Beispielinstallation Datenaustausch - Oracle / MySQL / MariaDB

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- Beispielinstallation Datenaustausch - Oracle / MySQL / MariaDB
  - Überblick
  - Installation der Datenbank-Software und Anlegen der Datenbanken
    - MariaDB: meitner.markusdba.internal
      - Sakila-DB anlegen
    - Oracle 19c: ohm.markusdba.internal
      - Beispielschema SCOTT installieren
    - PostgreSQL: planck.markusdba.internal
      - PostgreSQL-Repository installieren und aktivieren
      - PostgreSQL-Software installieren
      - Benutzer postgres vorbereiten
      - PostgreSQL-Cluster anlegen
      - Nacharbeiten
      - Demo-Datenbank dvdrental anlegen
      - Konfiguration anpassen
        - postgresql.conf:
        - pg_hba.conf
  - Vorbereitungen für den Datentransfer (Software-Installation)

- ohm (Oracle)
  - Vorbereitungen für ODBC-Gateway zu PostgreSQL
  - Vorbereitungen für ODBC-Gateway zu MariaDB
- planck (PostgreSQL)
  - Vorbereitungen für Oracle-FDW
    - Installation Oracle-Client
    - Installation weiterer Pakete für den Oracle-FDW
    - Installation des Oracle-FDW
    - Service-Konfiguration anpassen
  - Vorbereitungen für MariaDB-FDW
- meitner (MariaDB)
  - Connect-Engine installieren
  - Vorbereitungen für Zugriff auf Oracle-DB
  - Vorbereitungen für Zugriff auf PostgreSQL 18

- Konfiguration für den Datentransfer
  - planck: Oracle-FDW
    - Test
  - planck: MySQL-FDW
    - Vorbereitungen auf meitner
      - Benutzer für den Remote-Zugriff via FDW anlegen
    - Vorbereitungen auf planck
      - Schema importieren

        - Test
- ohm: Oracle-ODBC-Gateway -> PostgreSQL
    - planck: Benutzer für den Zugriff via ODBC(-Gateway) anlegen und Privilegien vergeben
    - ohm: nowendige Software für ODBC installieren
    - Informationen zum ODBC-Treiber
    - /etc/odbcinst.ini kontrollieren
    - ODBC-DSN anlegen
    - Testen mit isql
    - init-Datei für das Gateway definieren
    - listener für das Gateway definieren
    - Listener LISTENERPG starten und Status prüfen
    - tnsnames.ora-Eintrag anlegen
    - tnsnames.ora-Eintrag testen
    - Datenbank-Link anlegen und testen
- ohm: Oracle-ODBC-Gateway -> MariaDB
    - meitner: Benutzer in MariaDB anlegen
    - ohm: ODBC-Treiber installieren
    - ohm: /etc/odbc.ini
    - ohm: ODBC-Connect testen
    - ohm initMARIADB.ora anlegen
    - ohm: Listener für das ODBC-Gateway zur MariaDB anlegen
    - ohm: Listener LISTENERMARIADB starten
    - ohm: tnsnames.ora-Eintrag für MariaDB

        - ohm: Datenbank-Link anlegen und testen
        - ohm: Test
    - meitner: ODBC-Connector -> Oracle
        - meitner: notwendige Software-Komponenten installieren
- meitner: Connect-Engine aktivieren
- Oracle-ODBC-Treiber definieren
- meitner: ODBC-Datenquelle definieren
- meitner: ODBC-Datenquelle testen
- "Remote-Table" anlegen
- Remote-Tabelle testen
- meitner: ODBC-Connector -> PostgreSQL
    - Software installieren
    - ODBC-Treiber definieren
    - ODBC-Datenquelle definieren
    - ODBC-Datenquelle testen
    - "Remote-Table" anlegen
    - Remote-Tabelle testen
- Performance
- Einschränkungen
    - oracle_fdw
        - Datentypen und Konvertierung
        - Abfrage- und Pushdown-Limits
        - Performance und Konfiguration

- ODBC-Gateway
- Weitere Informationen
  - ODBC-Gateway
  - FDW
  - Connect-Engine

Überblick

Datenbank	MariaDB	Oracle	PostgreSQL
Rechner	meitner.markusdba.internal	ohm.markusdba.internal	planck.markusdba.internal
IP-Adresse	192.168.1.191	192.168.1.193	192.168.1.195
OS	Alma Linux 8	Oracle Linux 8	Alma Linux 8
CPU	4 vCPU	4 vCPU	4 vCPU
RAM	16 GB	8 GB	8 GB
HD	40 GB	40 GB	40 GB
Firewall	Deaktiviert	Deaktiviert	Deaktiviert
Oracle-SW	Instant Client 19.32	Oracle RDBMS 19c 19.32 (Read-Only-Oracle-Home)	Instant Client 19.32
PostgreSQL-SW	Client 18.6 inkl. ODBC	Client 18.6 inkl. ODBC	PostgreSQL-Server 18.6
MariaDB-SW	MariaDB-Server 12.3 MariaDB Connect Engine	MariaDB-Client inkl. ODBC	MariaDB-Client inkl. ODBC
Ports	3306	1521 (Oracle), 1522 (PostgreSQL GW), 1523 (MariaDB GW)	5432

Datenbank	MariaDB	Oracle	PostgreSQL
Datenbank (*)	sakila	ORACLEPDB	dvdrental
Schema/Benutzer			ora_scott
Benutzer für Remote-Zugriff	mariadb_remote_acc	oracle_remote_acc	postgres_remote_acc

(*) sakila und dvdrental sind häufig genutzte Demo-Datenbanken von MariaDB bzw. PostgreSQL, die uns in diesem Installationsbeispiel die nötigen Demo-Daten liefern. Die PDB ORACLEPDB enthält den Benutzer SCOTT mit den Tabellen EMP, DEPT, etc.

Installation der Datenbank-Software und Anlegen der Datenbanken

MariaDB: meitner.markusdba.internal

```
[root@meitner ~]# cat >/etc/yum.repos.d/mariadb.repo <<EOF
[mariadb]
name = MariaDB
baseurl = http://yum.mariadb.org/12.3/rhel8-amd64
module_hotfixes=1
gpgkey=https://yum.mariadb.org/RPM-GPG-KEY-MariaDB
gpgcheck=1
EOF

[root@meitner ~]# dnf module disable mariadb -y

[root@meitner ~]# dnf install -y MariaDB-server MariaDB-client MariaDB-backup

[root@meitner ~]# systemctl start mariadb
```

```
[root@meitner ~]# systemctl enable mariadb

[root@meitner ~]# mariadb <<EOF
ALTER USER 'root'@'localhost' IDENTIFIED BY 'manager';
EOF

[root@meitner ~]# mariadb-secure-installation
```

Sakila-DB anlegen

```
[root@meitner ~]# wget https://downloads.mysql.com/docs/sakila-db.zip
[root@meitner ~]# unzip sakila-db.zip
[root@meitner ~]# cd sakila-db
[root@meitner ~]# mysql -u root <sakila-schema.sql
[root@meitner ~]# mysql -u root <sakila-data.sql
[root@meitner ~]# cd ..
[root@meitner ~]# rm -rf sakila-db*

[root@meitner ~]# mariadb sakila
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 4
Server version: 12.3.3-MariaDB MariaDB Server

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [sakila]> show tables;
```

```
+---------------------------+
| Tables_in_sakila          |
+---------------------------+
| actor                     |
| actor_info                |
| address                   |
| category                  |
| city                      |
| country                   |
| customer                  |
| customer_list             |
| film                      |
| film_actor                |
| film_category             |
| film_list                 |
| film_text                 |
| inventory                 |
| language                  |
| nicer_but_slower_film_list |
| payment                   |
| rental                    |
| sales_by_film_category    |
| sales_by_store            |
| staff                     |
| staff_list                |
| store                     |
+---------------------------+
23 rows in set (0.000 sec)
```

```
MariaDB [sakila]> exit
Bye
```

Oracle 19c: ohm.markusdba.internal

Die Software ist bereits installiert und eine Datenbank DEMOCDB ist mittels dbca angelegt.

```
[oracle@ohm ~]$ echo $ORACLE_HOME
/u00/app/oracle/product/19.32-ee
[oracle@ohm ~]$ echo $ORACLE_SID
DEMOCDB
[oracle@ohm ~]$ $ORACLE_HOME/OPatch/opatch lspatches
39657094;DATAPUMP BUNDLE PATCH 19.32.0.0.0
39329591;JDK BUNDLE PATCH 19.0.0.0.260721
39222882;OJVM RELEASE UPDATE: 19.32.0.0.260721 (39222882)
39472050;Database Release Update : 19.32.0.0.260721 (39472050)
29585399;OCW RELEASE UPDATE 19.3.0.0.0 (29585399)
OPatch succeeded.

[oracle@ohm ~]$ sqlplus / as sysdba
SQL*Plus: Release 19.0.0.0.0 - Production on Sat Sep 12 12:25:20 2026
Version 19.32.0.0.0
Copyright (c) 1982, 2026, Oracle.  All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.32.0.0.0

SQL> create pluggable database ORACLEPDB admin user pdbadmin identified by manager roles=(DBA)
file_name_convert=('pdbseed','ORACLEPDB');
Pluggable database created.
```

```
SQL> alter pluggable database ORACLEPDB open;
Pluggable database altered.

SQL> alter pluggable database ORACLEPDB save state;
Pluggable database altered.

SQL> alter session set container=ORACLEPDB;
Session altered.

SQL> create tablespace users datafile '/u01/oradata/DEMOCDB/ORACLEPDB/users01.dbf' size 4G autoextend on maxsize
16G;
Tablespace created.

SQL> alter database datafile '/u01/oradata/DEMOCDB/ORACLEPDB/undotbs01.dbf' resize 4G;
Database altered.
```

Beispielschema SCOTT installieren

```
[oracle@ohm ~]$ wget https://github.com/oracle/dotnet-db-samples/raw/refs/heads/master/schemas/scott.sql
[...]

[oracle@ohm ~]$ sed -i 's/<PASSWORD>/tiger/' scott.sql
[oracle@ohm ~]$ sed -i 's/CONNECT SCOTT\/tiger/CONNECT\/scott\/tiger@ohm.markusdba.internal:1521\/ORACLEPDB/'
scott.sql

[oracle@ohm ~]$ sqlplus / as sysdba
SQL*Plus: Release 19.0.0.0.0 - Production on Sat Oct 31 09:40:29 2026
Version 19.32.0.0.0
Copyright (c) 1982, 2026, Oracle.  All rights reserved.
```

```
Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.32.0.0.0

SQL> alter session set container=ORACLEPDB;
Session altered.

SQL> start scott.sql
SQL>
[...]
SQL>

SQL> select * from scott.dept;

    DEPTNO DNAME          LOC
---------- -------------- -------------
    10 ACCOUNTING         NEW YORK
    20 RESEARCH   DALLAS
    30 SALES      CHICAGO
    40 OPERATIONS         BOSTON

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.32.0.0.0
```

Die ORACLEPDB enthält den Benutzer scott mit den bekannten Tabellen EMP, DEPT, SALGRADE und BONUS.

