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Real men don't use backups, they post their stuff on a public ftp server and let the rest of the world make copies.

Linus Torvalds

What is the value of
the backup?

Value added Backup

Boris Oblak
Abakus plus d.o.o.

ORACLE | CERTIFIED
PROFESSIONAL

@22.hrOUG
godišnja konferencija
17.-20.10.2017.

Abakus plus d.o.o.



Specialized
Oracle Database 11g

History

from 1992, ~20 employees

Applications:

special (DMS - Document Management System, DB - Newspaper Distribution, FIS - Flight Information System)

ARBITER - the ultimate tool in audit trailing

APPM - Abakus Plus Performance and Monitoring Tool

Services:

DBA, OS administration, programming (MediaWiki, Oracle)

networks (services, VPN, QoS, security)

open source, monitoring (Nagios, OCS, Wiki)

Hardware:

servers, **Backup server**, Deja Vu, SAN storage, firewalls

Infrastructure:

from 1995 GNU/Linux (*>20 years of experience!*)

>20 years of experience with High-Availability!





MESTNA OBČINA KOPER
COMUNE CITTA' DI CAPODISTRIA



SISTEMSKI OPERATER
DISTRIBUCIJSKEGA OMREŽJA Z
ELEKTRIČNO ENERGIJO

What is the value of
the backup?

Backup & Recovery Best Practices

- Backup takes no time!
 - no resources needed;
- Recover takes no time as well!
 - no resources needed;
- Copies are without errors and consistent.
- Data is always available & always in view.
- Backup history is always available & always in view.

Wish list:

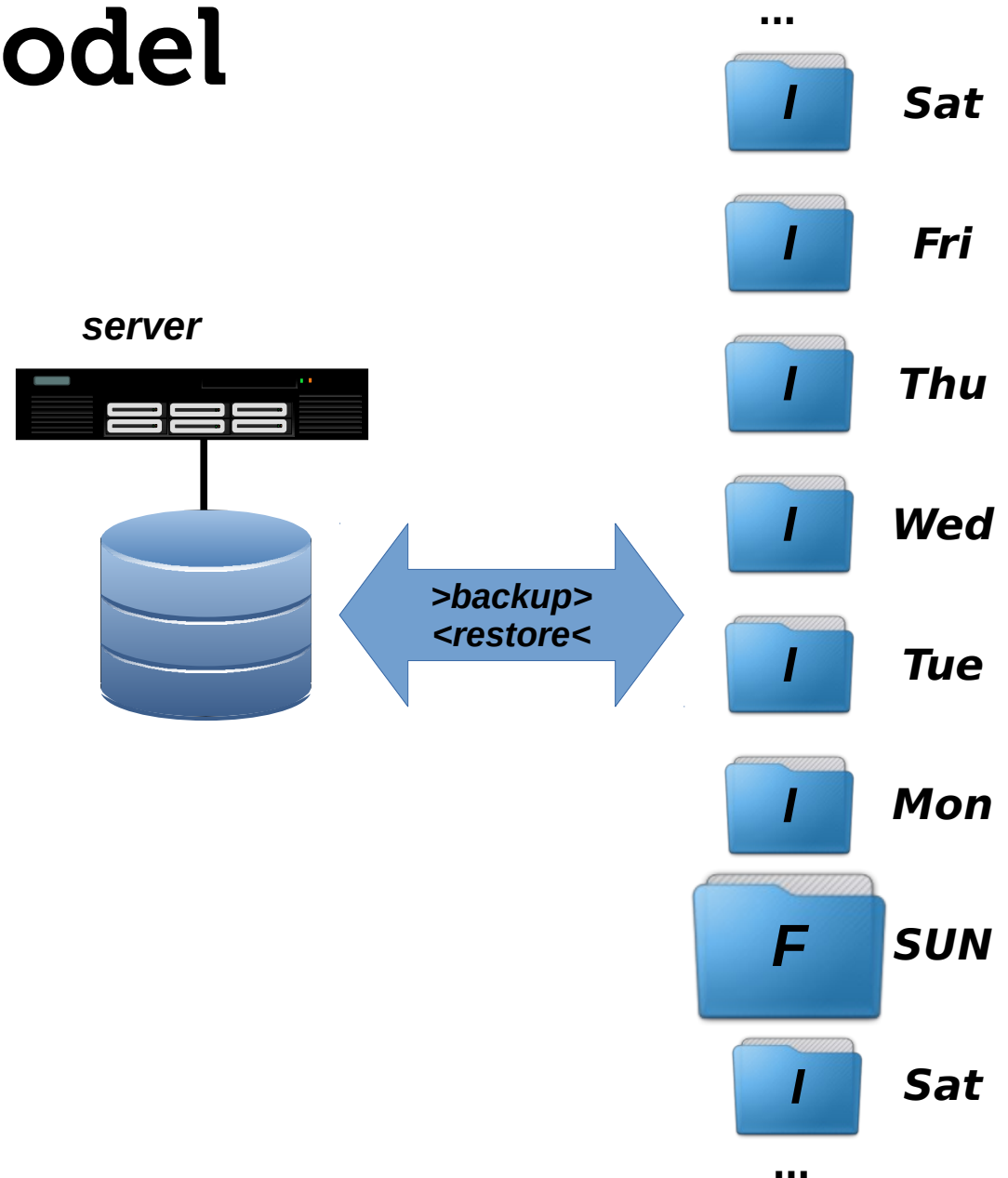
- Use backup for reporting/testing/developing/debugging from any point in time.

3-2-1 Backup rule

- Have at least **three** copies of your data.
- Store the copies on **two** different media.
- Keep **one** backup copy offsite.

Classic Full/Incremental Backup Model

- backup takes a long time (especially full)
- restore takes even longer (full + n x incremental)
- hard to test consistency (without actual restore)



Backup - backupset

- RMAN - backupset
 - `rman target /`
 - `RMAN> backup [as compressed backupset] database [plus archivelog delete input];`
 - `RMAN> backup incremental ...;`
 - `RMAN> restore [database | datafile];`

What is the value of
the backup?

Backup - copy

- Datafiles are physical copies – can be used for creating test/standby databases.
- Datafiles can be use for »switch« command.
- Incremental updateable backup:
 - Full copy only once.
 - Only incremental backups (fastest, can use block change tracking file with EE).

Open backup read only

- Physical copy can be open in read only mode.
- Easy to setup.
- Can run on same server as production.
 - No additional Oracle licence needed.
- Fast installaton.
 - No software installation.
 - No new server needed.
 - Prepared in minutes.

What is the value of the backup?



Open database READ WRITE?

Open read write from backup

- ALTER DATABASE OPEN RESETLOGS;

Open read write from backup

- ALTER DATABASE OPEN RESETLOGS;
- Backup becomes unusable!

Open read write from backup

- ALTER DATABASE OPEN RESETLOGS;
- Backup becomes unusable!

What is CloneDB?

- Clone R/W development/test databases from the same master copy database.
 - Requires read-only image copy of the master DB.
 - Each clone stores only changed blocks.
 - Available since 11.2.0.2 and requires dNFS mount.
 - Since 12.1.0.2 dNFS is not required.
- Not intended for performance testing.

License

- I did not find any mention of CloneDB in licensing documents/options.
 - dNFS is available in Standard Edition also.
- Works on Standard Edition.

:-)

Oracle feature that is free!

