Postgres in a world of DevOps

MOVE FAST, OR …

MARC LINSTER
SVP, PRODUCT DEVELOPMENT AND SUPPORT

As every company becomes a software company, DevOps is the new lean manufacturing.

PaaS

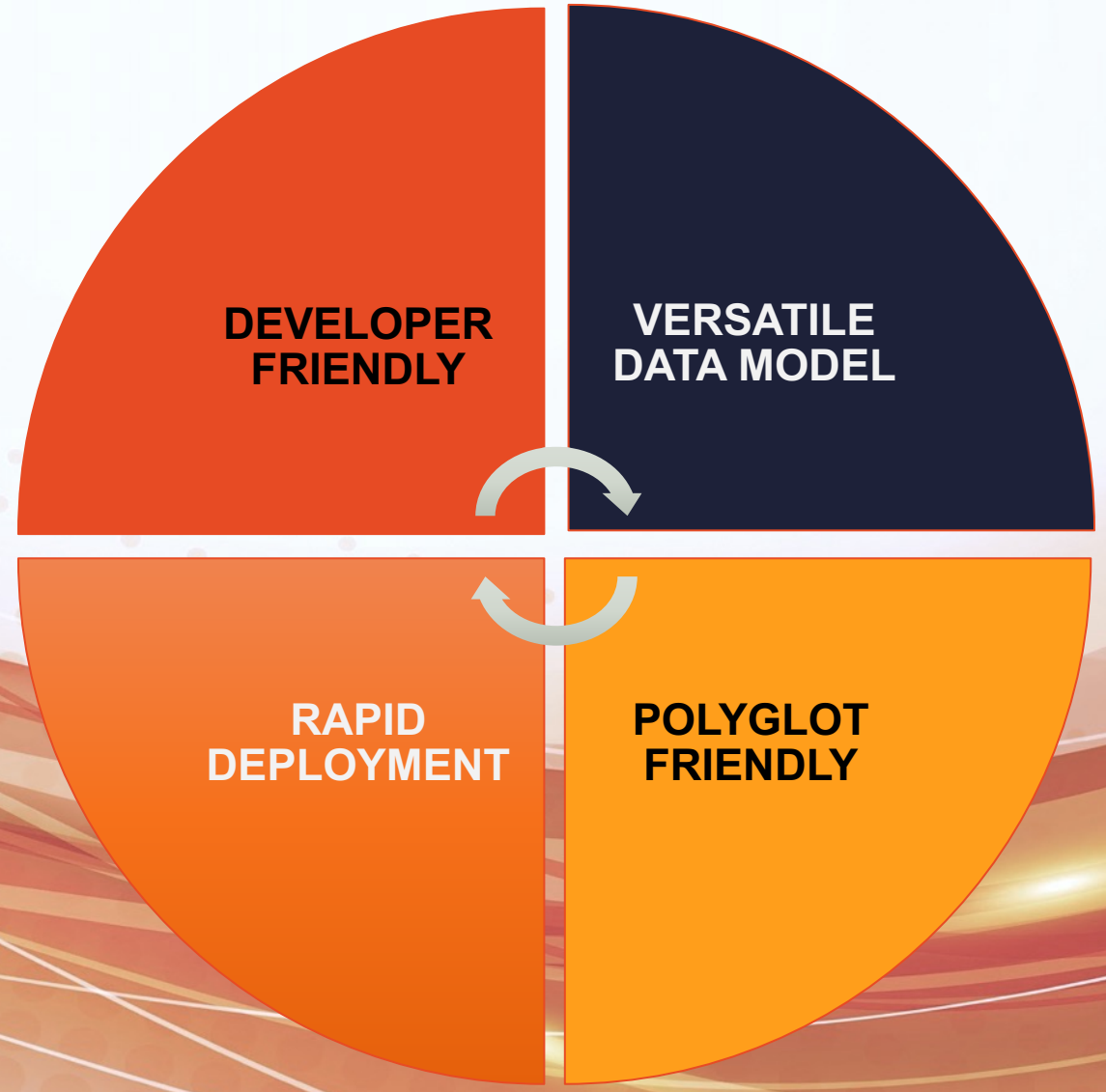
CICD

Microservices

Containers

EDB POSTGRES

What does it mean for the database?



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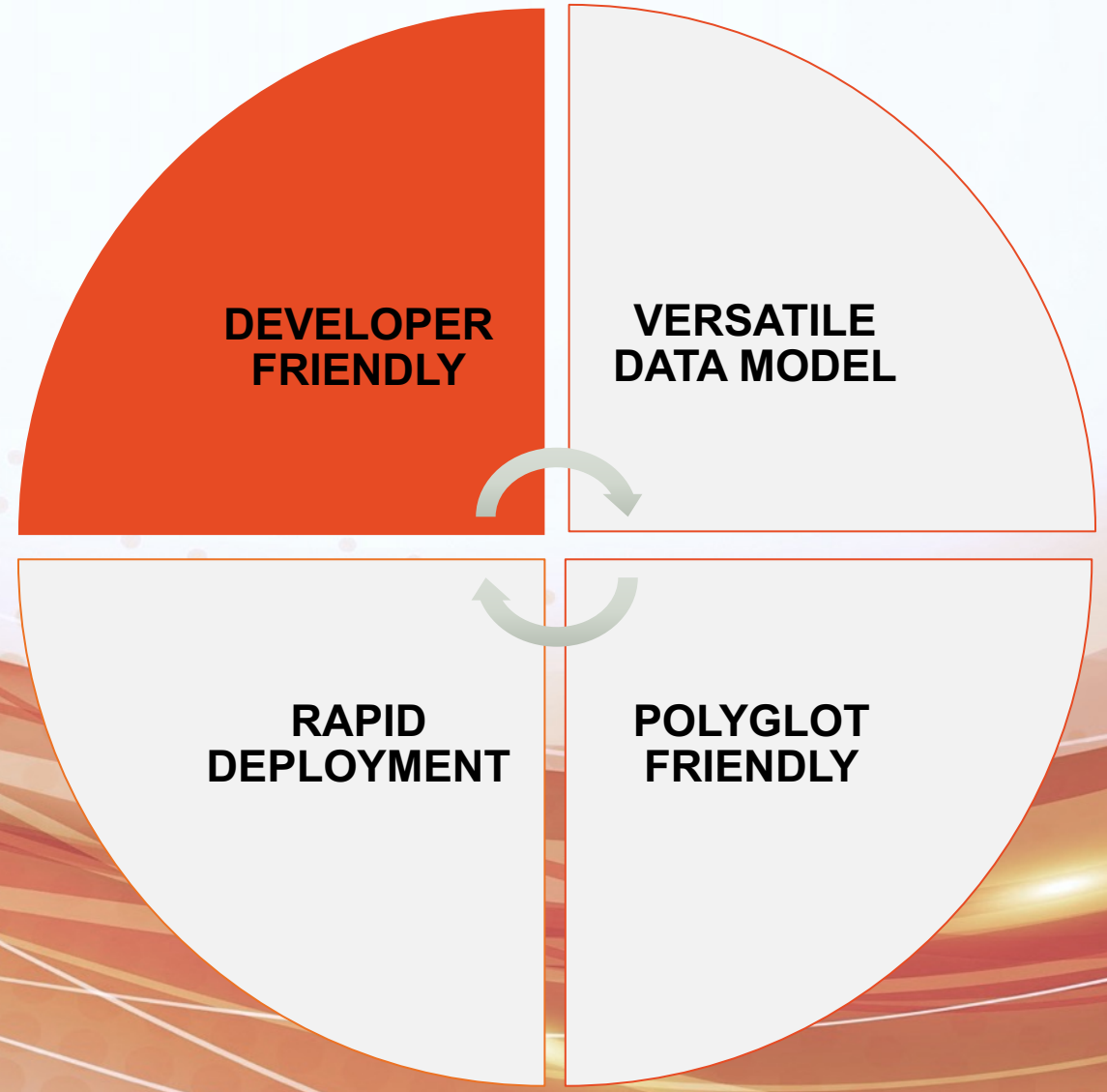

