

Comparing PostgreSQL to Oracle



The Best kept secrets to success

Agenda

- Introduction
- Comparing Technologies
- Eliminate the Confusion
- Some words on pricing
- Getting Started
- Questions / Conclusion

TimSteward #oracleguy #postgresguy #salesengineer

- 1991 Michael Jordan Defeated Detroit Pistons and went on to win the NBA Championship
- I defeated SQL programming and became an Oracle DBA
- Opponents: 12c,11g,10g,9i,8i,7.x,6.x,5.x,3.x
- Opponents: EBS 10.6,10.7nca,R11,R12
- Opponents: Forms 3, 6, 9
- Opponents: Sybase, Sql Server, Mysql, SAP Basis, Netsuite, Postgresql
- 2016 Kevin Durant joined the Golden State Warriors to create the super team
- I joined EDB to create the super team

I installed from these methods!!



WHO IS EDB?

The world leader in open-source based Postgres software and services.

- **Founded in 2004**
- **Recognized RDBMS leader by:**
 - Gartner
 - Forrester
- **Customer base > 4,000**
- **300+ employees**
- **Offices worldwide**
- **Largest PostgreSQL community leader**



WORLDWIDE PRESENCE

OVER 4,000 CUSTOMERS

Our customers benefit from the most reliable, high-performing, flexible, open, and cost-effective data management platform available.