Consistent image copy

- Can use image copies from incremental updateable backup.
- In case of hot copy (incremental updateable backup is hot copy) images have to be made consistent.
- Change few init.ora parameters:
 - `clonedb=true` # from 11.2.0.3
 - `clonedb_dir=/directory` # from 12.2.0.1

Create the controlfile

```
oracle@atlas [rosiougc] CLSIOUGC $ cat cf.sql
STARTUP NOMOUNT PFILE='/backup/clone/CLSIOUGC/initclsiougc.ora'
CREATE CONTROLFILE REUSE SET DATABASE "CLSIOUGC" RESETLOGS NOARCHIVELOG
    MAXLOGFILES 16
    MAXLOGMEMBERS 3
    MAXDATAFILES 1024
    MAXINSTANCES 8
    MAXLOGHISTORY 292
LOGFILE
  GROUP 1 '/backup/clone/CLSIOUGC/onlinelog/redo_1_1.rdo'  SIZE 200M BLOCKSIZE 512,
  GROUP 2 '/backup/clone/CLSIOUGC/onlinelog/redo_2_1.rdo'  SIZE 200M BLOCKSIZE 512,
  GROUP 3 '/backup/clone/CLSIOUGC/onlinelog/redo_3_1.rdo'  SIZE 200M BLOCKSIZE 512
DATAFILE
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-SYSTEM_FNO-1_03sat7ji',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-SYSAUX_FNO-3_04sat7k2',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-UNDOTBS1_FNO-4_0bsat7lc',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-SYSTEM_FNO-5_07sat7kn',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-SYSAUX_FNO-6_05sat7k9',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-USERS_FNO-7_0csat7lg',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-UNDOTBS1_FNO-8_09sat7l6',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-SYSTEM_FNO-9_08sat7kv',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-SYSAUX_FNO-10_06sat7kg',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-UNDOTBS1_FNO-11_0asat7l9',
  '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-USERS_FNO-12_0dsat7lh'
CHARACTER SET AL32UTF8
;
```

Modify data location

```
begin
  dbms_dnfs.clonedb_renamefile (
    '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-SYSTEM_FNO-1_03sat7ji',
    '/backup/clone/CLSIOUGC/datafile/TS-SYSTEM_FNO-1_03sat7ji.clone');
  dbms_dnfs.clonedb_renamefile (
    '/backup/clone/nfs/rman/data_D-SIOUGC_I-3478581416_TS-SYSAUX_FNO-3_04sat7k2',
    '/backup/clone/CLSIOUGC/datafile/TS-SYSAUX_FNO-3_04sat7k2.clone');
  ...
  ...
  ...
end;
/
```

< 12.1.0.2 /backup/clone/CLSIOUGC/datafile must be mounted with dNFS!

Open the clone

- ALTER DATABASE OPEN RESETLOGS;
 - create new tempfile(s) (for pluggable database(s) also);
 - recommended: create new undotbs.
- Bitmap file:
 - Can be found in:
`${ORACLE_HOME}/dbs/${ORACLE_SID}_bitmap.dbf`
 - `ls -lh ${ORACLE_HOME}/dbs/*_bitmap*`
`-rw-r----- 1 oracle dba 8.1G Aug 3 04:36`
`/oracle/db_se/12.2.0.1/dbhome_1/dbs/CLSI0UGC_bitmap.dbf`

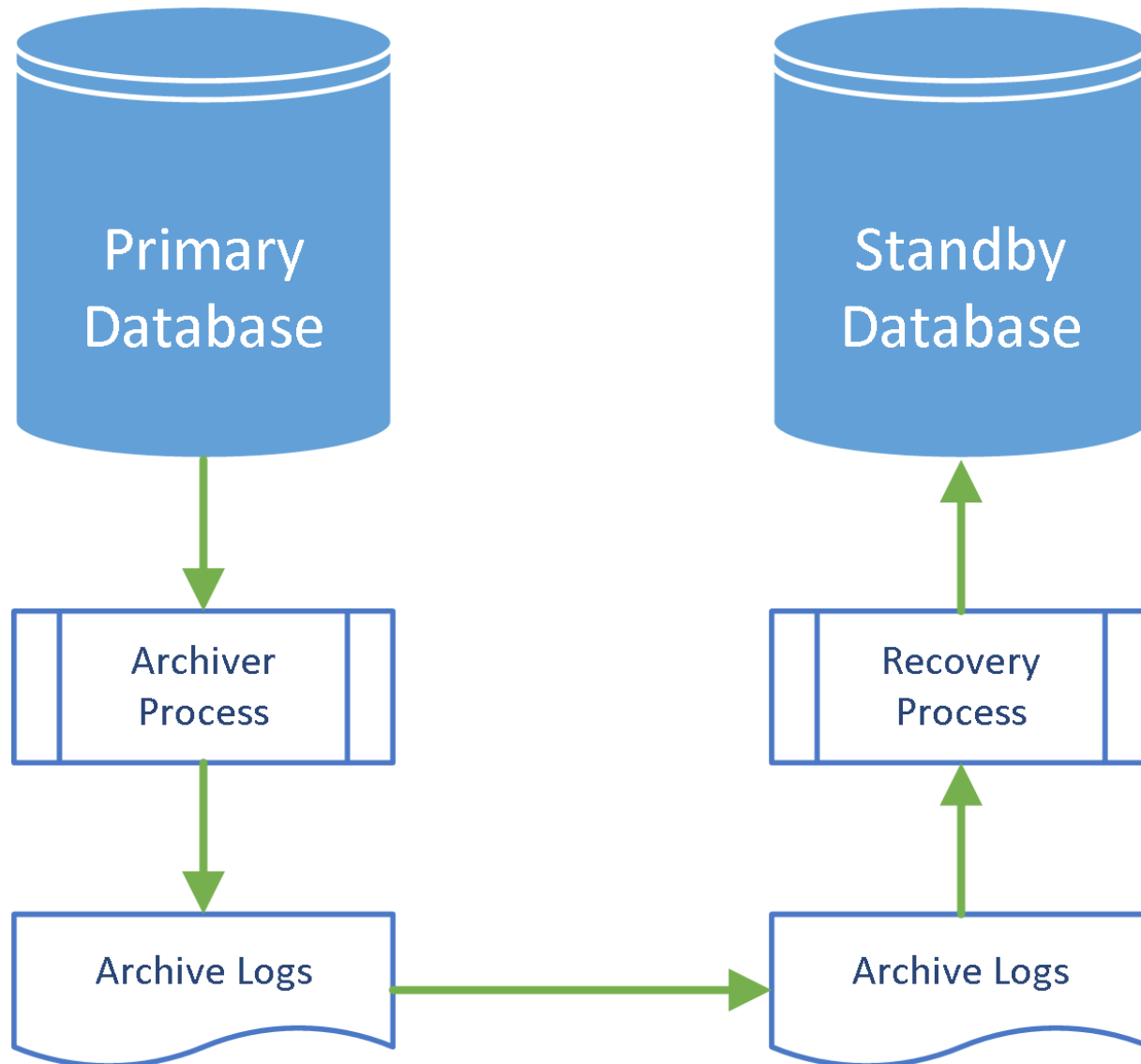
CloneDB: Considerations

- Image copy backup must remain read-only.
 - incremental updateable backup?
- Space consumption on long-running clone databases.
- **Suitable for short-term clones.**
- Usage: backup validation; test operations, reporting, ...
 - [MOS Note 1210656.1](#)
 - http://docs.oracle.com/cd/E16655_01/server.121/e17636/create.htm#ADMIN14023
 - <http://kevinclosson.wordpress.com/2010/12/23/oracle-database-11g-direct-nfs-clonedb-feature-part-i/>

What is the value of the backup?

\$\$

Standby database (1)



Standby database (2)

- Data Guard – Enterprise Edition.
- Manual archives transfer and recovery (Standard Edition).
- Can be used as DR site.
- Easy to setup.
- Backup standby database.
- Can be open in read only or read write mode.
 - READ WRITE:
 - with EE flashback.
 - with SE: recreate standby.