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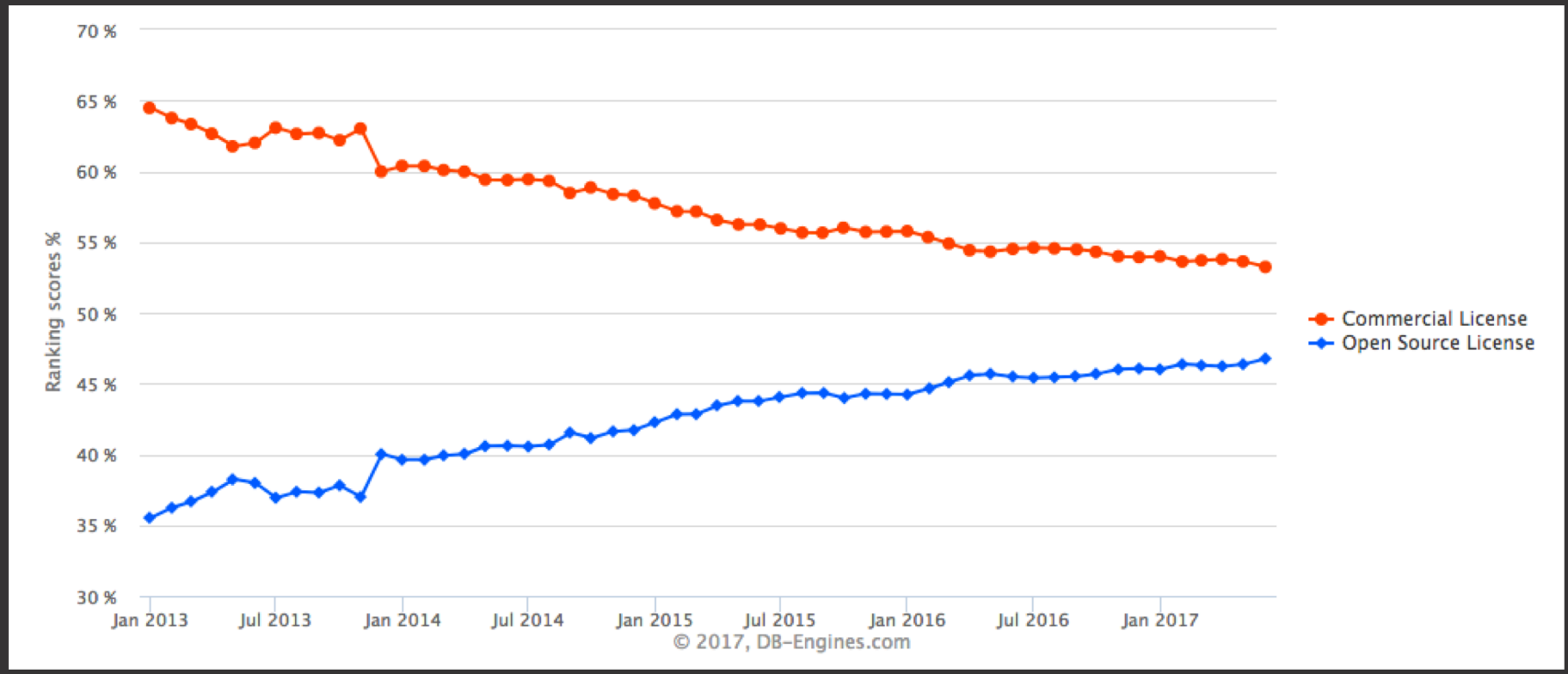
Popularity trend driven by cost and flexibility



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MOST USED

Databases

% of This Category | % of All Respondents | % of Professional Developers

MySQL	43.9%
SQL Server	34.1%
PostgreSQL	23.3%
SQLite	21.6%
MongoDB	18.5%
Oracle	14.0%
Redis	13.6%
Cassandra	2.9%

stackoverflow

27,612 responses; select all that apply. Shown as a percentage of the respondents who chose at least one language, framework, database, or platform.

MOST LOVED

Most Loved, Dreaded, and Wanted Databases

Loved | Dreaded | Wanted

stackoverflow

Redis	64.8%
PostgreSQL	60.8%
MongoDB	55.0%
SQL Server	54.2%
Cassandra	49.9%
MySQL	49.6%
SQLite	47.2%
Oracle	36.9%

% of developers who are developing with the language or technology and have expressed interest in continuing to develop with it

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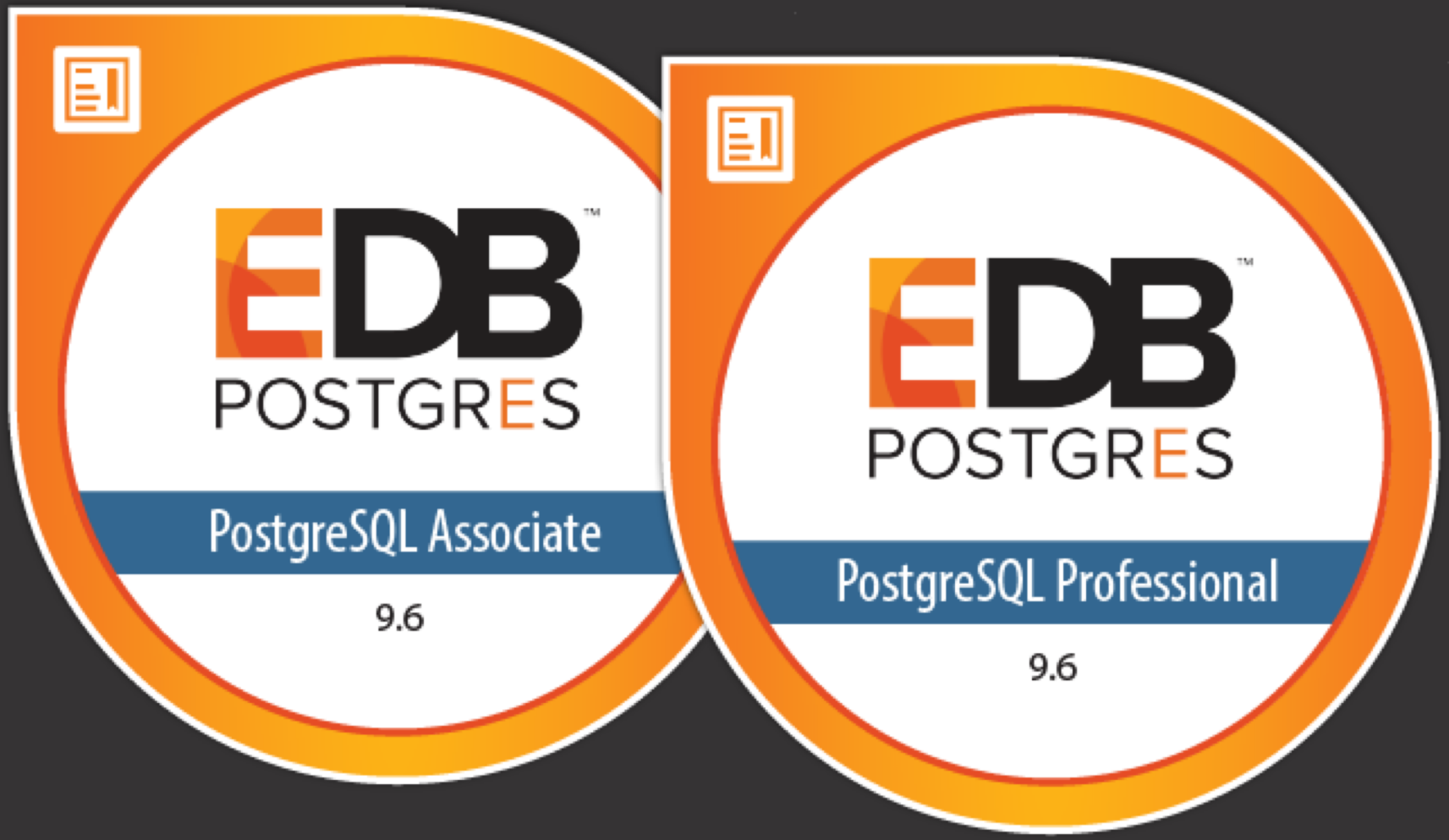
Industry recognition of skill proficiency