U.S. Customers



EMEA Customers



APAC Customers



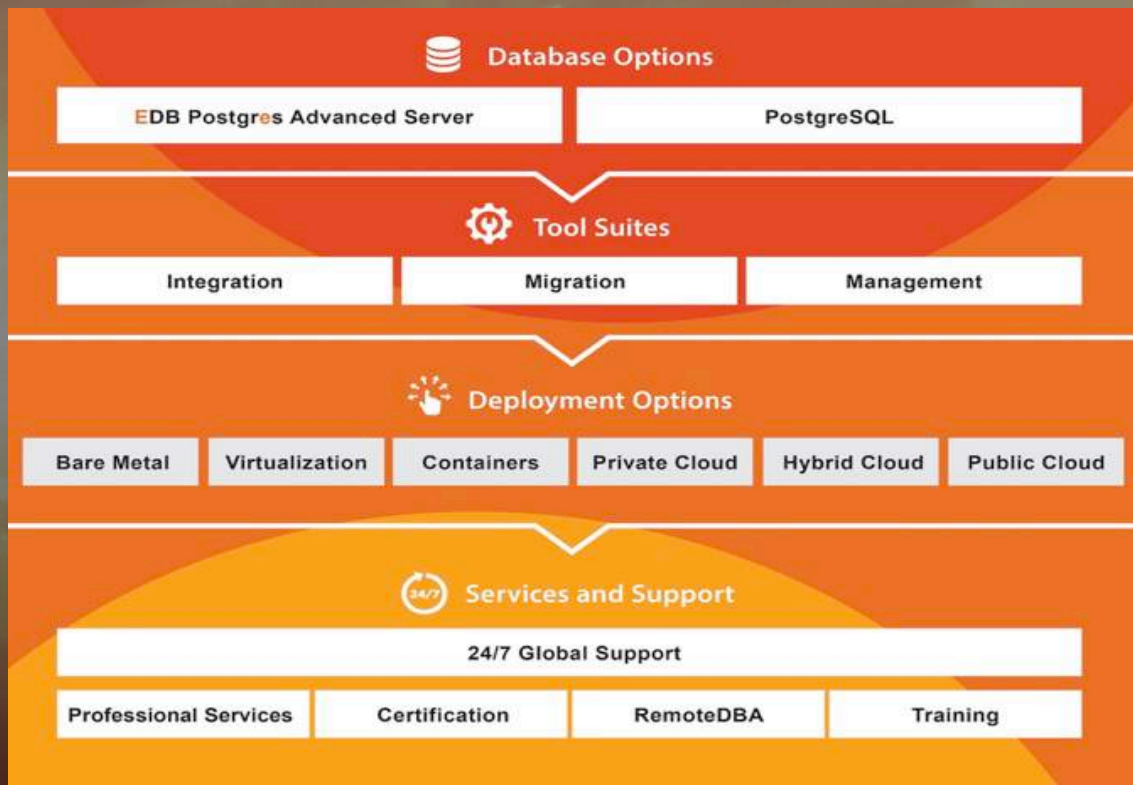
88

of the Fortune 500

241

of the Forbes
Global 2000

EDB Postgres Platform



EDB POSTGRES

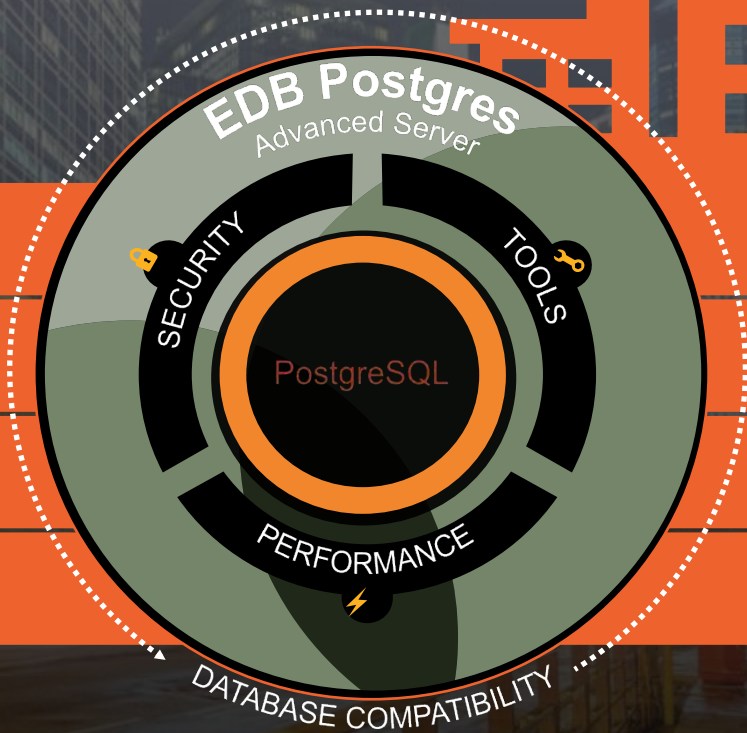
Advanced Server

Security

Tools

Performance

Compatibility



EDB OPEN SOURCE GURUS

Named EDB open source committers and contributors

CORE TEAM



Bruce Momjian



Dave Page

MAJOR CONTRIBUTORS



Andres Freund



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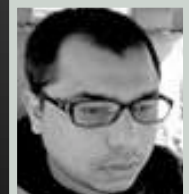
Dilip Kumar



Jeevan Ladhe



Mithun Cy



M. Usama



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Thom Brown

Disclaimer

When I say Oracle
I mean **Oracle Enterprise Edition + options**

When I say PostgreSQL
I mean **EnterpriseDB Advanced Server**

Comparing Technologies

Besides some differences
there are
a lot of similarities

Application Development

Tables and Partitioning

Deployment Options

Indexes

SQL Extensions

Integration

Security

Management



General / Capabilities

Capacities

Incompatibilities

Terminology

Data Types

SQL Capabilities

Big / Unstructured Data

High Availability

Performance / Scalability

General / Capabilities

- ◆ Both based on IBM research for System R.
https://en.wikipedia.org/wiki/IBM_System_R
- ◆ Both are (+) relational databases
- ◆ ACID compliant and MVCC or transactional consistency
- ◆ Full transaction logging (REDO vs. WAL)
- ◆ 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 & Partitions

Entities	Oracle	PostgreSQL
Temporary tables, (materialized) views, constraints	Same	
Partitioning: range, hash, list, sub-partitioning & IOT	Similar	
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, LONG	+ CHARACTER, TEXT, CHAR VARYING, CHARACTER VARYING, VARCHAR
Binary	BLOB, RAW, LONG RAW , BFILE	+ BYTEA -/- BFILE

Data Types cont...

