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Migrate Zabbix DB from Oracle to PostgreSQL with TimescaleDB

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Why should you migrate?

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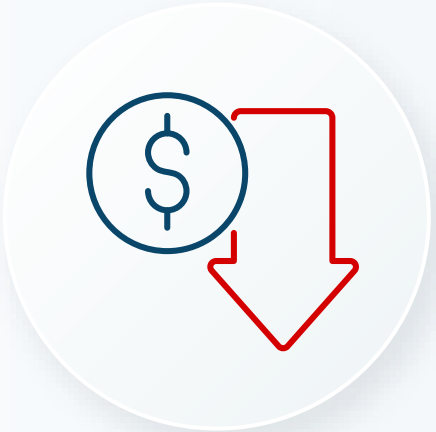
Oracle support is deprecated

Zabbix 7.0 LTS

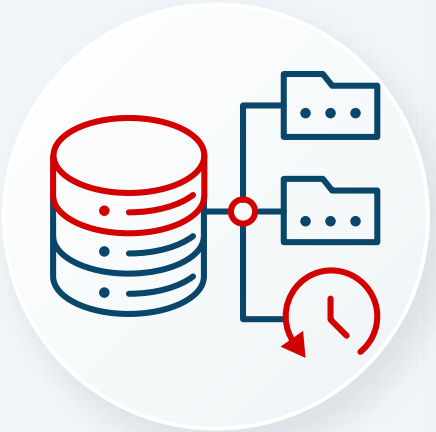
- Last release
- 5 years to migrate



Decrease the costs

PostgreSQL

- Free license
- Support available if needed



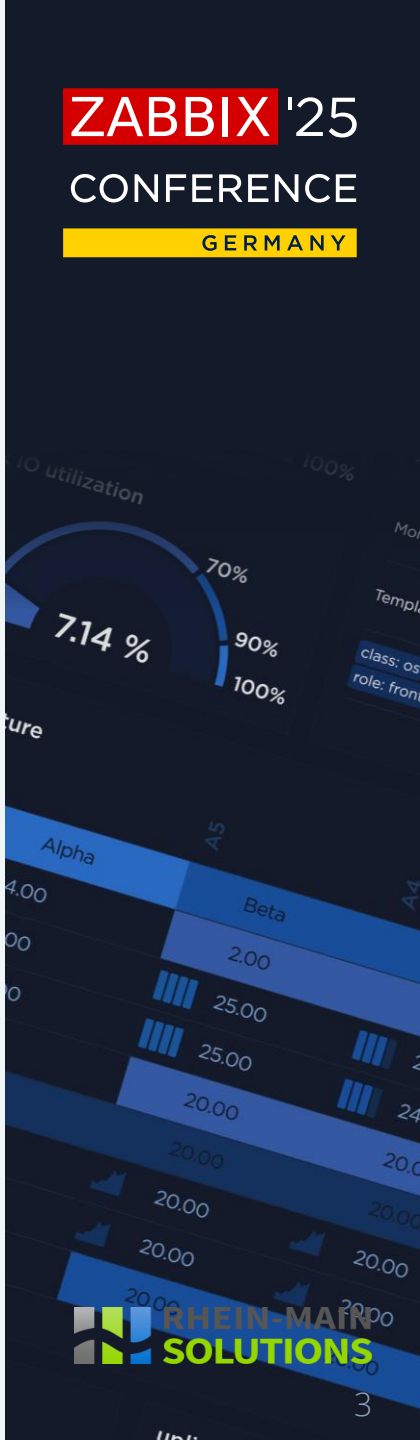
Partitioning and Compression

TimescaleDb

- Partitioning with Hypertables
- Compression

Available Migration Tools

- Pgora
  https://github.com/pgoracle/pgora-migrate
  11 years old no activity
- ora2pg
  https://ora2pg.darold.net
  Poor read performance on Oracle
- CYBERTEC Oracle Migrator
  https://www.cybertec-postgresql.com/en/products/cybertec-postgresql-migrator/
  No OpenSource
- More tools outside, not tested by our customers or ourself



PostgreSQL and TimescaleDB Toolset used for migration

- Foreign Data Wrapper for Oracle
  https://github.com/laurenz/oracle_fdw
  - Stable, reliable and fast
  - Many configuration options
  - All PostgreSQL functions are available for data conversion and validation
- timescaledb-parallel-copy
  https://github.com/timescale/timescaledb-parallel-copy
  - Really fast on importing CSV data to hypertables
    could work parallel with one CSV file
  - Low memory usage
  - Parameter batch-error-output-dir
    stores data that could not be imported
    great to find messed up data and correct them/convert them

