

# Where are you in your open source journey?

... and where do you plan to be in the future?

# Do you use PostgreSQL today?

... you may be using it and not know.



# Understanding Postgres For Oracle DBA's

Tim Steward  @ dba\_atwork  
APR-13-2021

# I installed oracle from these methods



# My Passport



## Oracle DBA road trip began in 1991

- **Resorts:** 19c, 18c, 12c, 11g, 10g, 9i, 8i, 7.x, 6.x, 5.x, 3.x
- **Cruises:** EBS 10.6, 10.7nca, R11, R12.2, Hyperion, Peoplesoft
- **Timeshares:** Forms 3, 6, 9
- **Cabins:** Sql Server, MySql, SAP Basis, Sybase ASE, Netsuite, Pentaho, Redshift
- **Ocean view resort:** PostgreSQL
- **Current Activity:** Helping customers migrate workloads from Oracle to PostgreSQL

**Postgres + Postgres Sequel + PostgreSql =**



*A database of many names...*

# “Popular, Powerful, People”

It's a community

# Agenda

- Introduction to Postgres
- Comparing Technologies
- Some words on pricing
- Getting Started
- Conclusion
- Questions

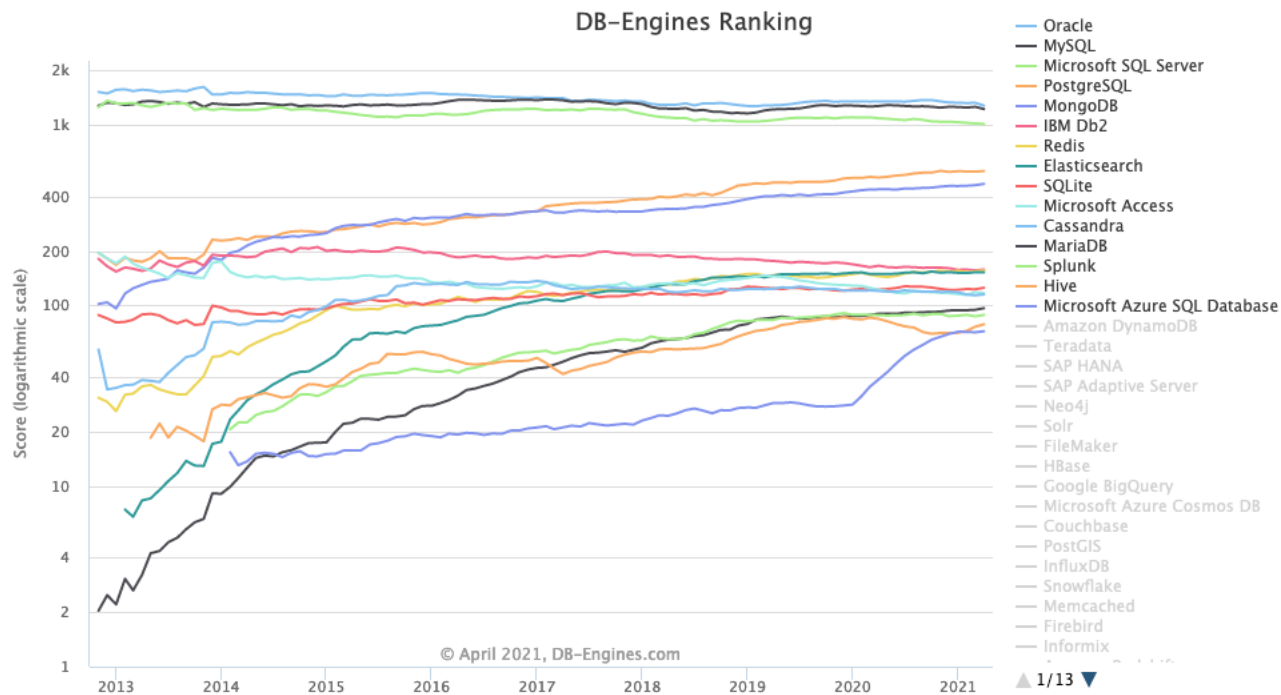


# DB-Engines Ranking By Popularity

370 systems in ranking, April 2021

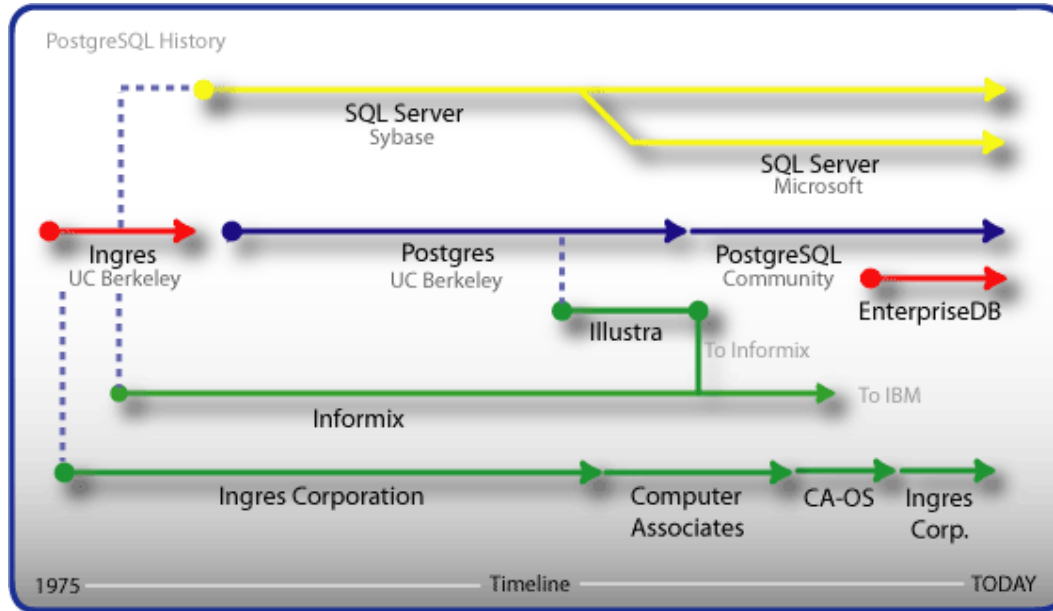
| Rank     |          |          | DBMS                   | Database Model               | Score    |          |          |
|----------|----------|----------|------------------------|------------------------------|----------|----------|----------|
| Apr 2021 | Mar 2021 | Apr 2020 |                        |                              | Apr 2021 | Mar 2021 | Apr 2020 |
| 1.       | 1.       | 1.       | Oracle +               | Relational, Multi-model ⓘ    | 1274.92  | -46.82   | -70.51   |
| 2.       | 2.       | 2.       | MySQL +                | Relational, Multi-model ⓘ    | 1220.69  | -34.14   | -47.66   |
| 3.       | 3.       | 3.       | Microsoft SQL Server + | Relational, Multi-model ⓘ    | 1007.97  | -7.33    | -75.46   |
| 4.       | 4.       | 4.       | PostgreSQL +           | Relational, Multi-model ⓘ    | 553.52   | +4.23    | +43.66   |
| 5.       | 5.       | 5.       | MongoDB +              | Document, Multi-model ⓘ      | 469.97   | +7.58    | +31.54   |
| 6.       | 6.       | 6.       | IBM Db2 +              | Relational, Multi-model ⓘ    | 157.78   | +1.77    | -7.85    |
| 7.       | 7.       | ↑ 8.     | Redis +                | Key-value, Multi-model ⓘ     | 155.89   | +1.74    | +11.08   |
| 8.       | 8.       | ↓ 7.     | Elasticsearch +        | Search engine, Multi-model ⓘ | 152.18   | -0.16    | +3.27    |
| 9.       | 9.       | 9.       | SQLite +               | Relational                   | 125.06   | +2.42    | +2.87    |
| 10.      | 10.      | 10.      | Microsoft Access       | Relational                   | 116.72   | -1.41    | -5.19    |
| 11.      | 11.      | 11.      | Cassandra +            | Wide column                  | 114.85   | +1.22    | -5.22    |
