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## **Triple-O migration scenarios**

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# Topics

- Triple-O technology and prerequisites
- Triple-O architecture
- Online migration with network
- Online migration with limited network bandwidth
- Online migration without network

# O2O Online / “Triple-O”

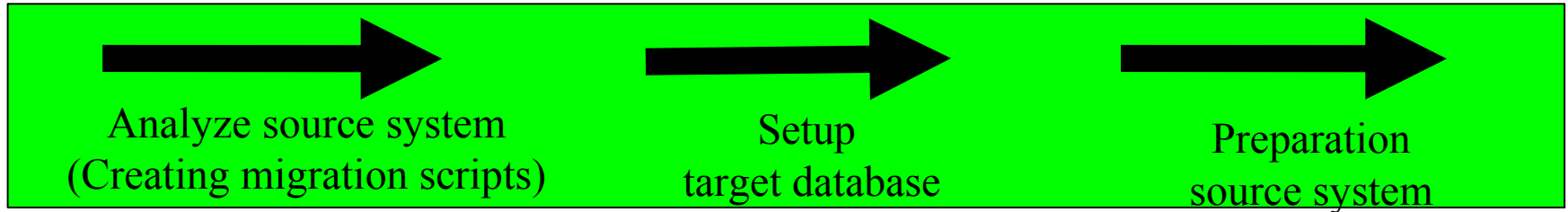
- Enhancement of the O2O method allows online migrations of databases
- Minimize needed downtime for database copy to a few minutes (10 - 15)
- Independent from the Database size
- SAP Support Note: 1508271

# Overview “Triple-O” steps

- Analyze source system
- Create empty target system
- Start GoldenGate process to record changes
- Perform initial data load while application is running
- Apply changes recorded on source system
- Synchronize source and target system
- Stop application on source system
- Start application on target

# Triple-O Method Overview

## Preparation phase



## Migration phase



## Synchronization phase (Oracle GoldenGate)



# Triple-O method summary

- Starting the migration doesn't need a downtime
- Method is save for the production system. A running Online migration can be stopped at any time, without downtime or harming the production system.
- Uses Oracle GoldenGate functionality
- A capture process on the source system analyses REDO-Log and/or archive logs, capturing DDL and DML changes
- Based on the Log information a logical change record (LCR) is created
- The LCRs are propagated to the target system.
- An apply process on the target system executes these LCRs

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# Technologies Triple-O

- Initial database load is using standard methods:
  - Oracle CTAS (Create Table As Select)
  - Oracle Export/Import
  - Oracle PL/SQL
  - Oracle DataPump (Network/ Dumpfiles)
- An automated scheduling program is used to control the migration progress
- Source and target systems are compared based on DB-objects and row-count
- Permanent monitoring of the synchronization process (delay time of target, apply errors)

# Architecture O2O

Source system  
Oracle >= 9.2

PL/SQL Package  
(Script generator)

Target system  
Oracle >= 11g

> 1000 GB/h  
(calculated on overall  
Database size)