Max	Oracle	PostgreSQL
Date / Time	Yes	
Row id	Yes	
XMLType	Yes	
JSON	is_json check constraint	<i>native JSON & JSONB with 58 operators, functions & relational converters</i>
Spatial	Yes	

Indexes

Entities	Oracle	PostgreSQL
B-Tree, hash, expressions, partial, full text search, spatial	Same	
Reverse, bitmap, block range	Similar <i>Block range = Smart Scan</i>	
K-nearest-neighbor	With options	Native
GIST, GIN <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	

Eliminate the confusion

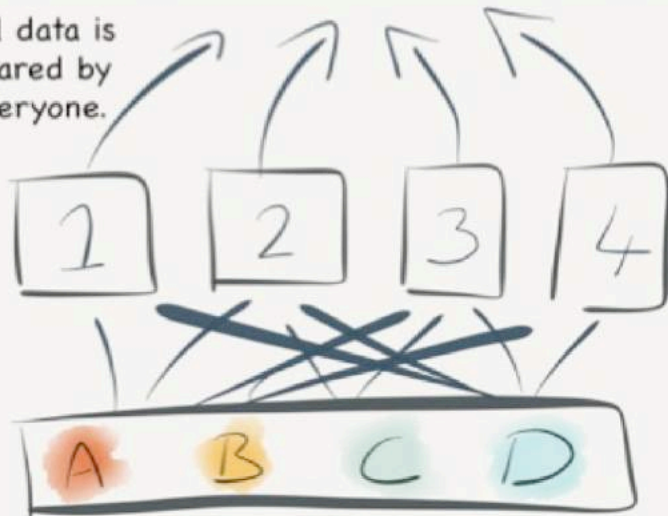
Closed vs Open

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

RAC vs MMR

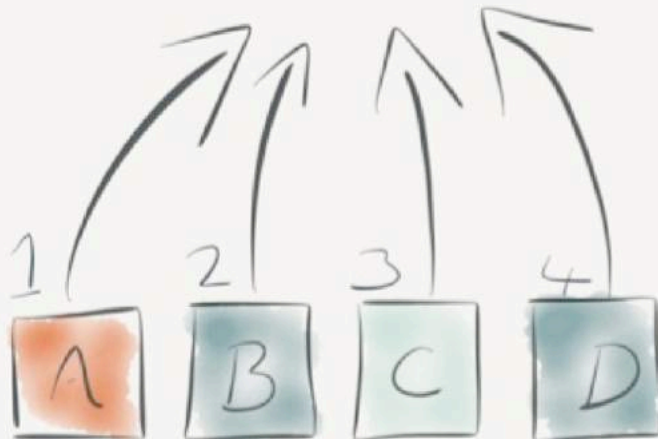
Shared Disk

All data is shared by everyone.