Backup and/or Cloning

- CloneDB (>= Oracle database 11.2.0.2)
- ZFS Appliance (Oracle 12c)
- Data Director (Linked Clones - Vmware)
- NetApp
- EMC
- Delphix
- Veeam
- Tivoli Storage Manager
- ...
- **DejaVu (Backup Server)**

Backup Server & Deja Vu

First, it is slightly cheaper; and second, it has the words "DON'T PANIC" inscribed in large friendly letters on its cover.

- Douglas Adams, The Hitchhiker's Guide to the Galaxy (1979)

A close-up, slightly blurred photograph of a server rack. The server units are stacked vertically, showing their front panels with various ports and ventilation grilles. The lighting is dramatic, with some units illuminated while others are in shadow.

**DON'T
PANIC**

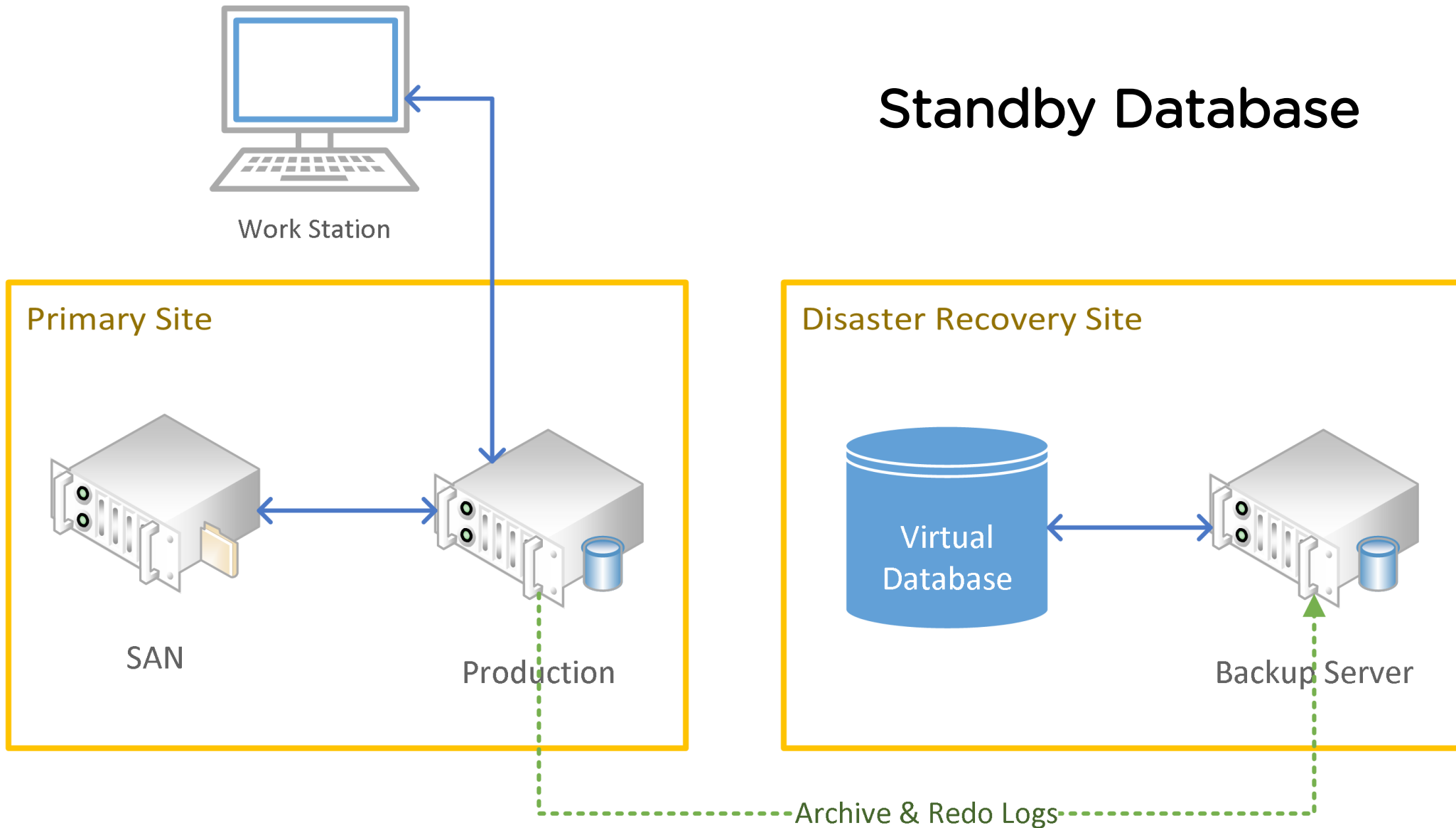
Backup server

Takes no time,
because data is backed up
in real-time.

Backup Server

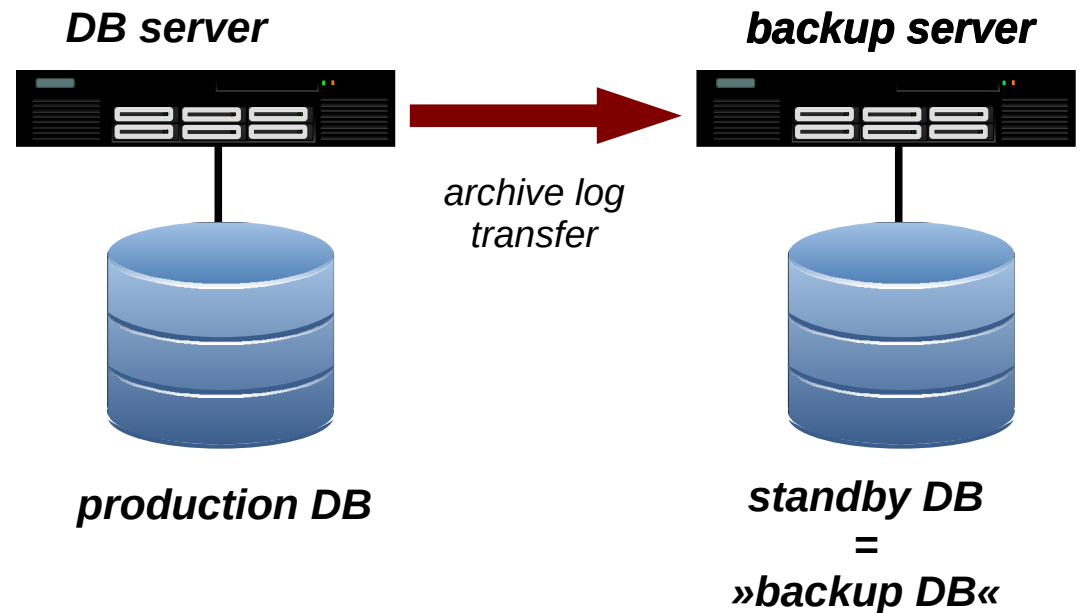
- Backup/Recover.
- Virtual databases (Deja Vu):
 - Oracle Databases,
 - MS SQL Server,
 - PostgreSQL (devel),
 - MySQL (devel).
- File system(s).
- ddlfs (<https://github.com/usrechnik/ddlfs>)
Open Source FUSE filesystem which represents Oracle Database objects as their DDL stored in .sql files.
 - Version control software (Mercurial, Git, ...) (devel).