Large tables (>= 50 MB)  
Transferred directly over network

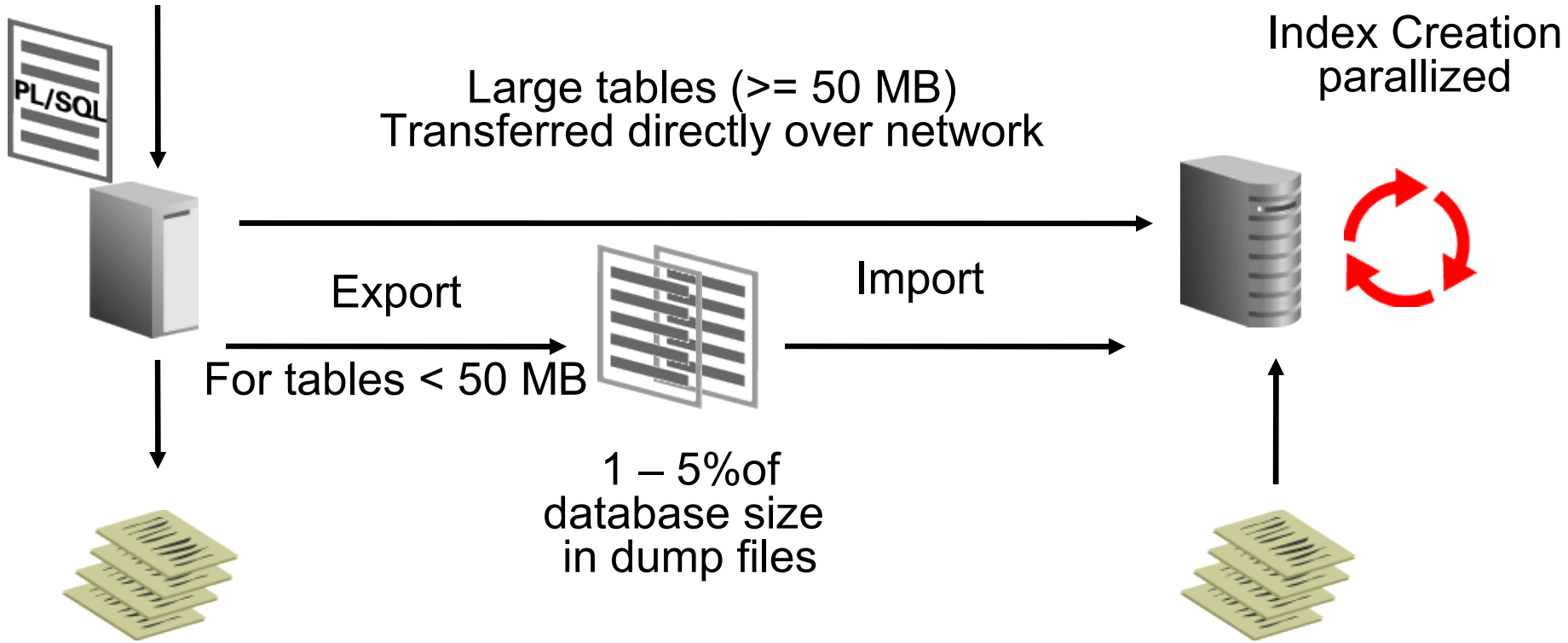
Export

Import

For tables < 50 MB

1 – 5% of  
database size  
in dump files

Index Creation  
parallized



# How It Works: Modular Architecture

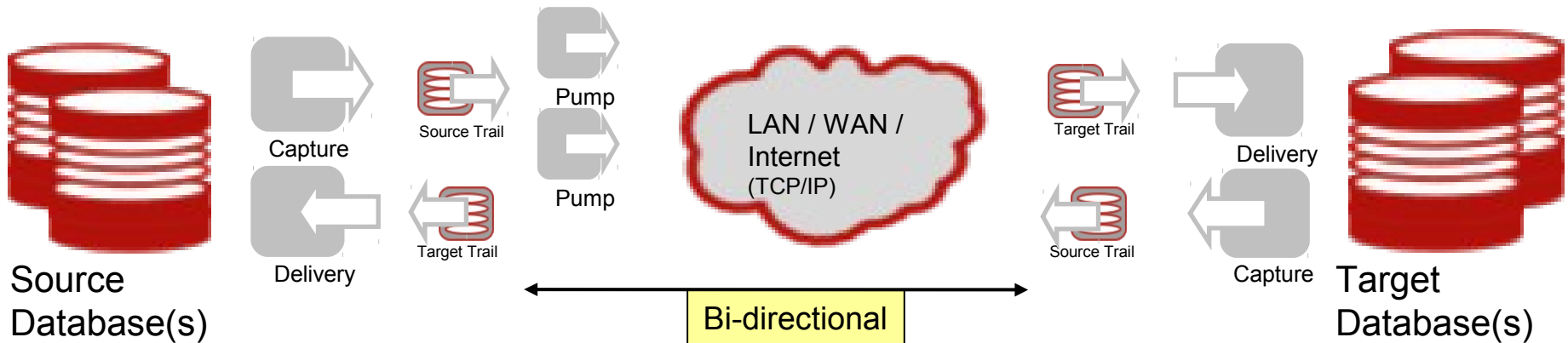
Capture: Committed changes are captured (and can be filtered) as they occur by reading the transaction logs.

Trail files: Stages and queues data for routing.

Pump: Distribute data for routing to multiple targets.

Route: Data is compressed, encrypted for routing to targets.

Delivery: Applies data with transaction integrity, transforming the data as required.