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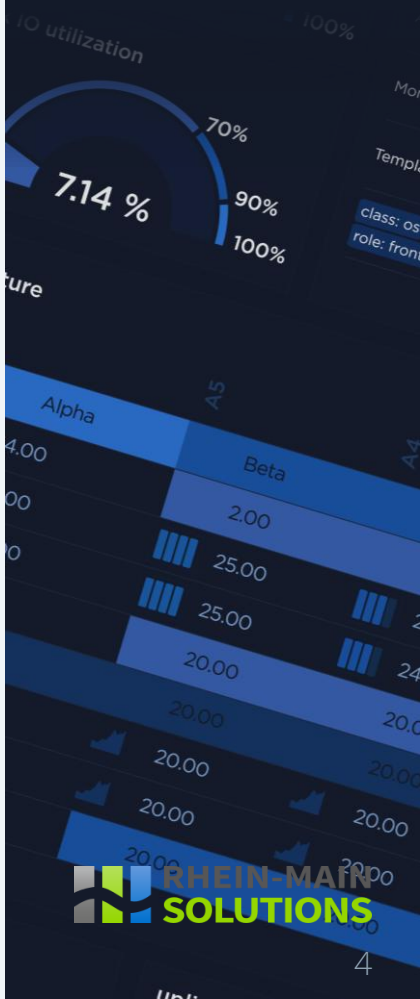
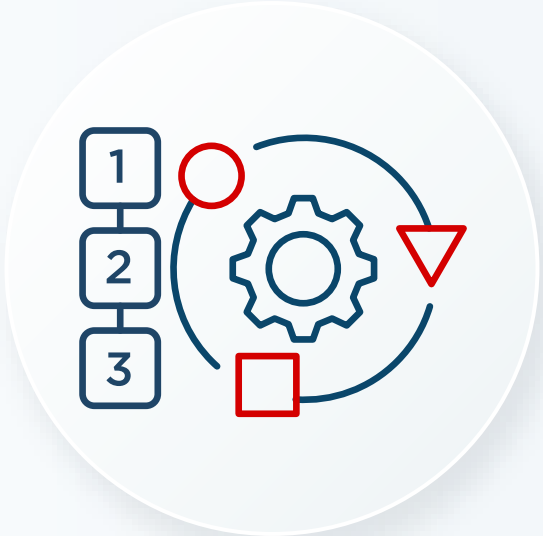


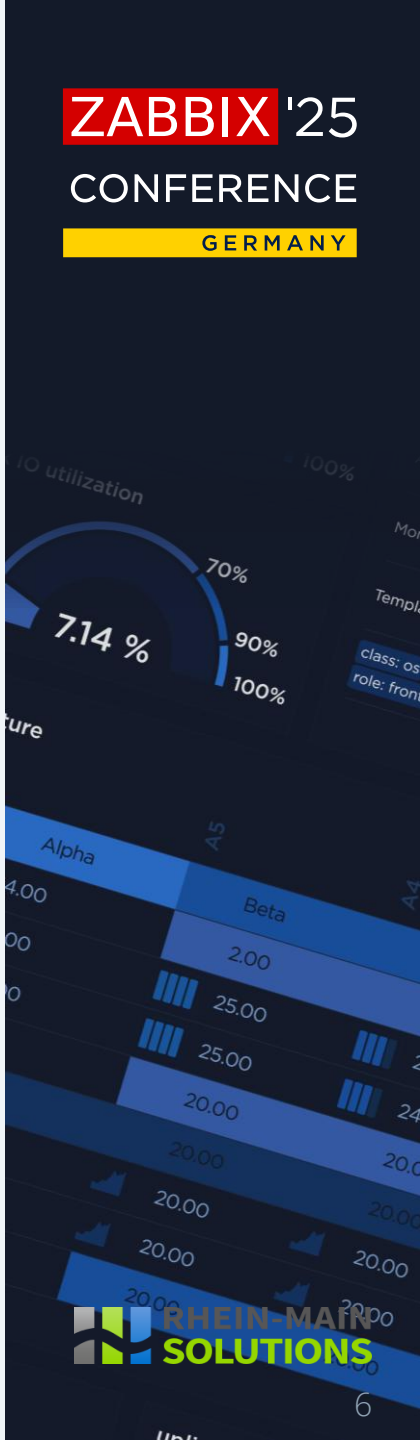
RHEIN-MAIN SOLUTIONS



Migration Steps

Step by Step Database Migration

- Assessment and planning
- Database Logic and Schema migration
- Data migration
- Data transformation
- Testing and Validation
- Deployment and checks



Security and Access control

- Different models for security
- Custom policies

No big deal!