Backup Server



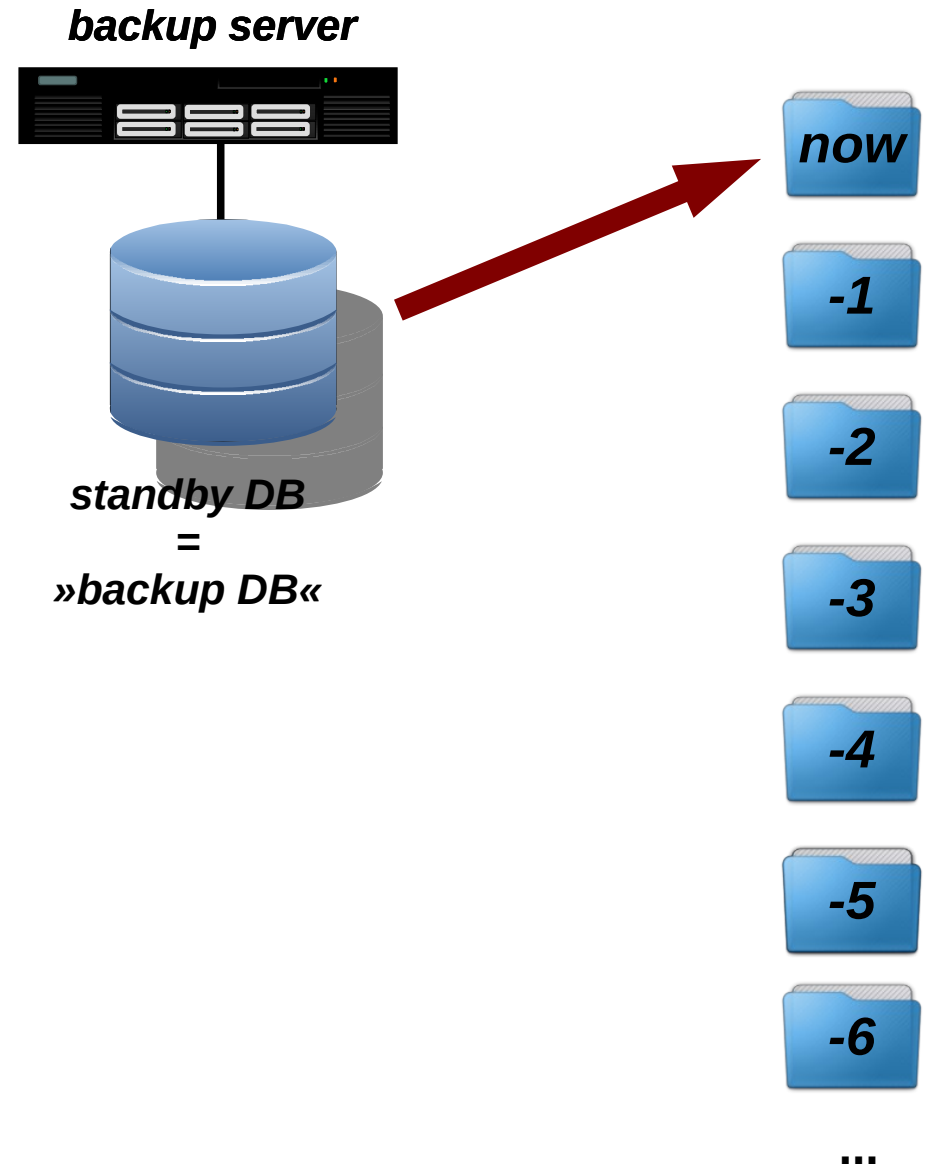
Backup in no time

- Backup takes no additional time!
- Backup requires no production resources.
- But, where is backup history?



... and history

- Snapshot backup DB.
- Save snapshot.
- Time and resources are consumed exclusively on backup server.

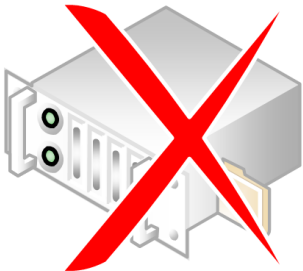


Recover in »no time« (1)

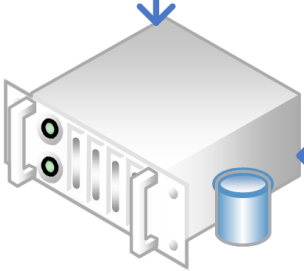


Work Station

Primary Site



SAN

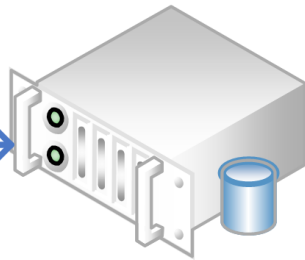


Production

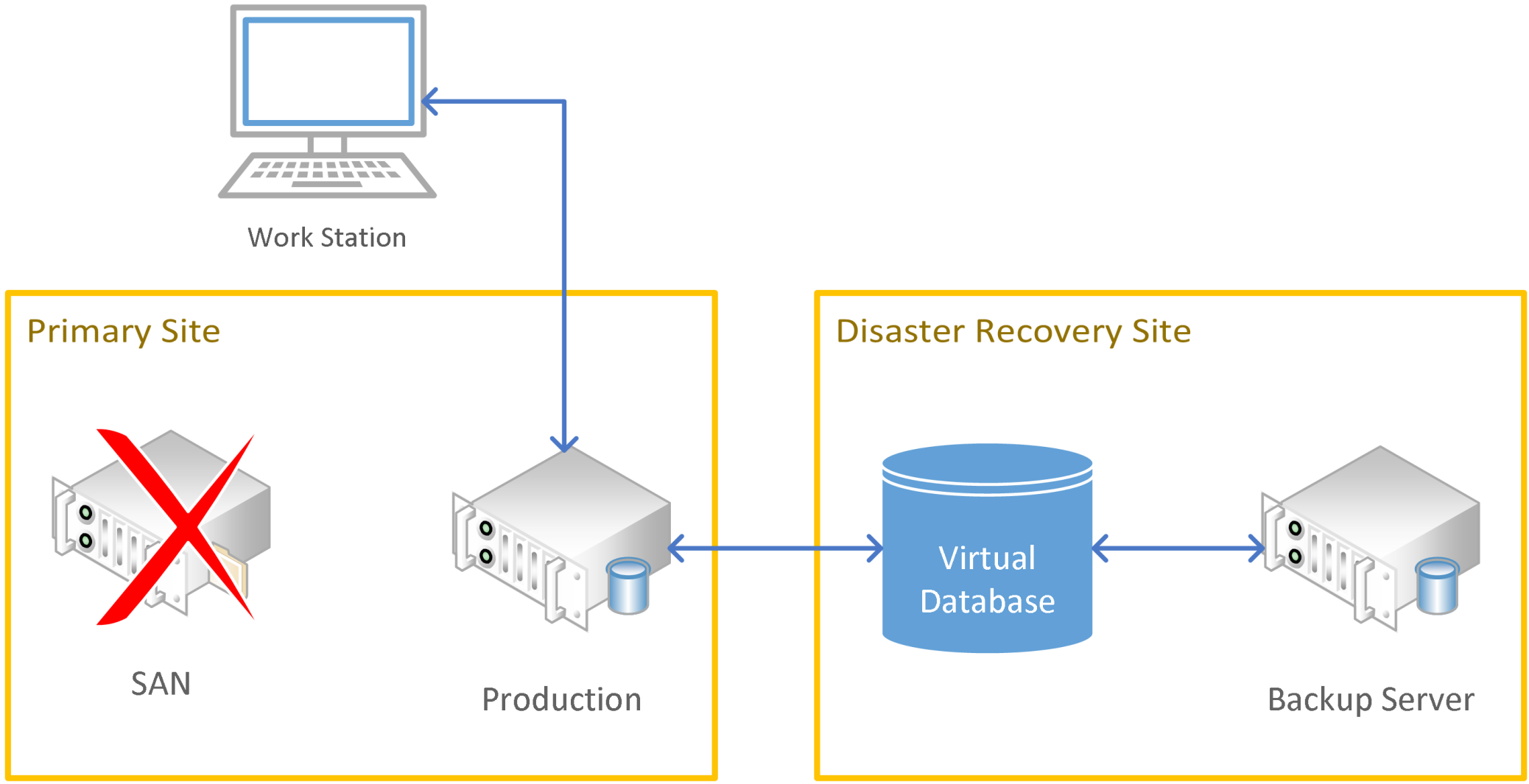
Disaster Recovery Site



Virtual Database



Backup Server

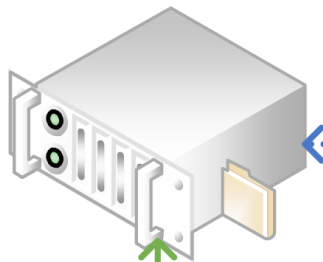


Recover in »no time« (2)