Postgres Certification

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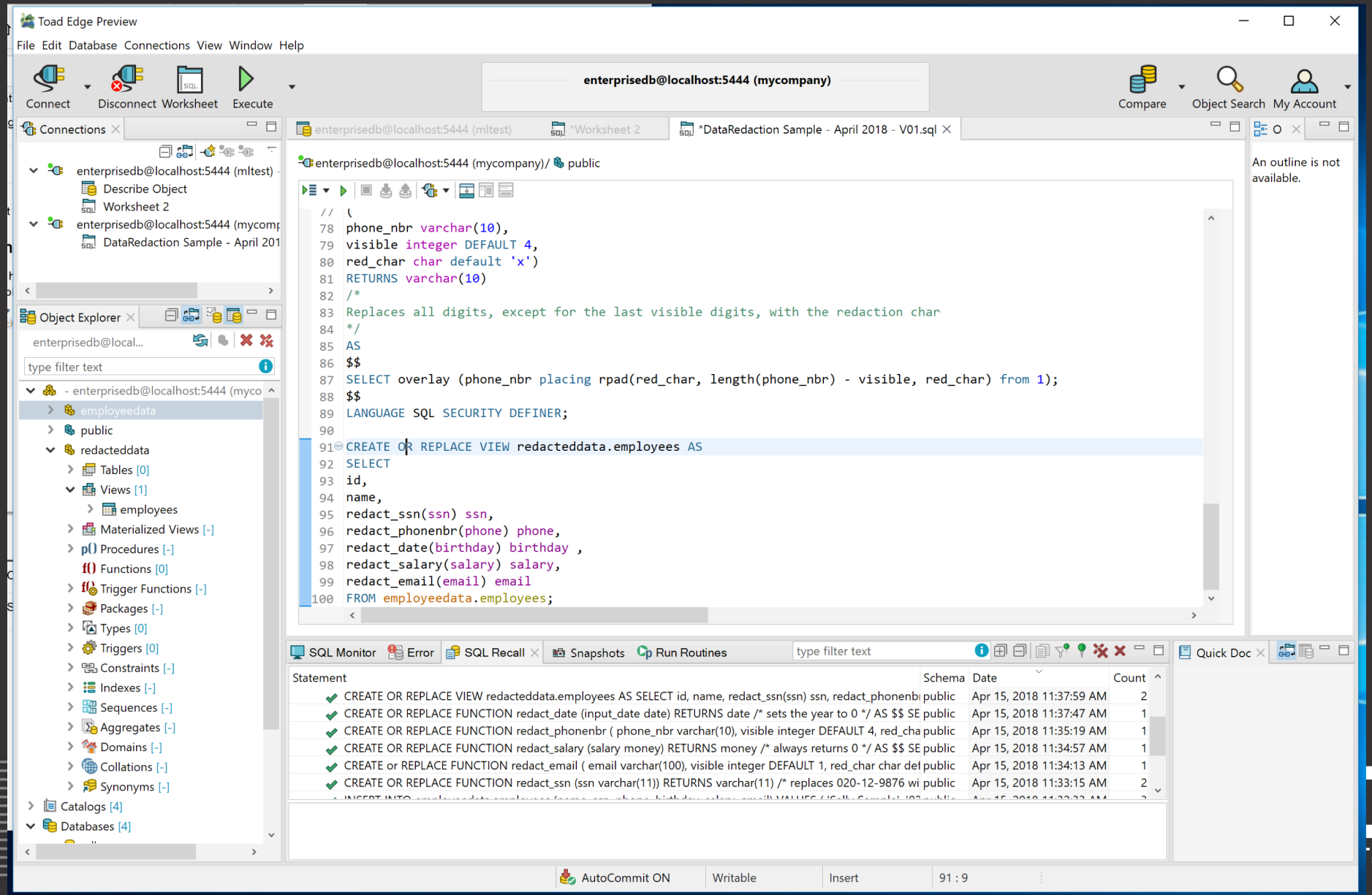
Major DB Developer Tooling



DATABASE WORLD IS CHANGING

PAST		PRESENT
“the corporate standard”	→	Many new databases
Company data centers	→	The cloud
Waterfall	→	Agile
IT provisioning	→	Self-service provisioning
Develop –then- operate	→	DevOps
Manual tasks	→	Automation
Routine tasks	→	Hard problems
Database expert	→	Data Expert

DBA and Developer are no longer living in separate worlds

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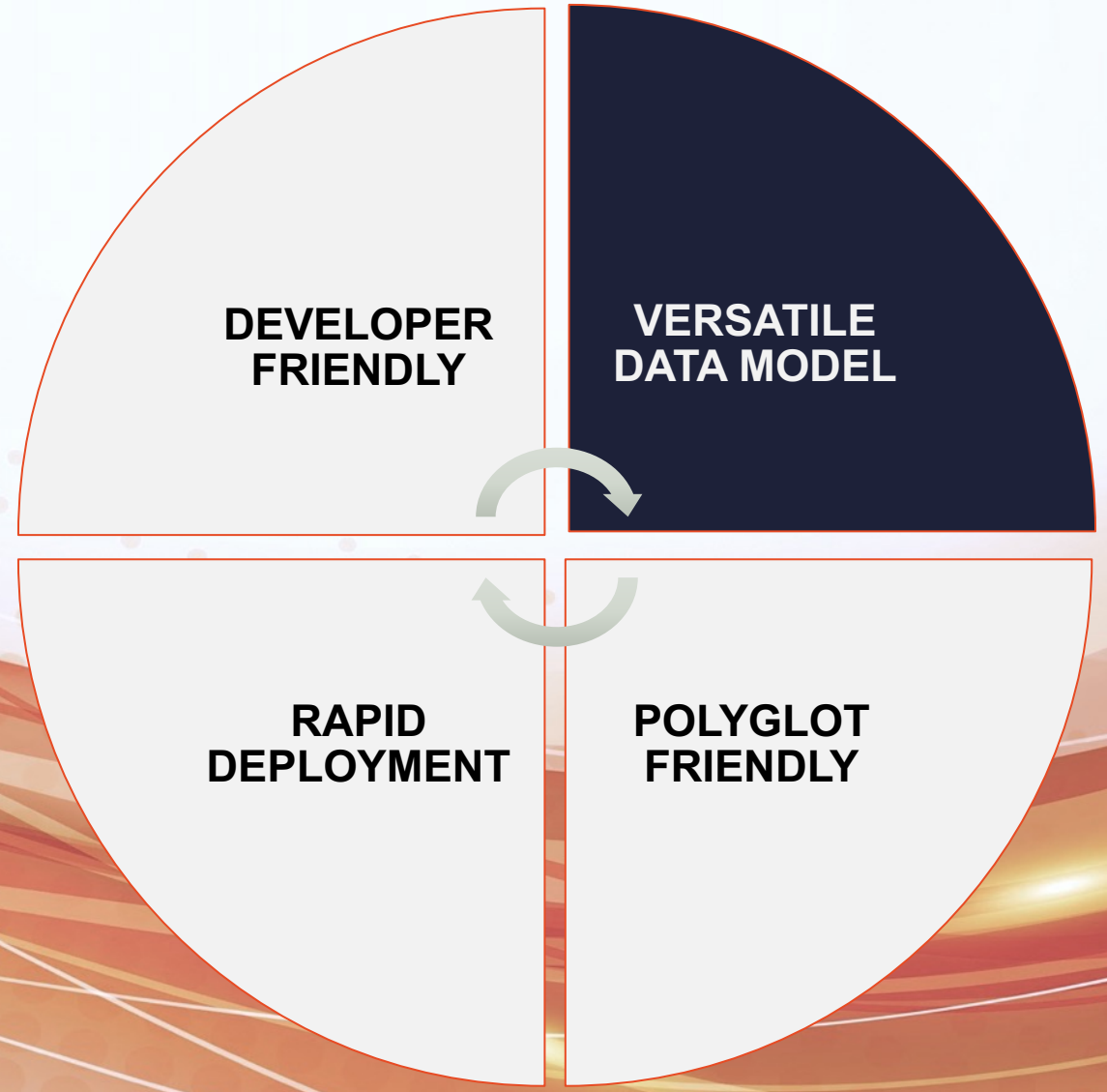