- Create new Zabbix PostgreSQL database
- Create the needed users and grant access rights
  - Zabbix Server account (should be DB owner)
  - Zabbix Web Frontend account
  - Zabbix Monitoring user account
  - Check for additional accounts

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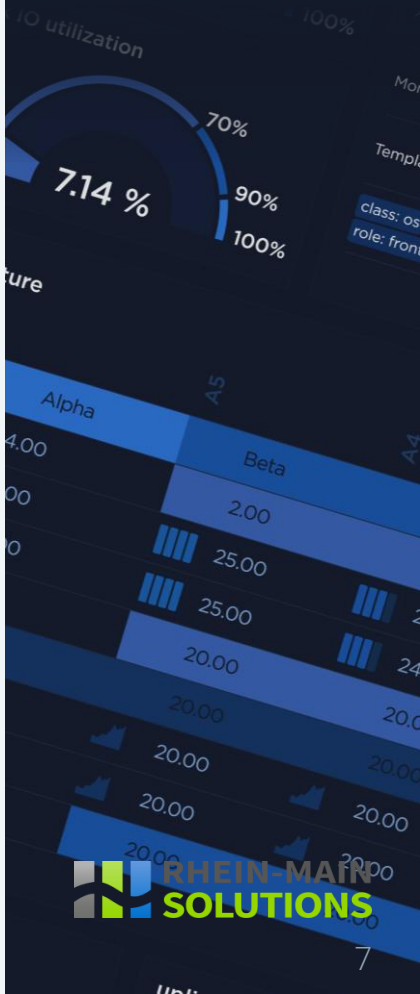

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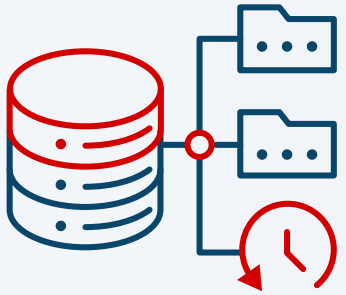
Partitioning challenges

- Oracle
  - Oracle supports partitioning
    Zabbix on Oracle does not!
  - Check if there is manual partitioning by scripts
  - Make sure to get all data including the partitioned one

- PostgreSQL
  - Official Zabbix Support for TimescaleDB
  - Transparent partitioning
  - Transparent compression



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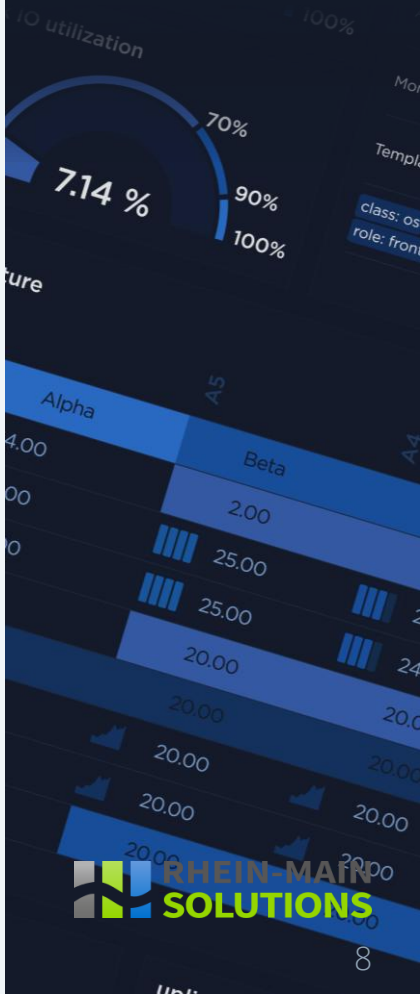

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Database logic migration

Stored Procedures and Triggers in Zabbix 7.0.12

- Oracle
  - 0 Stored Procedures
  - 0 Functions
  - 66 Trigger
- PostgreSQL
  - 0 Stored Procedures
  - 64 Functions
  - 65 Trigger

Nothing ToDo!

Zabbix Server and PostgreSQL database schema contains already the logic!

Schema migration

Table, indexes, constraints in Zabbix 7.0.12

- Oracle
  - 203 tables
  - 312 indexes
  - 272 constraints
- PostgreSQL
  - 203 tables
  - 312 indexes
  - 272 constraints

Nothing ToDo!

Zabbix Server and PostgreSQL database schema contains already the objects!

Pitfalls – Part I

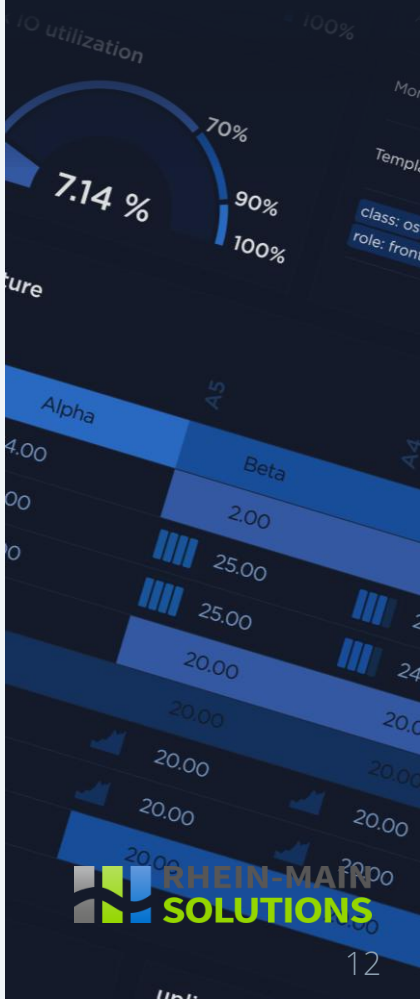
- Column order will be different between Oracle and PostgreSQL
  - Especially if Oracle database has seen many Zabbix DB upgrades
- Datatypes mapping
- Differences in Date and Time
  - Oracle DATE vs PostgreSQL TIMESTAMP
  - Oracle TIMESTAMP WITH LOCAL TIME ZONE vs PostgreSQL TIMESTAMPTZ
- Encoding issues
  - nclob
  - nvarchar2