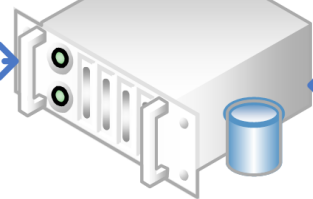


Work Station

Primary Site

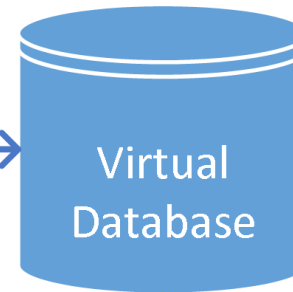


SAN

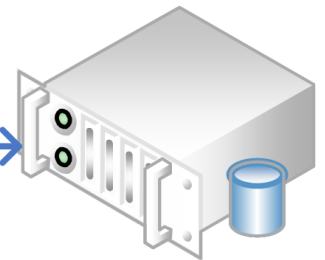


Production

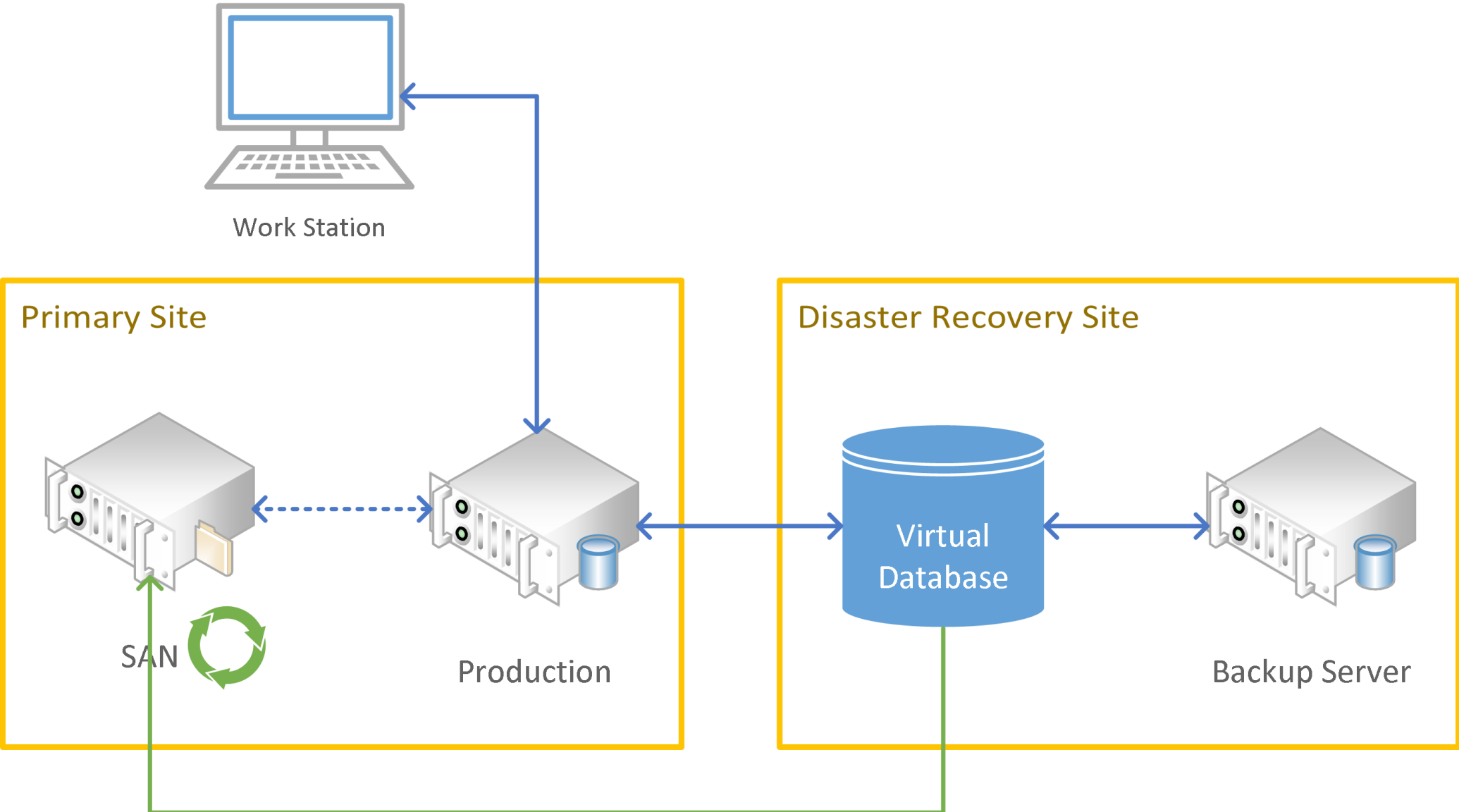
Disaster Recovery Site



Virtual Database



Backup Server



Branko Šeovac

šef oddeljenja
Sektor za informacione tehnologije

DBA at Nova Banka



Developeri uvijek imaju validne podatke



Više instanci – Za izvještaje, test i razvoj



Backup podataka u zadnjih godinu dana



Odlična podrška (vrijeme odziva, kvalitet i profesionalnost)

Backup server – DEVELOPERI



Razvoj programskog koda:

Developeri imaju potrebu da razvijaju kod zasnovan na validnim podacima. To dobijaju brzo i potpuno identično kao što je na produkciji.

Testiranje koda:

Prilikom faze testiranja za par minuta se dobije instanca koja ima podatke identične produkcionim podacima!

Istraživanje grešaka:

Kada je potrebno vratiti se u prošlost da se identifikuje situacija koja je dovela do nekih nekorektnih izračuna samo je važno da znamo tačno vrijeme. Za par minuta se dobije instanca na koja ima podatke kakvi su bili u trenutku nastanka problema!

Veličina baze = 400GB + archive logs

Prije ABAKUS backup servera smo prethodne kopije baze čuvali najviše 12 dana:

- 3 dana na serveru gdje se izvršava backup i trošili smo 2 TB kvalitetnog prostora na storidžu
- I još 9 dana na specijalizovanom uređaju EMC Data Domain
- 24h da se pripremi instanca

Nakon ABAKUS backup servera

- 1 godinu unazad sa svim backupima!
- 5 minuta da se napravi aktivna instanca











Backup Server GUI (1)

Backup Server *p-backup*
3659 backups provide 517 days of history since 2016-05-01.
102680 GB of backup data is stored on 4 TB / 4 TB physical volume.