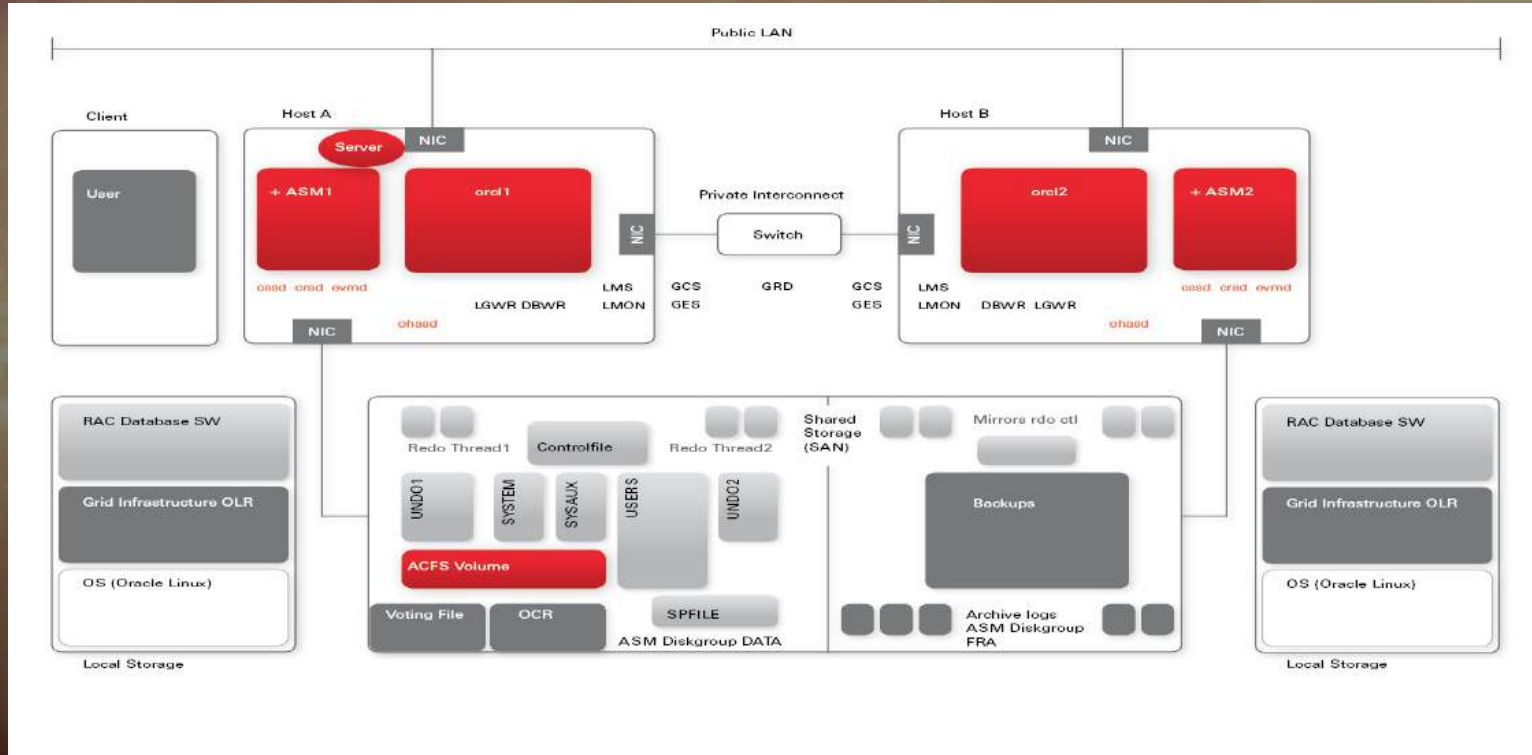
Shared Nothing

Each node has autonomy over a subset of the data

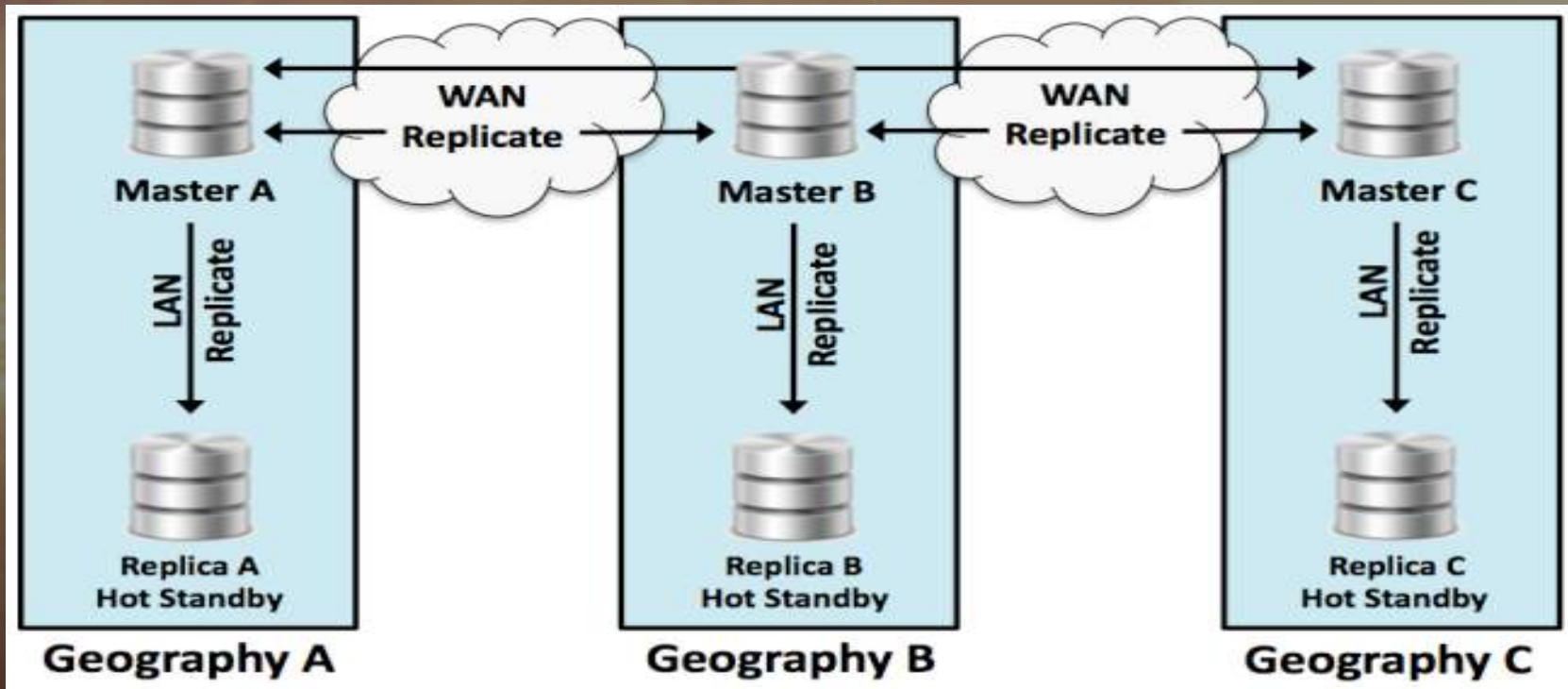


!!!

Real Application Cluster



Multi Master Replication



Include pgpool II

Courtesy: ULX Hungary



Connection Confusion:

- Oracle has a listener
- Postgres has a postmaster
- Oracle defaults 1521
- Postgres defaults 5432, 5444
- Oracle sqlnet.ora
- Postgres pg_hba.conf

Log Confusion:

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

Tuning/Configuration/Memory Confusion:

- Oracle has init.ora
- Postgres has postgresql.conf
- Oracle db_cache_size
- Postgres shared_buffers
- Oracle log_buffer_size
- Postgres wal_buffers

Permission Confusion:

- 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

Additional Monitoring Tools

PGadmin4 - default gui monitoring

DBA Scripts : (pg_stat_statements, pg_stat_activity, pg_locks, pg_roles, pg_tables...)

DBMS_ALERT

DBMS_AQ

DBMS_AQADM

DBMS_CRYPTO

DBMS_JOB

DBMS_LOB

DBMS_LOCK

DBMS_MVIEW

DBMS_OUTPUT

DBMS_PIPE

DBMS_PROFILE
R

DBMS_RANDOM

DBMS_RLS

DBMS_SESSION

DBMS_SCHEDUL
ER

DBMS_SQL

DBMS_UTILITY

UTL_ENCODE

UTL_FILE

UTL_HTTP

UTL_MAIL

UTL_SMTP

UTL_URL

UTL_RAW

Toad Edge

Actions View Window Help

Worksheet Execute

root@localhost

Compare completed in 1.0s.

CI/CD Compare Object S

SQL

sakila [root@localhost]

Tables (18)

Different (2)

actor

country

Only in source (15)

Only in target (1)

Views (107)

Procedures (29)

Functions (25)

Triggers (8)

Different (0)

Only in source (6)

Group by: Object Type and Status

Filter: type filter text

ys [root@localhost]

Comparison finished

Important

Read

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   last_name     varchar(45),
6   last_update   timestamp(0)
```

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