Pitfalls - Part II

- Different DBNULL handling
  - Oracle treats empty strings as NULL
  - PostgreSQL treats empty strings as NOT NULL
  - Oracle concatenates NULL values with strings to strings
  - PostgreSQL concatenates NULL values with strings to NULL
- Oracle SEQUENCE to PostgreSQL BIGSERIAL
  - Only one table in Zabbix Database

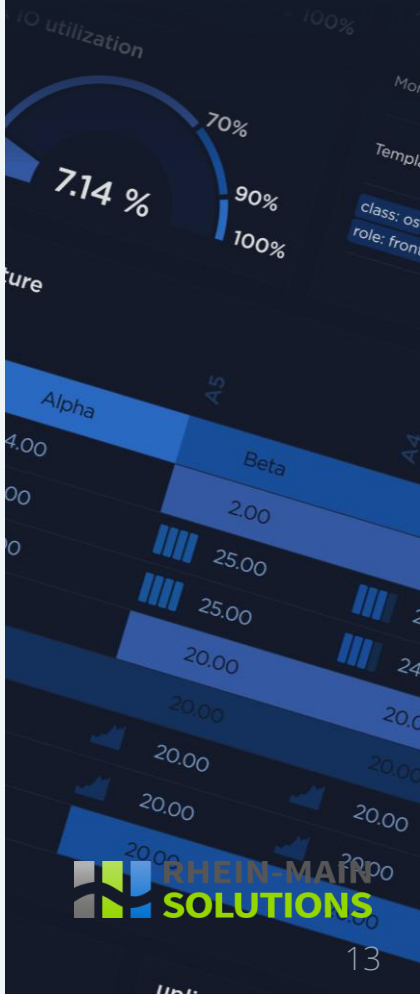
    changelog
  - Just Insert the data to the table
  - Reset the BIGSERIAL

```
SELECT max(changelogid) + 1 from changelog;
ALTER SEQUENCE changelog_changelogid_seq RESTART WITH xxxxxxxx;
```



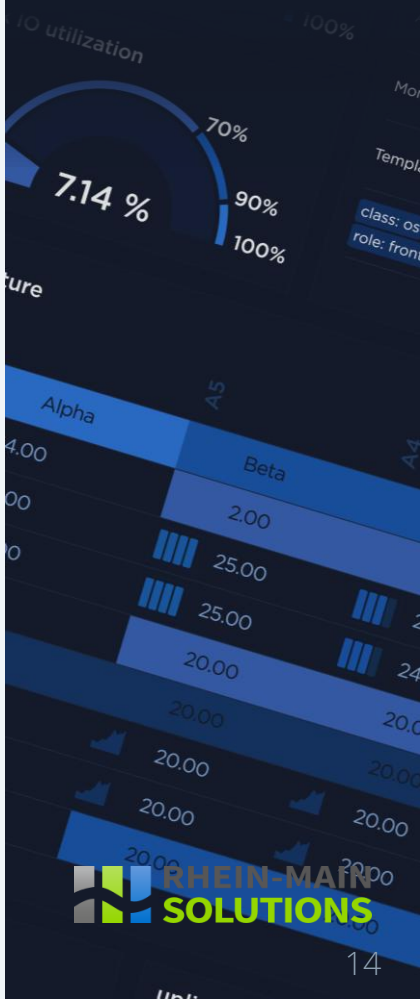
Data migration – Step 1
Prepare Oracle Zabbix database

- Create Views
  - e.g extract data for nclob with DBMS_LOB.substr
  - Much faster on Oracle site than converting it in PostgreSQL view
- Check configured timeouts on Oracle
  - SQL command timeout
- Check Oracle log for errors
  - to know which problems already exist
  - Fix them
- Check Zabbix server logs
  - Database errors/warning
  - Slow queries (could get a problem during migration)