| 12.      | 12.      | 12.      | MariaDB +              | Relational, Multi-model ⓘ    | 96.37    | +1.92    | +6.47    |

# DB-Engines Trend Chart



# A look back at history

## The evolution of the System-R research



Edgar Frank Codd



Donald D. Chamberlin

**Michael Stonebraker + Eugene Wong work on Ingres  
and develop Post Ingres which evolved to become  
Postgres in 1989**

**Ingres commercialized in 1983  
Oracle commercialized in 1979**



**“Oracle the first relational database”**

# Comparing Technologies

Besides some differences  
there are  
a lot of similarities

**Application Development**

**Deployment Options**

**Tables and Partitioning**

**Indexes**

**SQL Extensions**

**Integration**

**Security**

**Management**



**Performance / Scalability**

**General / Capabilities**

**Incompatibilities**

**Capacities**

**Terminology**

**Data Types**

**SQL Capabilities**

**Big / Unstructured Data**

**High Availability**

# General / Capabilities

- ❖ Both based on IBM research for System R.  
*[https://en.wikipedia.org/wiki/IBM\\_System\\_R](https://en.wikipedia.org/wiki/IBM_System_R)*
- ❖ Both are (+) relational databases
- ❖ ACID compliant and MVCC or transactional consistency
- ❖ Full transaction logging
- ❖ Multi-Tenant architecture

# Terminology

| WHAT           | ORACLE         | POSTGRESQL         |
|----------------|----------------|--------------------|
| Table or Index | Table or Index | Relation           |
| Row            | Row            | Tuple              |
| Column         | Column         | Attribute          |
| Data block     | Data block     | Page (on Disk)     |
| Page           | Page           | Buffer (in Memory) |



# Postgres Possible

But NOT Advised

- Unlimited database size
- Unlimited rows per table
- Unlimited number of indexes per table

# Capacity

| Maximum           | Oracle                             | PostgreSQL |
|-------------------|------------------------------------|------------|
| Table Size        | 4GB x db_block_size (default 32tb) | 32TB       |
| Row Size          | 4TB                                | 1.6TB      |
| Field Size        | 4GB -1 x db_block_size             | 1GB        |
| Columns per table | 1000                               | 256-1600   |

# Tables and Partitions

| Entities                                            | Oracle                  | PostgreSQL |
|-----------------------------------------------------|-------------------------|------------|
| Temporary tables, (materialized) views, constraints | Same                    |            |
| Partitioning: range, hash, list, sub-partitioning   | Similar<br>(pg_partman) |            |
| Interval partitioning & Partitioned indexes         | Yes                     | No         |