PostgreSQL: planck.markusdba.internal

PostgreSQL-Repository installieren und aktivieren

```
[root@planck ~]# dnf install -y https://download.postgresql.org/pub/repos/yum/reporpms/EL-8-x86_64/pgdg-redhat-repo-latest.noarch.rpm
[root@planck ~]# dnf -qy module disable postgresql
[root@planck ~]# dnf config-manager --disable pgdg14
[root@planck ~]# dnf config-manager --disable pgdg15
[root@planck ~]# dnf config-manager --disable pgdg16
[root@planck ~]# dnf config-manager --disable pgdg17
[root@planck ~]# dnf config-manager --enable pgdg18
[root@planck ~]# dnf config-manager --enable powertools
```

PostgreSQL-Software installieren

```
[root@planck ~]#  dnf install -y postgresql18-server postgresql18-devel
```

Benutzer postgres vorbereiten

```
[root@planck ~]# passwd postgres
[root@planck ~]# chown postgres:postgres /pgdata
```

```
[root@planck ~]#  su - postgres
[postgres@planck ~]$ mkdir -p /pgdata/PG18
```

```
[postgres@planck ~]$ cat .bash_profile
[ -f /etc/profile ] && source /etc/profile
PGDATA=/pgdata/PG18
export PGDATA
# If you want to customize your settings,
# Use the file below. This is not overridden
# by the RPMS.
```

```
[ -f /var/lib/pgsql/.pgsql_profile ] && source /var/lib/pgsql/.pgsql_profile
export PATH=/usr/pgsql-18/bin:$PATH
```

PostgreSQL-Cluster anlegen

```
[postgres@planck ~]$ initdb \
      --data-checksums \
           --pwprompt \
           --auth-host=scram-sha-256 \
           --auth-local=peer  \
           --pgdata=$PGDATA

exit
```

Nacharbeiten

```
[root@planck ~]# visudo

postgres ALL = (root) NOPASSWD: /bin/systemctl stop postgresql-18.service
postgres ALL = (root) NOPASSWD: /bin/systemctl start postgresql-18.service
postgres ALL = (root) NOPASSWD: /bin/systemctl restart postgresql-18.service
postgres ALL = (root) NOPASSWD: /bin/systemctl status postgresql-18.service
postgres ALL = (root) NOPASSWD: /bin/systemctl reload postgresql-18.service

[root@planck ~]# systemctl edit postgresql-18.service
[Service]
Environment=PGDATA=/pgdata/PG18

[root@planck ~]# systemctl enable postgresql-18.service

[root@planck ~]# systemctl start postgresql-18.service
```

Demo-Datenbank dvdrental anlegen

```
[postgres@planck ~]$ mkdir -p ~/dvdrental
[postgres@planck ~]$ cd ~/dvdrental

[postgres@planck dvdrental]$ wget https://neon.com/postgresqltutorial/dvdrental.zip
[...]

[postgres@planck dvdrental]$ unzip -q dvdrental.zip ;tar xvf dvdrental.tar

[postgres@planck dvdrental]$ createdb dvdrental


[postgres@planck dvdrental]$ pg_restore -U postgres -d dvdrental dvdrental.tar

[postgres@planck ~]$ psql dvdrental
psql (18.6)
Type "help" for help.

dvdrental=# \dt
              List of tables
 Schema |     Name      | Type  |  Owner
--------+---------------+-------+----------
 public | actor         | table | postgres
 public | address       | table | postgres
 public | category      | table | postgres
 public | city          | table | postgres
 public | country       | table | postgres
 public | customer      | table | postgres
 public | film          | table | postgres
```

```
 public | film_actor    | table | postgres
 public | film_category | table | postgres
 public | inventory     | table | postgres
 public | language      | table | postgres
 public | payment       | table | postgres
 public | rental        | table | postgres
 public | staff         | table | postgres
 public | store         | table | postgres
(15 rows)

dvdrental=# exit
```

Da die Objekte im public-Schema liegen, benötigen wir später für den externen Zugriff keine zusätzlichen Zugriffsrechte (SELECT, INSERT, UPDATE oder DELETE)

Konfiguration anpassen

postgresql.conf:

`listen_addresses = '*'`

pg_hba.conf

`host all all samenet scram-sha-256`

Vorbereitungen für den Datentransfer (Software-Installation)

ohm (Oracle)

Vorbereitungen für ODBC-Gateway zu PostgreSQL

```
[root@ohm ~]# dnf install -y https://download.postgresql.org/pub/repos/yum/reporpms/EL-8-x86_64/pgdg-redhat-repo-latest.noarch.rpm
```

```
[root@ohm ~]# dnf -qy module disable postgresql
[root@ohm ~]# dnf config-manager --disable pgdg14
[root@ohm ~]# dnf config-manager --disable pgdg15
[root@ohm ~]# dnf config-manager --disable pgdg16
[root@ohm ~]# dnf config-manager --disable pgdg17
[root@ohm ~]# dnf config-manager --enable pgdg18
[root@ohm ~]#

[root@ohm ~]#  dnf install -y unixODBC unixODBC-devel
[root@ohm ~]#  dnf install -y postgresql18-odbc

[root@ohm ~]#  ln -s /usr/pgsql-18/lib/psqlodbcw.so /usr/lib64/psqlodbcw.so
```

Vorbereitungen für ODBC-Gateway zu MariaDB

```
[root@ohm ~]#   cat >/etc/yum.repos.d/mariadb.repo <<EOF
[mariadb]
name = MariaDB
baseurl = http://yum.mariadb.org/12.3/rhel8-amd64
module_hotfixes=1
gpgkey=https://yum.mariadb.org/RPM-GPG-KEY-MariaDB
gpgcheck=1
EOF

[root@ohm ~]#  dnf module disable mariadb -y

[root@ohm ~]#   dnf install -y unixODBC unixODBC-devel mariadb-connector-odbc
```

planck (PostgreSQL)

Vorbereitungen für Oracle-FDW

Installation Oracle-Client

- Download der Instant-Client-rpms von https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/index.html
- Der SQL*Plus-Teil des Instant Client ist nicht erforderlich, kann aber zur Fehleranalyse hilfreich sein.

```
[root@planck tmp]# mkdir /tmp/instant-client
[root@planck tmp]# cd /tmp/instant-client

[root@planck instant-client]# wget
https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/getPackage/oracle-instantclient19.32-
devel-19.32.0.0.0-1.el8.x86_64.rpm

[...]
[root@planck instant-client]# wget
https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/getPackage/oracle-instantclient19.32-
odbc-19.32.0.0.0-1.el8.x86_64.rpm

[...]

[root@planck instant-client]# wget
https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/getPackage/oracle-instantclient19.32-
basic-19.32.0.0.0-1.el8.x86_64.rpm

[...]

[root@planck instant-client]# wget
https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/getPackage/oracle-instantclient19.32-
sqlplus-19.32.0.0.0-1.el8.x86_64.rpm
```

```
[...]



[root@planck instant-client]# ls -l
total 65608
-rw-r--r--. 1 root root 65590016 Jul 23 10:44 oracle-instantclient19.32-basic-19.32.0.0.0-1.el8.x86_64.rpm
-rw-r--r--. 1 root root   621136 Jul 23 10:44 oracle-instantclient19.32-devel-19.32.0.0.0-1.el8.x86_64.rpm
-rw-r--r--. 1 root root   253076 Jul 23 10:44 oracle-instantclient19.32-odbc-19.32.0.0.0-1.el8.x86_64.rpm
-rw-r--r--. 1 root root   710096 Jul 23 10:43 oracle-instantclient19.32-sqlplus-19.32.0.0.0-1.el8.x86_64.rpm

[root@planck instant-client]# dnf install -y *.rpm
[...]
```

Der Instant-Client wird im **ORACLE_HOME=/usr/lib/oracle/19.32/client64/** installiert.

Installation weiterer Pakete für den Oracle-FDW

```
[root@planck instant-client]# cd
[root@planck ~]# dnf install -y gcc gcc-c++ make glibc-devel
```

Installation des Oracle-FDW

```
[root@planck ~]# dnf install -y  perl-ExtUtils-MakeMaker perl-DBI perl-DBD-Pg perl-tests perl-devel perl-DBI
scl-utils redhat-rpm-config gcc gcc-c++ make glibc-devel

[root@planck ~]# export ORACLE_HOME=/usr/lib/oracle/19.32/client64/
[root@planck ~]# export LD_LIBRARY_PATH=$ORACLE_HOME/lib
[root@planck ~]# export PATH=/usr/pgsql-18/bin:$ORACLE_HOME/bin:$PATH
[root@planck ~]# export CLIENT_LIB=19.1
```

```
[root@planck ~]# ln -s $ORACLE_HOME/lib/libclntsh.so.${CLIENT_LIB} /usr/pgsql-18/lib/libclntsh.so.${CLIENT_LIB}

[root@planck ~]# ls -altr /usr/pgsql-18/lib/libclntsh.so*

[root@planck ~]# mkdir -p /tmp/oraclefdw
[root@planck ~]# cd /tmp/oraclefdw
[root@planck ~]# wget https://github.com/laurenz/oracle_fdw/archive/master.zip
[root@planck ~]# unzip -uq master.zip
[root@planck ~]# cd /tmp/oraclefdw/oracle_fdw-master

[root@planck ~]# make
[root@planck ~]# make install
```

Service-Konfiguration anpassen

`[root@planck ~]# systemctl edit postgresql-18.service`

Ergänzen:

```
Environment=ORACLE_HOME=/usr/lib/oracle/19.32/client64/
Environment=LD_LIBRARY_PATH=/usr/lib/oracle/19.32/client64/lib
```