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Postgres: The most versatile DBMS

Runs on all platforms

Speaks every language

Not only SQL

Scales in both directions

JSON Data Types

1. Number:
   - Signed decimal number that may contain a fractional part and may use exponential notation.
   - No distinction between integer and floating-point
2. String
   - A sequence of zero or more Unicode characters.
   - Strings are delimited with double-quotation mark
   - Supports a backslash escaping syntax.
3. Boolean
   - Either of the values true or false.
4. Array
   - An ordered list of zero or more values,
   - Each values may be of any type.
   - Arrays use square bracket notation with elements being comma-separated.
5. Object
   - An unordered associative array (name/value pairs).
   - Objects are delimited with curly brackets
   - Commas to separate each pair
   - Each pair the colon ':' character separates the key or name from its value.
   - All keys must be strings and should be distinct from each other within that object.
6. null
   - An empty value, using the word null

JSON is defined per RFC – 7159
For more detail please refer
http://tools.ietf.org/html/rfc7159

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JSON Data Type Example

```
{
  "firstName": "John",              -- String Type
  "lastName": "Smith",              -- String Type
  "isAlive": true,                  -- Boolean Type
  "age": 25,                        -- Number Type
  "height_cm": 167.6,               -- Number Type
  "address": {                      -- Object Type
    "streetAddress": "21 2nd Street”,
    "city": "New York”,
    "state": "NY”,
    "postalCode": "10021-3100”
  }
  "phoneNumbers": [          -- Object Array
    {                        --  Object
      "type": "home”,
      "number": "212 555-1234”
    },
    {
      "type": "office”,
      "number": "646 555-4567”
    }
  ],
  "children": [],
  "spouse": null             -- Null
}
```

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Why choose between NoSQL and Relational?

ANSI SQL

JSON

```
SELECT DISTINCT
    product_type,
    data->>'brand' as Brand,
    data->>'available' as Availability
FROM json_data
JOIN products
ON (products.product_type=json_data.data->>'name')
WHERE json_data.data->>'available'=true;
```

```
 product_type    | brand    | availability
-----------------------+----------+--------------
 AC3 Phone       | ACME  | true
```

No need for programmatic logic to combine SQL and NoSQL in the application.

Postgres does it all.

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START SCHEMALESS

- Leverage structure as it emerges
- Support agile, iterative development
- Create data models where they provide value

LEVERAGE JSONB

- Leverage JSONB for rapidly changing data models
  - Example: address data records
    - Conventional columns: First Name, Last Name
    - JSONB: Contact Information
    - Phone numbers (home, cell, car, weekend, boyfriend…)
    - Email (work, private, spam …)

AVOID PENALTY

- Avoid the DDL penalty for adding columns

Why not just SQL?

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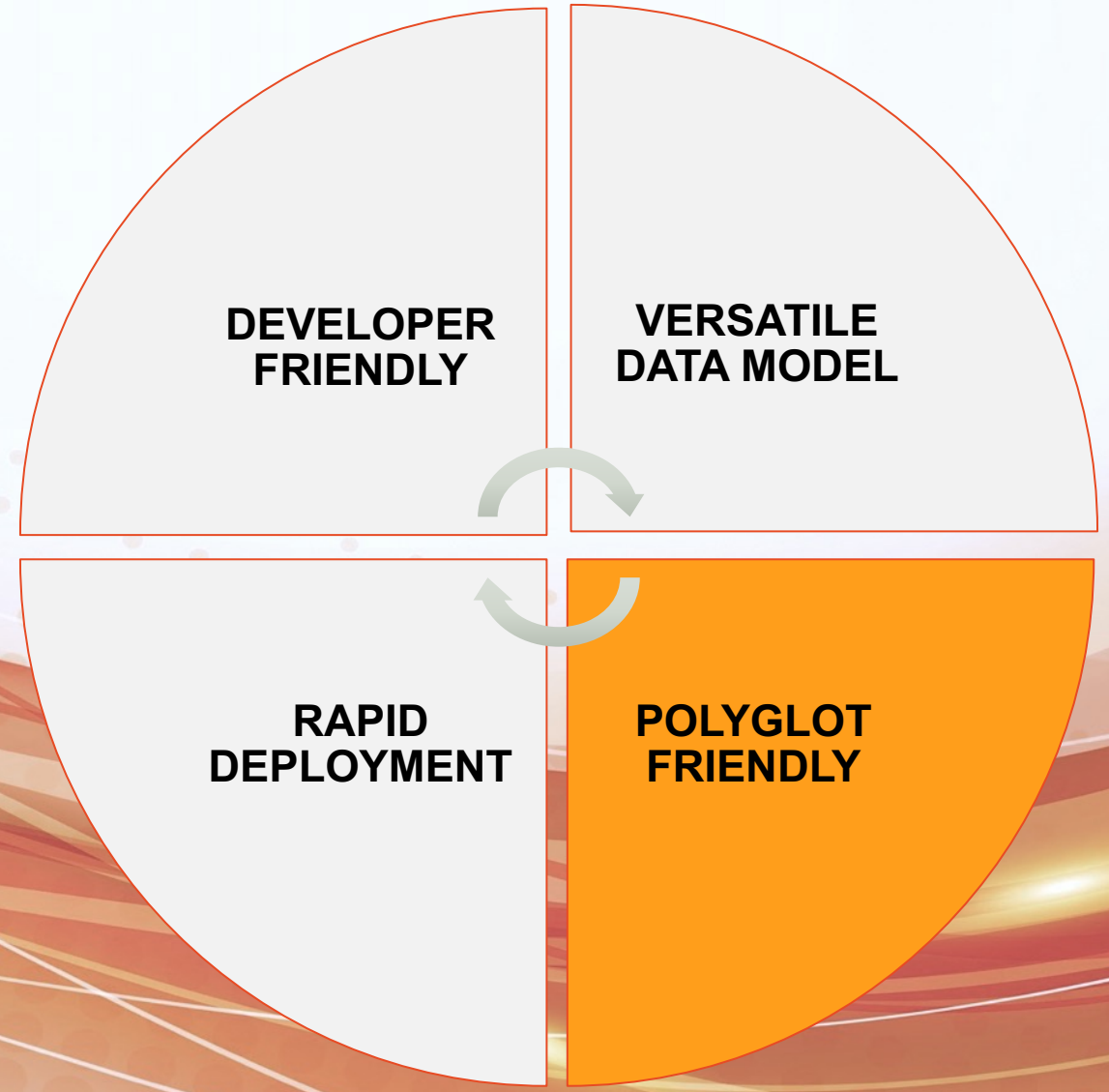