# Prerequisites Triple-O

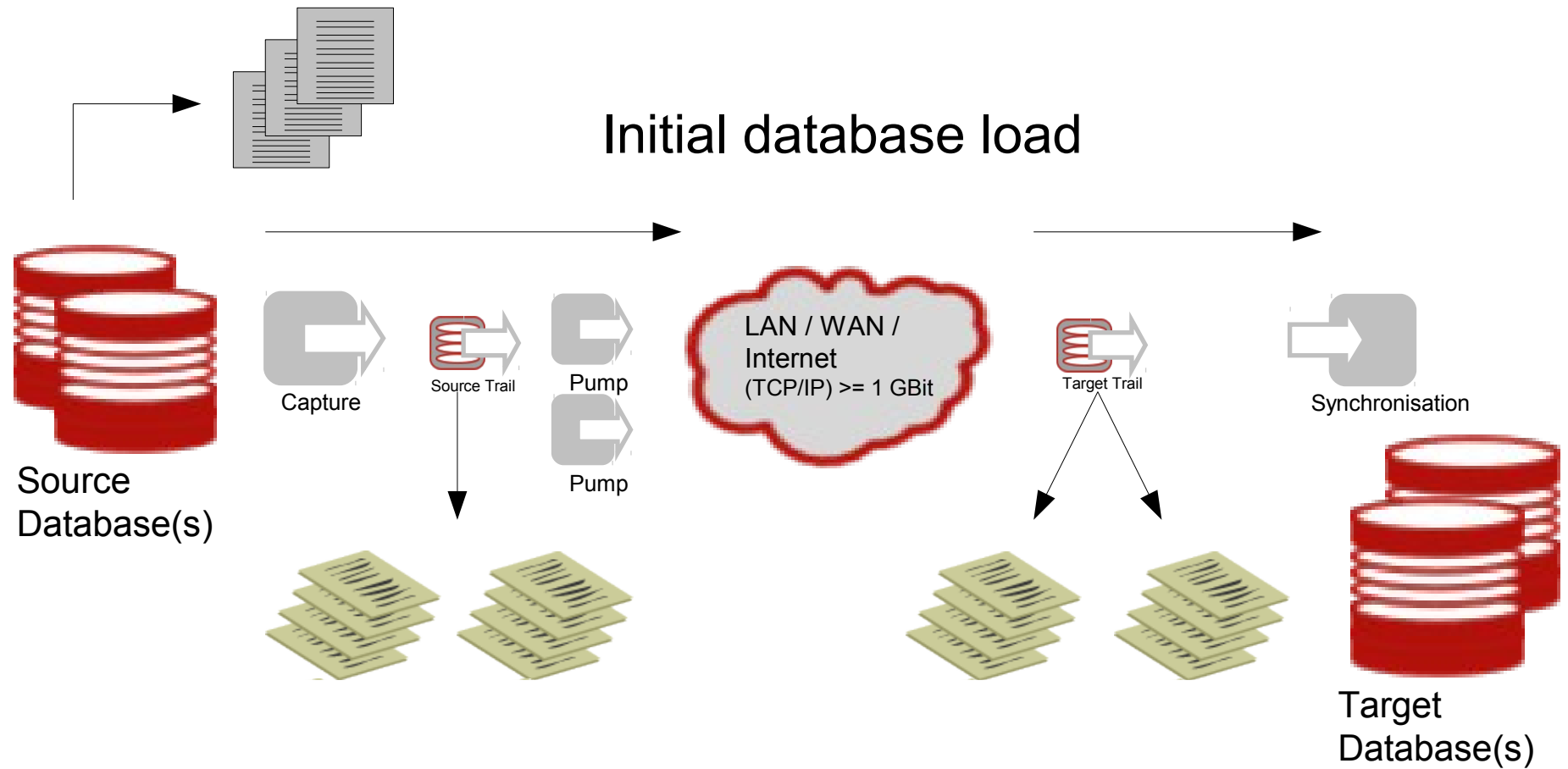
- Oracle version  $\geq 9i$
- Available CPU resources ( $> 30\%$ )
- Available space for trail files on source