```
1 CREATE TABLE actor
2 (
3   actor_id      smallint(5) UNSIGNED NOT NULL AUTO_INCREMENT,
4   first_name    varchar(50),
5   last_name     varchar(100),
6   last_update   timestamp(0)
```

Where is the UNDO?

Undo is kept inside datafiles

In postgresql this undo creates BLOAT

BLOAT needs to be VACUUMED

- Bloat leads to bad performance aka Transaction Wraparound.

High Availability

Entities	Oracle	PostgreSQL
PITR <i>Point In Time Recovery</i>	Similar	
Backup and recovery tools	RMAN	BART
Standby database	(Active) Data Guard	Streaming replication/ EFM
Flashback <i>Query, Table, Database</i>	Yes	No

Performance & Scalability

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

Security

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

Security cont...

Entities	Oracle	PostgreSQL
Password Verification		Similar
Roles/Profile limits		Similar
Password Complexity		Similar

Ease of Application Development

Entities	Oracle	PostgreSQL
PLSQL	Yes	Compatible
Additional programming language support	Java, C, C++	PL/pgSQL, PL/Java, C, C++, PL/Perl, Python, PLTcl, PL/R

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, varrays, hierachical queries, praga restrict_reference & except_init, user defined exceptions, object types, sub types, SYNONYMS , sequences, invoker rights, statement level rollback, AUTONOMOUS TRANSACTIONS		Similar

BIG DATA – Unstructured data

Entities	Oracle	PostgreSQL
Spatial	Good	Better
Key value store & full text search	Similar	
XML Storage, Compression	Yes	No!!!!
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	
Session based synchronous replication	No	Yes
Integration with SQL Server, Sybase, Hadoop, MongoDB, MySql	Yes	Yes, FDW

Management

Entities	Oracle	PostgreSQL
Bulk loader	SQL*Loader	EDB*Loader
Management	OEM	PEM
PITR, Diagnostic & Tuning pack, Sql Profiler, Online reorganization	Similar	
Automatic memory & storage management	Yes	No!!!!

!!!!In the OS we trust...

Database Setup

- `update /etc/yum.repos.d/CentOS-Base.repo`
`add exclude=postgresql* to base and update sections` 30 seconds
- `[root@riga-demo data]# yum install`
`https://download.postgresql.org/pub/repos/yum/9.6/redhat/rhel-7-x86_64/pgdg-centos96-9.6-3.noarch.rpm` 5 seconds
- `[root@riga-demo data]# yum install postgresql96-server` 15 seconds
- `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` 1 minute
- `[root@riga-demo data]# /usr/pgsql-9.6/bin/postgresql96-setup initdb` 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)

Is it really that easy

Installed and running in minutes!!

Where can I deploy?

EDB Postgres – Same Postgres Everywhere

- Bare metal (Windows, RHEL, CentOS, Linux on Power, SLES, Debian)
- Virtualized deployments (VM Ware)
- Container deployments (OpenShift, Kubernetes)
- Public cloud deployments (AWS, Azure, Alibaba)

Some words on pricing

- No Audit Police
- All inclusive – all options/tools
- Per core – subscription based (enterprise, standard, developer options)
- Independent of virtualization
- No vendor lock-in

Where do I get started?

- EDB Postgres server & tools from <https://www.enterprisedb.com/software-downloads-postgres>
- Documentation on <https://www.enterprisedb.com/resources/product-documentation>
- Advanced Setup scripts on <https://community.postgresrocks.net/t5/EDB-Guides/bg-p/edbguides>

Sample Postgres Customer Performance Stats

Global mobile ad network

- ✧ Largest database is 14TB
- ✧ 1.2 billion transactions a day, 55K transaction per second
- ✧ 400 concurrent users
- ✧ Analyzes 240TB of data per day

Online Brokerage Firm

- ✧ 1 billion writes a day
- ✧ 3,000 transactions per second
- ✧ 800 concurrent users

Global stock trade underwriter

- ✧ Largest database is 8 TB
- ✧ 6 to 10 million transactions per day

Global consumer financial services provider

- ✧ Example application database is 2 TB
- ✧ 200K SELECT statements per second
- ✧ 25K WRITE transactions per second

Conclusion

- Oracle has a solid place in the database ecosystem
- PostgreSQL has a solid place in the database ecosystem
- What's your use case ? Lowering cost, Vendor Lock In, Audit Police
- The Comparison show it can be a true alternative in most cases
- EDB Can help guide you to success - Let's Talk!!!

QUESTIONS

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THANK YOU