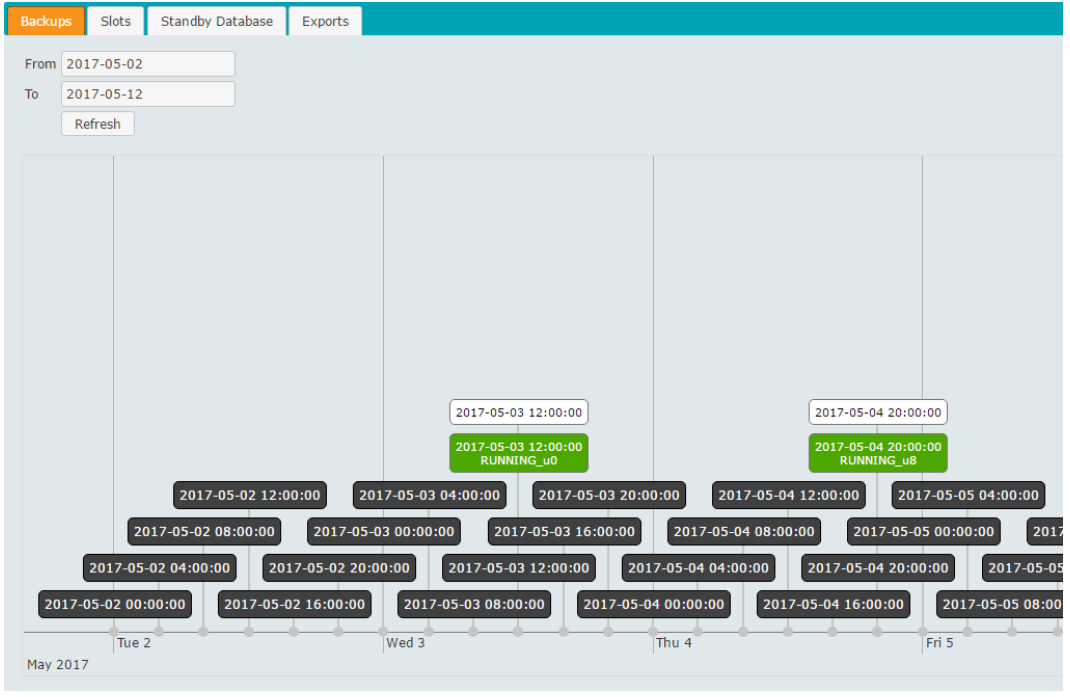
Backup Server *bks-master*
498 backups provide **65 days** days of history since 2017-02-01.
762 GB of backup data is stored on 4 GB / **41 GB** physical volume.

Administration My Session (BSADMIN)