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# Network based migration

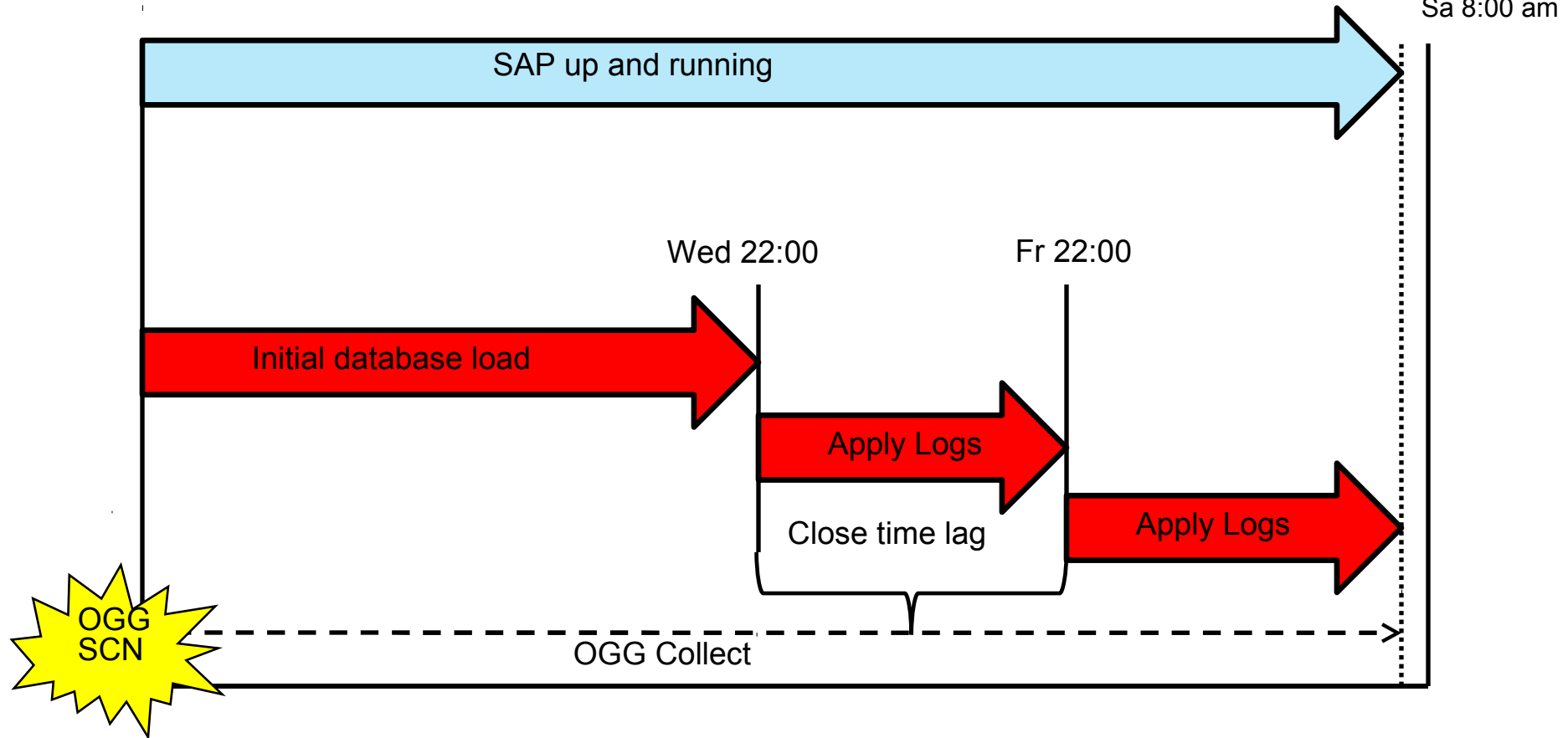
## Migration scripts



# O2O Online – Data Flow

Sun 8:00 am

Sa 8:00 am



# Summary network migration

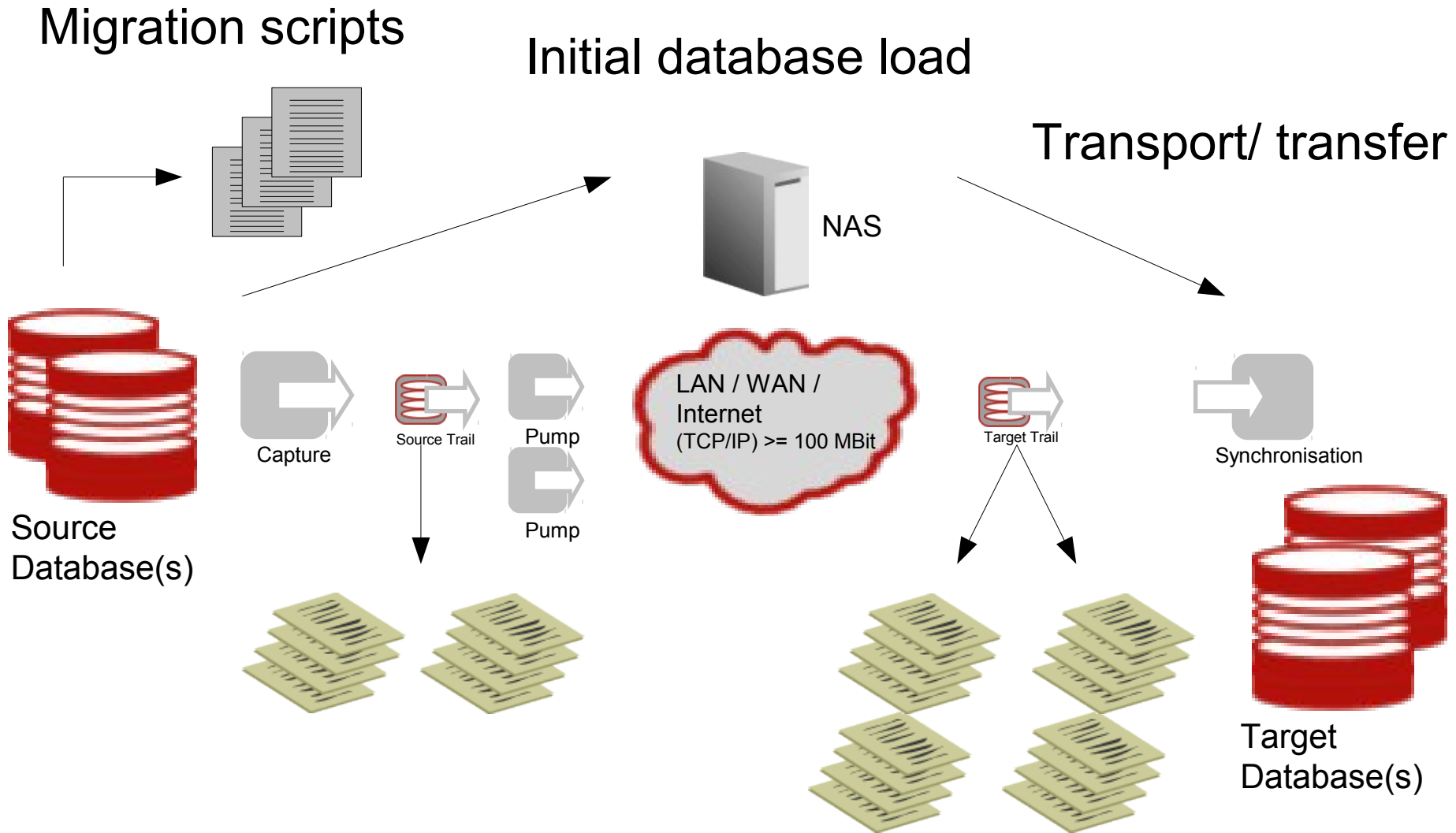
- Database downtime ~ 15 minutes
- Needs direct network connection
- Network at least 1 GBit
- Available space for trail files on source
- Trail files must be stored on the source system, while script generation is running.
- Volume of trail files can become very large, if script generation takes a long time (e.g. BW systems)
- As soon script generation is finished, trail files are transferred to the target. Transferred files are deleted on source (steady state)
- When initial database load (using O2O) is finished recorded changes are applied. Apply rate is up to 50 GB redo/ hour
- When time gap is closed, both systems can run in parallel with real time apply of changes
- System switch can taken place an any time