Anschließend:

```
[root@planck ~]# systemctl stop postgresql-18
[root@planck ~]# systemctl start postgresql-18
[root@planck ~]# systemctl status postgresql-18
```

Vorbereitungen für MariaDB-FDW

```
[root@planck ~]# cat >/etc/yum.repos.d/mariadb.repo <<EOF
[mariadb]
name = MariaDB
```

```
baseurl = http://yum.mariadb.org/12.3/rhel8-amd64
module_hotfixes=1
gpgkey=https://yum.mariadb.org/RPM-GPG-KEY-MariaDB
gpgcheck=1
EOF

[root@planck ~]# dnf module disable mariadb -y

[root@planck ~]#
dnf install -y postgresql18-devel mysql_fdw_18 MariaDB-devel  gcc make
```

meitner (MariaDB)

Connect-Engine installieren

```
[root@meitner /]# dnf install -y MariaDB-connect-engine



[root@meitner /]# mariadb
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 12.3.3-MariaDB MariaDB Server
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> install soname 'ha_connect.so';
Query OK, 0 rows affected (0.001 sec)


MariaDB [(none)]> show engines;
```

```
+-------------------+---------+-------------------------------------------------------------------------------
----------------+--------------+------+------------+
| Engine             | Support | Comment
| Transactions | XA   | Savepoints |
+-------------------+---------+-------------------------------------------------------------------------------
----------------+--------------+------+------------+
[...]
| CONNECT            | YES     | Management of External Data (SQL/NOSQL/MED), including Rest query results
[...]
-------------------+---------+-------------------------------------------------------------------------------
--------------+--------------+------+------------+
9 rows in set (0.000 sec)

MariaDB [(none)]> quit
Bye
```

Vorbereitungen für Zugriff auf Oracle-DB

- Download der Instant-Client-rpms von https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/index.html
- Der SQL*Plus-Teil des Instant Client ist nicht erforderlich, kann aber zur Fehleranalyse hilfreich sein.

```
[root@meitner tmp]# mkdir /tmp/instant-client
[root@meitner tmp]# cd /tmp/instant-client

[root@meitner instant-client]# wget
https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/getPackage/oracle-instantclient19.32-
devel-19.32.0.0.0-1.el8.x86_64.rpm

[...]
```

```
[root@meitner instant-client]# wget
https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/getPackage/oracle-instantclient19.32-
odbc-19.32.0.0.0-1.el8.x86_64.rpm

[...]

[root@meitner instant-client]# wget
https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/getPackage/oracle-instantclient19.32-
basic-19.32.0.0.0-1.el8.x86_64.rpm

[...]

[root@meitner instant-client]# wget
https://yum.oracle.com/repo/OracleLinux/OL8/oracle/instantclient/x86_64/getPackage/oracle-instantclient19.32-
sqlplus-19.32.0.0.0-1.el8.x86_64.rpm


[...]



[root@meitner instant-client]# ls -l
total 65608
-rw-r--r--. 1 root root 65590016 Jul 23 10:44 oracle-instantclient19.32-basic-19.32.0.0.0-1.el8.x86_64.rpm
-rw-r--r--. 1 root root   621136 Jul 23 10:44 oracle-instantclient19.32-devel-19.32.0.0.0-1.el8.x86_64.rpm
-rw-r--r--. 1 root root   253076 Jul 23 10:44 oracle-instantclient19.32-odbc-19.32.0.0.0-1.el8.x86_64.rpm
-rw-r--r--. 1 root root   710096 Jul 23 10:43 oracle-instantclient19.32-sqlplus-19.32.0.0.0-1.el8.x86_64.rpm

[root@meitner instant-client]# dnf install -y *.rpm
```

```
[root@meitner instant-client]# cd /tmp
[...]
```

Der Instant-Client wird im **ORACLE_HOME=/usr/lib/oracle/19.32/client64/** installiert.

Vorbereitungen für Zugriff auf PostgreSQL 18

```
[root@meitner tmp]# dnf install -y https://download.postgresql.org/pub/repos/yum/reporpms/EL-8-x86_64/pgdg-redhat-repo-latest.noarch.rpm
[root@meitner tmp]# dnf -qy module disable postgresql
[root@meitner tmp]# dnf config-manager --disable pgdg14
[root@meitner tmp]# dnf config-manager --disable pgdg15
[root@meitner tmp]# dnf config-manager --disable pgdg16
[root@meitner tmp]# dnf config-manager --disable pgdg17
[root@meitner tmp]# dnf config-manager --enable pgdg18

[root@meitner tmp]# dnf install -y unixODBC unixODBC-devel
[root@meitner tmp]# dnf install -y postgresql18-odbc
```

Konfiguration für den Datentransfer

planck: Oracle-FDW

```
[postgres@planck dvdrental]$ psql dvdrental
psql (18.6)
Type "help" for help.

dvdrental=# create user ora_scott password 'loewe';
CREATE ROLE
dvdrental=# grant create on database dvdrental to ora_scott;
```

```
GRANT
dvdrental=# grant connect on database dvdrental to ora_scott;
GRANT
dvdrental=# create schema ora_scott;
CREATE SCHEMA
dvdrental=# grant all on schema ora_scott to ora_scott;
GRANT
dvdrental=# create extension oracle_fdw;
CREATE EXTENSION

dvdrental=# create server oraclepdb foreign data wrapper oracle_fdw
dvdrental-# options (dbserver '//ohm.markusdba.internal:1521/ORACLEPDB');
CREATE SERVER

dvdrental=# grant usage on foreign server oraclepdb to ora_scott;
GRANT
dvdrental=# exit

[postgres@planck dvdrental]$ psql -h 127.0.0.1 -p 5432 -U ora_scott dvdrental
Password for user ora_scott:
psql (18.6)
Type "help" for help.

dvdrental=> create user mapping for ora_scott server oraclepdb
dvdrental-> options (user 'scott', password 'tiger');
CREATE USER MAPPING

dvdrental=> import foreign schema "SCOTT" from server oraclepdb
dvdrental-> into ora_scott options (case 'lower');
IMPORT FOREIGN SCHEMA
```

```
dvdrental=> \d ora_scott.*
                       Foreign table "ora_scott.bonus"
 Column |         Type          | Collation | Nullable | Default | FDW options
--------+-----------------------+-----------+----------+---------+-------------
 ename  | character varying(10) |           |          |         |
 job    | character varying(9)  |           |          |         |
 sal    | numeric               |           |          |         |
 comm   | numeric               |           |          |         |
Server: oraclepdb
FDW options: (schema 'SCOTT', "table" 'BONUS')

                        Foreign table "ora_scott.dept"
 Column |         Type          | Collation | Nullable | Default | FDW options
--------+-----------------------+-----------+----------+---------+-------------
 deptno | smallint              |           | not null |         | (key 'true')
 dname  | character varying(14) |           |          |         |
 loc    | character varying(13) |           |          |         |
Server: oraclepdb
FDW options: (schema 'SCOTT', "table" 'DEPT')

                             Foreign table "ora_scott.emp"
  Column  |              Type              | Collation | Nullable | Default | FDW options
----------+--------------------------------+-----------+----------+---------+-------------
 empno    | smallint                       |           | not null |         | (key 'true')
 ename    | character varying(10)          |           |          |         |
 job      | character varying(9)           |           |          |         |
 mgr      | smallint                       |           |          |         |
 hiredate | timestamp(0) without time zone |           |          |         |
```

```
 sal      | numeric(7,2)                  |           |          |         |
 comm     | numeric(7,2)                  |           |          |         |
 deptno   | smallint                      |           |          |         |
Server: oraclepdb
FDW options: (schema 'SCOTT', "table" 'EMP')

              Foreign table "ora_scott.salgrade"
 Column |  Type   | Collation | Nullable | Default | FDW options
--------+---------+-----------+----------+---------+-------------
 grade  | numeric |           |          |         |
 losal  | numeric |           |          |         |
 hisal  | numeric |           |          |         |
Server: oraclepdb
FDW options: (schema 'SCOTT', "table" 'SALGRADE')
```

Die aufgeführten Tabellenstrukturen zeigen recht gut die automatische Konvertierung der Oracle Datentypen in passende PostgreSQL-Datentypen.

```
dvdrental=> \dew+
                                                List of foreign-data wrappers
    Name    |  Owner   |      Handler       |      Validator       | Access privileges | FDW options |
Description
------------+----------+--------------------+----------------------+-------------------+-------------+----------
------------------
 oracle_fdw | postgres | oracle_fdw_handler | oracle_fdw_validator |                   |             | Oracle
foreign data wrapper
(1 row)

dvdrental=> \des+
                                                                  List of foreign servers
   Name    |  Owner   | Foreign-data wrapper |  Access privileges   | Type | Version |                      FDW
```

```
options                     | Description
----------+---------+---------------------+---------------------+------+---------+-------------------------
--------------------------+-------------
 oraclepdb | postgres | oracle_fdw           | postgres=U/postgres +|      |         | (dbserver
'//ohm.markusdba.internal:1521/ORACLEPDB') |
           |          |                      | ora_scott=U/postgres |      |         |
|
(1 row)

dvdrental=> \deu+
                  List of user mappings
  Server   | User name |            FDW options
-----------+-----------+-----------------------------------
 oraclepdb | ora_scott | ("user" 'scott', password 'tiger')
(1 row)

dvdrental=> \det+
                              List of foreign tables
  Schema   |  Table   |  Server   |             FDW options              | Description
-----------+----------+-----------+--------------------------------------+-------------
 ora_scott | bonus    | oraclepdb | (schema 'SCOTT', "table" 'BONUS')    |
 ora_scott | dept     | oraclepdb | (schema 'SCOTT', "table" 'DEPT')     |
 ora_scott | emp      | oraclepdb | (schema 'SCOTT', "table" 'EMP')      |
 ora_scott | salgrade | oraclepdb | (schema 'SCOTT', "table" 'SALGRADE') |
(4 rows)
```