Administration My Session (BSADMIN) ▾

System State: **WARNING**

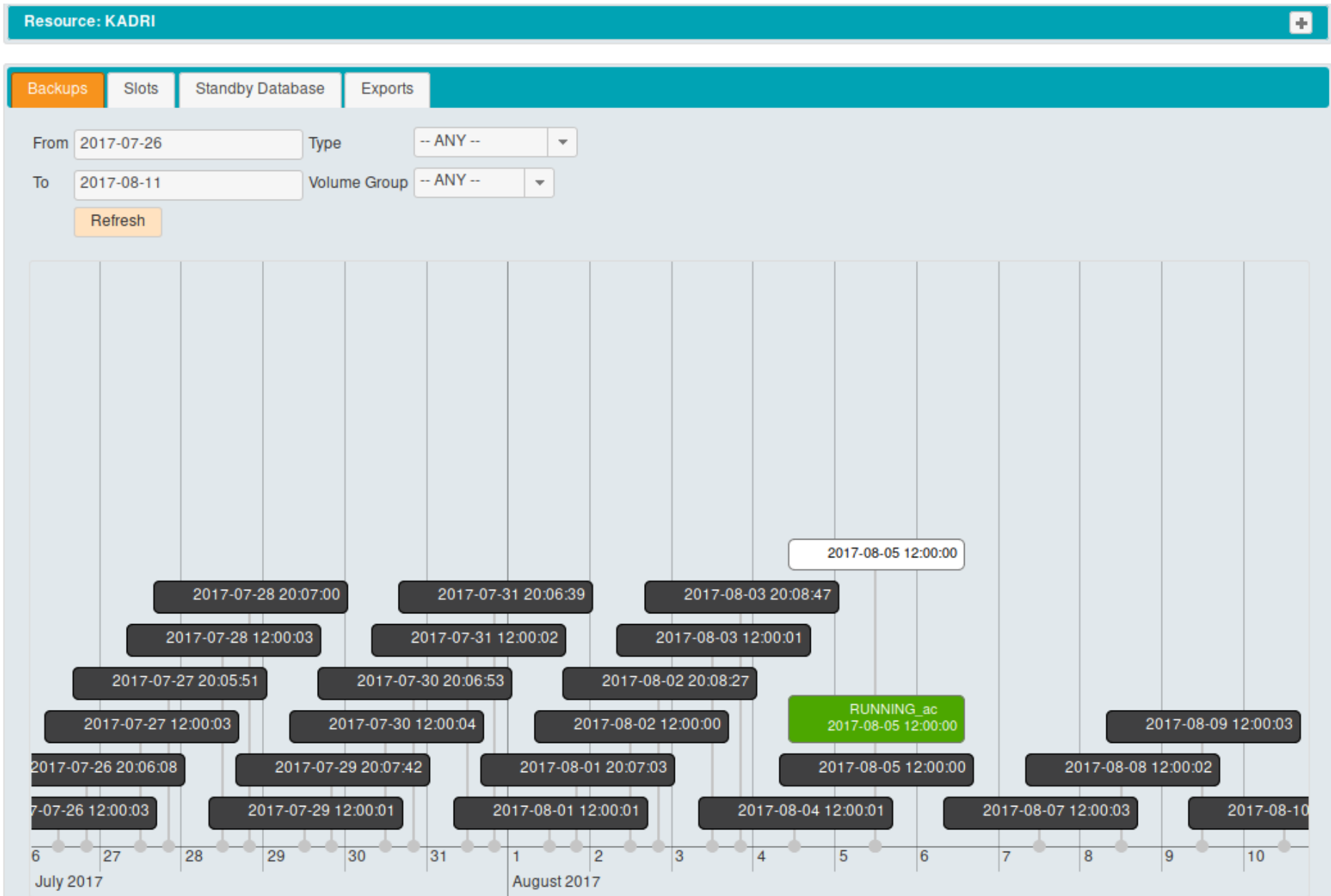
Resources

Type	Name	Actual Date	First Date	Last Date	Status	Monthly Growth	...
database_oracle	BIR	2017-10-01 05:31:56	2015-09-17 16:09:58	2017-09-30 12:00:00	ACTIVE	1GB	 
database_oracle	CSRE	2017-10-01 05:25:22	2016-04-19 12:50:05	2017-09-30 12:00:00	ACTIVE	150MB	 
database_oracle	KADRI	2017-10-01 05:09:19	2015-06-26 20:44:26	2017-09-30 12:00:01	ACTIVE	40MB	 
database_oracle	LW1	2017-10-01 05:24:17	2015-06-26 20:45:52	2017-09-30 12:00:00	ACTIVE	30MB	 
database_oracle	PROBIT	2017-10-01 05:03:57	2015-12-16 01:40:14	2017-09-30 12:00:01	ACTIVE	0B	 

[Create Resource](#)

Version: 4.4-p10-104

Backup Server GUI (2)



Backup Server GUI (3)

Resource: KADRI

Backups Slots Standby Database Exports

From 2017-07-26 Type -- ANY --
To 2017-08-11 Volume Group -- ANY --
Refresh

Backup Details

Resource ID: 84 KADRI
Backup ID: 54761 |vbs/dedup_slow1/KADRI-2017-08-05-12-00
Actual Date: 2017-08-05 12:00:00 Volume Group: Group is on slow disks (usually /zbackup).
Taken Date: 2017-08-06 13:44:00 Origin: n/a
Persistent Until: Software: Standard Edition 11.2.0.4.0
Directory Size: 27GB
Status: NORMAL
Is Consistent?
Is Snapshot?
Is Succeeded? [Mark as Failed](#)
Log File: [backup_54761.log](#)

Export Snapshot Create Snapshot Delete Snapshot Browse Backup Start Virtual Database

Date	Time
2017-07-26	12:00:03
2017-07-26	20:06:08
2017-07-27	20:05:51
2017-07-27	12:00:03
2017-07-29	12:00:01
2017-07-29	20:07:42
2017-07-30	12:00:04
2017-08-01	12:00:01
2017-08-01	20:07:03
2017-08-04	12:00:01
2017-08-05	12:00:00
2017-08-07	12:00:03
2017-08-08	12:00:02
2017-08-09	12:00:03
2017-08-10	

Backup Server GUI (4)

Resource: KADRI

Backups Slots Standby Database Exports

From: 2017-07-26 Type: -- ANY --
To: 2017-08-11 Volume Group: -- ANY --
Refresh

Start Virtual Database

Slot: ac
Backup ID: #54761
Open Mode: READ ONLY
Start Virtual Database Advanced Options

Date	Time
2017-07-26	12:00:03
2017-07-26	20:06:08
2017-07-27	12:00:03
2017-07-27	20:05:51
2017-07-28	12:00:03
2017-07-28	20:07:00
2017-07-29	12:00:01
2017-07-29	20:07:42
2017-07-30	12:00:04
2017-07-30	20:06:53
2017-07-31	12:00:02
2017-07-31	20:06:39
2017-08-01	12:00:01
2017-08-01	20:07:03
2017-08-02	12:00:00
2017-08-02	20:08:27
2017-08-03	12:00:01
2017-08-03	20:08:47
2017-08-04	12:00:01
2017-08-05	12:00:00
2017-08-07	12:00:03
2017-08-08	12:00:02
2017-08-09	12:00:03
2017-08-10	12:00:03

Backup Server GUI (5)

Resource: KADRI



Backups **Slots** Standby Database Exports

Refresh

Slot Name	Actual Time	Running Server	Restore Point	Status
ac	2017-08-05 12:00:00	p-backup		ONLINE
tt				OFFLINE
u0	2017-04-17 20:20:38	p-backup		ONLINE
u1				OFFLINE
u2				OFFLINE
u3				OFFLINE
u4				OFFLINE
u5				OFFLINE
u6				OFFLINE
u7				OFFLINE
u8				OFFLINE
u9				OFFLINE

Slot:

slot.log ****loading****

Database:

alert.log

Version: 4.4-p8-102

Backup Server GUI (6)

Resource: KADRI +

Backups **Slots** Standby Database Exports

Refresh

Slot Name	Actual Time	Running Server	Restore Point	Status
ac	2017-08-05 12:00:00	p-backup		ONLINE
tt				OFFLINE
u0	2017-04-17 20:20:38	p-backup		ONLINE
u1				OFFLINE
u2				OFFLINE
u3				OFFLINE
u4				OFFLINE
u5				OFFLINE
u6				OFFLINE
u7				OFFLINE
u8				OFFLINE
u9				OFFLINE

Slot Status ✕

Slot Name ac

Running Server p-backup

Access Method tns

Open Mode READ ONLY

Actual Time 05-08-2017 12:00:00

EasyConnect p-backup:1521/ackadri.backup.server

TNS Block
KADRIac = (DESCRIPTION =
(ADDRESS = (PROTOCOL = TCP)(HOST = p-backup)(PORT = 1521))
(CONNECT_DATA = (SERVICE_NAME = ackadri.backup.server)))

Slot:

Database:

Version: 4.4-p8-102

Backup & Recover Best Practices

- Backup takes no time!
 - no resources needed;
- Recover takes no time as well!
 - no resources needed;
- Copies are without errors and consistent.
- Data is always available & always in view.
- Backup history is always available & always in view.