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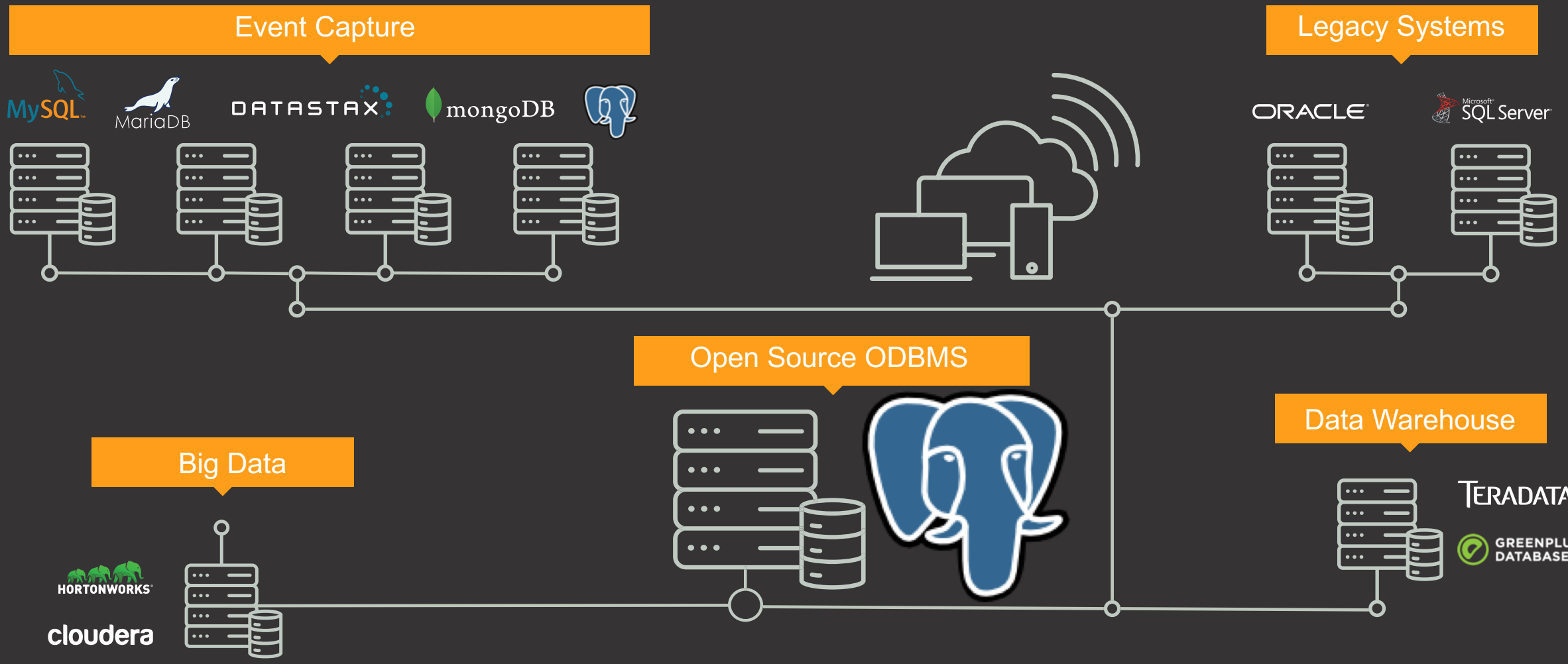
Postgres in the Polyglot Ecosystem



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FDW IMPLEMENTS SQL/MED ("SQL MANAGEMENT OF EXTERNAL DATA")

PostgreSQL 9.1 - read-only support

PostgreSQL 9.3 – read/write support

PostgreSQL 9.6 – pushdown joins, sorts, UPDATE, DELETE

PostgreSQL 10 - aggregate pushdown

FDW: *Makes data on other servers (or services) look like tables in Postgres. Available for many data sources (MongoDB, MySQL, HDFS, Spark, …)*

Foreign Data Wrappers – Making Polyglot Happen

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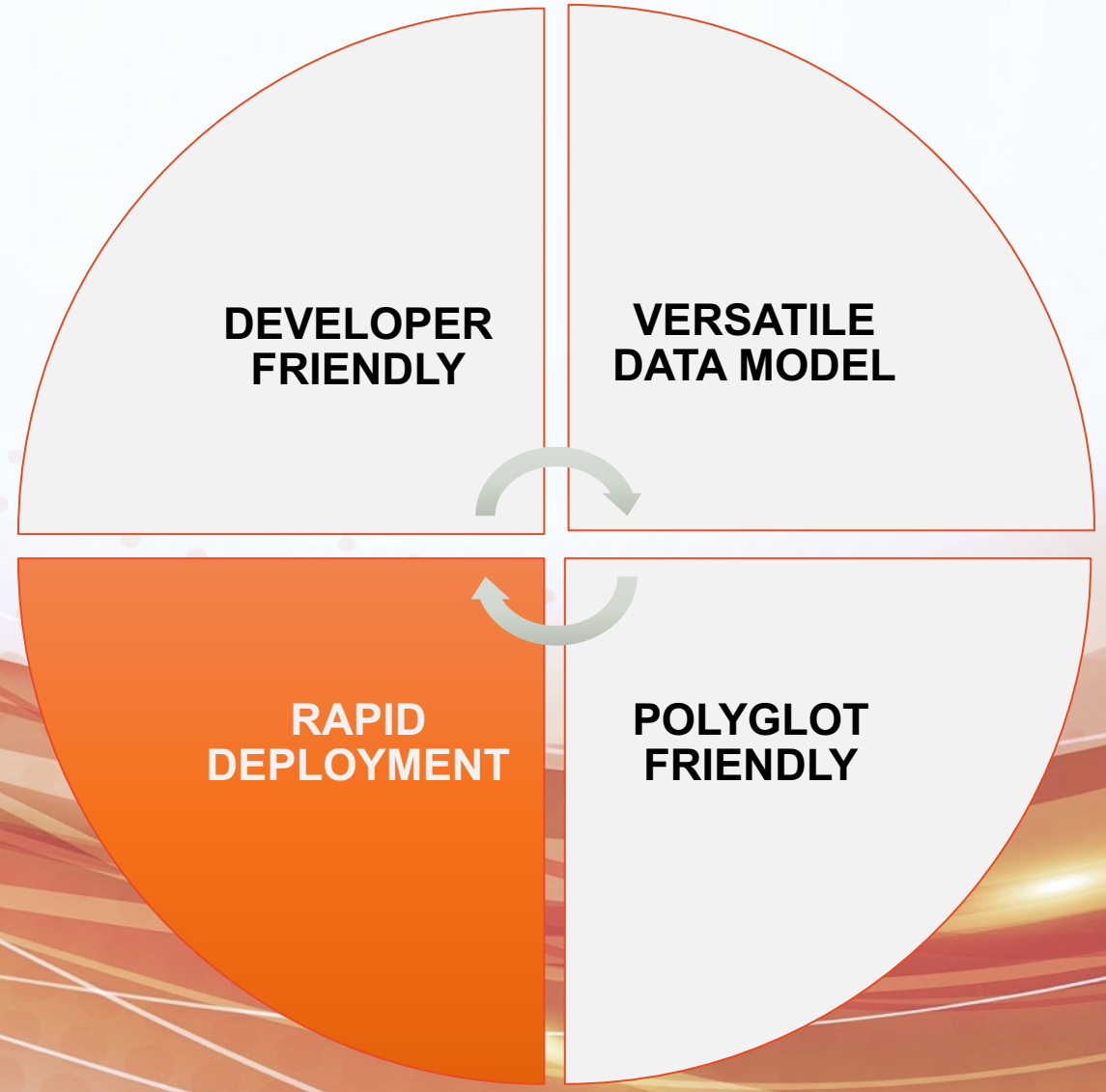
What does it mean for the database?



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CLOUD

- Public (AWS, Google, Azure, Alibaba Cloud, …)
- Private (OpenStack, VCloud, Puppet/Chef on Virtualization, Pivotal Cloud Foundry, Container/Kubernetes/ OpenShift)

DBaaS

- Stop deploying databases
  - Deploy clusters w. HA, DR, self healing, scaling, etc.
  - provide services, not databases

Micro Services

- Large monolithic databases refactored into transaction sets
- Applications get refactored into micro-services
- Deployment models move from VM/Bare Metal to DBaaS and Containers

Rapid Deployment

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SUPPORTING DevOps WITH DBaaS

Address the tension between developers and operations

DEVELOPERS WANT | Agility | Speed to deploy | Flow through tool chain

OPERATIONS WANTS | Visibility | Control – *budgeted resources – cost –data models* | Efficient use of resources

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Micro Services and Containers