Test

```
dvdrental=> select * from ora_scott.dept;
 deptno |   dname    |   loc
```

```
--------+------------+----------
     10 | ACCOUNTING | NEW YORK
     20 | RESEARCH   | DALLAS
     30 | SALES      | CHICAGO
     40 | OPERATIONS | BOSTON
(4 rows)

dvdrental=> update ora_scott.dept set loc='NUREMBERG' where deptno=40;
UPDATE 1
dvdrental=> select * from ora_scott.dept;
 deptno |   dname    |    loc
--------+------------+-----------
     10 | ACCOUNTING | NEW YORK
     20 | RESEARCH   | DALLAS
     30 | SALES      | CHICAGO
     40 | OPERATIONS | NUREMBERG
(4 rows)

dvdrental=> explain analyze select d.deptno,d.dname,e.empno,e.ename from ora_scott.dept d,ora_scott.emp e
where d.deptno=e.deptno and d.deptno < 30 order by d.deptno;
                                                                                                  QUERY PLAN

------------------------------------------------------------------------------------------------------------------------------
------------------------------------------------------------------------
------------------
 Sort  (cost=26759.21..26763.38 rows=1667 width=88) (actual time=1.196..1.197 rows=8.00 loops=1)
   Sort Key: d.deptno
   Sort Method: quicksort  Memory: 25kB
   ->  Foreign Scan  (cost=10000.00..26670.00 rows=1667 width=88) (actual time=1.172..1.183 rows=8.00 loops=1)
```

```
        Oracle query: SELECT /*9bbc414cad32f0e7*/ r1."DEPTNO", r1."DNAME", r2."EMPNO", r2."ENAME" FROM
("SCOTT"."DEPT" r1 INNER JOIN "SCOTT"."EMP" r2 ON (r1."DEPTNO" = r2."DEPTNO") AND (r1."DEPTNO" < 30))
 Planning Time: 2.204 ms
 Execution Time: 1.237 ms
(7 rows)
```

planck: MySQL-FDW

Vorbereitungen auf meitner

Benutzer für den Remote-Zugriff via FDW anlegen

```
[root@meitner ~]# mariadb
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 12.3.3-MariaDB MariaDB Server
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> use sakila
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changedMariaDB [sakila]> CREATE USER 'fdw_user'@'planck.markusdba.internal' IDENTIFIED BY 'geheim';
Query OK, 0 rows affected (0.009 sec)

MariaDB [sakila]> GRANT ALL PRIVILEGES ON sakila.* TO 'fdw_user'@'planck.markusdba.internal';
Query OK, 0 rows affected (0.008 sec)
```

```
MariaDB [sakila]> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.001 sec)
```

Vorbereitungen auf planck

```
[postgres@planck ~]$ psql dvdrental
psql (18.6)
Type "help" for help.

postgres=# CREATE ROLE mariadb_ext LOGIN PASSWORD 'demo';
CREATE ROLE

dvdrental=# CREATE SCHEMA IF NOT EXISTS mariadb_ext AUTHORIZATION mariadb_ext;
CREATE SCHEMA

dvdrental=# CREATE EXTENSION IF NOT EXISTS mysql_fdw;
CREATE EXTENSION

dvdrental=# CREATE SERVER mariadb FOREIGN DATA WRAPPER mysql_fdw
dvdrental-# OPTIONS (host 'meitner.markusdba.internal',  port '3306');
CREATE SERVER

dvdrental=# ALTER SERVER mariadb OWNER TO mariadb_ext;
ALTER SERVER

dvdrental=# grant usage on foreign server mariadb to mariadb_ext;
GRANT

dvdrental=# CREATE USER MAPPING FOR mariadb_ext SERVER mariadb
dvdrental-# OPTIONS ( username 'fdw_user', password 'geheim');
```

```
CREATE USER MAPPING

dvdrental=# \deu+
                      List of user mappings
  Server   |  User name  |               FDW options
-----------+-------------+-----------------------------------------
 mariadb   | mariadb_ext | (username 'fdw_user', password 'geheim')
 oraclepdb | ora_scott   | ("user" 'scott', password 'tiger')
(2 rows)

dvdrental=# exit                            ^
```

Schema importieren

```
[postgres@planck ~]$ psql -h 127.0.0.1 -p 5432 -U mariadb_ext dvdrental
Password for user mariadb_ext:
psql (18.6)
Type "help" for help.

dvdrental=> IMPORT FOREIGN SCHEMA sakila LIMIT TO (actor, customer)
dvdrental-> FROM SERVER mariadb INTO mariadb_ext;
IMPORT FOREIGN SCHEMA
```

Test

```
dvdrental=> select * from mariadb_ext.actor limit 1;
 actor_id | first_name | last_name |      last_update
----------+------------+-----------+-----------------------
        1 | PENELOPE   | GUINESS   | 2006-02-15 04:34:33+01
(1 row)
```

```
dvdrental=> update mariadb_ext.actor set first_name='MIA' where actor_id=1;
UPDATE 1

dvdrental=> select * from mariadb_ext.actor limit 1;
 actor_id | first_name | last_name |      last_update
----------+------------+-----------+-----------------------
        1 | MIA        | GUINESS   | 2026-11-12 19:40:24+01
(1 row)

dvdrental=> explain analyze select * from mariadb_ext.actor limit 1;
                                                 QUERY PLAN
------------------------------------------------------------------------------------------- Foreign Scan on actor
(cost=1.00..2.00 rows=1 width=226) (actual time=1.093..1.094 rows=1.00 loops=1)
   Remote server startup cost: 25
 Planning Time: 0.859 ms
 Execution Time: 2.258 ms
(4 rows)

dvdrental=> exit
```

ohm: Oracle-ODBC-Gateway -> PostgreSQL

planck: Benutzer für den Zugriff via ODBC(-Gateway) anlegen und Privilegien vergeben

```
[postgres@planck ~]$ psql dvdrental
psql (18.6)
Type "help" for help.

dvdrental=# create user odbcgw password 'odbcgw';
CREATE ROLE
```

```
dvdrental=# grant all on public.actor to odbcgw;
GRANT

dvdrental=# grant all on public.country to odbcgw;
GRANT

dvdrental=# grant all on public.customer to odbcgw;
GRANT

dvdrental=# grant all on public.payment to odbcgw;
GRANT

dvdrental=# exit
```

ohm: nowendige Software für ODBC installieren

```
[root@ohm oracle]#  dnf install -y unixODBC unixODBC-devel postgresql18-odbc
Last metadata expiration check: 0:59:26 ago on Thu 12 Nov 2026 07:43:14 PM CET.
Package unixODBC-2.3.7-2.el8_10.x86_64 is already installed.
Package unixODBC-devel-2.3.7-2.el8_10.x86_64 is already installed.
Package postgresql18-odbc-18.00.0005-1PGDG.rhel8.10.x86_64 is already installed.
Dependencies resolved.
================================================================================================================
================================================================================
 Package                                    Architecture                        Version
Repository                              Size
================================================================================================================
================================================================================
Upgrading:
```

```
 postgresql18-libs                          x86_64                                 18.7-1PGDG.rhel8.10
pgdg18                              308 k
 postgresql18-odbc                          x86_64                                 18.00.0006-2PGDG.rhel8.10
pgdg18                              339 k

Transaction Summary
================================================================================================================================
================================================================================
Upgrade  2 Packages

Total download size: 647 k
Downloading Packages:
(1/2): postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64.rpm
908 kB/s | 308 kB     00:00
(2/2): postgresql18-odbc-18.00.0006-2PGDG.rhel8.10.x86_64.rpm
974 kB/s | 339 kB     00:00
--------------------------------------------------------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Total
1.8 MB/s | 647 kB     00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :
1/1
  Upgrading        : postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64
1/4
```

```
  Running scriptlet: postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64
1/4
  Upgrading        : postgresql18-odbc-18.00.0006-2PGDG.rhel8.10.x86_64
2/4
  Running scriptlet: postgresql18-odbc-18.00.0006-2PGDG.rhel8.10.x86_64
2/4
  Cleanup          : postgresql18-odbc-18.00.0005-1PGDG.rhel8.10.x86_64
3/4
  Running scriptlet: postgresql18-odbc-18.00.0005-1PGDG.rhel8.10.x86_64
3/4
  Cleanup          : postgresql18-libs-18.6-1PGDG.rhel8.10.x86_64
4/4
  Running scriptlet: postgresql18-libs-18.6-1PGDG.rhel8.10.x86_64
4/4
  Verifying        : postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64
1/4
  Verifying        : postgresql18-libs-18.6-1PGDG.rhel8.10.x86_64
2/4
  Verifying        : postgresql18-odbc-18.00.0006-2PGDG.rhel8.10.x86_64
3/4
  Verifying        : postgresql18-odbc-18.00.0005-1PGDG.rhel8.10.x86_64
4/4

Upgraded:
  postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64                                  postgresql18-odbc-
18.00.0006-2PGDG.rhel8.10.x86_64

Complete!
```

Informationen zum ODBC-Treiber

```
[root@ohm oracle]#  odbcinst -j
unixODBC 2.3.7
DRIVERS............: /etc/odbcinst.ini
SYSTEM DATA SOURCES: /etc/odbc.ini
FILE DATA SOURCES..: /etc/ODBCDataSources
USER DATA SOURCES..: /root/.odbc.ini
SQLULEN Size.......: 8
SQLLEN Size........: 8
SQLSETPOSIROW Size.: 8
[root@ohm oracle]# ln -s /usr/pgsql-18/lib/psqlodbcw.so /usr/lib64/psqlodbcw.so
[root@ohm oracle]# ls -altr /usr/lib64/libodbcpsqlS.so
lrwxrwxrwx. 1 root root 21 Dec 18  2025 /usr/lib64/libodbcpsqlS.so -> libodbcpsqlS.so.2.0.0
[root@ohm oracle]# ls -altr /usr/lib64/psqlodbcw.so
lrwxrwxrwx. 1 root root 30 Nov 12 20:49 /usr/lib64/psqlodbcw.so -> /usr/pgsql-18/lib/psqlodbcw.so
```

/etc/odbcinst.ini kontrollieren

(meist schon durch die Installation von unixODBC passend vorbereitet)

```
[...]
# Driver from the postgresql-odbc package
# Setup from the unixODBC package
[PostgreSQL]
Description     = ODBC for PostgreSQL
Driver          = /usr/lib/psqlodbcw.so
Setup           = /usr/lib/libodbcpsqlS.so
Driver64        = /usr/lib64/psqlodbcw.so
Setup64         = /usr/lib64/libodbcpsqlS.so
FileUsage       = 1
[...]
```