# Topics

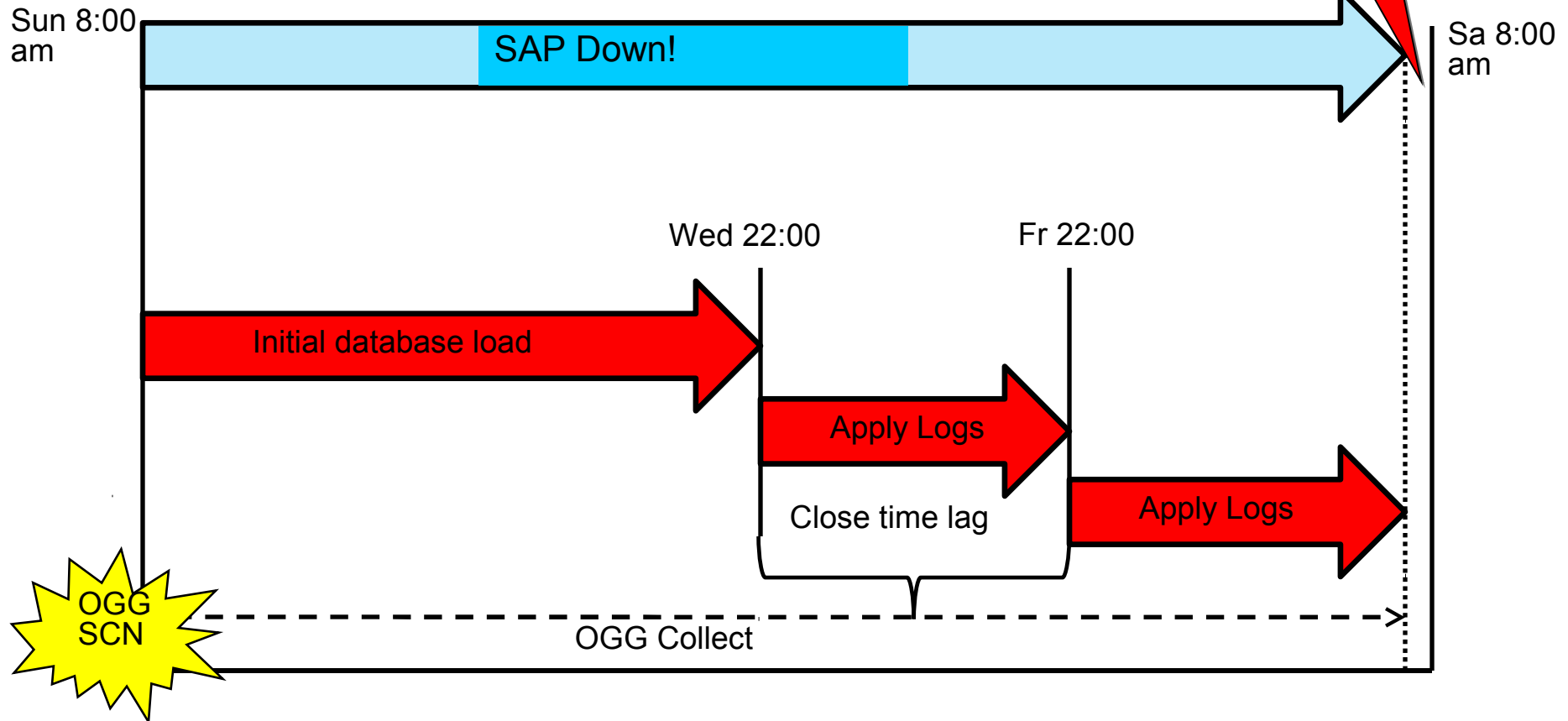
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# Network with limited bandwidth