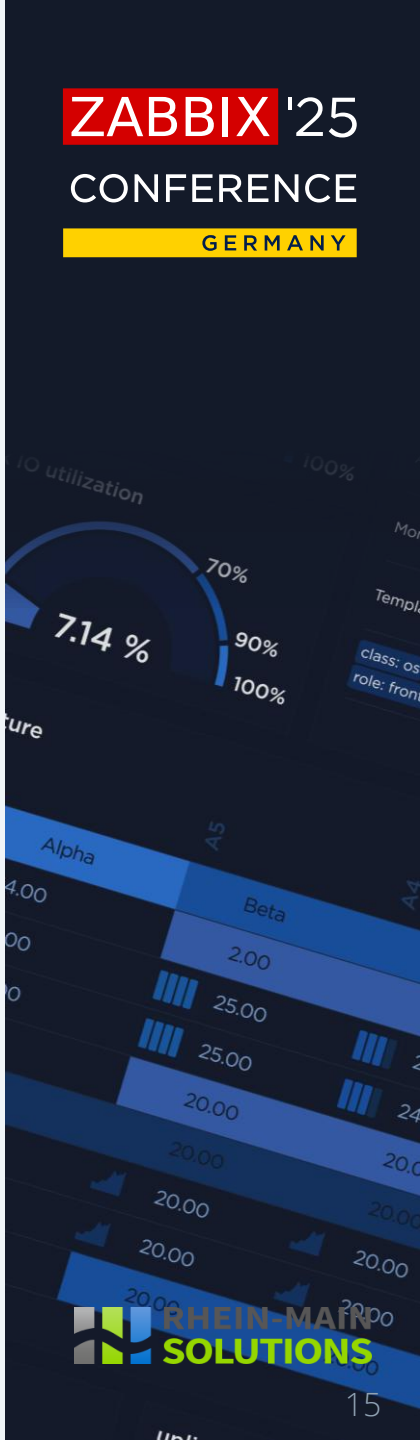
Data migration – Step 2
Prepare PostgreSQL

- Create Zabbix user and database
  - Create only the tables from Zabbix schema (CREATE TABLE statements)
  - No indexes and constraints!
- Install and configure PostgreSQL Foreign Data Wrapper
  - Create extension oracle_fdw
  - Create foreign server and user mapping
  - Create foreign tables for all tables (use an own schema e.g. or_import)
  - Use the Oracle views instead of tables if your created one
- Create views for data conversion and cleansing if necessary
  - DataType Mapping
  - Column order according to PostgreSQL Zabbix database schema
  - Use PostgreSQL logic for automating the view creation
  - Check every view and adjust if necessary



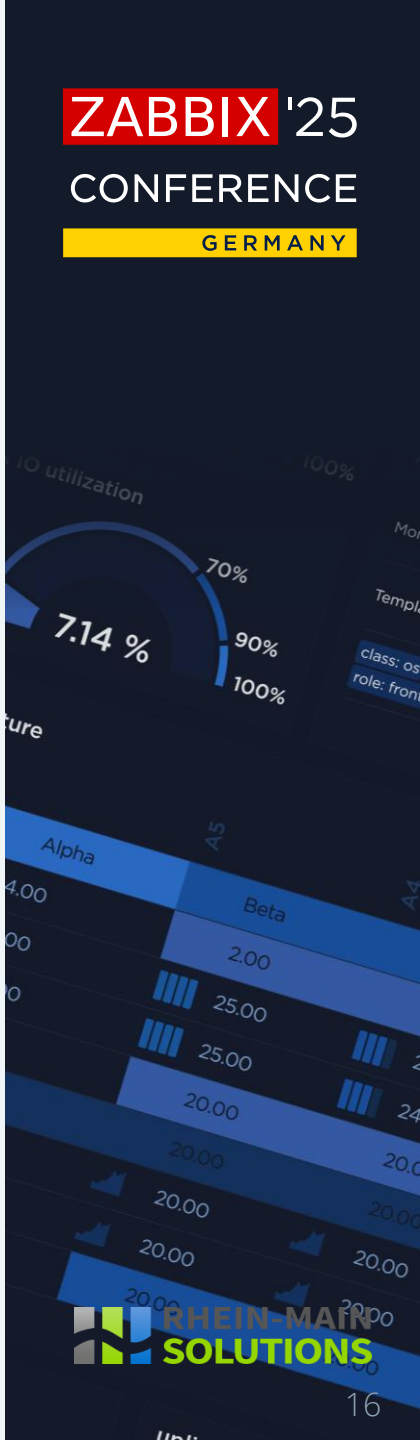
Data migration – Step 2 Prepare PostgreSQL

- Optimize PostgreSQL configuration for data loading
- Adjust to your DB Server configuration
- Good starting point
  https://www.pgconfig.org
  - Application Profile:
    DataWare house and BI Application
  - max_wal_size should be high for bulk load
    Reduces the count of checkpoints
  - checkpoint_timeout should be increased
    Reduces the amount of full-page image writes



Data migration – Step 3 TimescaleDB

- Install and configure TimescaleDB
- Enable timescaledb extension in the Zabbix database
- Run Zabbix TimescaleDB script against the Zabbix database
  - Checks TimescaleDB configuration
  - Creates hypertables
  - Enables compression