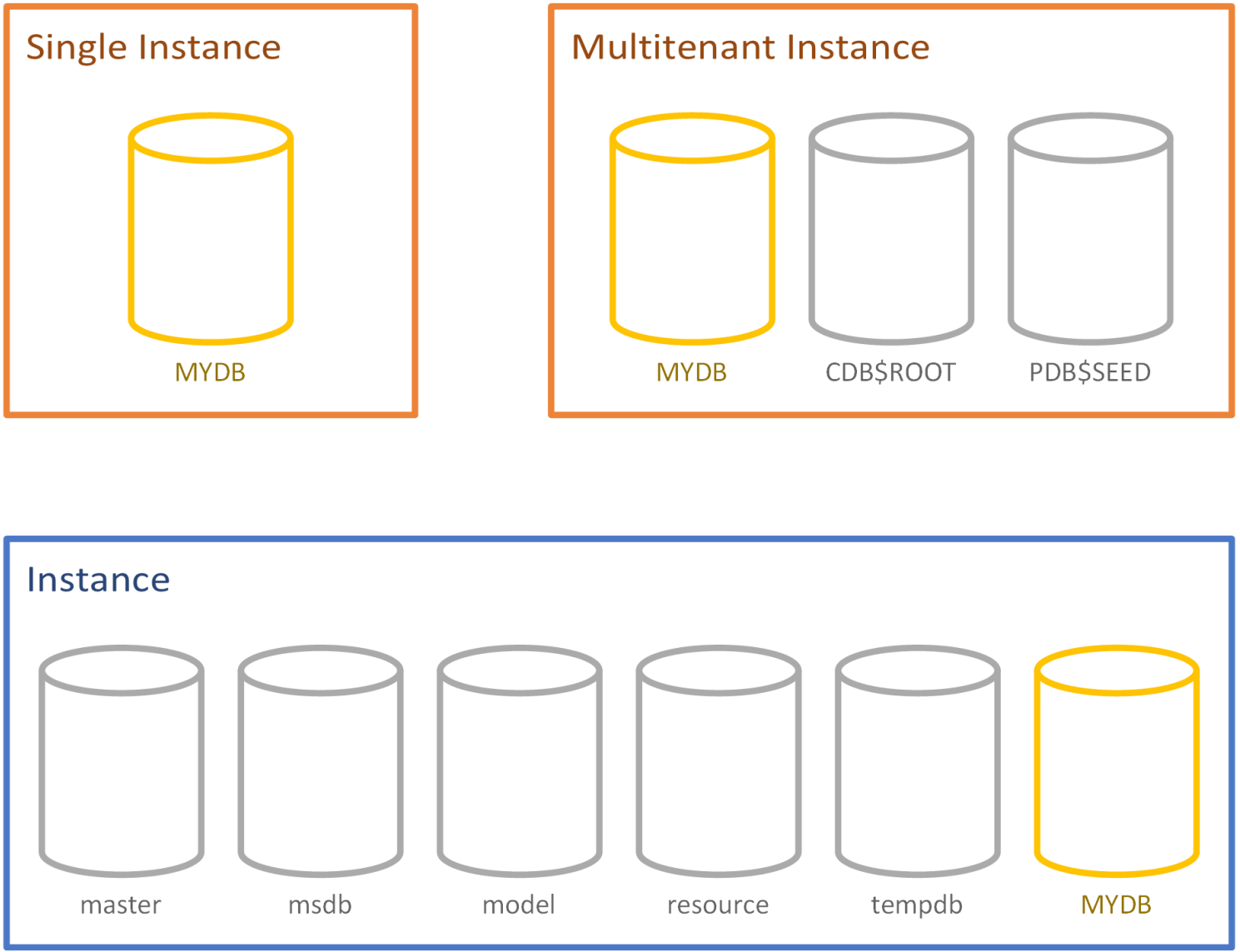
Resources

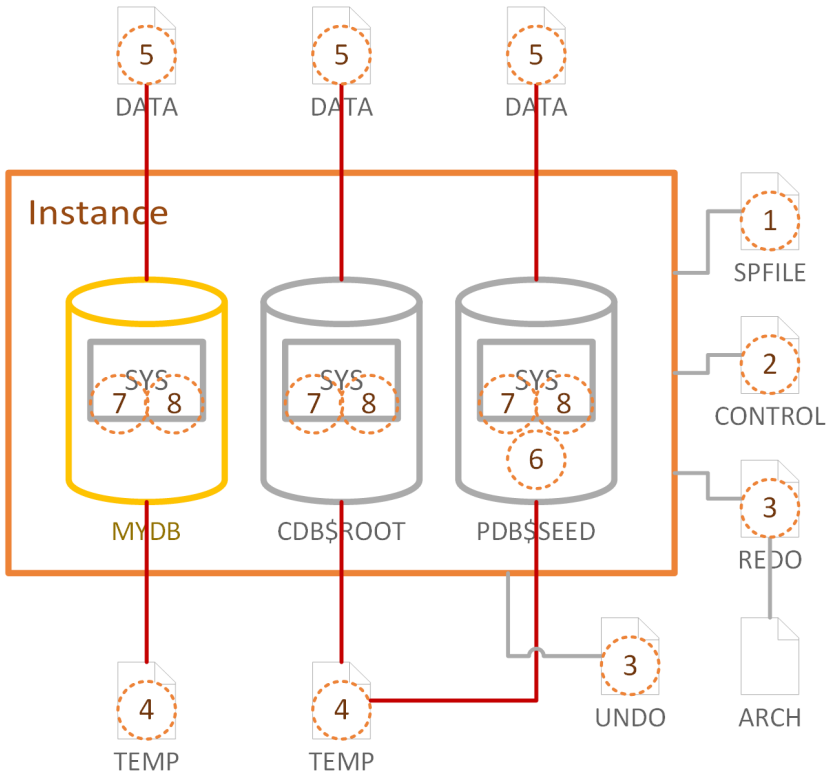
Type	Name	Actual Date	First Date	Last Date	Status	Monthly Growth	...
database_mssql	MSDEMO	2017-04-07 11:45:16	2017-02-11 15:00:00	2017-04-07 08:00:00	ACTIVE	495KB	
database_oracle	**ORADEMO**	**2017-04-07 11:17:30**	**2017-02-28 11:09:31**	**2017-04-07 08:17:31**	**ACTIVE**	**20MB**	

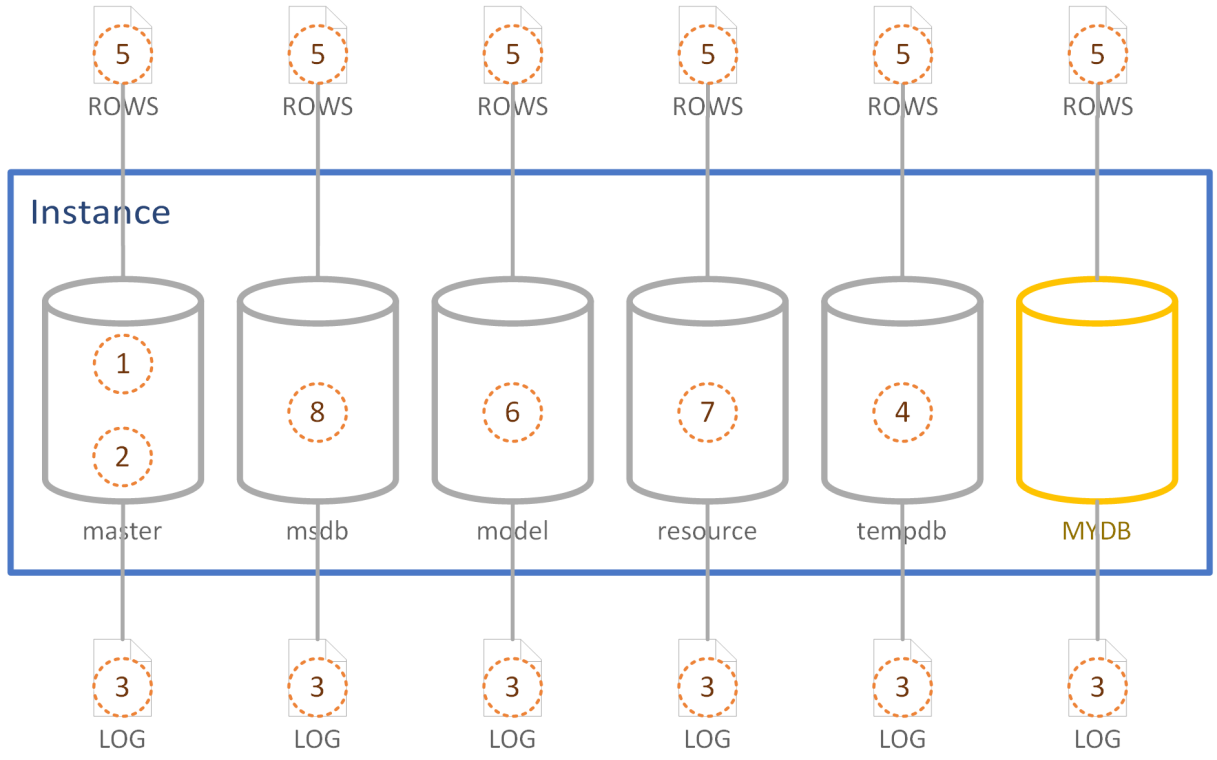
Create Resource



Basics

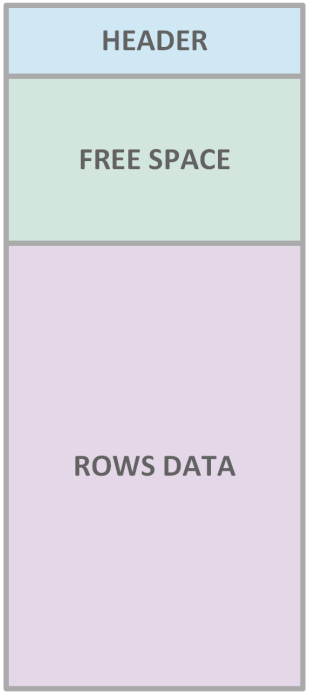

Single Instance
MYDB
Multitenant Instance
MYDB
CDB$ROOT
PDB$SEED
Instance
master
msdb
model
resource
tempdb
MYDB


5
DATA
5
DATA
5
DATA
Instance
SYS
7
8
SYS
7
8
SYS
7
8
6
MYDB
CDB$ROOT
PDB$SEED
1
SPFILE
2
CONTROL
3
REDO
ARCH
3
UNDO
4
TEMP
4
TEMP


5
ROWS
5
ROWS
5
ROWS
5
ROWS
5
ROWS
5
ROWS
Instance
1
2
8
6
7
4
master
msdb
model
resource
tempdb
MYDB
3
LOG
3
LOG
3
LOG
3
LOG
3
LOG
3
LOG