ODBC-DSN anlegen

```
[root@ohm ~]# cat /etc/odbc.ini
[...]
[postgresql_dvdrental]
Database         = dvdrental
Description      = Connection to PostgreSQL Cluster
Driver           = PostgreSQL
Servername       = planck.markusdba.internal
Port             = 5432
Username         = odbcgw
Password         = odbcgw
```

Testen mit isql

```
[root@ohm ~]# isql -v postgresql_dvdrental
+---------------------------------------+
| Connected!                            |
|                                       |
| sql-statement                         |
| help [tablename]                      |
| quit                                  |
|                                       |
+---------------------------------------+
SQL> select tablename from pg_tables where schemaname='public';
+-----------------------------------------------------------------+
| tablename                                                       |
+-----------------------------------------------------------------+
| actor                                                           |
| store                                                           |
| address                                                         |
```

```
| category                                                      |
| city                                                          |
| country                                                       |
| customer                                                      |
| film_actor                                                    |
| film_category                                                 |
| inventory                                                     |
| language                                                      |
| rental                                                        |
| staff                                                         |
| payment                                                       |
| film                                                          |
+---------------------------------------------------------------+
SQLRowCount returns 15
15 rows fetched
SQL> quit
```

Alternativ (wenn User + Password) nicht in der /etc/odbc.ini abgelegt sind:

```
[root@ohm oracle]# isql -v postgresql_dvdrental scott tiger
+---------------------------------------+
| Connected!                            |
|                                       |
| sql-statement                         |
| help [tablename]                      |
| quit                                  |
|                                       |
+---------------------------------------+
SQL> quit
```

init-Datei für das Gateway definieren

(Vorlage unter $ORACLE_HOME/hs/admin/initdg4odbc.ora)

Da mein System mit Read-Only-Oracle-Home arbeitet die müssen init-Dateien für die Gateways in $ORACLE_BASE/homes/<HOME_NAME>/hs/admin liegen, ansonsten liegen die init-Dateien unter $ORACLE_HOME/hs/admin

```
[oracle@ohm ~]$ mkdir -p /u00/app/oracle/homes/OraDB19Home1/hs/admin
```

```
[oracle@ohm ~]$ cat /u00/app/oracle/homes/OraDB19Home1/hs/admin/initPGDVDRENTAL.ora
# Name of the data source
HS_FDS_CONNECT_INFO = postgresql_dvdrental
# Trace Level (other levels: OFF or DEBUG)
HS_FDS_TRACE_LEVEL = ON
# full path name of odbc driver manager or driver
HS_FDS_SHAREABLE_NAME=/usr/lib64/libodbc.so
# set language to American, character set depending on client char set
HS_LANGUAGE = AMERICAN_AMERICA.WE8ISO8859P15
# full path name of the odbc initialization file
set ODBCINI=/etc/odbc.ini
```

listener für das Gateway definieren

```
[oracle@ohm ~]$ cat $TNS_ADMIN/listener.ora
LISTENER =
    (ADDRESS_LIST =
        (ADDRESS = (PROTOCOL=IPC )(KEY=LISTENER ))
        # for external procedure calls, create a separate listener
        # See basenv_user_guide.pdf for details (chapter of listener.ksh )
        (ADDRESS =
            (PROTOCOL = TCP )
```

```
            (HOST =  )
            (PORT = 1521 )
        )
    )

LISTENERPG =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = TCP)(HOST = ohm.markusdba.internal)(PORT = 1522))
    )
  )

SID_LIST_LISTENERPG=
   (SID_LIST =
     (SID_DESC =
       (SID_NAME = PGDVDRENTAL)
       (ORACLE_HOME = /u00/app/oracle/product/19.32-ee)
       (PROGRAM = dg4odbc)
     )
   )
```

Die listener.ora kann natürlich auch - je nach Konfiguration unter $ORACLE_HOME/network/admin bzw. $ORACLE_BASE/homes/<HOME_NAME>/network/admin (bei Read-Only-Oracle-Home) liegen, ebenso die tnsnames.ora.

Listener LISTENERPG starten und Status prüfen

```
[oracle@ohm ~]$ lsnrctl start listenerpg
```

```
LSNRCTL for Linux: Version 19.0.0.0.0 - Production on 12-NOV-2026 20:59:02
Copyright (c) 1991, 2026, Oracle.  All rights reserved.
Starting /u00/app/oracle/product/19.32-ee/bin/tnslsnr: please wait...

TNSLSNR for Linux: Version 19.0.0.0.0 - Production
System parameter file is /u00/app/oracle/network/admin/listener.ora
Log messages written to /u00/app/oracle/diag/tnslsnr/ohm/listenerpg/alert/log.xml
Listening on: (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=ohm.markusdba.internal)(PORT=1522)))

Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=ohm.markusdba.internal)(PORT=1522)))
STATUS of the LISTENER
------------------------
Alias                     listenerpg
Version                   TNSLSNR for Linux: Version 19.0.0.0.0 - Production
Start Date                12-NOV-2026 20:59:02
Uptime                    0 days 0 hr. 0 min. 0 sec
Trace Level               off
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File   /u00/app/oracle/network/admin/listener.ora
Listener Log File         /u00/app/oracle/diag/tnslsnr/ohm/listenerpg/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=ohm.markusdba.internal)(PORT=1522)))
Services Summary...
Service "PGDVDRENTAL" has 1 instance(s).
  Instance "PGDVDRENTAL", status UNKNOWN, has 1 handler(s) for this service...
The command completed successfully
```

tnsnames.ora-Eintrag anlegen

```
[oracle@ohm ~]$ cat $TNS_ADMIN/tnsnames.ora
[...]
PGDVDRENTAL =
  (DESCRIPTION=
  (ADDRESS=
  (PROTOCOL=TCP)(HOST = ohm.markusdba.internal)(PORT = 1522))
  (CONNECT_DATA= (SID=DVDRENTAL)) (HS=OK)
  (ENVS="LD_LIBRARY_PATH=/usr/lib64:/u00/app/oracle/product/19.32-ee/lib")
)
```

tnsnames.ora-Eintrag testen

```
[oracle@ohm ~]$ tnsping PGDVDRENTAL

TNS Ping Utility for Linux: Version 19.0.0.0.0 - Production on 12-NOV-2026 21:00:58
Copyright (c) 1997, 2026, Oracle.  All rights reserved.
Used parameter files:
/u00/app/oracle/network/admin/sqlnet.ora

Used TNSNAMES adapter to resolve the alias
Attempting to contact (DESCRIPTION= (ADDRESS= (PROTOCOL=TCP)(HOST = ohm.markusdba.internal)(PORT = 1522))
(CONNECT_DATA= (SID=DVDRENTAL)) (HS=OK))
OK (0 msec)
```

Datenbank-Link anlegen und testen

```
[oracle@ohm ~]$ sqlplus system@ORACLEPDB

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Nov 12 21:03:20 2026
Version 19.32.0.0.0
Copyright (c) 1982, 2026, Oracle.  All rights reserved.
```

```
Enter password:
Last Successful login time: Tue Sep 08 2026 21:55:25 +01:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.32.0.0.0

SQL> create database link PGDVDRENTAL connect to "odbcgw" identified by "odbcgw" using 'PGDVDRENTAL';
Database link created.

SQL> select "tablename" from "pg_catalog"."pg_tables"@PGDVDRENTAL where "schemaname"='public';

tablename
--------------------------------------------------------------------------------
actor
store
address
category
city
country
customer
film_actor
film_category
inventory
language

tablename
--------------------------------------------------------------------------------
```

```
rental
staff
payment
film

15 rows selected.


SQL> select * from "public"."actor"@PGDVDRENTAL where "actor_id"=1;

  actor_id
----------
first_name
--------------------------------------------------------------------------------
last_name
--------------------------------------------------------------------------------
last_upda
---------
     1
Penelope
Guiness
26-MAY-13


SQL> update "public"."actor"@PGDVDRENTAL set "last_name"='Meyer' where "actor_id"=1;

1 row updated.

SQL>  select * from "public"."actor"@PGDVDRENTAL where "actor_id"=1;
```

```
  actor_id
----------
first_name
--------------------------------------------------------------------------------
last_name
--------------------------------------------------------------------------------
last_upda
---------
     1
Penelope
Meyer
12-NOV-26

SQL> set autotrace traceonly explain;
SQL>  select * from "public"."actor"@PGDVDRENTAL where "actor_id"=1;

Execution Plan
----------------------------------------------------------
Plan hash value: 1788691278

-------------------------------------------------------------------------------------------
| Id  | Operation         | Name  | Rows  | Bytes | Cost (%CPU)| Time     | Inst   |IN-OUT|
-------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT |       |    20 | 11320 |   200   (0)| 00:00:01 |        |      |
|   1 |  REMOTE          | actor |    20 | 11320 |   200   (0)| 00:00:01 | PGDVD~ | R->S |
-------------------------------------------------------------------------------------------

Remote SQL Information (identified by operation id):
```

```
------------------------------------------------

   1 - SELECT "actor_id","first_name","last_name","last_update" FROM
       "public"."actor" WHERE "actor_id"=1 (accessing 'PGDVDRENTAL' )
```

ohm: Oracle-ODBC-Gateway -> MariaDB

meitner: Benutzer in MariaDB anlegen

```
[root@meitner ~]# mariadb
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 6
Server version: 12.3.3-MariaDB MariaDB Server
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> CREATE USER 'odbc_user'@'ohm.markusdba.internal' IDENTIFIED BY 'geheim';
Query OK, 0 rows affected (0.008 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON sakila.* TO 'odbc_user'@'ohm.markusdba.internal';
Query OK, 0 rows affected (0.008 sec)

MariaDB [(none)]> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.001 sec)

MariaDB [(none)]> exit
Bye
```

ohm: ODBC-Treiber installieren

```
[root@ohm oracle]#  dnf install -y unixODBC unixODBC-devel mariadb-connector-odbc
Last metadata expiration check: 2:09:52 ago on Thu 12 Nov 2026 07:43:14 PM CET.
Package unixODBC-2.3.7-2.el8_10.x86_64 is already installed.
Package unixODBC-devel-2.3.7-2.el8_10.x86_64 is already installed.
Package mariadb-connector-odbc-3.1.12-1.el8.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
```

ohm: /etc/odbc.ini

```
[mariadb]
Database        = sakila
Description     = Connection to MariaDB
Driver          = MariaDB
Servername      = meitner.markusdba.internal
Port            = 3306
UID             = odbc_user
PWD             = geheim
```