# Data Types

| Max            | Oracle                                                         | PostgreSQL                                                                   |
|----------------|----------------------------------------------------------------|------------------------------------------------------------------------------|
| Integer        | NUMBER                                                         | + DEC, NUMERIC, SMALLINT, INT, BINARY_INTEGER, PLS_INTEGER, INTEGER & BIGINT |
| Floating point | BINARY_FLOAT, BINARY_DOUBLE                                    | + FLOAT, REAL & DOUBLE_PRECISION                                             |
| Decimal        | NUMBER                                                         | + DEC, DECIMAL, NUMERIC                                                      |
| String         | CHAR, VARCHAR2, CLOB, NCLOB, NVARCHAR2, NCHAR, <del>LONG</del> | + CHARACTER, TEXT, CHAR VARYING, CHARACTER VARYING, VARCHAR                  |
| Binary         | BLOB, RAW, <del>LONG-RAW</del> , BFILE                         | + BYTEA<br>-/- BFILE                                                         |

# Data Types

| Max         | Oracle                         | PostgreSQL                            |
|-------------|--------------------------------|---------------------------------------|
| Date / Time | Yes not same format yyyy-mm-dd |                                       |
| Row id      | Yes                            |                                       |
| XMLType     | Yes                            |                                       |
| JSON        | Yes                            | <i>JSON &amp; JSONB more advanced</i> |
| Spatial     | Yes                            |                                       |

# Indexes

| Entities                                                      | Oracle                                     | PostgreSQL        |
|---------------------------------------------------------------|--------------------------------------------|-------------------|
| B-Tree, hash, expressions, partial, full text search, spatial | Same                                       |                   |
| Reverse, bitmap, block range                                  | Similar<br><i>Block range = Smart Scan</i> |                   |
| K-nearest-neighbor                                            | Yes                                        | Yes more advanced |
| GIST, GIN<br><i>Speed up full-text searches</i>               | No                                         | Yes               |

# SQL Capabilities

| Entities                                                                                                                                                                 | Oracle | PostgreSQL |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------|
| Union, Intersect, Except, Inner joins, Outer joins, Merge joins, Common Table expressions, Windowing functions, Parallel query, Query hints, Alter session & Dynamic SQL | Same   |            |
| Transactional DDL                                                                                                                                                        | No     | Yes        |

# SQL Extensions

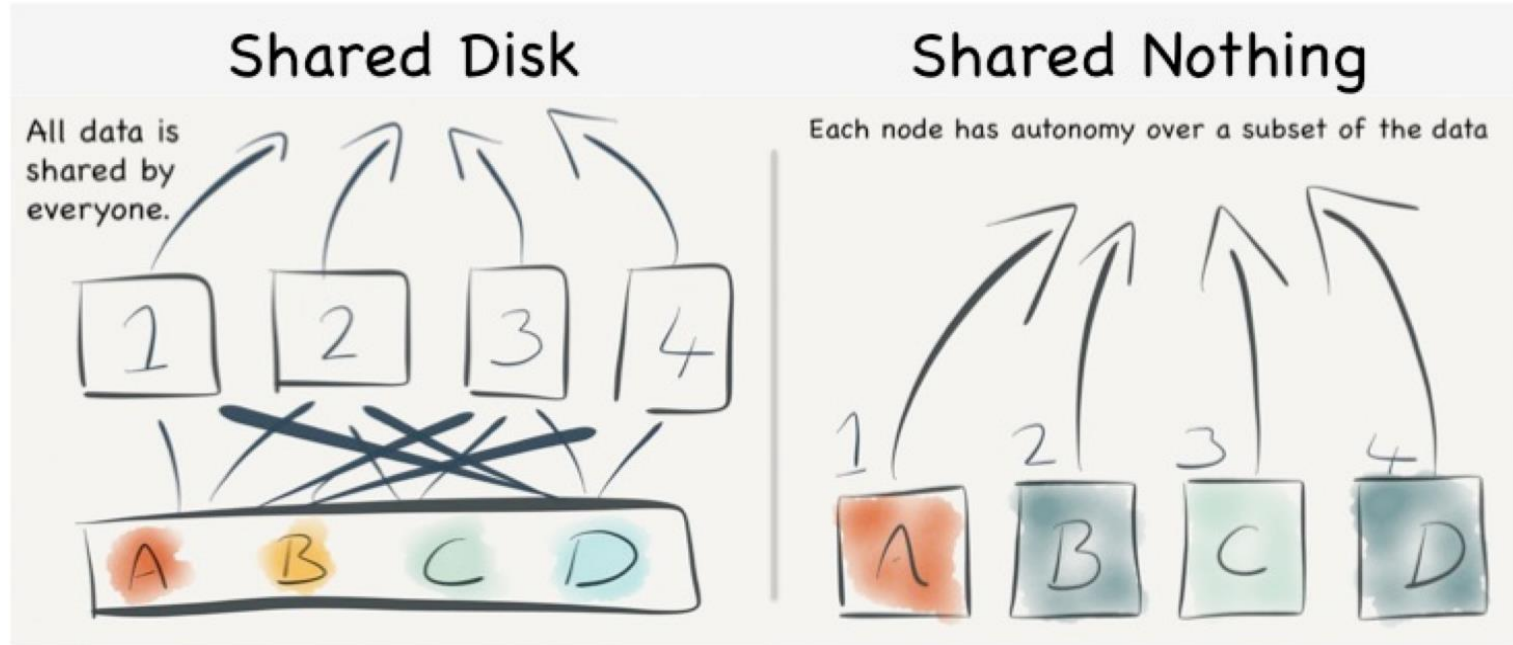
| Entities                                                | Oracle | PostgreSQL |
|---------------------------------------------------------|--------|------------|
| Dual, DECODE, Rownum, Sysdate, Systimestamp, NVL & NVL2 | Same   |            |