Wish list:

- Use backup for reporting/testing/developing/debugging from any point in time.

Why database in any point in time?

> ----- Original Message -----
> From: xxxxxxxxxxxxxxxxxxxxxxxxx
> To: "Boris Oblak" <boris.oblak@abakus.si>
> Sent: Tuesday, 4. Marec 2014 11:43:55
> Subjects: The database from Friday
>
> Boris,
a procedure that ran over the weekend went wrong. Can you restore the friday's database somewhere where we could repeat the procedure and debug it?
>

- Report usually takes 15 minutes to finish, last night it ran for 3 hours!

Virtual databases (Deja Vu) (1)

- Create virtual databases (VDB).
 - Current (actual clone of production database).
 - test/dev/acceptance;
 - upgrade testing, ...
 - Production clone from any point in time.
 - debugging;
 - performance analyzing, ...
 - READ WRITE or READ ONLY.
 - Custom tnsnames.ora.
 - Custom post create sql scripts.
 - Renaming database links.
 - Creating clone of clone.

Virtual databases (Deja Vu) (2)

Start Virtual Database

Resource(s) x KADRI

Slot tt

Slave p-backup

Origin Historical Backup Perfect Recall

Origin Time 2017-07-31 20:06:39

Origin Backup #54683 Reuse Snapshot

Volume Group slow

Recover Until 2017-07-31 20:06:39 Point in Time Recovery

Open Mode July 2017

Access Method S M T W T F S

Restore Point 1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31
Create new restore point

Time 20:06:39

Hour

Minute

Second

Backup Server & Deja Vu

- Backup takes no time!
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- Copies are without errors and consistent.
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Wish list:

- Use backup for reporting/testing/developing/debugging from any point in time.

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<http://www.oracle.com/technetwork/licenses/wls-dev-license-1703567.html>

Virtual databases (Deja Vu)

PROD

DEV srv1
(VM)

TEST srv1
(VM)