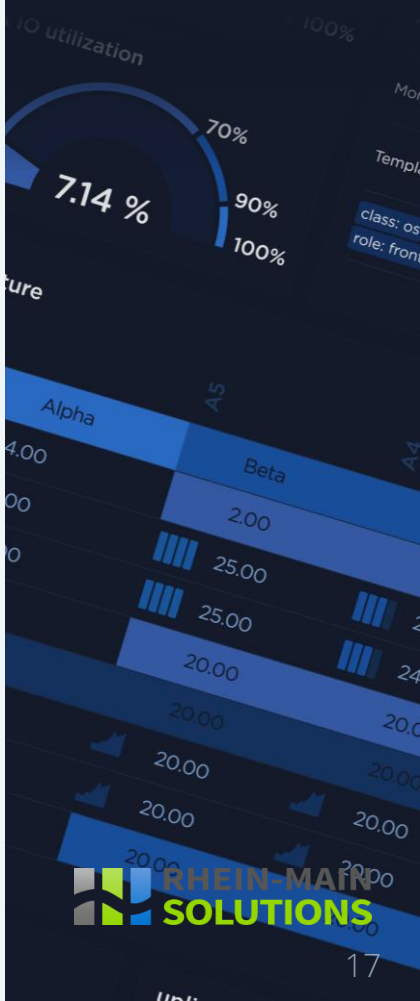
Data migration – Step 4
Transfer data – regular tables

- 203 tables in Zabbix Version 7.0.12
- 193 tables – very straight forward
- Create views on foreign tables if needed
- Export the data to CSV files and import it
  Use table or view as source, check column order!

```
COPY (SELECT * FROM or_import.hosts ) TO '/tmpstorage/hosts.csv';
COPY public.hosts FROM '/tmpstorage/hosts.csv';
```

- Slower but also possible
  Use table or view as source, check column order!

```
INSERT INTO public.tablename (column1, …, columnN)
SELECT column1, …, columnN FROM or_import.tablename;
```

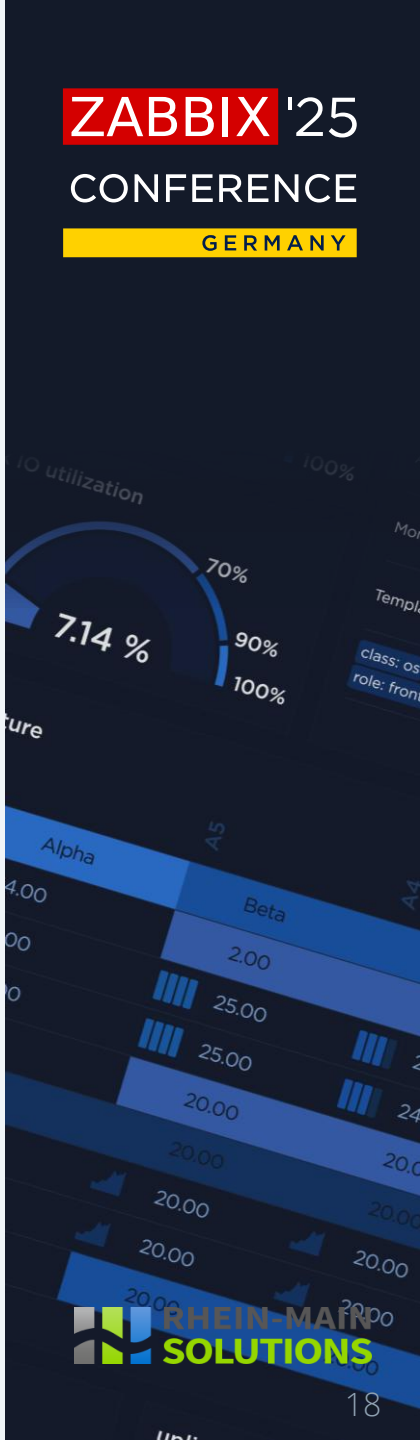



Data migration – Step 4
Transfer data – binary tables

- Oracle uses blob and PostgreSQL bytea
  - oracle_fdw supports casting blob column to bytea
  - create view with the according cast if Oracle Version older than 19
  - set lob_prefetch according to typical screenshot size for better performance
- Transfer the data

```
INSERT INTO public.images (imageid, imagetype, name, image)
SELECT imageid, imagetype, name, image::bytea FROM or_import.images;
```

- Infos according to binary tables
  - images (background images and icons)
    normaly fast
  - history_bin
    definitly the table with the slowest migration speed