## Closed vs Open

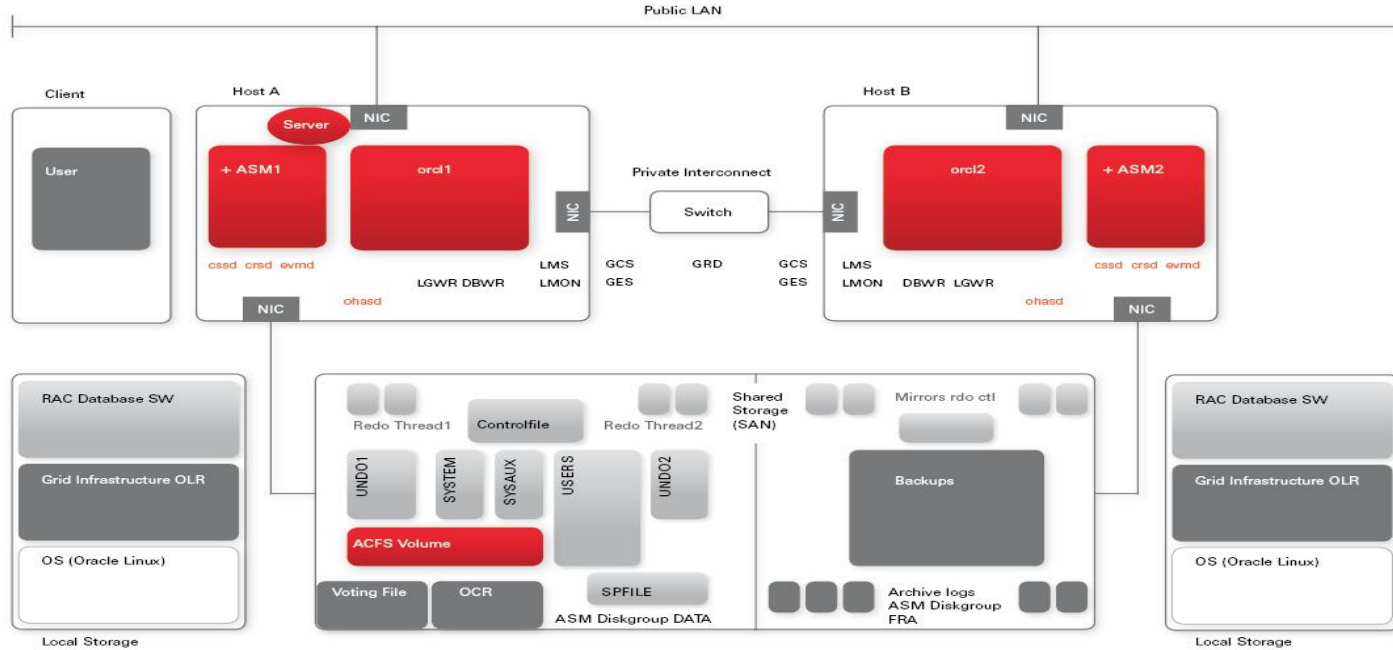
- Oracle has an isolated operating environment
- Operating system like qualities
- PostgreSQL integrates in it's surroundings
- Eliminating the need to “re-invent the wheel”