Time 1

Time 2

ORACLE

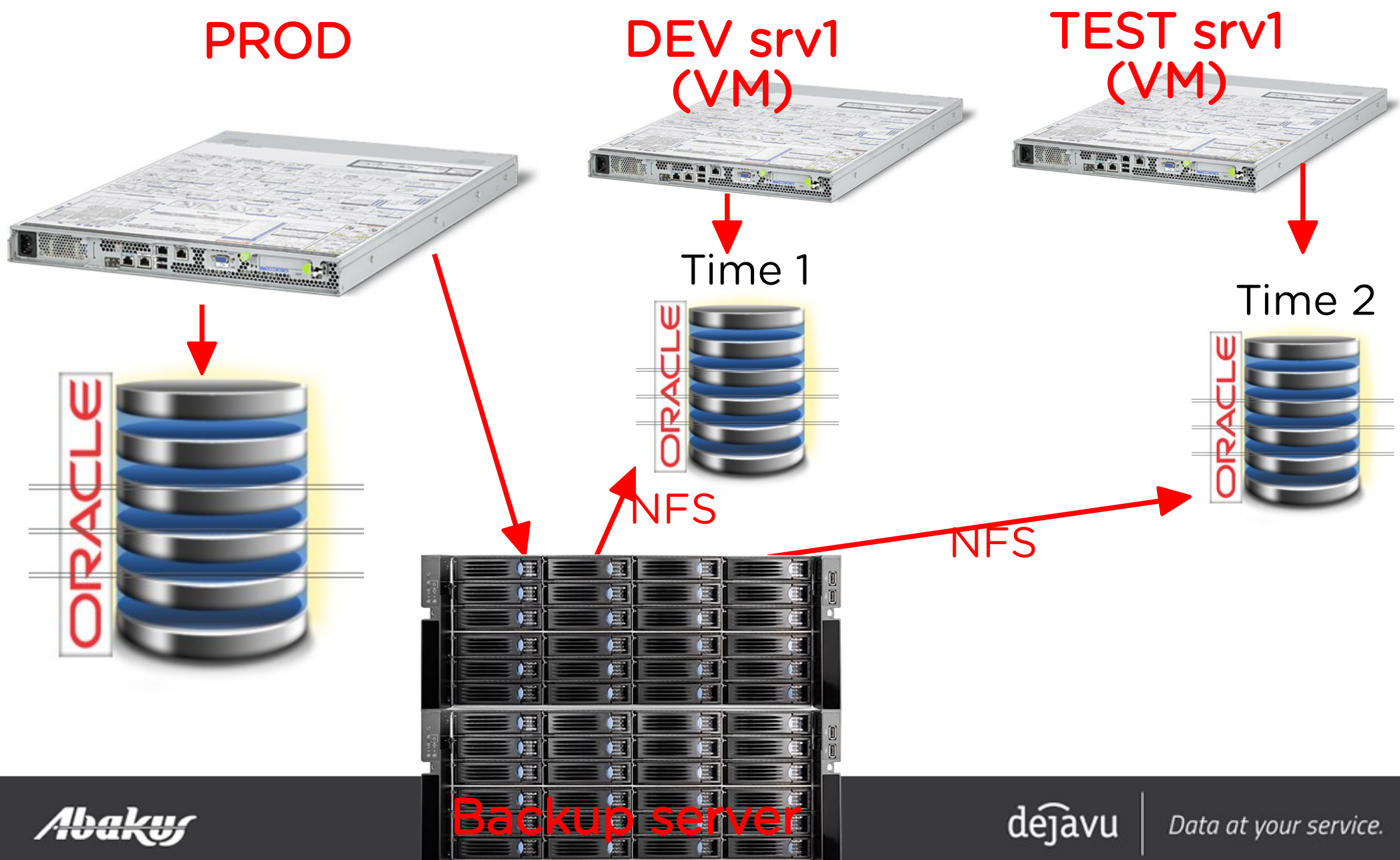
ORACLE

ORACLE

NFS

NFS

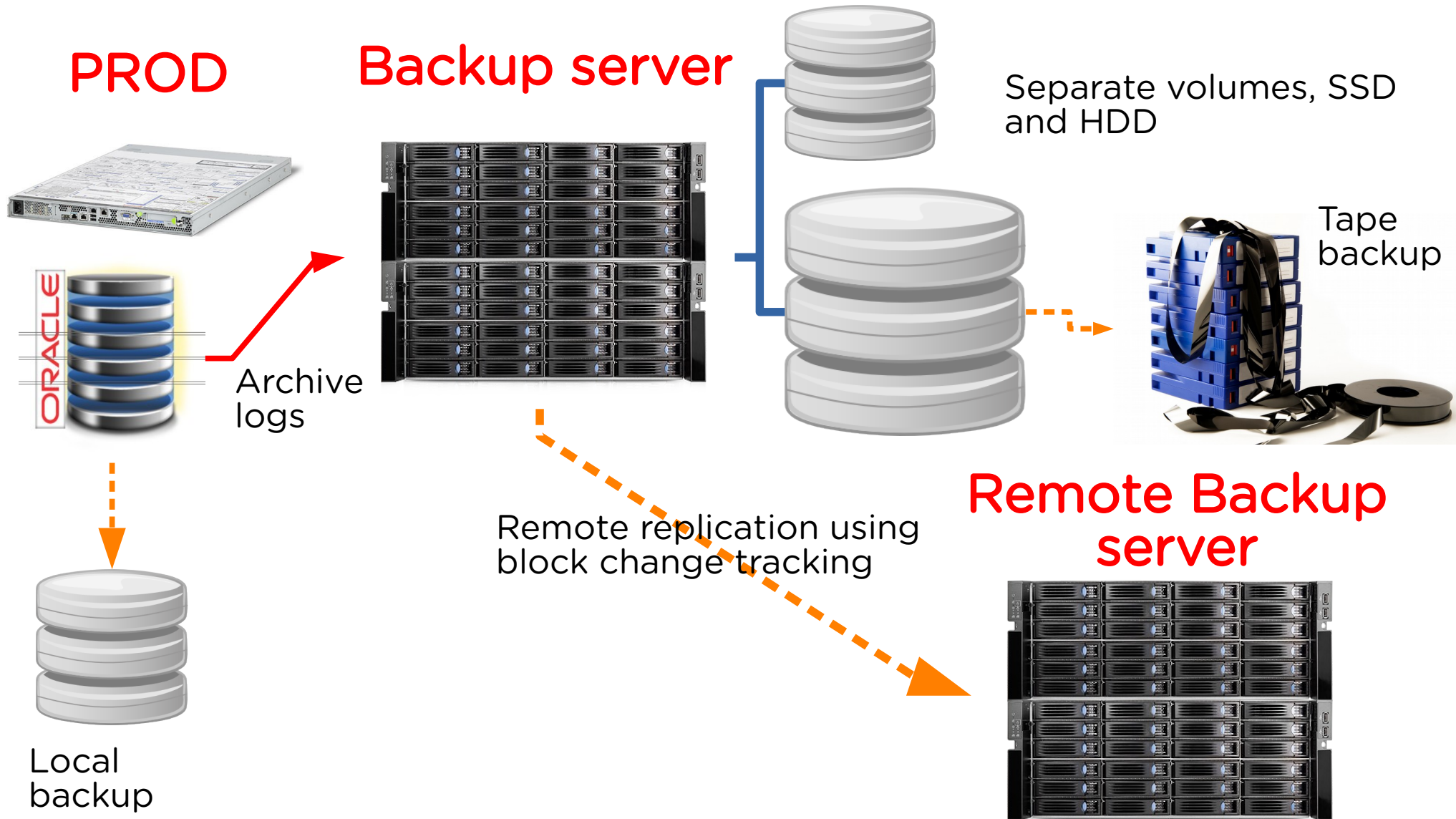
Backup server



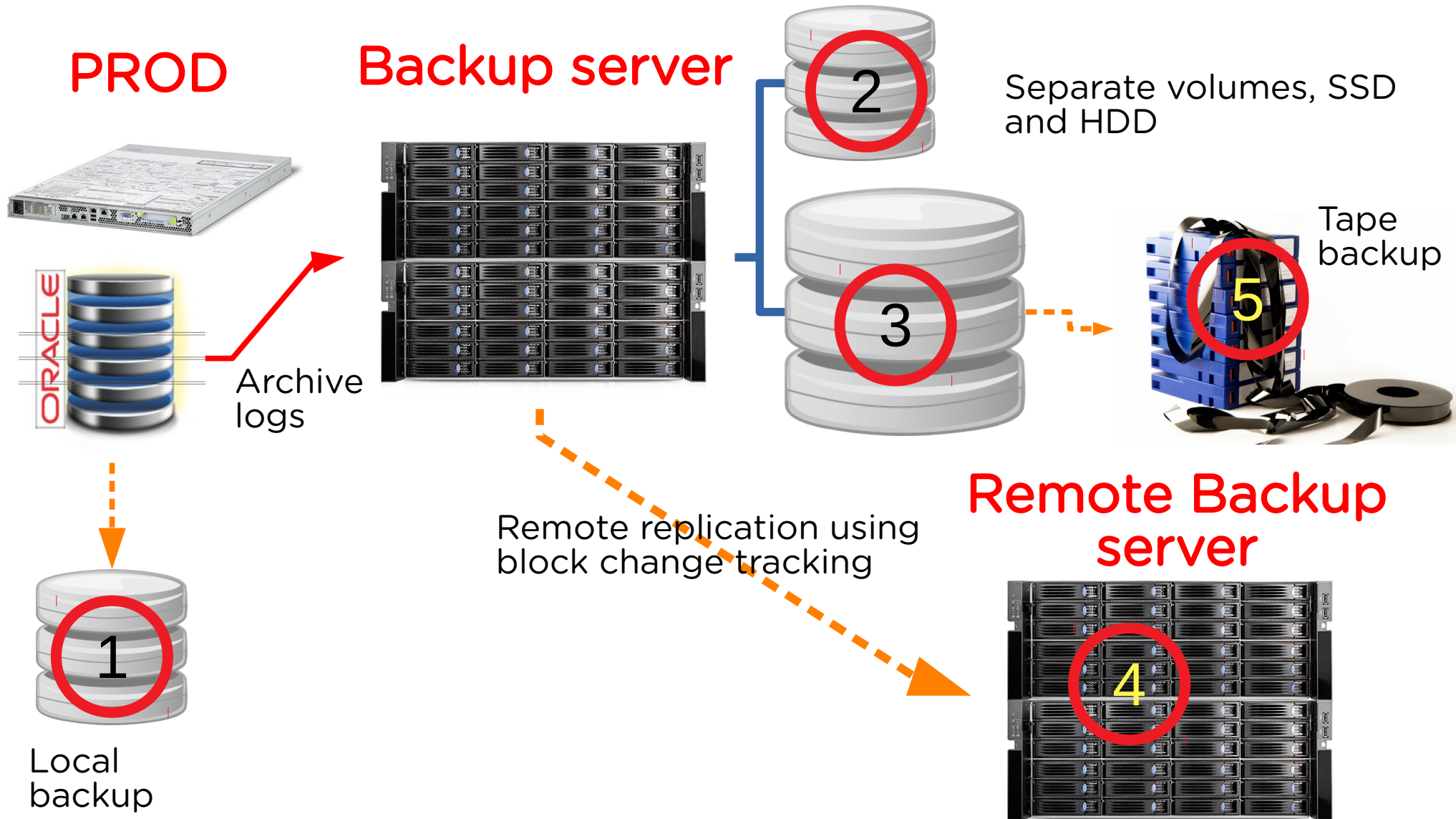
3-2-1 Backup rule

- Have at least **three** copies of your data.
- Store the copies on **two** different media.
- Keep **one** backup copy offsite.

Backup server



Backup server





Perfect Recall

What is Perfect Recall?

- True real time backup on Standard Edition as well!
- No data loss.

Every committed transaction has already been backed up!

Conclusion

- 3-2-1 Backup Rule (Backup Server).
- Backup & Recovery best practices (Backup Server / Deja Vu).
- True real time backup (Backup Server & Perfect Recall).

What is the value of the backup?

\$\$\$

ORA-03113: end-of-file on communication channel

Value added Backup

Thank You

Boris Oblak
Abakus plus d.o.o.
boris.oblak@abakus.si

Backup Server - Editions

	Lite	Standard	Deja Vu
Primary purpose	backup & recovery	backup & recovery	test & development
Oracle license required	NO	YES	YES
Perfect Recall	Optional	Optional	Optional