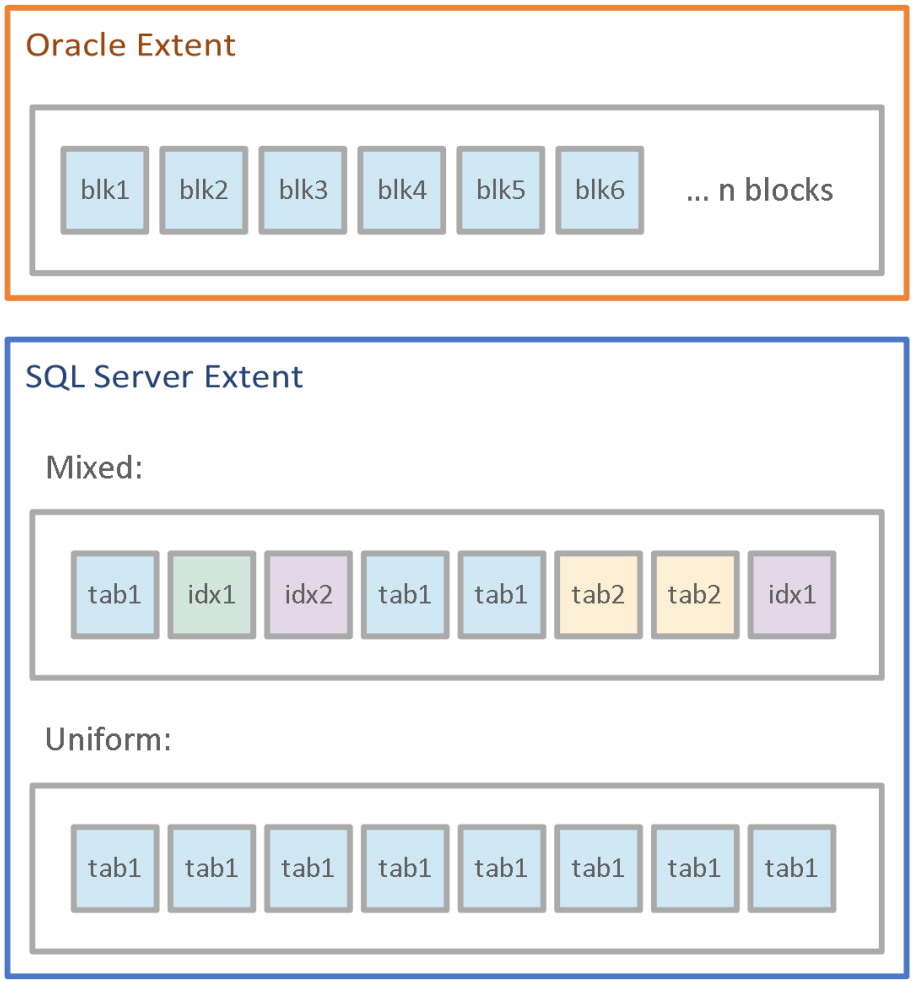
Logical Storage

Block / Page



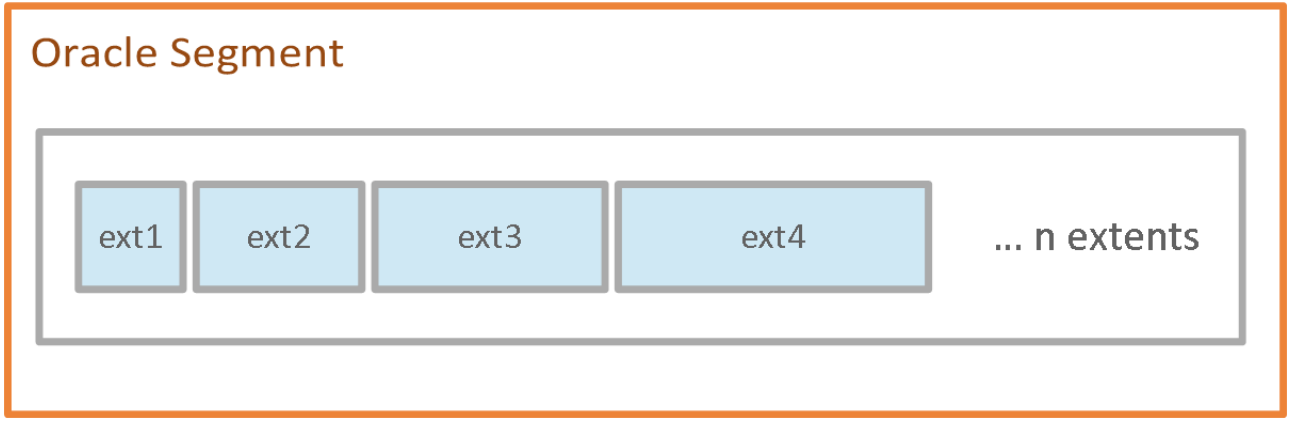
- Oracle **Block**
  - Size: 2kb - 32kb
- SQL Server **Page**
  - Size: 8kb

Extents



- Oracle
  - Size: 1 block to »unlimited«
    - UNIFORM / AUTOALLOCATE
  - ~~Dictionary~~ / Locally managed
- SQL Server
  - Size: always 64kb (8 pages)
  - Uniform/Mixed
  - Global Allocation Map Pages (GAM) (all extents, 1=used, 0=free)
  - Shared Global Allocation Map Pages (SGAM) (1=mixed, but still free)

Segments / Allocation Units (IAM)



Datafiles

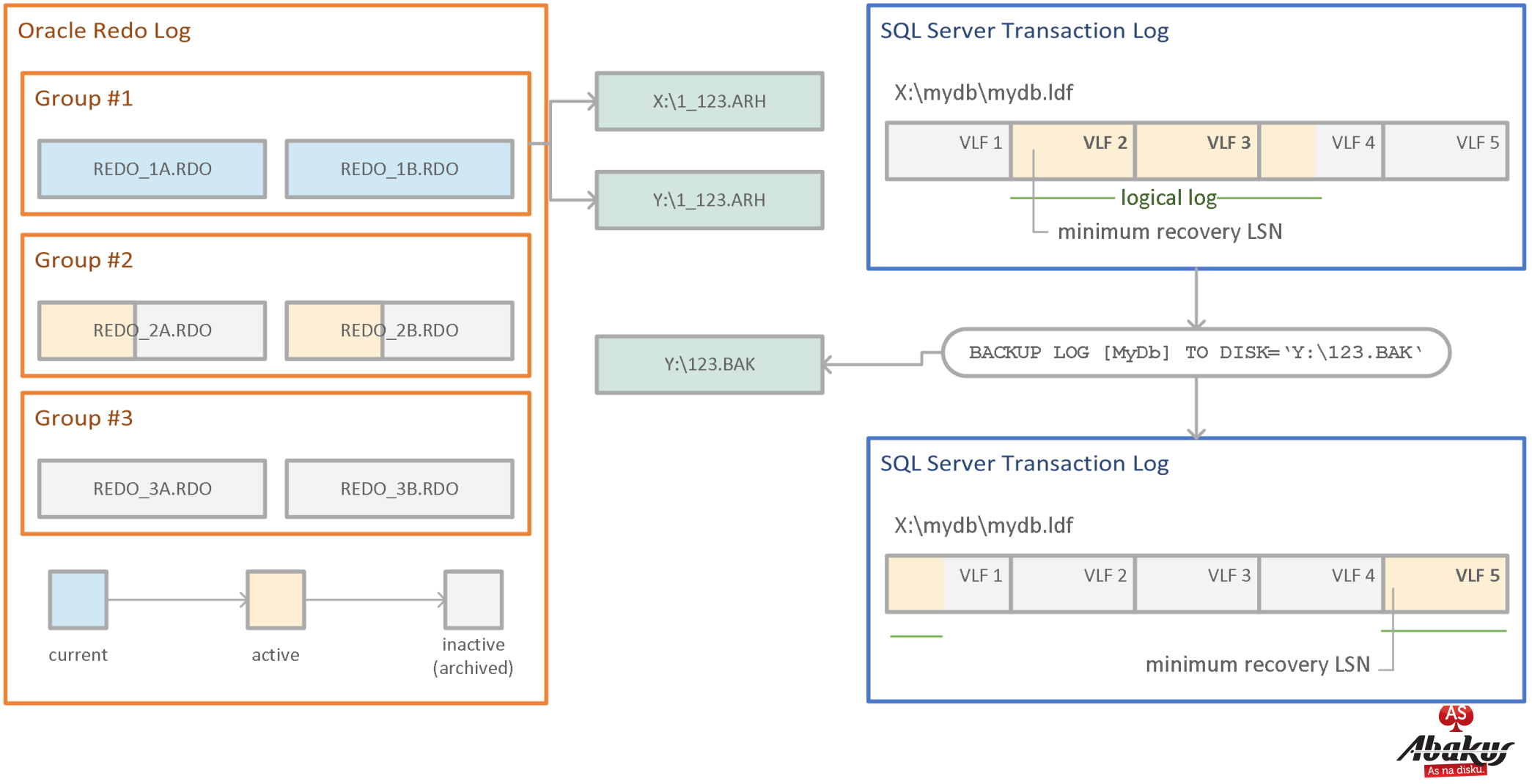
- Contain segments
- **Controlfile** points to other files in the database.
- Each has ID
  - No logical name

- Contain extents
- **Primary datafile** (.mdf) contains the startup information for the database and points to the other files in the database
- Each has ID and **logical name**.