# Oracle RAC vs PostgreSQL MMR



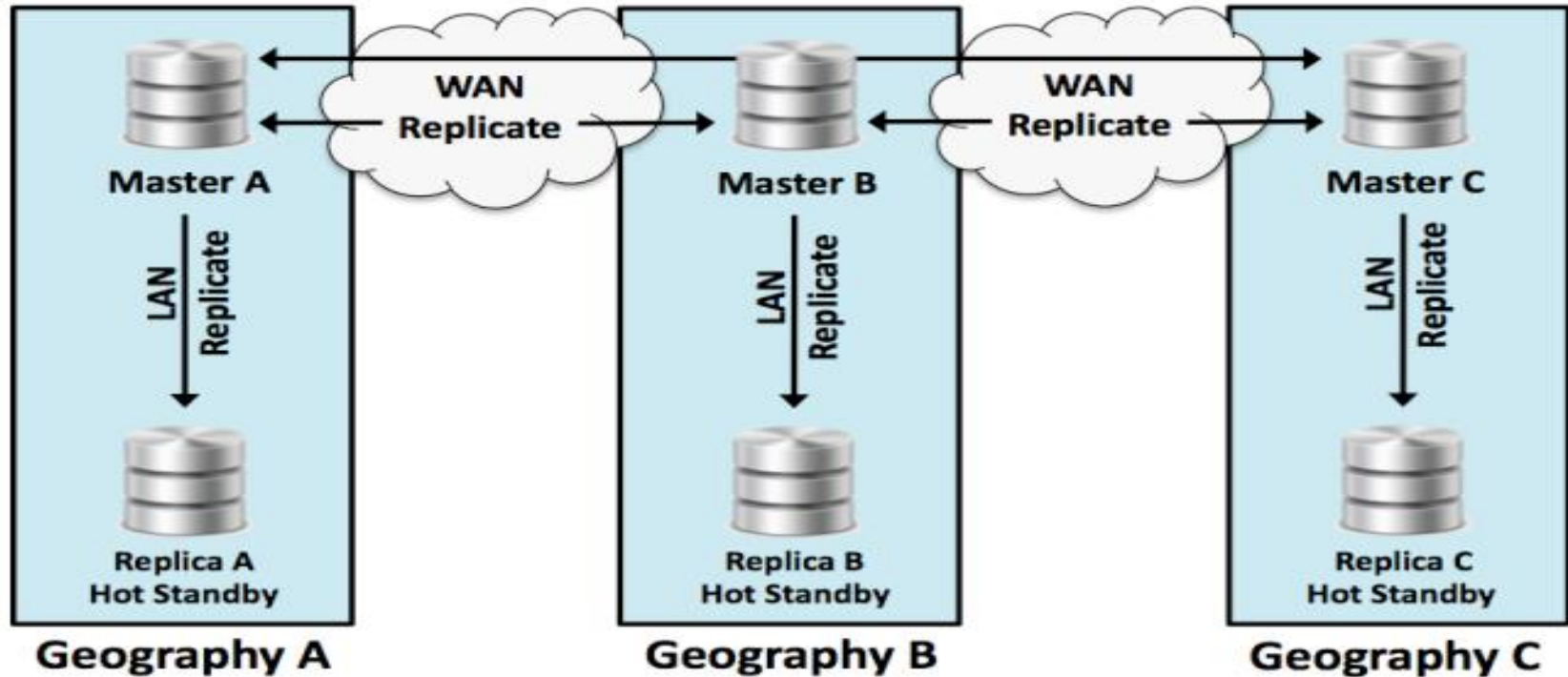
Courtesy: Ben Stopford

# Real Application Cluster



Courtesy: Uwe Hesse

# Multi Master Replication



Include pgpool II

# Connection Confusion

- Oracle has a listener
- Postgres has a postmaster
- Oracle defaults 1521
- Postgres defaults 5432
- Oracle sqlnet.ora
- Postgres pg\_hba.conf

# Logging

- Oracle has online redo logs
- Postgres has wal logs (write ahead logging)
- Oracle has log switch tuning
- Postgres has file reuse tuning

## Tuning / Configuration

- Oracle has init.ora
- Postgres has postgresql.conf
- Oracle db\_cache\_size
- Postgres shared\_buffers
- Oracle log\_buffer\_size
- Postgres wal\_buffers

## Permissions / Privileges

- Oracle has users and roles
- Postgres has roles only
- Oracle schema consist from a single user objects (schema = user)
- Postgres schema is a grantable name-space object



## Key Catalog Tables

| Max         | Oracle        | PostgreSQL                |
|-------------|---------------|---------------------------|
| Table Locks | dba_ddl_locks | <i>pg_locks</i>           |
| User Roles  | dba_roles     | <i>pg_roles</i>           |
| Tables      | dba_tables    | <i>pg_tables</i>          |
| Sql         | v\$sql        | <i>pg_stat_statements</i> |
| Sql         | v\$sqlsession | <i>pg_stat_activity</i>   |

# Performance and Scalability

| Entities                                        | Oracle                                                | PostgreSQL        |
|-------------------------------------------------|-------------------------------------------------------|-------------------|
| Wait Events/Timed statistics                    | Similar                                               |                   |
| Connection pooling<br>CPU & I/O Resource limits | Similar – pgpool, pgbouncer                           |                   |
| Columnar store                                  | InMemory option                                       | Cstore FDW        |
| In-memory database                              | Yes                                                   | No                |
| Multi-master Replication                        | Golden Gate, Quest<br>Shareplex, Dbvisit<br>Replicate | Yes via extension |

# High Availability/Backups

| Entities                                   | Oracle                 | PostgreSQL                            |
|--------------------------------------------|------------------------|---------------------------------------|
| PITR<br><i>Point In Time Recovery</i>      | Similar                |                                       |
| Backup and recovery tools                  | RMAN                   | pgdump/pgrestore,<br>pgbasebackup     |
| Standby database                           | (Active)<br>Data Guard | Streaming replication<br>w/extensions |
| Flashback<br><i>Query, Table, Database</i> | Yes                    | No                                    |

# High Availability/Backups Tools Extensions

| Feature                   | Tools                                |                                |
|---------------------------|--------------------------------------|--------------------------------|
| Active Passive HA         | Repmgr                               | EFM                            |
| Backup and recovery tools | PG_Backrest                          | Barman                         |
| Logical Replication       | PG_Logical                           | XDB (oracle,sql server, mysql) |
| 5x9's                     | BDR<br>(active-active geo disbursed) |                                |

# Security

| Entities                                                                                                                                                                                                                     | Oracle                                       | PostgreSQL |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------|
| Authentication support                                                                                                                                                                                                       | LDAP, SSL, RADIUS,PAM,<br>KERBOS,GSSAPI,SSPI |            |
| Connection encryption, password profiles,<br>code wrapping, ansi sql grants, column<br>level security, row level security(virtual<br>private database), fine grained auditing,<br>data encryption toolkit, database firewall | Similar                                      |            |
| Database-connection encryption<br>& white lists                                                                                                                                                                              | Yes                                          | Yes        |
| Audit Vault                                                                                                                                                                                                                  | Yes                                          | No         |