# O2O Online – Data

Last Apply



# Summary network with limited bandwidth

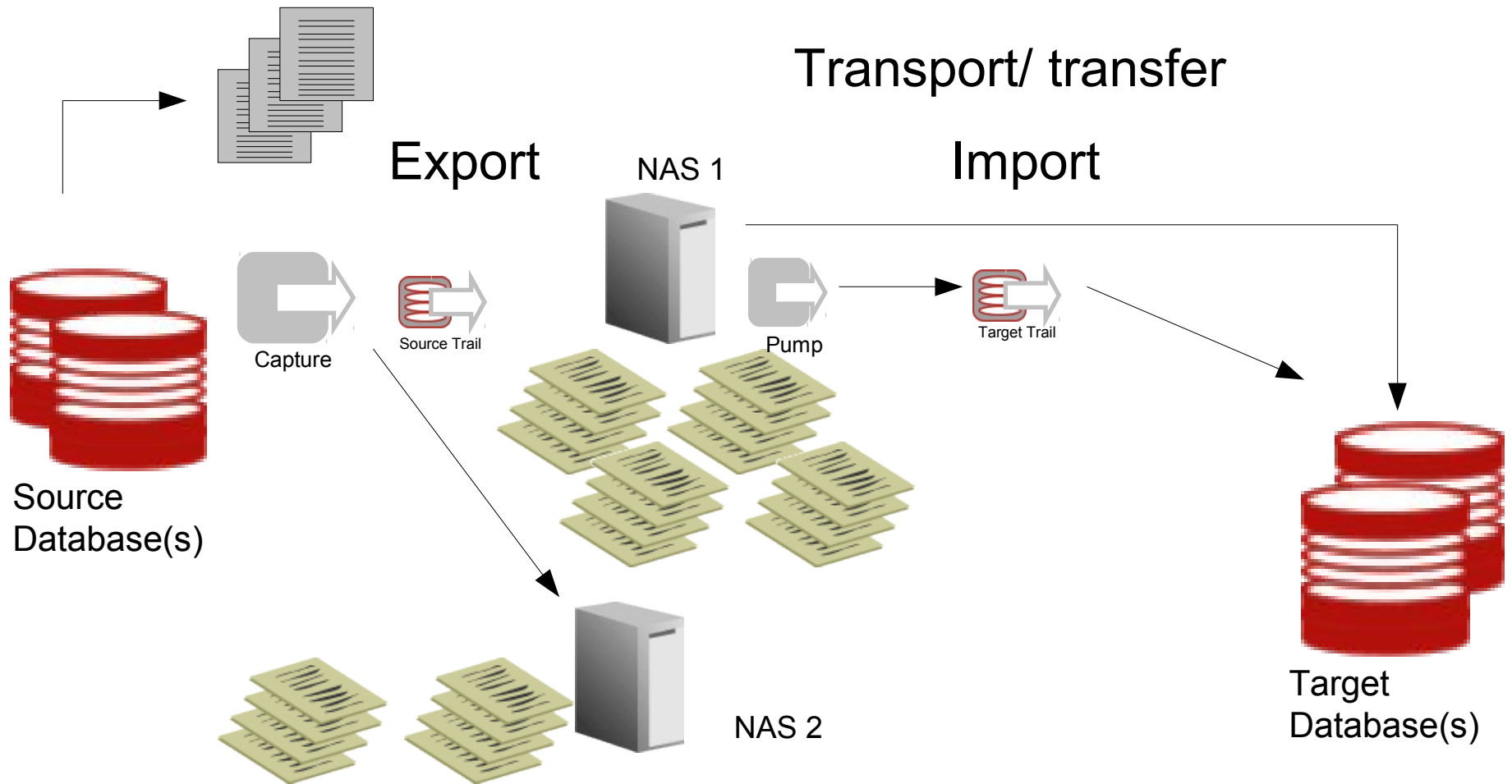
- Database downtime ~ 15 minutes
- Also 100 Mbit network connection sufficient
- Available space for trail files on source
- Trail files must be stored on the source system, while script generation is running.
- Volume of trail files can become very large, if script generation takes a long time (e.g. BW systems)
- As soon script generation is finished, trail files are transferred to the target. Transferred files are deleted on source (steady state)
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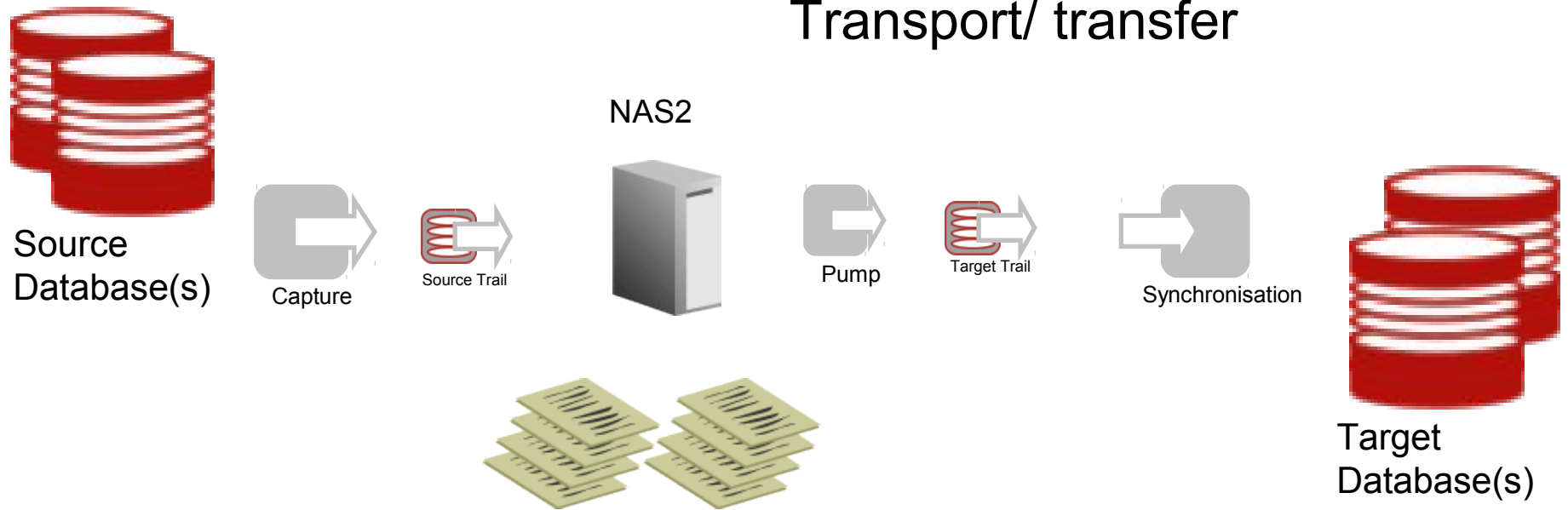
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# Migration without network