ohm: ODBC-Connect testen

```
[oracle@ohm ~]$ isql -v mariadb
+---------------------------------------+
| Connected!                            |
|                                       |
| sql-statement                         |
| help [tablename]                      |
| quit                                  |
|                                       |
```

```
+--------------------------------------+
SQL> select count(*) from actor;
+--------------------+
| count(*)           |
+--------------------+
| 200                |
+--------------------+
SQLRowCount returns 1
1 rows fetched
SQL> quit
```

ohm initMARIADB.ora anlegen

```
[oracle@ohm ~]$ cat /u00/app/oracle/homes/OraDB19Home1/hs/admin/initMARIADB.ora
# Name of the data source
HS_FDS_CONNECT_INFO = mariadb
# Trace Level (other levels: OFF or DEBUG)
HS_FDS_TRACE_LEVEL = ON
# full path name of odbc driver manager or driver
HS_FDS_SHAREABLE_NAME = /usr/pgsql-18/lib/psqlodbcw.so
# set language to American, character set depending on client char set
HS_LANGUAGE = AMERICAN_AMERICA.WE8ISO8859P15
# full path name of the odbc initialization file
set ODBCINI=/etc/odbc.ini
```

ohm: Listener für das ODBC-Gateway zur MariaDB anlegen

```
[oracle@ohm ~]$ cat $TNS_ADMIN/listener.ora

[...]
```

```
LISTENERMARIADB =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = TCP)(HOST = ohm.markusdba.internal)(PORT = 1523))
    )
  )

SID_LIST_LISTENERMARIADB=
   (SID_LIST =
     (SID_DESC =
       (SID_NAME = MARIADB)
       (ORACLE_HOME = /u00/app/oracle/product/19.32-ee)
       (PROGRAM = dg4odbc)
       (ENVS="LD_LIBRARY_PATH=/usr/lib64:/u00/app/oracle/product/19.32-ee/lib")
     )
   )
```

ohm: Listener LISTENERMARIADB starten

```
[oracle@ohm ~]$ lsnrctl start LISTENERMARIADB

LSNRCTL for Linux: Version 19.0.0.0.0 - Production on 12-NOV-2026 21:29:52
Copyright (c) 1991, 2026, Oracle.  All rights reserved.

Starting /u00/app/oracle/product/19.32-ee/bin/tnslsnr: please wait...

TNSLSNR for Linux: Version 19.0.0.0.0 - Production
System parameter file is /u00/app/oracle/network/admin/listener.ora
Log messages written to /u00/app/oracle/diag/tnslsnr/ohm/listenermariadb/alert/log.xml
Listening on: (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=ohm.markusdba.internal)(PORT=1523)))
```

```
Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=ohm.markusdba.internal)(PORT=1523)))
STATUS of the LISTENER
------------------------
Alias                     LISTENERMARIADB
Version                   TNSLSNR for Linux: Version 19.0.0.0.0 - Production
Start Date                12-NOV-2026 21:29:52
Uptime                    0 days 0 hr. 0 min. 0 sec
Trace Level               off
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File   /u00/app/oracle/network/admin/listener.ora
Listener Log File         /u00/app/oracle/diag/tnslsnr/ohm/listenermariadb/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=ohm.markusdba.internal)(PORT=1523)))
Services Summary...
Service "MARIADB" has 1 instance(s).
  Instance "MARIADB", status UNKNOWN, has 1 handler(s) for this service...
The command completed successfully
```

ohm: tnsnames.ora-Eintrag für MariaDB

```
[oracle@ohm ~]$ cat $TNS_ADMIN/tnsnames.ora
[...]

MARIADB =
  (DESCRIPTION=
  (ADDRESS=
  (PROTOCOL=TCP)(HOST = ohm.markusdba.internal)(PORT = 1523))
  (CONNECT_DATA= (SID=MARIADB)) (HS=OK)
```

```
)

[oracle@ohm ~]$ tnsping MARIADB

TNS Ping Utility for Linux: Version 19.0.0.0.0 - Production on 12-NOV-2026 21:32:04
Copyright (c) 1997, 2026, Oracle.  All rights reserved.

Used parameter files:
/u00/app/oracle/network/admin/sqlnet.ora

Used TNSNAMES adapter to resolve the alias
Attempting to contact (DESCRIPTION= (ADDRESS= (PROTOCOL=TCP)(HOST = ohm.markusdba.internal)(PORT = 1523))
(CONNECT_DATA= (SID=MARIADB)) (HS=OK))
OK (0 msec)
```

ohm: Datenbank-Link anlegen und testen

```
[oracle@ohm ~]$ sqlplus system@ORACLEPDB

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Nov 12 21:34:11 2026
Version 19.32.0.0.0
Copyright (c) 1982, 2026, Oracle.  All rights reserved.
Enter password:
Last Successful login time: Thu Nov 12 2026 21:08:54 +01:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.32.0.0.0
```

```
SQL> create database link MARIADB connect to "odbc_user" identified by "geheim" using 'MARIADB';
Database link created.
```

ohm: Test

```
SQL> select count(*) from "actor"@MARIADB;
  COUNT(*)
----------
       200

SQL> select * from "actor"@MARIADB where "actor_id"=3;
  actor_id
----------
first_name
--------------------------------------------------------------------------------
last_name
--------------------------------------------------------------------------------
last_upda
---------
     3
ED
CHASE
15-FEB-06



SQL> update "actor"@MARIADB set "first_name" ='EDUARD' where  "actor_id"=3;
1 row updated.

SQL> select "first_name" from "actor"@MARIADB where "actor_id"=3;
```

```
first_name
--------------------------------------------------------------------------------
EDUARD

SQL> commit;
Commit complete.

SQL> set autotrace traceonly explain
SQL> select * from "actor"@MARIADB where "actor_id"=3;

Execution Plan
----------------------------------------------------------
Plan hash value: 1788691278

-------------------------------------------------------------------------------------------
| Id  | Operation        | Name  | Rows  | Bytes | Cost (%CPU)| Time     | Inst   |IN-OUT|
-------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT |       |    20 | 11320 |   200   (0)| 00:00:01 |        |      |
|   1 |  REMOTE          | actor |    20 | 11320 |   200   (0)| 00:00:01 | MARIA~ | R->S |
-------------------------------------------------------------------------------------------

Remote SQL Information (identified by operation id):
----------------------------------------------------

   1 - SELECT `actor_id`,`first_name`,`last_name`,`last_update` FROM `actor`
       WHERE `actor_id`=3 (accessing 'MARIADB' )
```

meitner: ODBC-Connector -> Oracle

meitner: notwendige Software-Komponenten installieren

```
[root@meitner ~]# dnf install -y unixODBC  unixODBC-devel MariaDB-connect-engine
Last metadata expiration check: 2:49:57 ago on Thu 12 Nov 2026 07:39:12 PM CET.
Package unixODBC-2.3.7-2.el8_10.x86_64 is already installed.
Package unixODBC-devel-2.3.7-2.el8_10.x86_64 is already installed.
Package MariaDB-connect-engine-12.3.3-1.el8.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
```

---

meitner: Connect-Engine aktivieren

```
[root@meitner ~]# mariadb
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 12.3.3-MariaDB MariaDB Server
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> install soname 'ha_connect.so';
Query OK, 0 rows affected (0.001 sec)

MariaDB [(none)]> exit
Bye
```

Oracle-ODBC-Treiber definieren

```
[root@meitner ~]# odbcinst -j
unixODBC 2.3.7
DRIVERS............: /etc/odbcinst.ini
SYSTEM DATA SOURCES: /etc/odbc.ini
```

```
FILE DATA SOURCES..: /etc/ODBCDataSources
USER DATA SOURCES..: /root/.odbc.ini
SQLULEN Size.......: 8
SQLLEN Size........: 8
SQLSETPOSIROW Size.: 8
```

```
[root@meitner /]# cat /etc/odbcinst.ini
[...]

[Oracle]
Description=Oracle Driver
Driver=/usr/lib/oracle/19.32/client64/lib/libsqora.so.19.1
```

meitner: ODBC-Datenquelle definieren

```
[root@meitner /]# cat /etc/odbc.ini
[oracle_scott]
Driver = Oracle
UserID = scott
Password = tiger
ServerName = //ohm.markusdba.internal:1521/ORACLEPDB
```

meitner: ODBC-Datenquelle testen

```
[root@meitner /]# isql -v oracle_scott
+---------------------------------------+
| Connected!                            |
|                                       |
| sql-statement                         |
| help [tablename]                      |
```

```
| quit                                  |
|                                       |
+---------------------------------------+
SQL> select table_name from user_tables;
+---------------------------------------+
| TABLE_NAME                            |
+---------------------------------------+
| DEPT                                  |
| EMP                                   |
| BONUS                                 |
| SALGRADE                              |
+---------------------------------------+
SQLRowCount returns -1
4 rows fetched

SQL> quit
```

"Remote-Table" anlegen

```
[root@meitner ~]# mariadb
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 4
Server version: 12.3.3-MariaDB MariaDB Server
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> use sakila
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A
```

```
Database changed
MariaDB [sakila]> create table emp_remote engine=connect table_type=ODBC tabname='EMP' dbschema='SCOTT'
connection='dsn=oracle_scott';
Query OK, 0 rows affected (2.890 sec)
```