# Security

| Entities              | Oracle | PostgreSQL |
|-----------------------|--------|------------|
| Password Verification | Yes    | Not Easy   |
| Roles/Profile limits  | Yes    | Similar    |
| Password Complexity   | Yes    | Not Easy   |

## Ease of Application Development

| Entities                                | Oracle  | PostgreSQL                        |
|-----------------------------------------|---------|-----------------------------------|
| PLSQL                                   | Yes     | User defined functions (PL/pgSQL) |
| Additional programming language support | similar |                                   |

## Ease of Application Development cont...

| Entities                                                                                                    | Oracle                                                                                                | PostgreSQL |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------------|
| Java, JDBC, ODBC,.NET,user defined functions & objects, nested transactions, external routines              | Same                                                                                                  |            |
| STORED PROCEDURES, triggers, cursors, bulk collect, anonymous blocks, associate arrays, nested tables etc.. | Similar yet the developer favorite autonomous transactions requires some thought of a new transaction |            |



# Big Data – Unstructured data

| Entities                           | Oracle  |                                |
|------------------------------------|---------|--------------------------------|
| Spatial                            | Good    | Better                         |
| Key value store & full text search | Similar |                                |
| XML Storage, Compression           | Yes     | No!!!!<br>(xmlparse, xmltable) |
| Hadoop, MongoDB, Cubes             | Yes     |                                |

!!!In the OS we trust...

# Integration

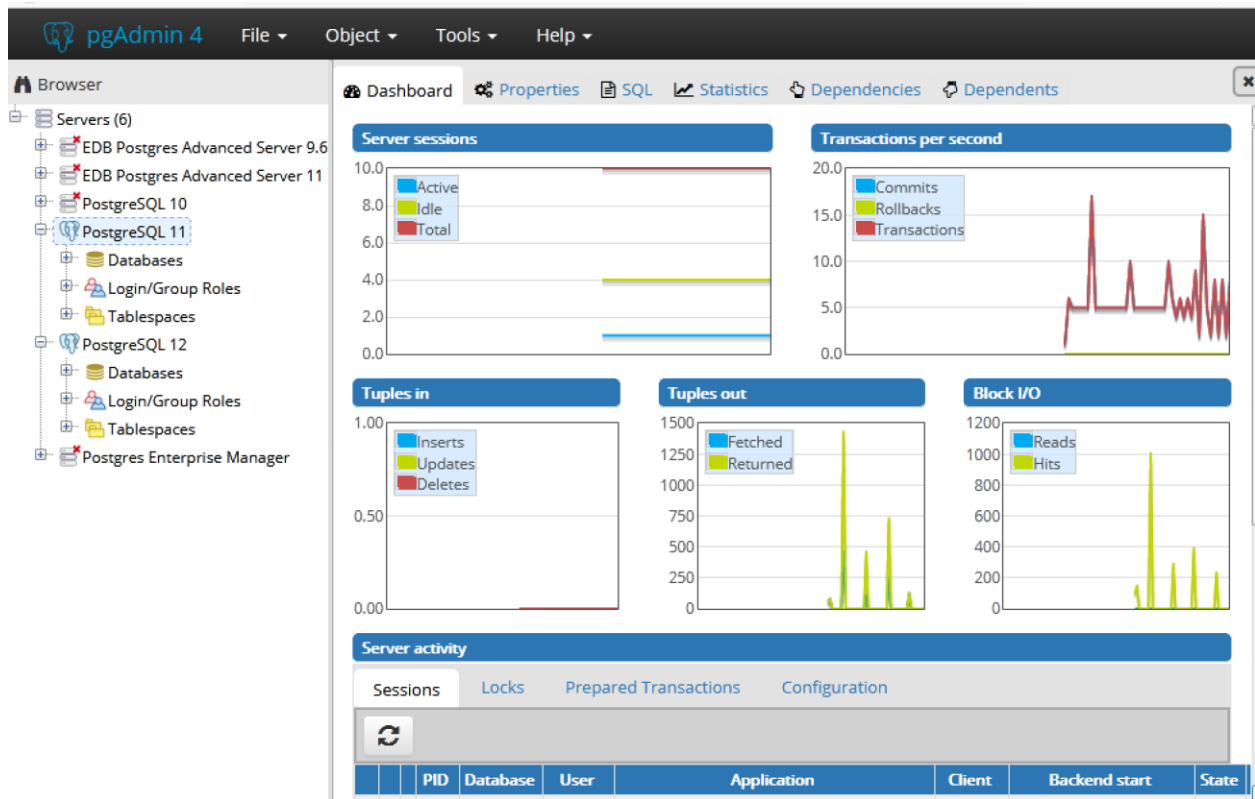
| Entities                                                                                               | Oracle  | PostgreSQL |
|--------------------------------------------------------------------------------------------------------|---------|------------|
| DATABASE LINKS, (a)synchronous transaction-log shipping, distributed transactions, distributed queries | Similar |            |
| Integration with SQL Server, Sybase, Hadoop, MongoDB, MySql                                            | Yes     | Yes - fdw  |

# Management

| Entities                              | Oracle     | PostgreSQL |
|---------------------------------------|------------|------------|
| Bulk loader                           | SQL*Loader | Copy       |
| Management                            | OEM        | pgAdmin    |
| Automatic memory & storage management | Yes        | No!!!!     |

!!!In the O/S we trust...