## Migration scripts

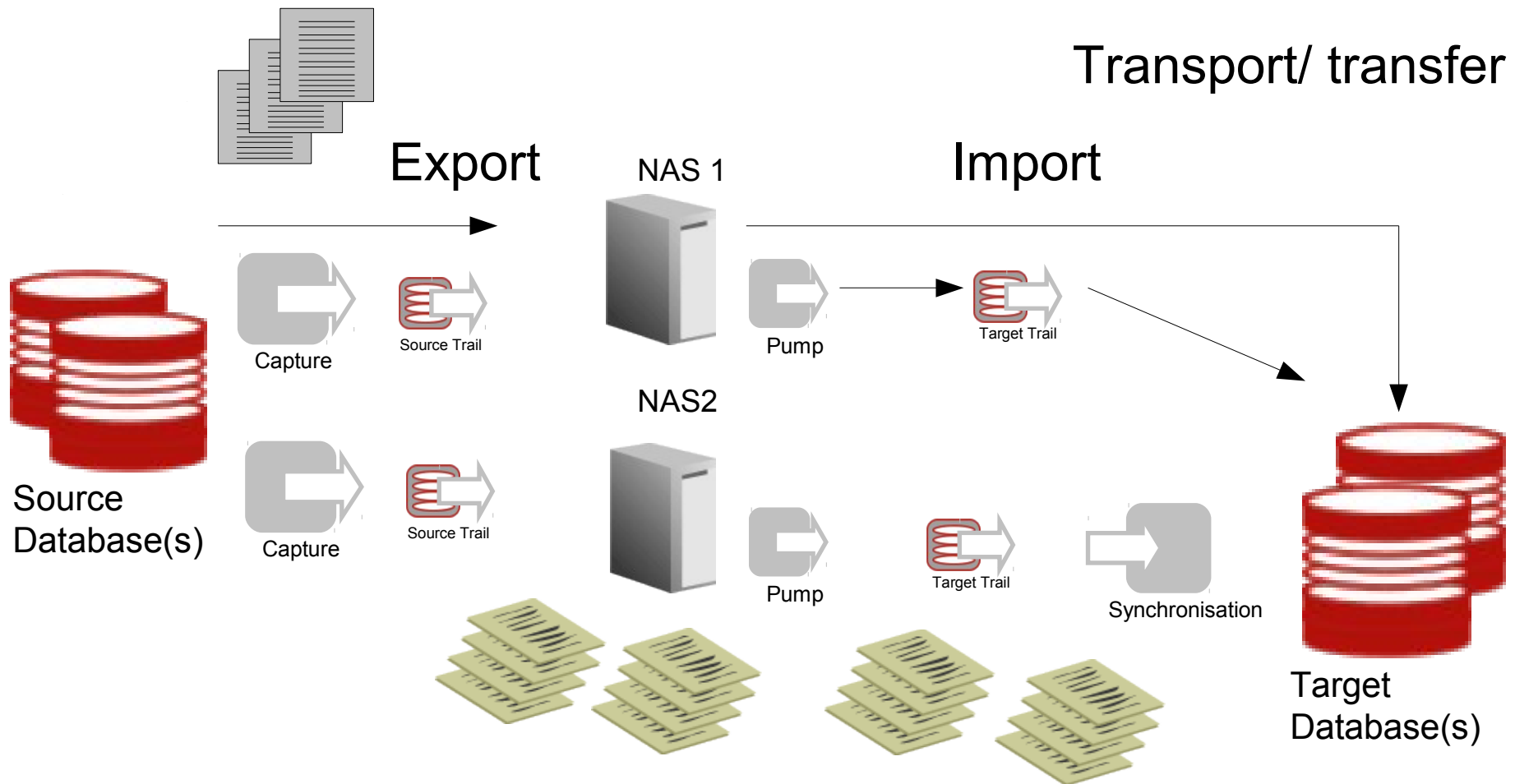


# Migration without network



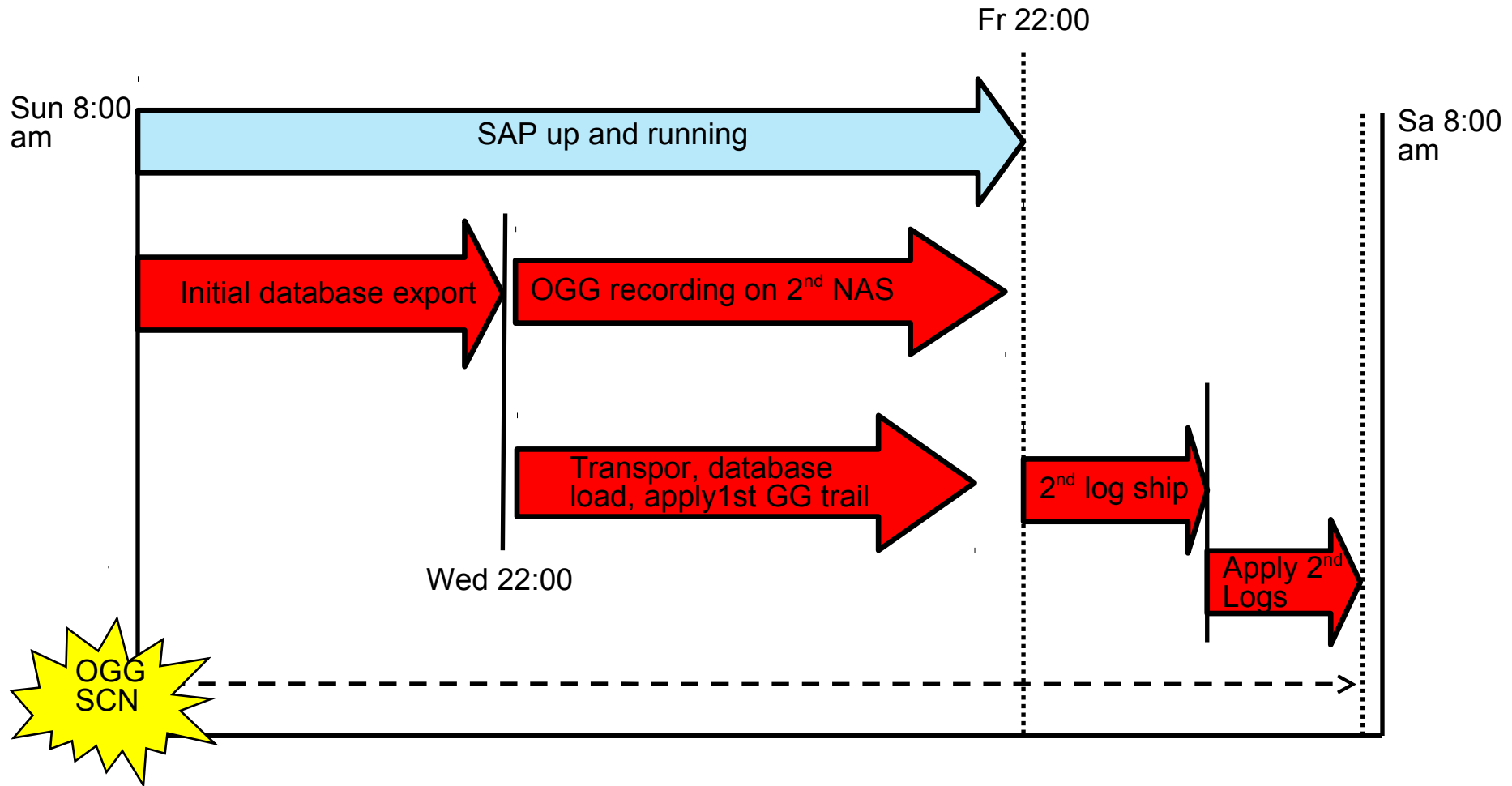
# Migration without network

## Migration scripts





# O2O Online – Data Flow



# Summary migration without network

- Database downtime depends on project situation
- Available space for trail files on source
- Trail files must be stored on the source system, while script generation is running.
- Volume of trail files can become very large, if script generation takes a long time (e.g. BW systems)
- As soon script generation is finished, 1<sup>st</sup> set of trail files is transferred with export dumpfiles to the target.
- On source recording is writing trails files to 2<sup>nd</sup> NAS
- At the desired time, SAP is stopped and 2<sup>nd</sup> trail file set is transported to the target system
- Changes are applied on target
- System is started on the target

# Questions & Answers

Optional Sub Title



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