MAJOR TRENDS

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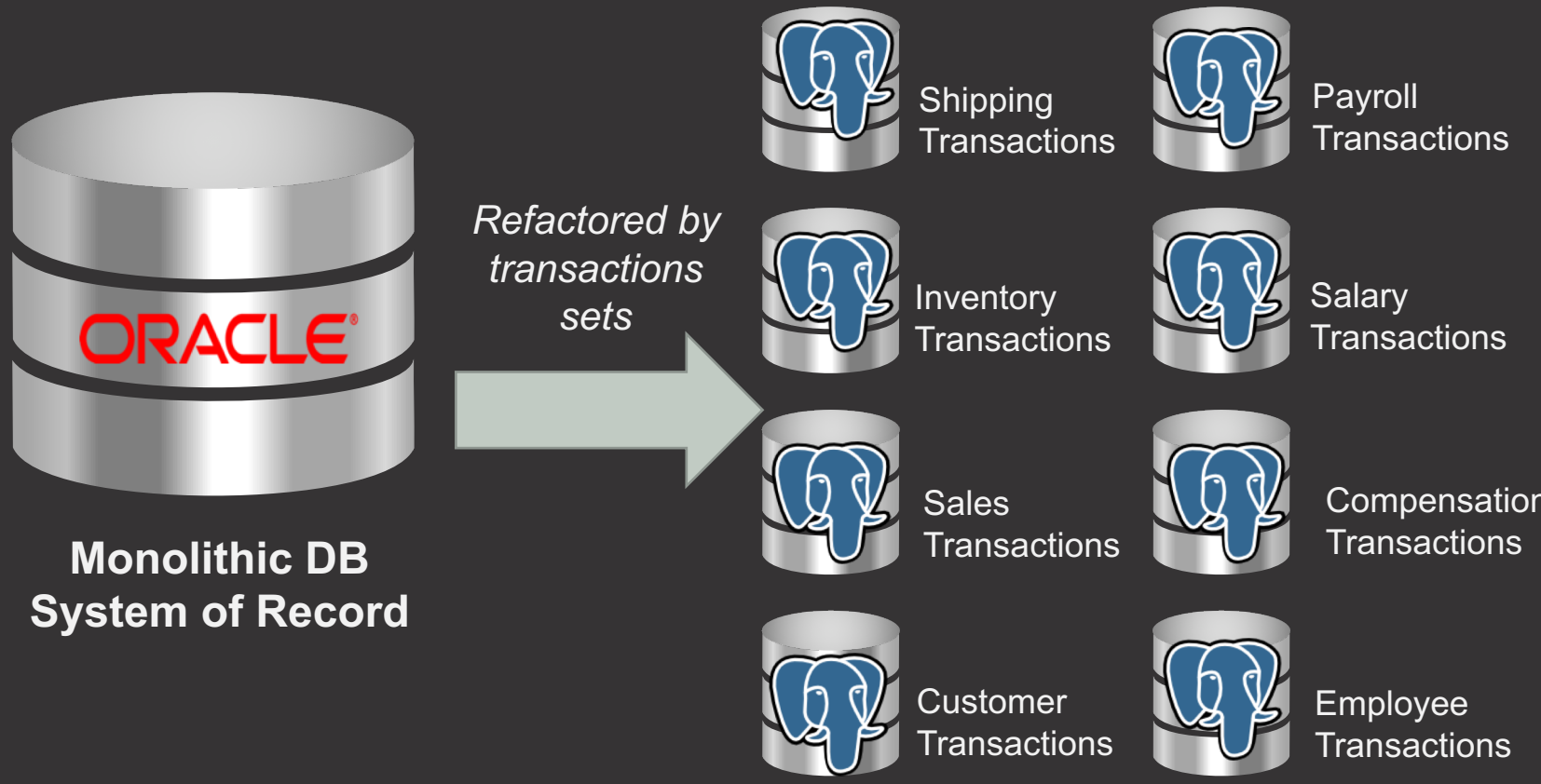

Key to DevOps

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THE CHANGING ROLE OF THE DBA
From Ops Supporter to
DevOps Collaborator

FROM DATABASE ADMIN TO DATA STRATEGIST

Automation ends mundane and repetitive tasks

Adding new servers by clicking a few buttons

Frees up time for strategic efforts

More focus on the data and applications

Understanding data sources and value to organization

Develop new skills in areas such as data science and machine learning

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FROM HARDWARE TWEAKER TO MASTER OF CLOUD TECHNOLOGIES

CLOUDS

CONTAINERS

Pivotal **Cloud Foundry**

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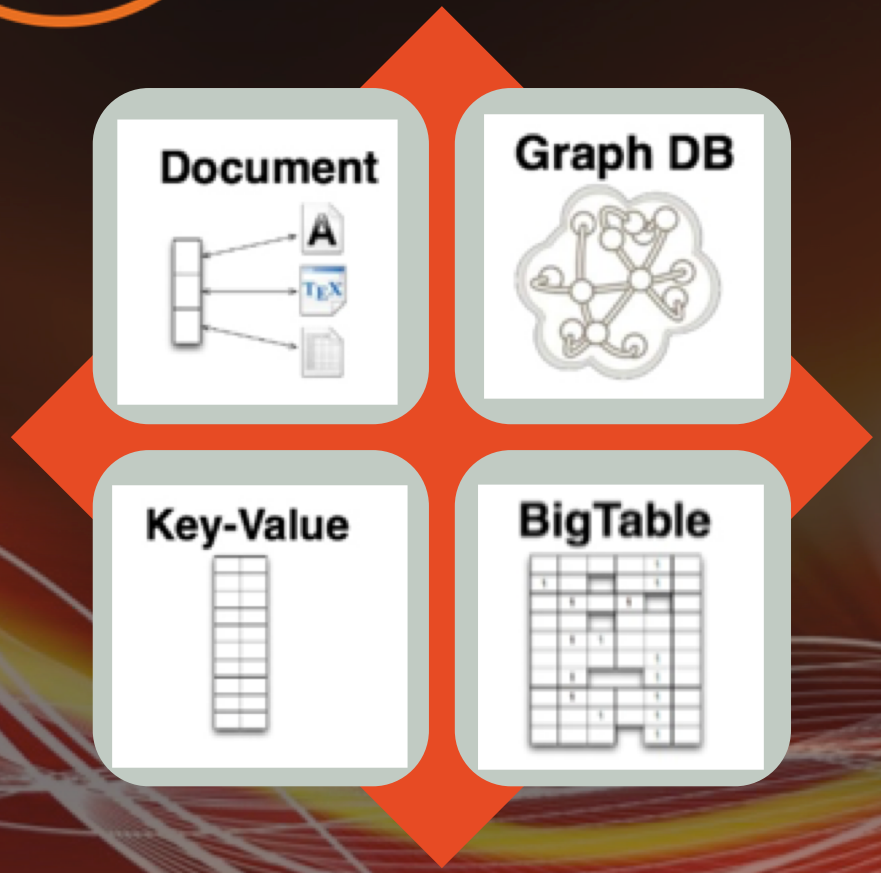
3 FROM SCHEMA INDEXER TO MASTER MODELER