Tablespaces / File Groups

- Oracle Tablespaces
  - SYSTEM
  - SYSAUX
  - USER
  - TEMP
  - UNDO
  - User-Defined
- SQL Server File Groups
  - PRIMARY
  - User-Defined

Backup


Oracle Redo Log
Group #1
REDO_1A.RDO
REDO_1B.RDO
Group #2
REDO_2A.RDO
REDO_2B.RDO
Group #3
REDO_3A.RDO
REDO_3B.RDO
current
active
inactive
(archived)
X:\1_123.ARH
Y:\1_123.ARH
Y:\123.BAK
SQL Server Transaction Log
X:\mydb\mydb.ldf
VLF 1
VLF 2
VLF 3
VLF 4
VLF 5
logical log
minimum recovery LSN
BACKUP LOG [MyDb] TO DISK='Y:\123.BAK'
SQL Server Transaction Log
X:\mydb\mydb.ldf
VLF 1
VLF 2
VLF 3
VLF 4
VLF 5
minimum recovery LSN

Full Database Backup

Oracle

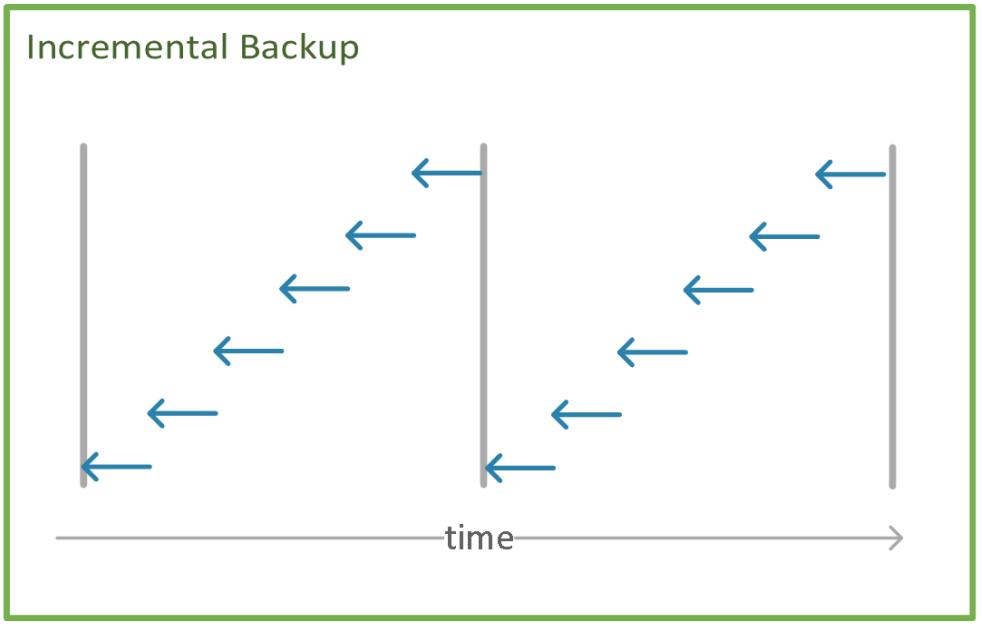
```
RMAN> BACKUP AS
BACKUPSET DATABASE;
```

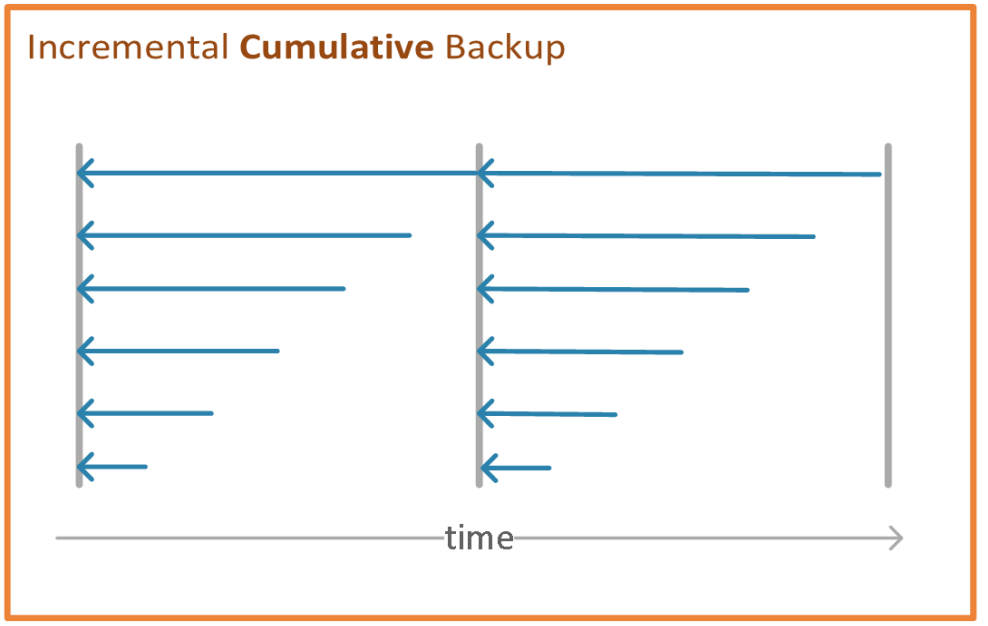
- »attach/detach« ?

SQL Server

```
BACKUP DATABASE [Demo]
  TO DISK =
N'E:\Backup\Demo.bak'
```

- »as copy« ?
- »user managed backup« ?