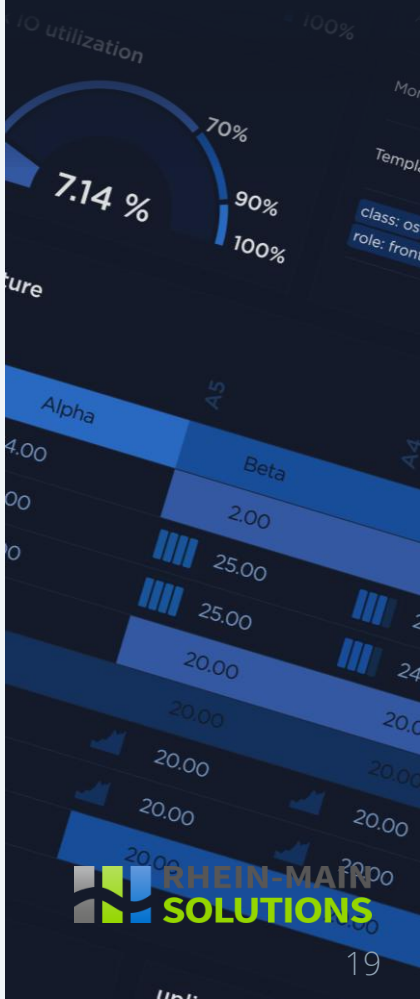


Data migration – Step 4
Transfer data – TimescaleDB tables

- How to handle the TimescaleDB Zabbix tables:
  - auditlog
  - history*
  - trends*
- Create views on foreign tables if needed
- Export the data to CSV files
  (Use table or view as source)

```
COPY (SELECT itemd, clock, value, ns FROM or_import.history)
TO '/tmpstorage/history.csv';
```

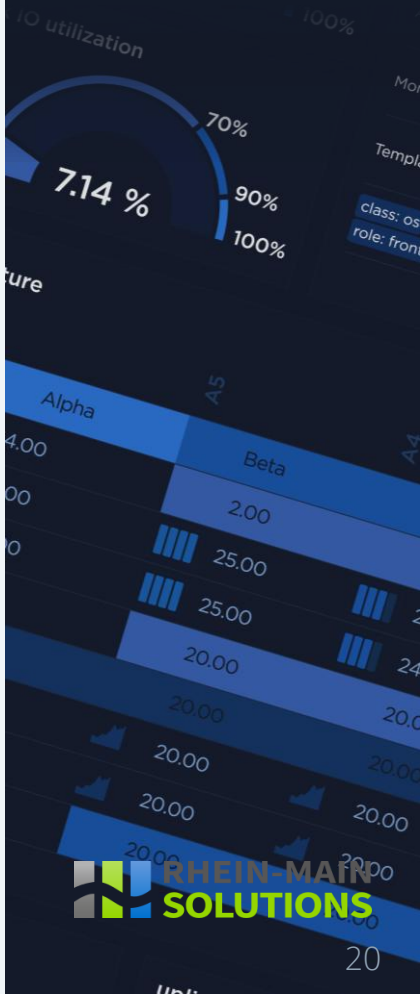
- It is possible to export the data partitionend by WHERE clause
  - Use interval that fits to your data days, weeks, months
  - Can be done parallel to the production workload, no need for downtime
  - Possibility to calculate time for migration by duration of testing interval



Data migration – Step 4
Transfer data – TimescaleDB tables

- Importing the data to the hyperscale tables

```
timescaledb-parallel-copy --db-name zabbix \
--connection "host=127.0.0.1 user=zabbix_srv" \
--table history \
--file /tmpstorage/history.csv \
--workers 24 --batch-size 50000 \
--reporting-period 30s \
--skip-header --split "\t" -truncate \
--verbose \
--copy-options "CSV"
```



Data migration – Step 5
Indexes - Triggers - Constraints

- Create all unique indexes from Zabbix database schema file
  - May take some time
  - May cause troubles if data are not unique
  - Find source of the problem and fix it
- Create all non unique indexes from Zabbix database schema file
  - May take some time
- Create all triggers from Zabbix database schema file
  - Should be created without troubles
- Create all constraints from Zabbix database schema file
  - The point of truth, data consistence is checked!
  - Fix all problems that occurs
  - May take some time

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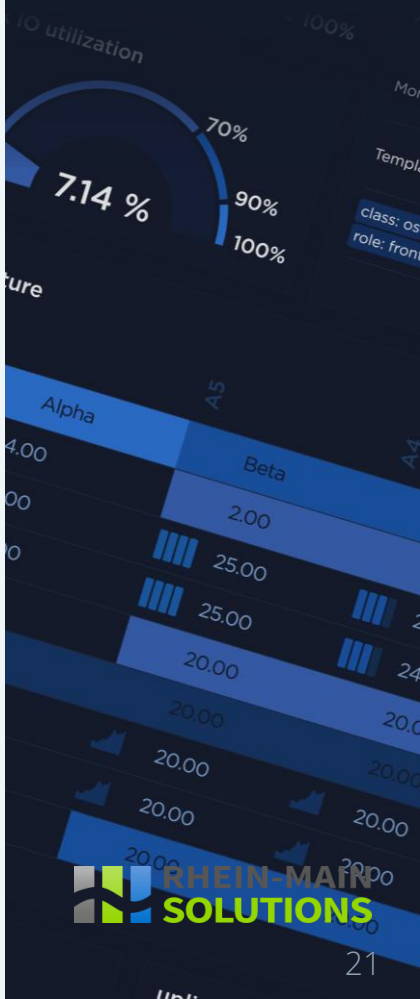
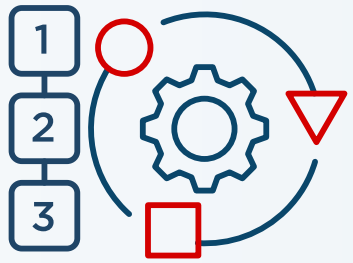