# pgAdmin Monitoring/debugging



# Toad Edge Monitoring

Actions View Window Help

Worksheet Execute

root@localhost  
Compare completed in 1.0s.

CI/CD Compare Object S

SQL

p0 film not in stock DeomCompare x

Group by: Object Type and Status Filter: type filter text

Generate Script for Target...  
Generate Script for Target to Clipboard  
Generate Script for Target to Worksheet

ys [root@localhost]  
Comparison finished

|                     | Important | Read                |
|---------------------|-----------|---------------------|
| actor               |           |                     |
| country             |           |                     |
| Only in source (15) |           |                     |
| Only in target (1)  |           |                     |
| Views (107)         |           | Comparison finished |
| Procedures (29)     |           | Comparison finished |
| Functions (25)      |           | Comparison finished |
| Triggers (8)        |           | Comparison finished |
| Different (0)       |           |                     |
| Only in source (6)  |           |                     |

Script Definition Change Script

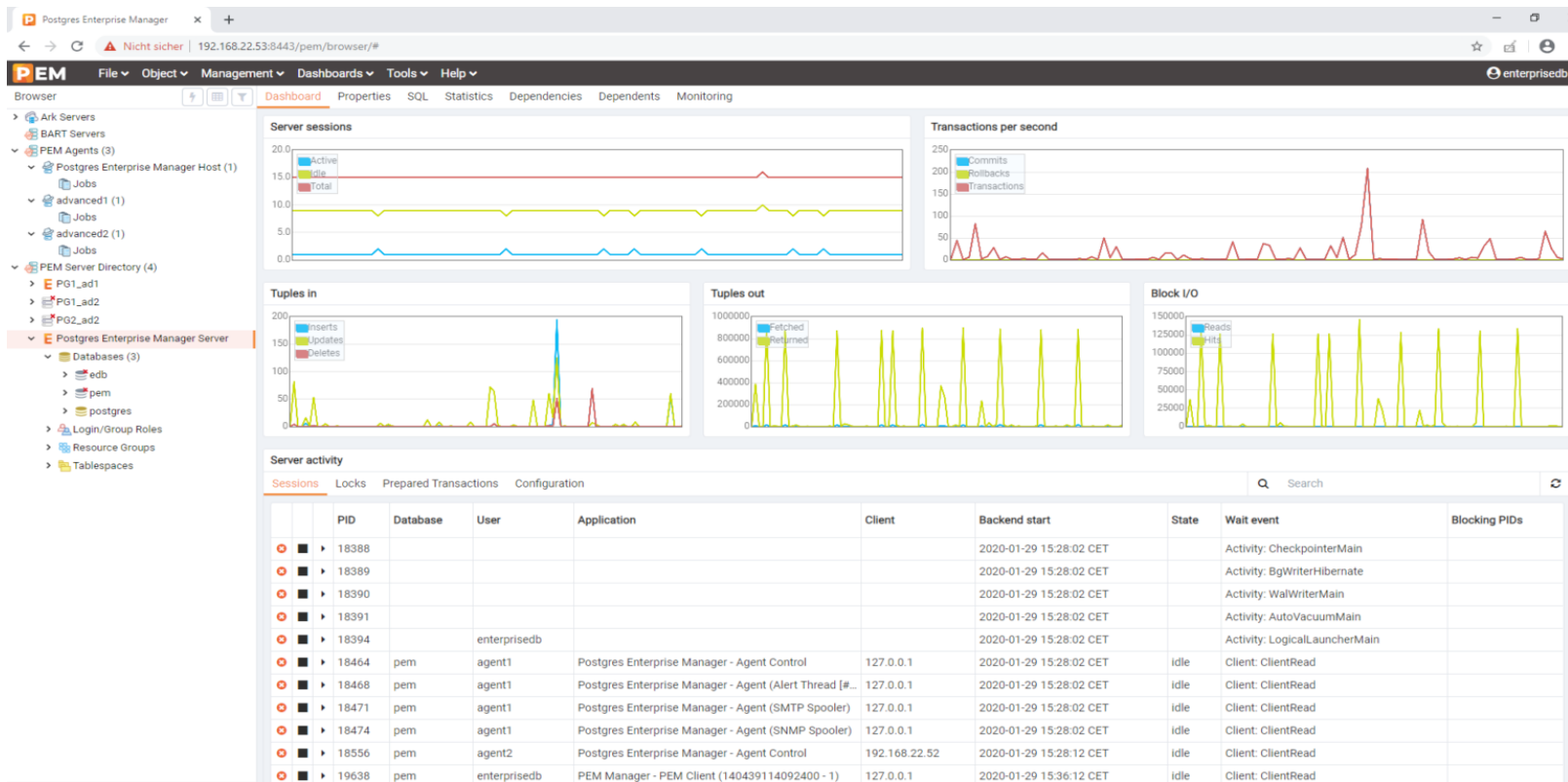
Source: sakila.actor (last modified: 09/08/2017 16:09:22)

```
1 CREATE TABLE actor
2 (
3   actor_id          smallint(5) UNSIGNED NOT NULL AUTO_INCREMENT,
4   first_name        varchar(45)
5                     CHARACTER SET utf8
6                     COLLATE utf8_general_ci
7                     NOT NULL,
8   last_name         varchar(45)
9                     CHARACTER SET utf8
10                    COLLATE utf8_general_ci
11                    NOT NULL,
12   last_update       timestamp(0)
13 )
```