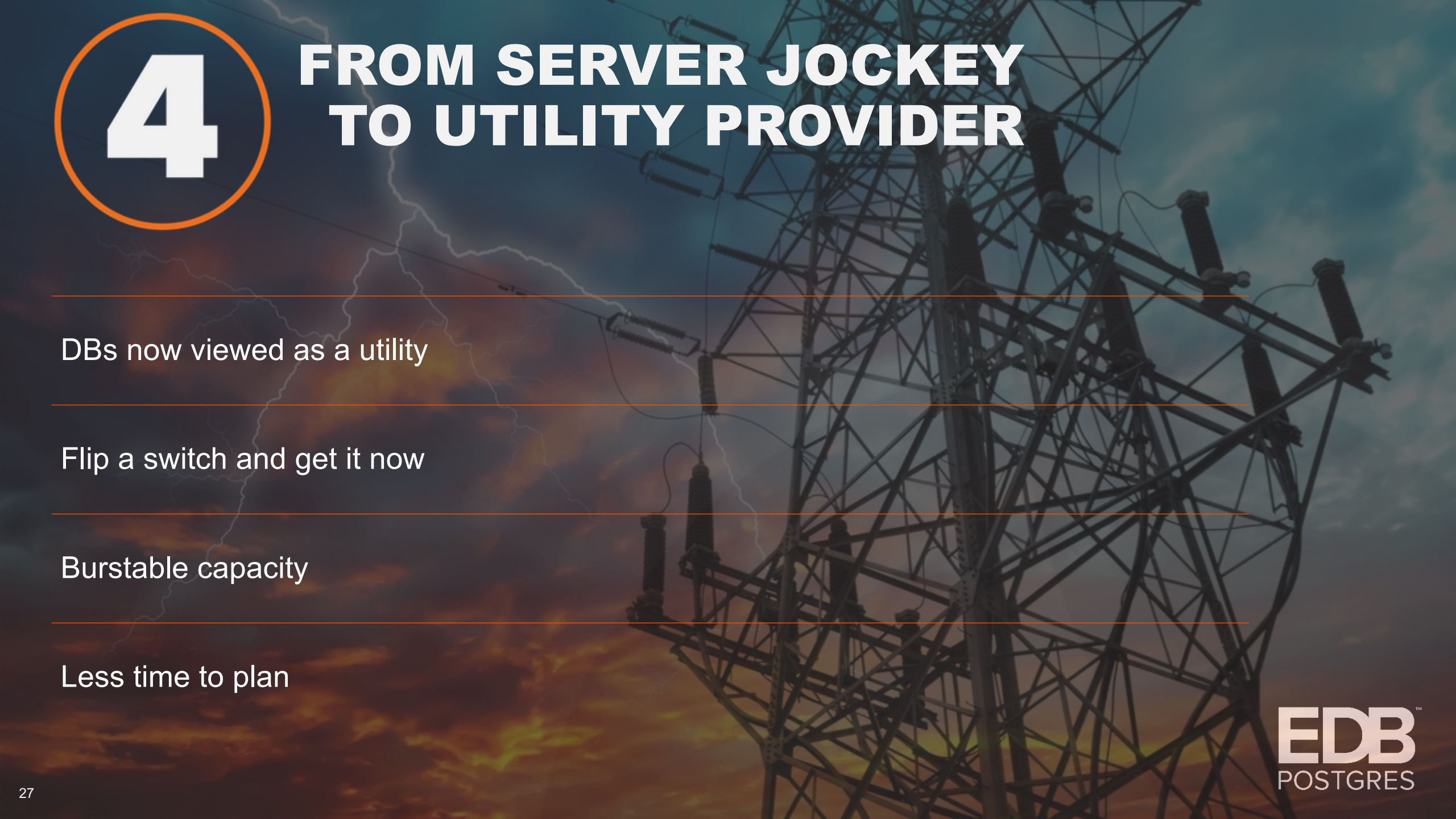


DBAs historically specialized by RDBMS

Now need to know/recommend different platforms

Also still need deep DB knowledge

And understand DB as part of a full stack



4 FROM SERVER JOCKEY TO UTILITY PROVIDER

DBs now viewed as a utility

Flip a switch and get it now

Burstable capacity

Less time to plan

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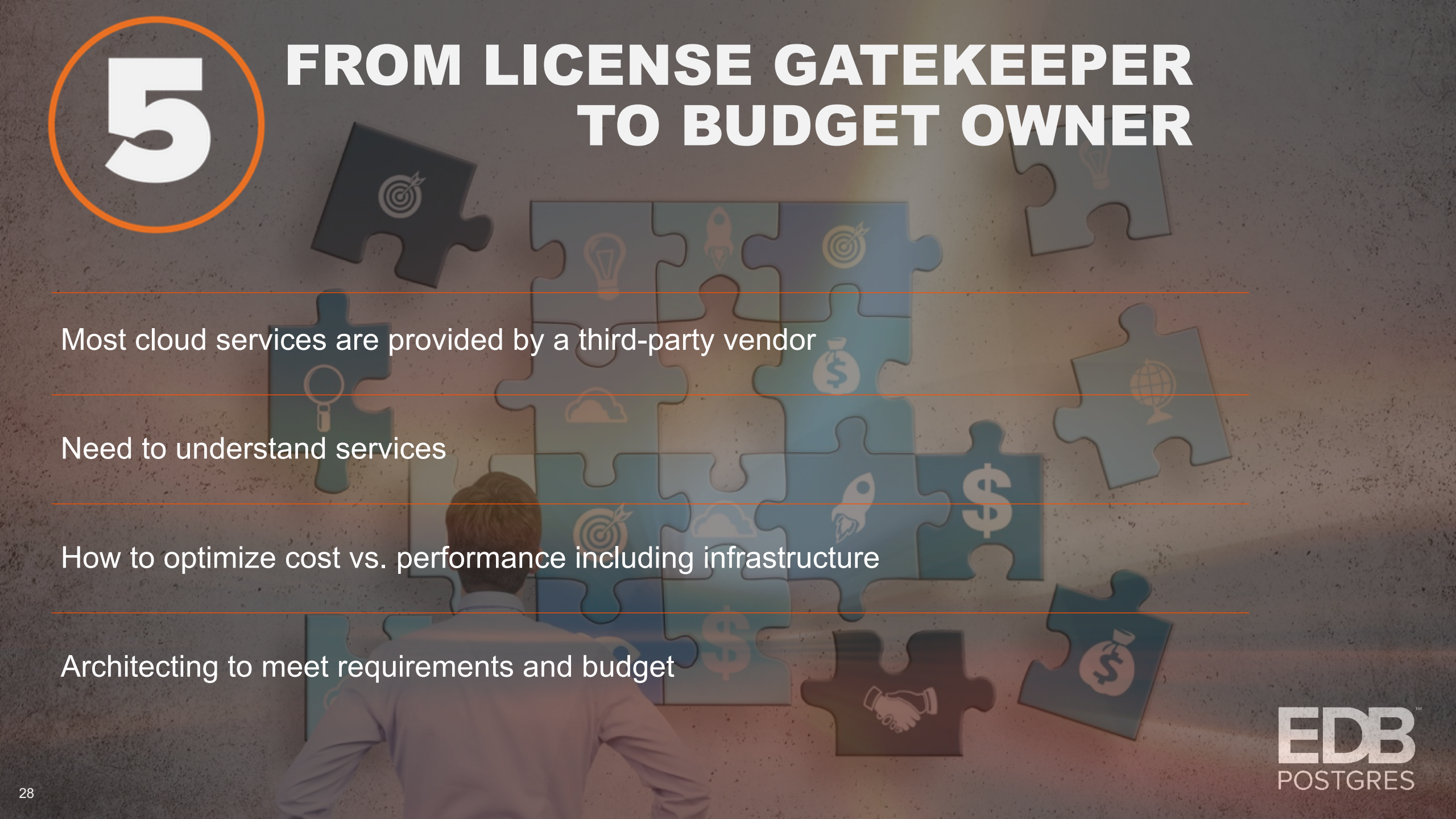
5 FROM LICENSE GATEKEEPER TO BUDGET OWNER