RHEIN-MAIN SOLUTIONS

Testing and validation

- Use DEV/QA systems
- Have all tables data?
- Verify the row count on the tables!
- Pay attention to NULL handling



Be careful and validate thoroughly!

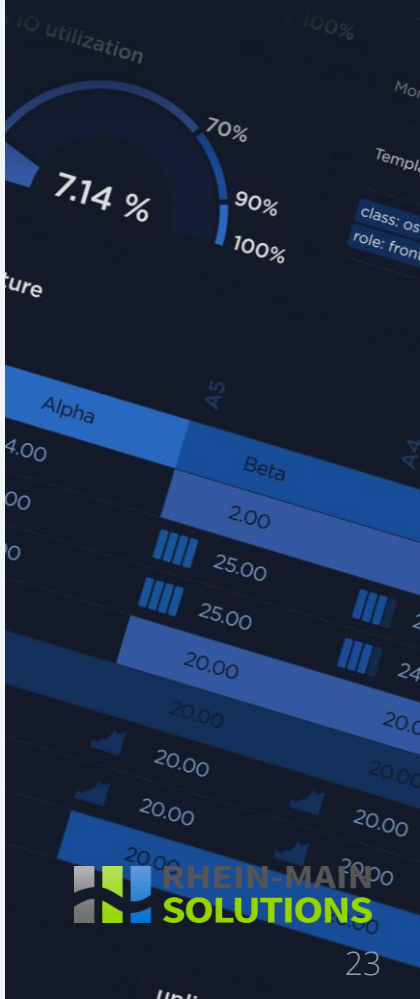
- Check all errors and warning during data migration!
- Test the Zabbix Web Frontend against the migrated database
- Check Network Maps

Deployment, check and monitoring

- Stop old Zabbix Server and Web Frontend
- Replace Zabbix Oracle with PostgreSQL packages
- Migrate the latest data
- Start the Web Frontend and check
- Start the Zabbix Server and check

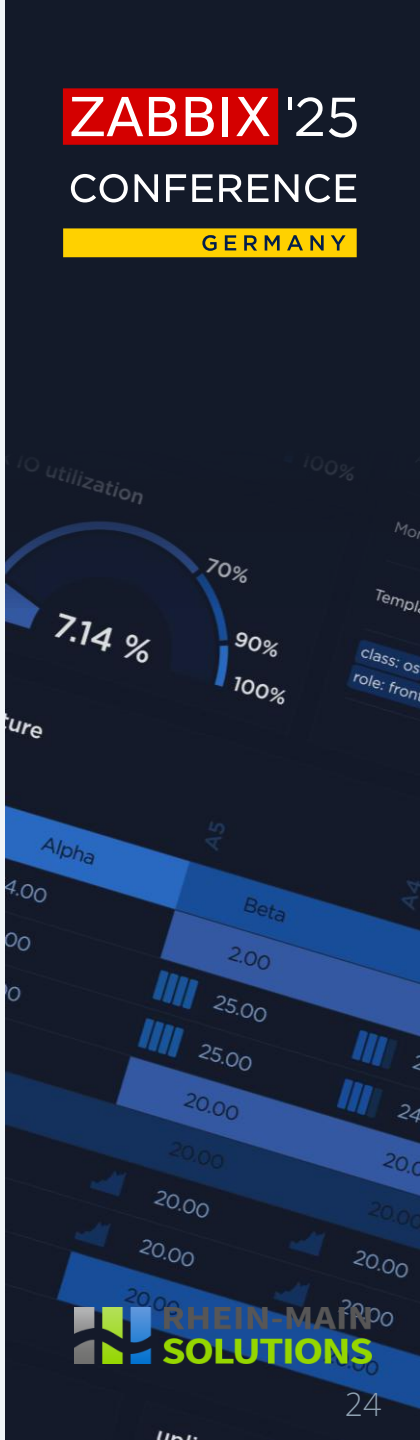
Checking and monitoring!!!

- Check log files for errors and warnings
  - PostgreSQL
  - Zabbix Server
- Monitor PostgreSQL with Zabbix



Summary/Lessons learned

- Migration Oracle to PostgreSQL with TimescaleDB is possible
- Needs preparation
- Needs time for testing
- Needs a Testing/QA Platform
- Possible with free toolchain
- It is possible to minimize the migration duration



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