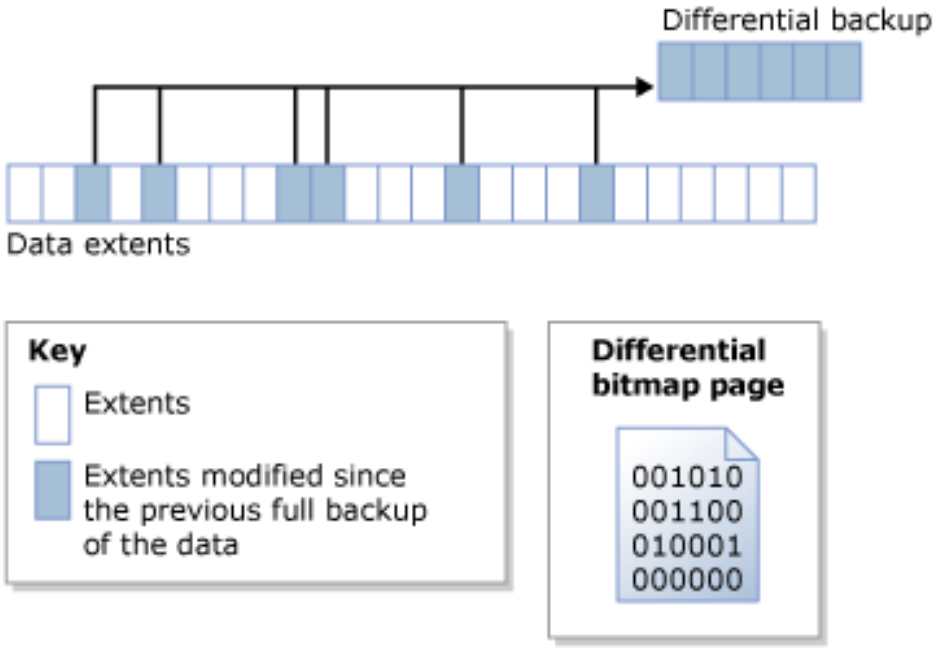



```
BACKUP INCREMENTAL LEVEL 1 CUMULATIVE DATABASE; -- oracle
BACKUP DATABASE MyAdvWorks TO MyAdvWorks_1 WITH DIFFERENTIAL;  -- mssql
```

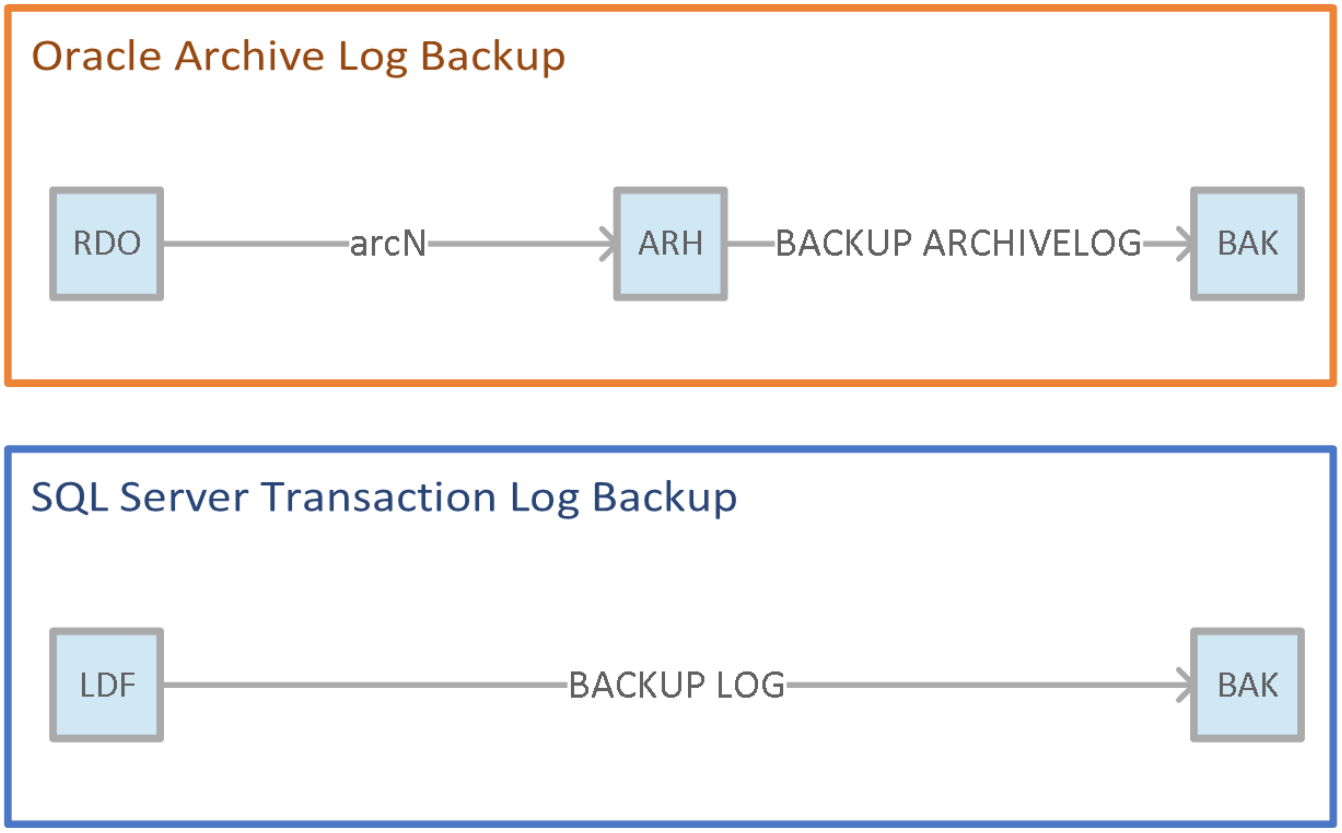
- »from SCN« ?
- »cumulative« only?

Block Change Tracking / Differential Change Map

- Oracle:
  - **Optional** BCT File
  - Last 8 versions
  - 32k chunks
  - EE only
- MSSQL:
  - **Mandatory** DCM pages
  - From last full backup
  - 8k (extent) chunks
  - All releases
  - 2017 – `sys.dm_db_file_space_usage (percent_used)`



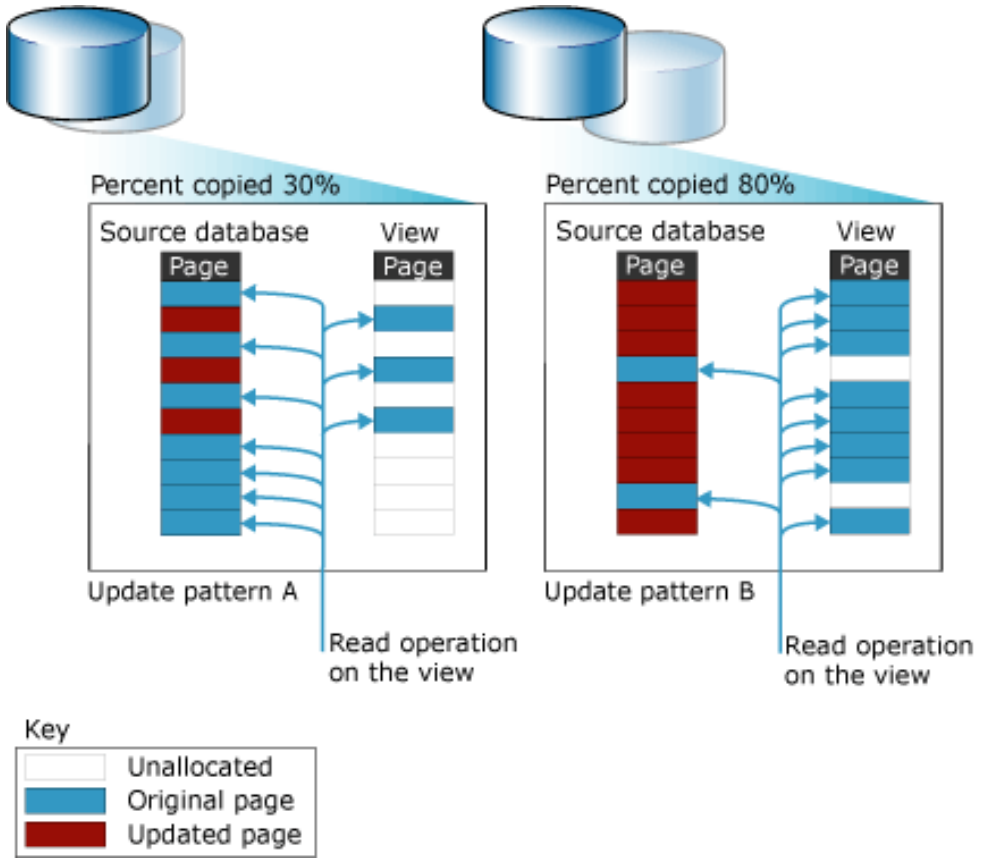
Archived Redo / Transaction Log Backups



User-Managed Backup

- `alter database begin/end backup;`
- VSS (ISV-provided solutions)