Remote-Tabelle testen

```
MariaDB [sakila]> select * from emp_remote;
+-------+--------+-----------+------+---------------------+---------+---------+--------+
| EMPNO | ENAME  | JOB       | MGR  | HIREDATE            | SAL     | COMM    | DEPTNO |
+-------+--------+-----------+------+---------------------+---------+---------+--------+
|  7369 | SMITH  | CLERK     | 7902 | 1980-12-17 00:00:00 |  800.00 |    NULL |     20 |
|  7499 | ALLEN  | SALESMAN  | 7698 | 1981-02-20 00:00:00 | 1600.00 |  300.00 |     30 |
|  7521 | WARD   | SALESMAN  | 7698 | 1981-02-22 00:00:00 | 1250.00 |  500.00 |     30 |
|  7566 | JONES  | MANAGER   | 7839 | 1981-04-02 00:00:00 | 2975.00 |    NULL |     20 |
|  7654 | MARTIN | SALESMAN  | 7698 | 1981-09-28 00:00:00 | 1250.00 | 1400.00 |     30 |
|  7788 | SCOTT  | ANALYST   | 7566 | 1987-04-19 00:00:00 | 3000.00 |    NULL |     20 |
|  7839 | KING   | PRESIDENT | NULL | 1981-11-17 00:00:00 | 5000.00 |    NULL |     10 |
|  7844 | TURNER | SALESMAN  | 7698 | 1981-09-08 00:00:00 | 1500.00 |    0.00 |     30 |
|  7876 | ADAMS  | CLERK     | 7788 | 1987-05-23 00:00:00 | 1100.00 |    NULL |     20 |
|  7900 | JAMES  | CLERK     | 7698 | 1981-12-03 00:00:00 |  950.00 |    NULL |     30 |
|  7902 | FORD   | ANALYST   | 7566 | 1981-12-03 00:00:00 | 3000.00 |    NULL |     20 |
|  7934 | MILLER | CLERK     | 7782 | 1982-01-23 00:00:00 | 1300.00 |    NULL |     10 |
+-------+--------+-----------+------+---------------------+---------+---------+--------+
12 rows in set (0.088 sec)

MariaDB [sakila]> update emp_remote set ename='KONG' where ename='KING';
Query OK, 0 rows affected, 1 warning (0.070 sec)
Rows matched: 0  Changed: 0  Warnings: 1
```

```
MariaDB [sakila]> select * from emp_remote;
+-------+--------+-----------+------+---------------------+---------+---------+--------+
| EMPNO | ENAME  | JOB       | MGR  | HIREDATE            | SAL     | COMM    | DEPTNO |
+-------+--------+-----------+------+---------------------+---------+---------+--------+
|  7369 | SMITH  | CLERK     | 7902 | 1980-12-17 00:00:00 |  800.00 |    NULL |     20 |
|  7499 | ALLEN  | SALESMAN  | 7698 | 1981-02-20 00:00:00 | 1600.00 |  300.00 |     30 |
|  7521 | WARD   | SALESMAN  | 7698 | 1981-02-22 00:00:00 | 1250.00 |  500.00 |     30 |
|  7566 | JONES  | MANAGER   | 7839 | 1981-04-02 00:00:00 | 2975.00 |    NULL |     20 |
|  7654 | MARTIN | SALESMAN  | 7698 | 1981-09-28 00:00:00 | 1250.00 | 1400.00 |     30 |
|  7788 | SCOTT  | ANALYST   | 7566 | 1987-04-19 00:00:00 | 3000.00 |    NULL |     20 |
|  7839 | KONG   | PRESIDENT | NULL | 1981-11-17 00:00:00 | 5000.00 |    NULL |     10 |
|  7844 | TURNER | SALESMAN  | 7698 | 1981-09-08 00:00:00 | 1500.00 |    0.00 |     30 |
|  7876 | ADAMS  | CLERK     | 7788 | 1987-05-23 00:00:00 | 1100.00 |    NULL |     20 |
|  7900 | JAMES  | CLERK     | 7698 | 1981-12-03 00:00:00 |  950.00 |    NULL |     30 |
|  7902 | FORD   | ANALYST   | 7566 | 1981-12-03 00:00:00 | 3000.00 |    NULL |     20 |
|  7934 | MILLER | CLERK     | 7782 | 1982-01-23 00:00:00 | 1300.00 |    NULL |     10 |
+-------+--------+-----------+------+---------------------+---------+---------+--------+
12 rows in set (0.056 sec)

MariaDB [sakila]> update emp_remote set sal=sal*1.1;
Query OK, 0 rows affected, 1 warning (0.068 sec)
Rows matched: 0  Changed: 0  Warnings: 1

MariaDB [sakila]> explain select * from emp_remote where deptno=20;
+------+-------------+------------+------+---------------+------+---------+------+------+-------------+
| id   | select_type | table      | type | possible_keys | key  | key_len | ref  | rows | Extra       |
+------+-------------+------------+------+---------------+------+---------+------+------+-------------+
|    1 | SIMPLE      | emp_remote | ALL  | NULL          | NULL | NULL    | NULL | 10   | Using where |
```

```
+------+------------+-----------+------+--------------+------+---------+------+------+------------+
1 row in set (0.001 sec)
```

Achtung: Anscheinend wird das Feedback "#geänderter Datensätze" nicht sauber von Oracle übertragen.

meitner: ODBC-Connector -> PostgreSQL

Software installieren

```
[root@meitner ~]# dnf install -y unixODBC unixODBC-devel postgresql18-odbc
Last metadata expiration check: 2:56:49 ago on Thu 12 Nov 2026 07:39:12 PM CET.
Package unixODBC-2.3.7-2.el8_10.x86_64 is already installed.
Package unixODBC-devel-2.3.7-2.el8_10.x86_64 is already installed.
Package postgresql18-odbc-18.00.0005-1PGDG.rhel8.10.x86_64 is already installed.
Dependencies resolved.
================================================================================
================================================================================
 Package                                  Architecture                    Version
Repository                            Size
================================================================================
================================================================================
Upgrading:
 postgresql18-libs                        x86_64                          18.7-1PGDG.rhel8.10
pgdg18                               308 k
 postgresql18-odbc                        x86_64                          18.00.0006-
2PGDG.rhel8.10                           pgdg18                         339 k

Transaction Summary
================================================================================
================================================================================
```

```
Upgrade  2 Packages

Total download size: 647 k
Downloading Packages:
(1/2): postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64.rpm
589 kB/s | 308 kB     00:00
(2/2): postgresql18-odbc-18.00.0006-2PGDG.rhel8.10.x86_64.rpm
515 kB/s | 339 kB     00:00
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Total
977 kB/s | 647 kB     00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :
1/1
  Upgrading        : postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64
1/4
  Running scriptlet: postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64
1/4
  Upgrading        : postgresql18-odbc-18.00.0006-2PGDG.rhel8.10.x86_64
2/4
  Running scriptlet: postgresql18-odbc-18.00.0006-2PGDG.rhel8.10.x86_64
2/4
  Cleanup          : postgresql18-odbc-18.00.0005-1PGDG.rhel8.10.x86_64
3/4
```

```
  Running scriptlet: postgresql18-odbc-18.00.0005-1PGDG.rhel8.10.x86_64
3/4
  Cleanup          : postgresql18-libs-18.6-1PGDG.rhel8.10.x86_64
4/4
  Running scriptlet: postgresql18-libs-18.6-1PGDG.rhel8.10.x86_64
4/4
  Verifying        : postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64
1/4
  Verifying        : postgresql18-libs-18.6-1PGDG.rhel8.10.x86_64
2/4
  Verifying        : postgresql18-odbc-18.00.0006-2PGDG.rhel8.10.x86_64
3/4
  Verifying        : postgresql18-odbc-18.00.0005-1PGDG.rhel8.10.x86_64
4/4

Upgraded:
  postgresql18-libs-18.7-1PGDG.rhel8.10.x86_64                                  postgresql18-
odbc-18.00.0006-2PGDG.rhel8.10.x86_64

Complete!
[root@meitner ~]# ln -s /usr/pgsql-18/lib/psqlodbcw.so /usr/lib64/psqlodbcw.so
```

ODBC-Treiber definieren

```
[root@meitner /]# cat /etc/odbcinst.ini
[...]

[PostgreSQL]
Description     = ODBC for PostgreSQL
Driver          = /usr/pgsql-18/lib/psqlodbcw.so
```

```
Setup           = /usr/lib64/libodbcpsqlS.so
Driver64        = /usr/pgsql-18/lib/psqlodbcw.so
Setup64         = /usr/lib64/libodbcpsqlS.so
FileUsage       = 1
```

ODBC-Datenquelle definieren

```
[root@meitner ~]# cat /etc/odbc.ini
[...]
[postgresql_dvdrental]
Database         = dvdrental
Description      = Connection to PostgreSQL Cluster
Driver           = PostgreSQL
Servername       = planck.markusdba.internal
Port             = 5432
Username         = odbcgw
Password         = odbcgw
```

ODBC-Datenquelle testen

```
[root@meitner ~]# isql -v postgresql_dvdrental
+---------------------------------------+
| Connected!                            |
|                                       |
| sql-statement                         |
| help [tablename]                      |
| quit                                  |
|                                       |
+---------------------------------------+
SQL> select tablename from pg_tables where schemaname='public';
+------------------------------------------------------------------+
```

```
| tablename                                                    |
+--------------------------------------------------------------+
| store                                                        |
| address                                                      |
| category                                                     |
| city                                                         |
| country                                                      |
| customer                                                     |
| film_actor                                                   |
| film_category                                                |
| inventory                                                    |
| language                                                     |
| rental                                                       |
| staff                                                        |
| payment                                                      |
| actor                                                        |
| film                                                         |
+--------------------------------------------------------------+
SQLRowCount returns 15
15 rows fetched

SQL> quit
```

"Remote-Table" anlegen

```
[root@meitner ~]# mariadb
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 5
Server version: 12.3.3-MariaDB MariaDB Server
```

```
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> use sakila
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MariaDB [sakila]> create table pg_country  engine=connect table_type=ODBC tabname='country' dbschema='public'
connection='dsn=postgresql_dvdrental';
Query OK, 0 rows affected (0.052 sec)
```