Most cloud services are provided by a third-party vendor

Need to understand services

How to optimize cost vs. performance including infrastructure

Architecting to meet requirements and budget

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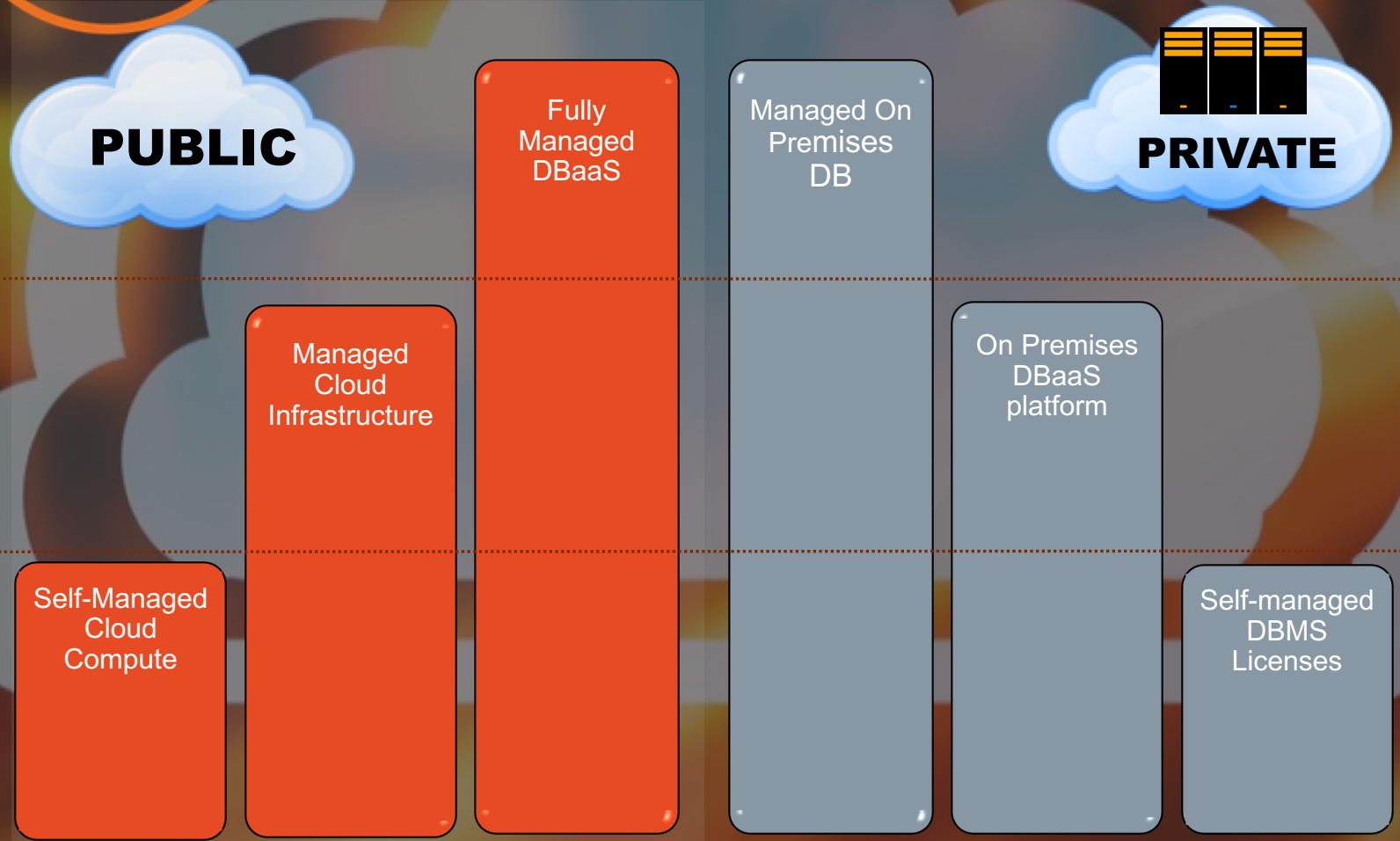
6 FROM SITE ADMIN TO PLATFORM BROKER



DBs becoming platform agnostic

Support on premises or public cloud

Many deployment and service level options

Collaborate with teams supporting the cloud/full application stack

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FROM QUERY OPTIMIZER TO PERFORMANCE PRO

Less time updating/troubleshooting servers

More time optimizing data architecture

Monitoring of infrastructure and database performance holistically

Advanced data modeling, query tuning and Indexing strategies to improve performance

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8 FROM TO ACCOUNT ADMIN TO SECURITY EXPERT

Cloud vendors provide secure infrastructure

But must ensure that all systems are using that infrastructure properly, especially the database

Protecting sensitive information across highly-distributed infrastructures can be a challenge

DBA needs to understand possible threat sources

Compliance with corporate, industry, and governmental regulations add new responsibilities on DBA

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9 FROM OPS SUPPORT TO DevOps COLLABORATOR

Increasing focus on continuous deployment and delivery

DBAs take on tasks once reserved for developers and work closely with DevOps teams

More moving out of centralized IT and into the line-of-business/applications teams

While continuing as data steward and trusted adviser

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10 AND STILL NEED TO KEEP IT RUNNING

Service providers apply fix packs and upgrade DBMS versions

Backup and recovery in the cloud is fully automated

DBA still needs awareness and understanding of the potential impact

NOW HAVE TO WORRY ABOUT THE CLOUD FOR:

Scalability

Fault tolerance

Replication

DBA IS STILL ULTIMATELY RESPONSIBLE

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DATABASE AS A SERVICE

DBaaS CAN HELP

- Self-service provisioning
- Automation of routine tasks
- “Infinite” capacity
- Multi-cloud/hybrid deployment
- Tradeoff control and options for agility

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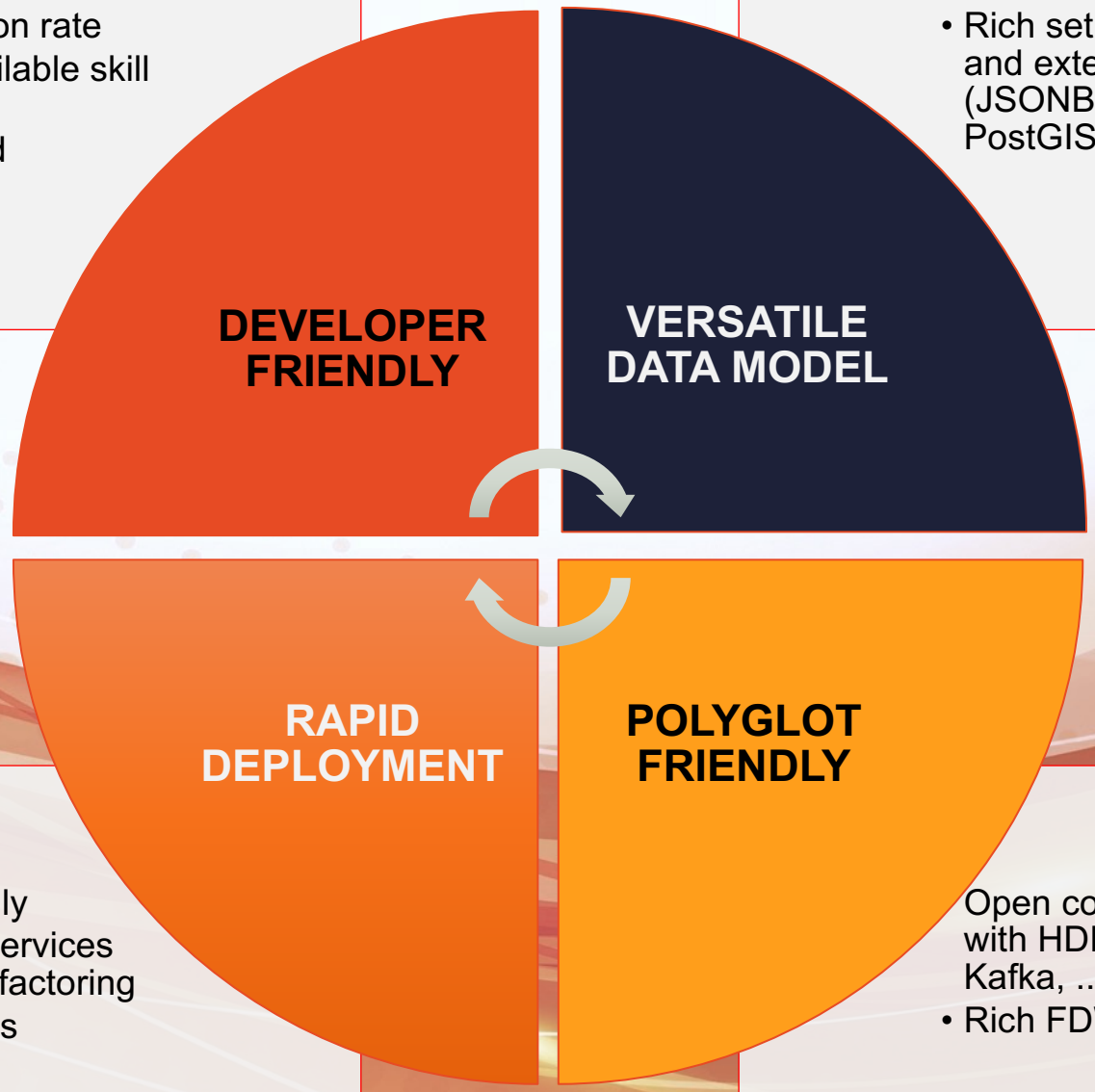
What does it mean for the database?

- Easy to use
- High adoption rate
- Readily available skill set
- Training and certification

- Multi model database
- Rich set of data types and extensions (JSONB, Hstore, PostGIS, ...)



- Cloud friendly
- Micro/Mini services database refactoring
- DBaaS focus

Open co-existence with HDFS, Mongo, Kafka, ...

- Rich FDW library

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THANK YOU