Target: sys.actor (last modified: 01/24/2018 13:22:33)

```
1 CREATE TABLE actor
2 (
3   actor_id          smallint(5) UNSIGNED NO
4   first_name        varchar(50)
5                     CHARACTER SET utf8
6                     COLLATE utf8_general_ci
7                     NOT NULL,
8   last_name         varchar(100)
9                     CHARACTER SET utf8
10                    COLLATE utf8_general_ci
11                    NOT NULL,
12   last_update       timestamp(0)
13 )
```

# Postgres Enterprise Monitoring



# Some words on pricing

... is open source free

## Some words on pricing

- No audit police
- Independent of virtualization
- No vendor lock-in
- Lower cost (total cost of ownership)
- Do I really need support?      YES!!!



# Where do I start?

... are you ready

# It is too easy

My first thoughts:

- ❖ It's too easy maybe that's why it's Popular
- ❖ It's too easy to be Powerful
- ❖ It's really the database for the People

If other People can try it why not you?

# postgresql.org/docs

## Documentation

[View the manual](#)

## Manuals

You can view the manual for an older version or download a PDF of a manual from the below table.

| Online Version              | PDF Version                                       |
|-----------------------------|---------------------------------------------------|
| <b>13</b>                   | <b>A4 PDF</b> (12.7 MB) • <b>US PDF</b> (12.6 MB) |
| <b>12</b>                   | <b>A4 PDF</b> (12.4 MB) • <b>US PDF</b> (12.3 MB) |
| <b>11</b>                   | <b>A4 PDF</b> (12.1 MB) • <b>US PDF</b> (12.0 MB) |
| <b>10</b>                   | <b>A4 PDF</b> (11.8 MB) • <b>US PDF</b> (11.7 MB) |
| <b>9.6</b>                  | <b>A4 PDF</b> (6.5 MB) • <b>US PDF</b> (6.5 MB)   |
| <b>Development snapshot</b> | PDF version not available                         |

Looking for documentation for an older, unsupported, version? Check the **archive** of older manuals.

## Translated Manuals

- **Chinese**
- **French**
- **Japanese**
- **Russian**

# postgresql.org/download

## Downloads

### PostgreSQL Downloads

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PostgreSQL is available for download as ready-to-use packages or installers for various platforms, as well as a source code archive if you want to build it yourself.

### Packages and Installers

Select your operating system family:



Select your Linux distribution:



# Database setup

```
update /etc/yum.repos.d/CentOS-Base.repo  
add exclude=postgresql* to base and update sections
```

```
[root@riga-demo data]# yum install
```

```
https://download.postgresql.org/pub/repos/yum/9.6/redhat/rhel7-x86_64/pgdg-centos96-9.6-3.noarch.rpm
```

```
[root@riga-demo data]# yum install postgresql96-server
```

```
alter /etc/profile
```

```
export PATH=/usr/pgsql-9.6/bin/:$PATH
```

```
export PGDATA=/var/lib/pgsql/9.6/data
```

```
export PGDATABASE=postgres
```

```
export PGUSER=postgres
```

```
export PGPORT=5432
```

```
[root@riga-demo data]# /usr/pgsql-9.6/bin/pgsql96-setup initdb
```

30  
SECONDS

5  
SECONDS

15  
SECONDS

1  
MINUTE

30  
SECONDS

# Database setup

```
[root@riga-demo data]# systemctl enable postgresql-9.6.service
```

```
[root@riga-demo data]# systemctl start postgresql-9.6.service
```

```
[root@riga-demo data]# su - postgres
```

```
-bash-4.2$ psql
```

```
postgres-# \l
```

| List of databases |          |          |             |             |                       |
|-------------------|----------|----------|-------------|-------------|-----------------------|
| Name              | Owner    | Encoding | Collate     | Ctype       | Access privileges     |
| postgres          | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 |                       |
| template0         | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 | =c/postgres +         |
|                   |          |          |             |             | postgres=Ctc/postgres |
| template1         | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 | =c/postgres +         |
|                   |          |          |             |             | postgres=Ctc/postgres |

```
(3 rows)
```

**It is too easy**

Installed and running in minutes!!

# Deployment of your choice

- ✓ Bare metal (Windows, RHEL, CentOS, Ubuntu, Debian, PowerLinux)
- ✓ Virtualized deployments
- ✓ Container deployments
- ✓ Public cloud deployments





# Conclusion

... the open source alternative

# Conclusion

- Oracle has a solid place in the database ecosystem
- PostgreSQL has a solid place in the database ecosystem
- You need to love extensions and add-ons
- What's your use case?
- The comparison shows it can be a true alternative for specific workloads

# Interesting Blogs

## **How to Choose Which Database to Use**

<https://www.enterprisedb.com/blog/how-choose-which-database-use>

## **Comparing Oracle with EDB Postgres**

<https://www.enterprisedb.com/blog/comparing-oracle-edb-postgres>

## **How to import data from Oracle into PostgreSQL**

<https://www.enterprisedb.com/postgres-tutorials/how-import-data-oracle-postgresql>

## **4 Reasons PostgreSQL was Named Database Management System of the Year 2020**

<https://www.enterprisedb.com/blog/4-reasons-postgresql-was-named-database-management-system-year-2020>

**Are you ready to use PostgreSQL today?**

... now that you see how easy it can be

# Thank You