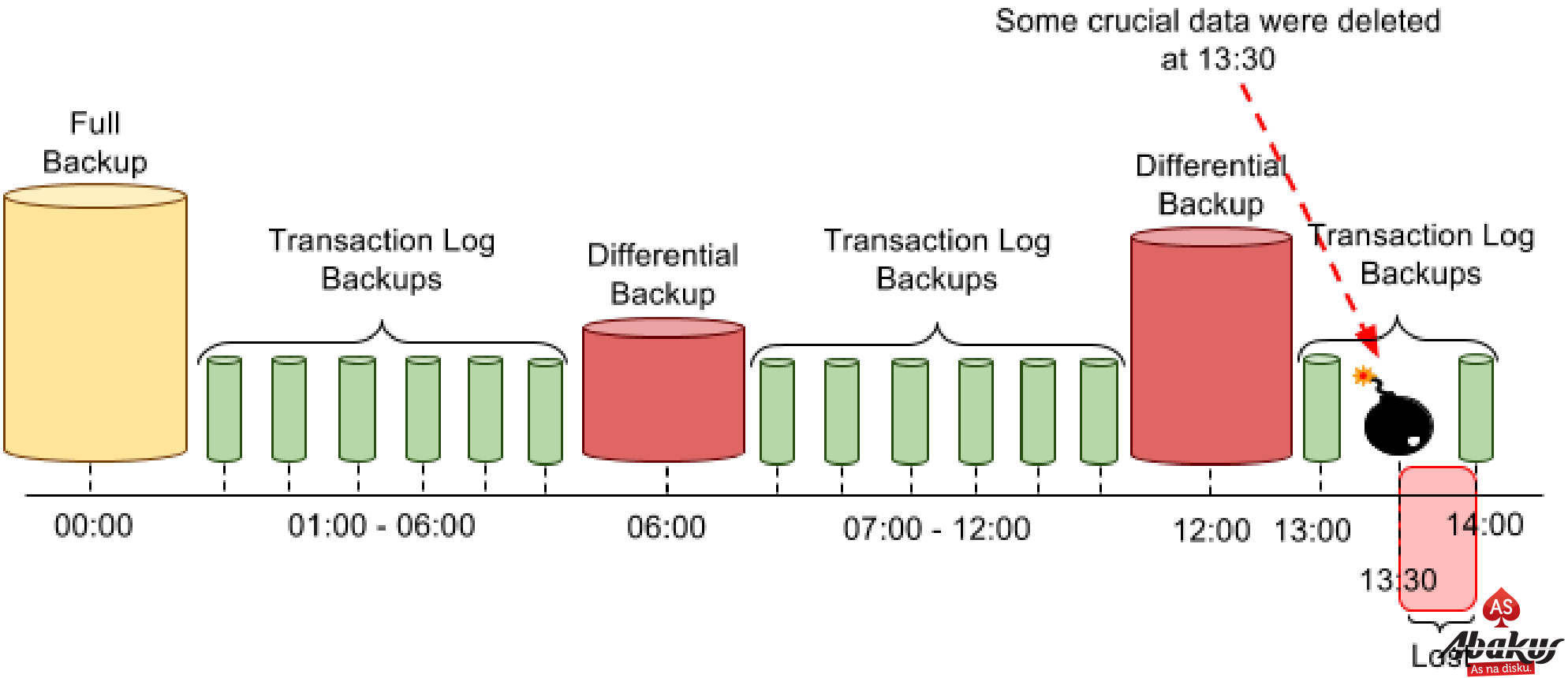
CloneDB / Database Snapshots



Oracle – Flashback Database

- rewind database **back** in time.
- Uses flashback logs (.flb) to get back
  - .flb contain past block images
- Uses archived logs (.arc) to get forward (to consistent state).

Recap :)


Some crucial data were deleted
at 13:30
Full
Backup
Transaction Log
Backups
Differential
Backup
Transaction Log
Backups
Differential
Backup
Transaction Log
Backups
00:00
01:00 - 06:00
06:00
07:00 - 12:00
12:00
13:00
13:30
14:00
Lost

Restore

Catalog

- Oracle
  - Controlfile
  - Schema (optional)
  - Used by RMAN
  - `catalog start with`
- SQL Server
  - Stored in **`msdb`** database
  - Used by SSMS
  - `restore filelistonly`
  - `restore headeronly`

Restore Database

- `restore database; -- oracle`

- `restore database [mydb] from disk='E:\backup\mydb.bak' with recovery|norecovery; -- sql server`
  - »with move«