Remote-Tabelle testen

```
MariaDB [sakila]>  select count(*) from pg_country;
+----------+
| count(*) |
+----------+
|      109 |
+----------+
1 row in set (0.029 sec)

MariaDB [sakila]> select * from pg_country;
+------------+-------------------------------------+---------------------+
| country_id | country                             | last_update         |
+------------+-------------------------------------+---------------------+
|          1 | Afghanistan                         | 2006-02-15 09:44:00 |
|          2 | Algeria                             | 2006-02-15 09:44:00 |
```

```
|          3 | American Samoa                          | 2006-02-15 09:44:00 |
|          4 | Angola                                  | 2006-02-15 09:44:00 |
|          5 | Anguilla                                | 2006-02-15 09:44:00 |
|          6 | Argentina                               | 2006-02-15 09:44:00 |
|          7 | Armenia                                 | 2006-02-15 09:44:00 |
|          8 | Australia                               | 2006-02-15 09:44:00 |
[...]
|        108 | Yugoslavia                              | 2006-02-15 09:44:00 |
|        109 | Zambia                                  | 2006-02-15 09:44:00 |
+------------+-----------------------------------------+---------------------+
109 rows in set (0.021 sec)

MariaDB [sakila]> update pg_country set country='Federal Republic of Germany' where country_id=38;
Query OK, 0 rows affected, 1 warning (0.025 sec)
Rows matched: 0  Changed: 0  Warnings: 1

MariaDB [sakila]> select * from pg_country where country_id=38;
+------------+----------------------------+---------------------+
| country_id | country                    | last_update         |
+------------+----------------------------+---------------------+
|         38 | Federal Republic of Germany | 2026-11-12 22:43:19 |
+------------+----------------------------+---------------------+
1 row in set (0.017 sec)

MariaDB [sakila]> create table pg_customer  engine=connect table_type=ODBC tabname='customer' dbschema='public'
connection='dsn=postgresql_dvdrental';
Query OK, 0 rows affected (0.044 sec)

MariaDB [sakila]> create table pg_payment  engine=connect table_type=ODBC tabname='payment' dbschema='public'
```

```
connection='dsn=postgresql_dvdrental';
Query OK, 0 rows affected (0.045 sec)


MariaDB [sakila]> SELECT
    ->     c.first_name,
    ->     c.last_name,
    ->     p.amount,
    ->     p.payment_date
    -> FROM
    ->     pg_customer c
    -> INNER JOIN
    ->     pg_payment p ON c.customer_id = p.customer_id
    -> WHERE
    ->     EXTRACT(YEAR FROM p.payment_date) = 2007
    -> AND
    ->     c.last_name like 'B%'
    -> AND
    ->     c.first_name like 'A%'
    -> AND
    ->     p.amount > 5
    -> ORDER BY
    ->     p.payment_date DESC;
+------------+-------------+--------+---------------------+
| first_name | last_name   | amount | payment_date        |
+------------+-------------+--------+---------------------+
| April      | Burns       |   5.99 | 2007-04-30 19:33:25 |
| Ana        | Bradley     |   8.99 | 2007-04-30 17:05:26 |
| Ana        | Bradley     |   5.99 | 2007-04-30 12:15:43 |
```

```
| April      | Burns       |   7.99 | 2007-04-30 03:59:53 |
| Agnes      | Bishop      |   6.99 | 2007-04-30 03:30:49 |
| Ana        | Bradley     |   9.99 | 2007-04-29 11:31:57 |
| Ana        | Bradley     |   5.99 | 2007-04-29 11:06:40 |
| Allen      | Butterfield |   8.99 | 2007-04-29 05:12:49 |
| Allen      | Butterfield |   8.99 | 2007-04-29 02:37:33 |
| Ana        | Bradley     |   8.99 | 2007-04-26 22:08:33 |
| Angel      | Barclay     |   6.99 | 2007-04-10 20:09:53 |
| Angel      | Barclay     |   6.99 | 2007-04-06 19:36:55 |
| Ana        | Bradley     |   6.99 | 2007-04-06 16:03:48 |
| Allen      | Butterfield |   8.99 | 2007-03-23 12:09:31 |
| Allen      | Butterfield |   6.99 | 2007-03-21 13:51:03 |
| Ana        | Bradley     |   7.99 | 2007-03-18 06:21:15 |
| April      | Burns       |   5.99 | 2007-03-02 12:01:50 |
| April      | Burns       |   5.99 | 2007-03-02 01:20:44 |
| Agnes      | Bishop      |   6.99 | 2007-03-01 21:58:24 |
| Ana        | Bradley     |   6.99 | 2007-03-01 19:22:11 |
| Agnes      | Bishop      |   5.99 | 2007-03-01 12:20:56 |
| Allen      | Butterfield |   5.99 | 2007-03-01 08:14:24 |
| Ana        | Bradley     |   6.99 | 2007-03-01 04:23:39 |
| Ana        | Bradley     |   5.99 | 2007-02-21 19:29:53 |
| Ana        | Bradley     |   5.99 | 2007-02-19 08:19:01 |
| Agnes      | Bishop      |   6.99 | 2007-02-17 15:12:13 |
+------------+-------------+--------+---------------------+
26 rows in set (0.107 sec)

MariaDB [sakila]> explain SELECT
    ->     c.first_name,
    ->     c.last_name,
```

```
    ->     p.amount,
    ->     p.payment_date
    -> FROM
    ->     pg_customer c
    -> INNER JOIN
    ->     pg_payment p ON c.customer_id = p.customer_id
    -> WHERE
    ->     EXTRACT(YEAR FROM p.payment_date) = 2007
    -> AND
    ->     c.last_name like 'B%'
    -> AND
    ->     c.first_name like 'A%'
    -> AND
    ->     p.amount > 5
    -> ORDER BY
    ->     p.payment_date DESC;
+------+-------------+-------+------+---------------+------+---------+------+------+----------------------------
--------------------+
| id   | select_type | table | type | possible_keys | key  | key_len | ref  | rows | Extra
|
+------+-------------+-------+------+---------------+------+---------+------+------+----------------------------
--------------------+
|    1 | SIMPLE      | c     | ALL  | NULL          | NULL | NULL    | NULL | 10   | Using where; Using
temporary; Using filesort    |
|    1 | SIMPLE      | p     | ALL  | NULL          | NULL | NULL    | NULL | 10   | Using where; Using join
buffer (flat, BNL join) |
+------+-------------+-------+------+---------------+------+---------+------+------+----------------------------
--------------------+
2 rows in set (0.001 sec)
```

```
MariaDB [sakila]> quit
Bye
```

Performance

Einschränkungen

oracle_fdw

Der oracle_fdw unterliegt mehreren technischen Einschränkungen bei der Datentyp- und Abfrageverarbeitung.

Datentypen und Konvertierung

- NCLOB wird nicht unterstützt: Oracle kann NCLOB nicht automatisch in das Client-Encoding konvertieren.
- LANGE Datentypen: Spalten vom Typ LONG und LONG RAW werden bei der Verwendung von RETURNING-Klauseln oder bestimmten Triggern nicht unterstützt.
- TIMESTAMP mit Zeitzone: Die Konvertierung von TIMESTAMP WITH LOCAL TIME ZONE erfordert die Aktivierung der Option set_timezone, da sonst Inkonsistenzen auftreten können.
- NCHAR/NVARCHAR2: Die Nutzung erfordert die Option nchar, was die Performance beeinträchtigt und bei langen Strings zu Fehlern führen kann.

Abfrage- und Pushdown-Limits

- JOINs: Pushdowns von Joins funktionieren nur zwischen zwei Tabellen auf demselben Server; Joins mit drei oder mehr Tabellen werden lokal in PostgreSQL ausgeführt.
- ORDER BY: Sortierungen nach Zeichenfolgentypen (Strings) werden nicht nach Oracle gepusht, da die Sortierreihenfolge zwischen den Systemen nicht garantiert identisch ist. Numerische und Datums-Sortierungen werden jedoch gepusht.
- Fehlende Features: Prepared Statements und Two-Phase Commit werden nicht unterstützt, da der Wrapper keine direkte Kontrolle über das Oracle-Transaktionsmanagement ausüben kann.

- Stored Procedures: In Oracle definierte Stored Procedures oder User-Defined Functions können nicht direkt über oracle_fdw aufgerufen werden, da der PostgreSQL-Parser keine Remote-Definitionen kennt.

Performance und Konfiguration

- Schreiboperationen: INSERT, UPDATE und DELETE sind möglich, aber ineffizient, da für jede betroffene Zeile ein Roundtrip zur Oracle-Datenbank stattfindet.
- Statistiken: Die PostgreSQL-Statistiken (ANALYZE) werden für Foreign Tables nicht automatisch aktualisiert; sie müssen manuell angestoßen werden, um korrekte Ausführungspläne zu gewährleisten.
- Isolation Level: Der Standard-Isolation-Level ist SERIALIZABLE, um Datenkonsistenz bei Mehrfachscans zu gewährleisten, was jedoch zu Serialization Errors (ORA-08177) führen kann, wenn parallel in dieselben Tabellen eingefügt wird.

ODBC-Gateway

Das Oracle-ODBC-Gateway zieht in der Standard-Einstellung alle Datensätze der Ergebnismenge in den Speicher. Dadurch hat es einen hohen Speicherbedarf.

Abhilfe: "UseDeclareFetch = 1" in der odbc.ini

Weitere Informationen

ODBC-Gateway

- Oracle AI Database 19c: Oracle® Database Gateway for ODBC - User's Guide https://docs.oracle.com/en/database/oracle/oracle-database/19/odbcu/index.html
- https://www.enterprisedb.com/postgres-tutorials/accessing-postgresql-databases-using-psqlodbc-oracle
- MOS-Notes
  - How to Resolve Common Errors Encountered while using Database Gateways (DG4IFMX, Dg4MSQL, DG4SYBS), DG4ODBC or Generic Connectivity (Doc ID 234517.1)
  - ORA-28545 If PROGRAM=dg4odbc.exe Is Specified In The Gateway LISTENER.ORA (Doc ID 1323387.1)

- How to Configure DG4ODBC on 64bit Unix OS (Linux, Solaris, AIX, HP-UX Itanium) to Connect to Non-Oracle Databases Post Install (Doc ID 561033.1)
- Error Ora-28500 and Sqlstate I or Displays a Square Bracket - [- Issuing Selects From a Unicode Oracle RDBMS With Dg4odbc To Non-Oracle Databases Using the UnixODBC Driver Manager (Doc ID 756186.1)
- DG4ODBC connection Fails With Error ORA-28500 / KB272140

FDW

- Übersicht im PostgreSQL-Wiki: https://wiki.postgresql.org/wiki/Foreign_data_wrappers
- FDW for Oracle: https://github.com/laurenz/oracle_fdw
- FDW for MySQL/MariaDB: https://github.com/EnterpriseDB/mysql_fdw
- PostgreSQL Accessing MySQL as a Data Source Using mysql_fdw https://www.percona.com/blog/2018/08/24/postgresql-accessing-mysql-as-a-data-source-using-mysql_fdw/

Connect-Engine

- Installing the CONNECT Storage Engine - MariaDB Knowledge Base https://mariadb.com/docs/server/server-usage/storage-engines/connect/installing-the-connect-storage-engine
- Die MariaDB Connect Engine: Bitte bleiben Sie dran, die Verbindung wird hergestellt. https://blog.ordix.de/die-mariadb-connect-engine-bitte-bleiben-sie-dran-die-verbindung-wird-hergestellt