Recover Database

- `recover database until time »sysdate-2«;`

- ```
  restore log [sb_demo] from
  disk='C:\logship\demo_20161227151501.trn' with
  standby='C:\standby\sb_demo.tuf',
  restricted_user,
  stopat='2016-12-28 12:00:00'; -- sql server
  ```
  ```

Restore Block / Page

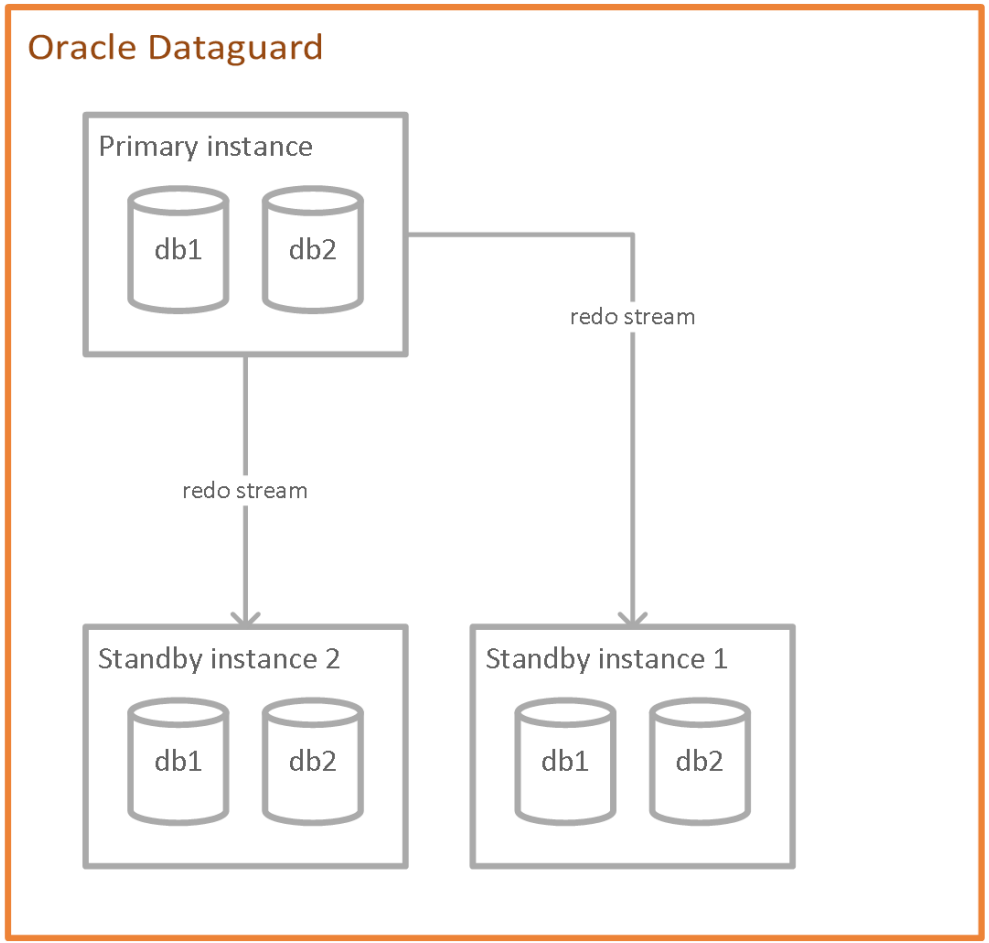
- ```
  RECOVER DATAFILE 8 BLOCK 13 ;
  -- v$database_block_corruption
  ```

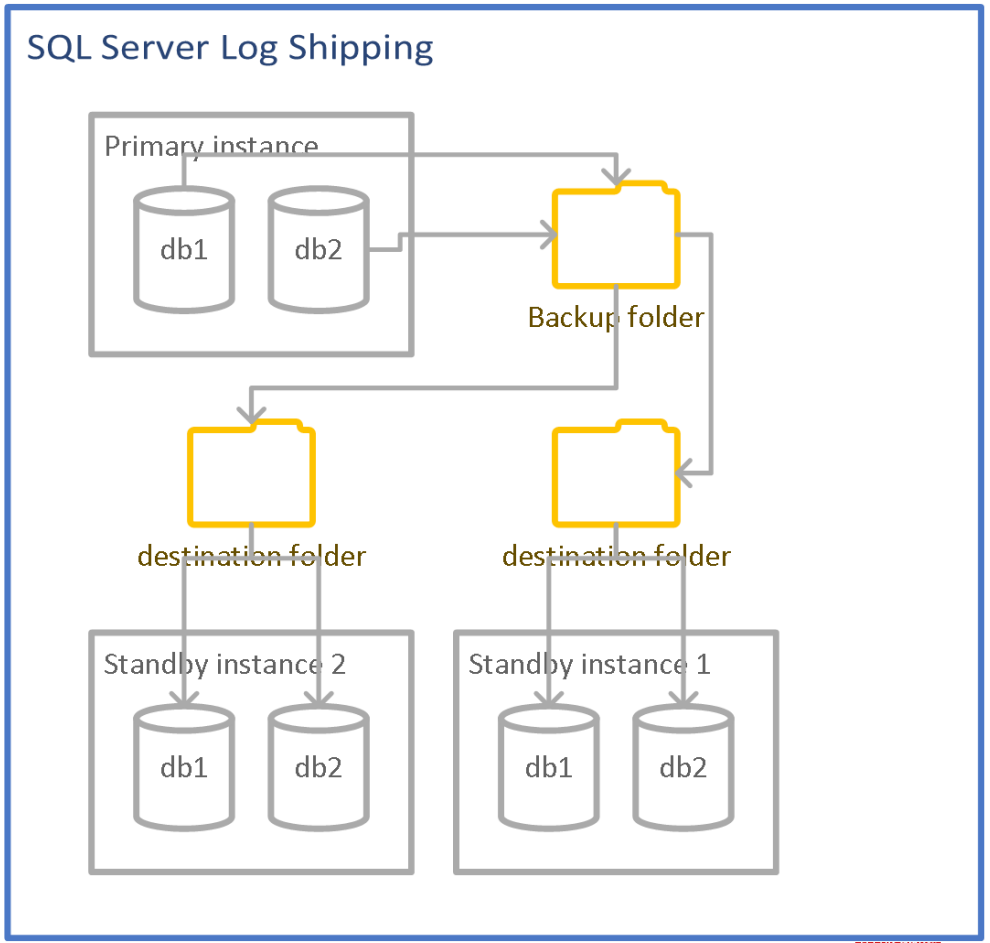
- ```
  RESTORE DATABASE test
  PAGE = '1:41'
  FROM DISK = 'E:\MSSQL\test-full.bak'
  WITH NORECOVERY; -- msdb.dbo.suspect_pages;
  ```

High Availability

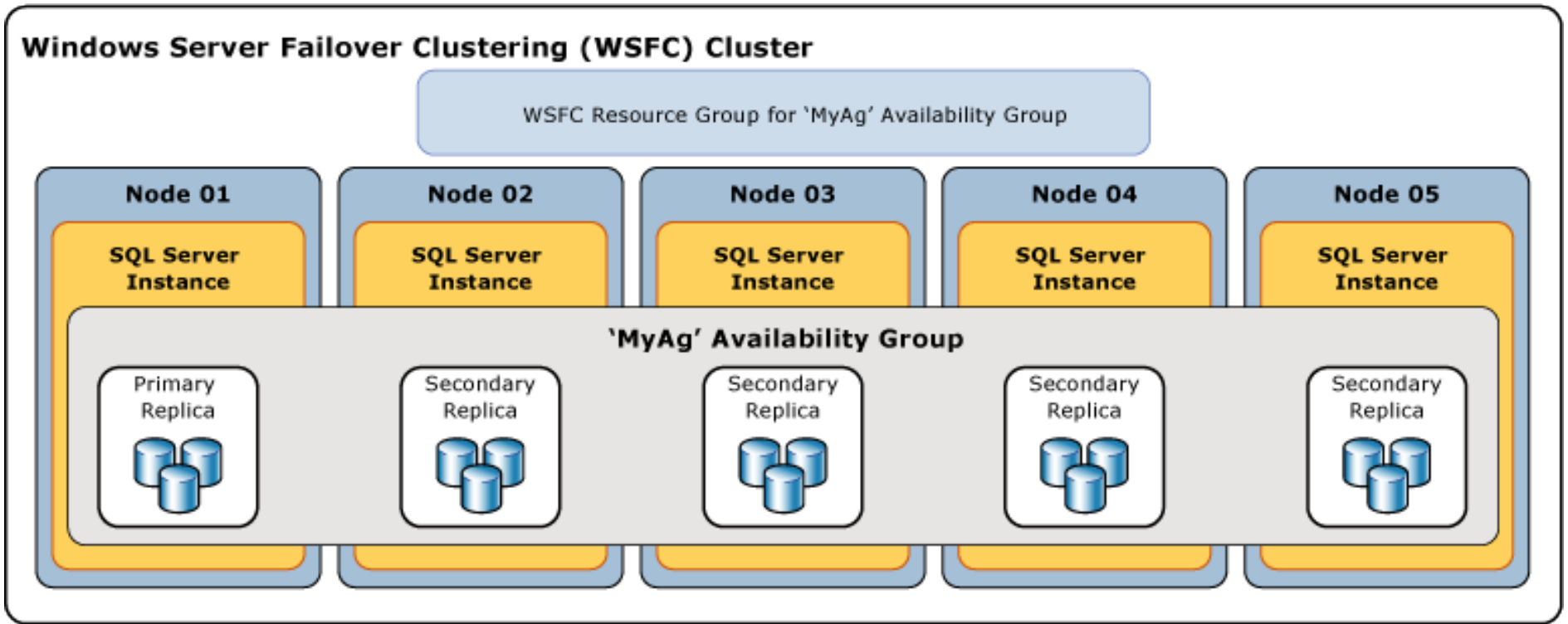
* *next slide makes this comparison fair (complete)*

Data Guard / Log Shipping





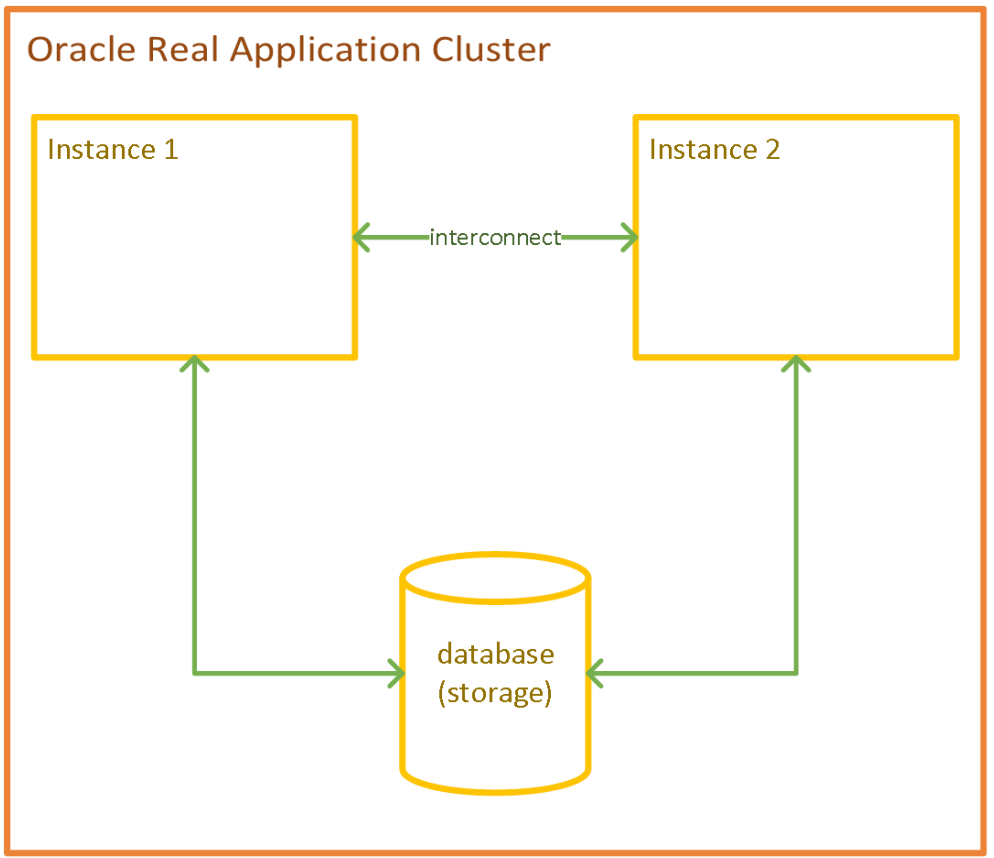
SQL Server – AlwaysOn Availability Groups

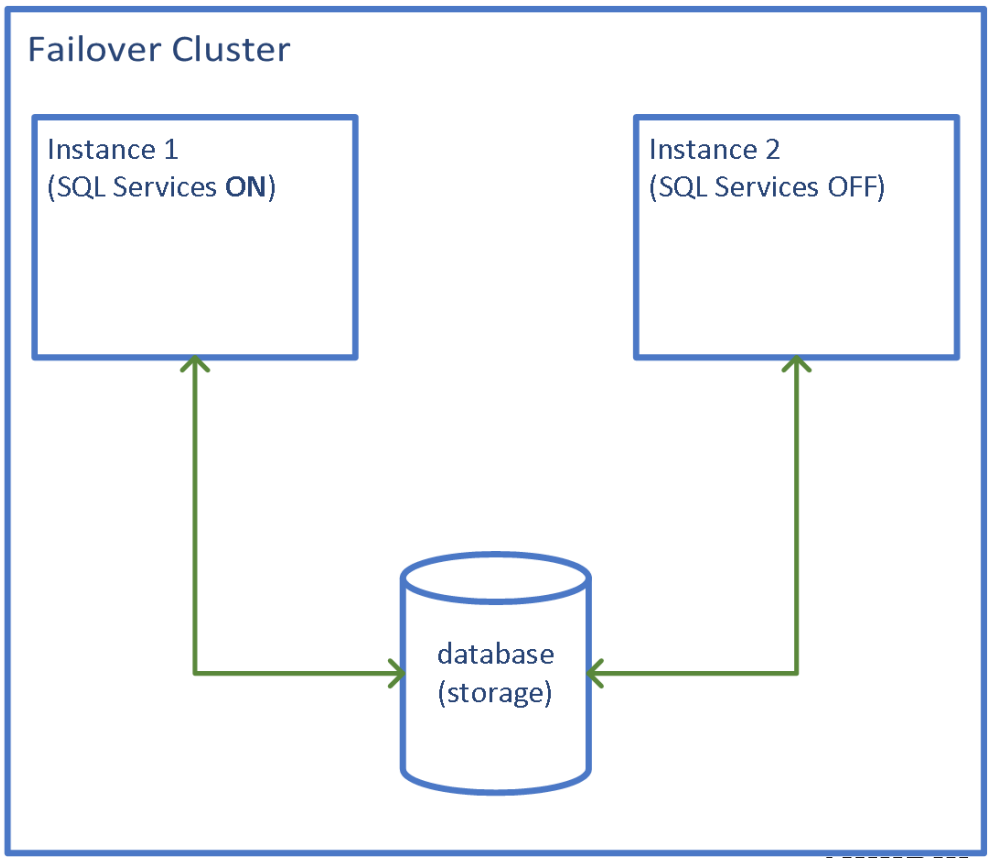


Data Guard / Always On Availability Groups

- Automatic block recovery
- Can make backups
- Active Data Guard
- Protection modes
  - Maximum availability
  - Maximum protection
  - Maximum performance
- Automatic page repair
- Can make `copy-only` backups
- Readable secondary replicas
- Availabilty modes
  - Asynchronous commit
  - Synchronous commit

Oracle RAC / Failover Cluster





https://github.com/usrecnik/ddlfs

- FUSE filesystem which represents Oracle Database objects as their DDL stored in .sql files.

- Open Source, MIT license

```
$ cd myschema/ && ls
function/ java_source/
package_body/ package_spec/
procedure/ type/ type_body/ view/

$ ls procedure/
another.sql  myproc.sql  yey.sql

$ cat procedure/myproc.sql
CREATE OR REPLACE PROCEDURE
"DDLFS"."MYPROC" AS
BEGIN
    dbms_output.put_line('hello');
END;
```

http://www.abakus.si/

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