AWS re:Invent

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Babelfish architecture and design

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What is Babelfish for PostgreSQL

Babelfish is a migration accelerator for moving SQL Server Applications to PostgreSQL. It provides the capability for the execution of T-SQL statements over the TDS protocol.

This capability has been natively implemented in PostgreSQL.

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Open-source project

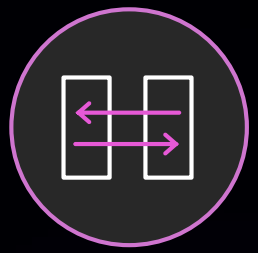
Project website
https://babelfishpg.org

Freedom from proprietary databases



No vendor lock-in

Apache 2.0 and PostgreSQL licenses



Use it for any purpose, innovate, and distribute your modifications

Available on GitHub
https://github.com/babelfish-for-postgresql

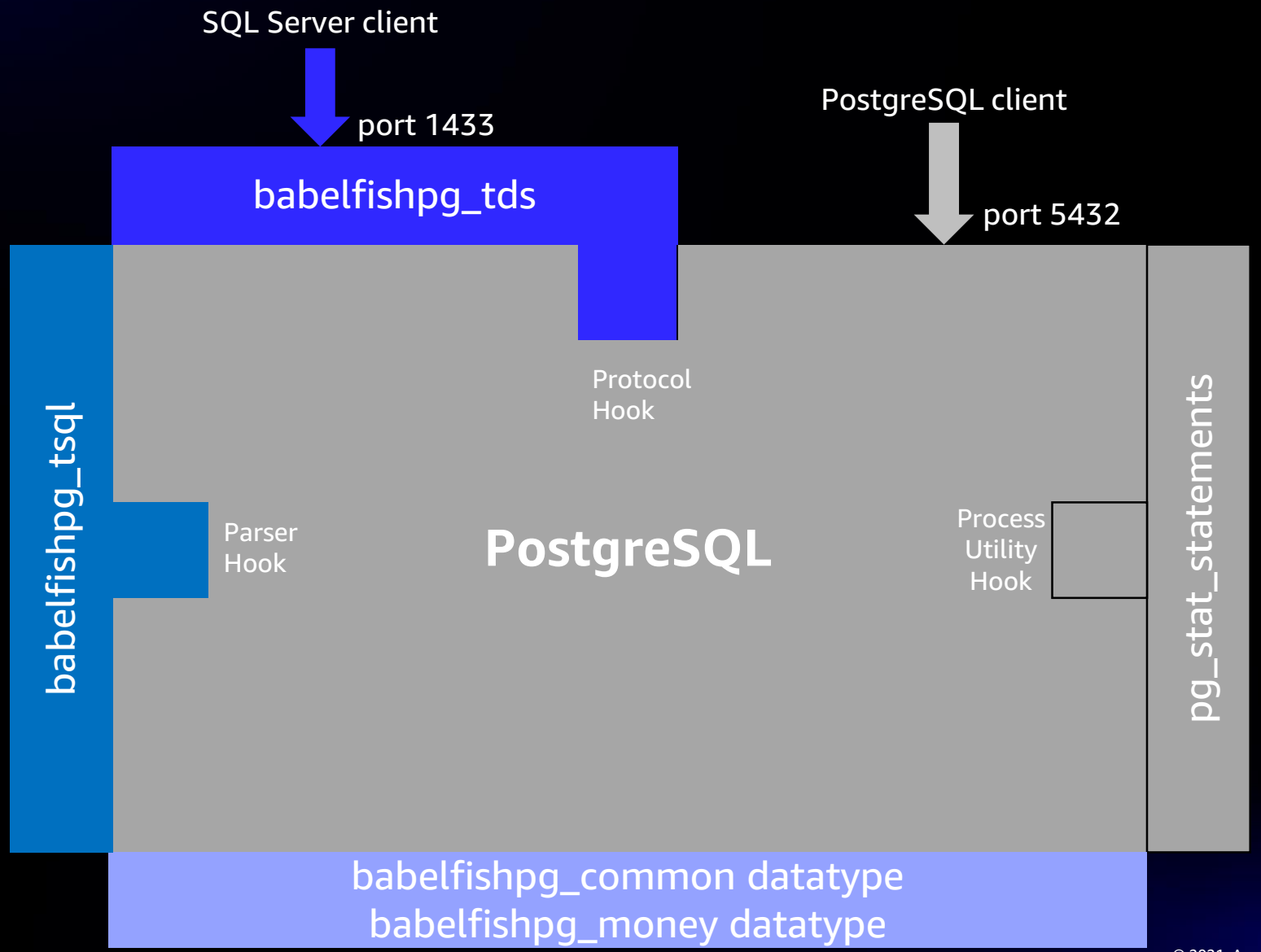


Is community driven

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Babelfish architecture



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TDS Protocol Extension

Current design in PostgreSQL	Changes to PostgreSQL to add Babelfish extension
By default PostgreSQL allows only the libpq protocol	Created a pluggable protocol hook. This can be used by any extension that implements a new protocol.
Default libpq functions	Replaced with hooks that will load the following functions • Libpq functions for 5432 connection • TDS functions for 1433 connection

	Create socket	Accept connection	Login and Authentication	Request and Response
Remarks	use GUC parameters to create socket to configure settings and manage behavior of the socket	accepts connection. loads protocol config based on connection received.	password authentication	read, parse and process tds requests with the help of language extension until eof
PG parent function	PostmasterMain	Server loop calls ConnCreate	InitPostgres	PostgresMain
Backend hook	listen_init_hook	fn_accept	fn_authenticate	fn_read_command fn_process_command
TDS function	pe_listen_init	pe_accept	pe_authenticate	TDSSocketBackend

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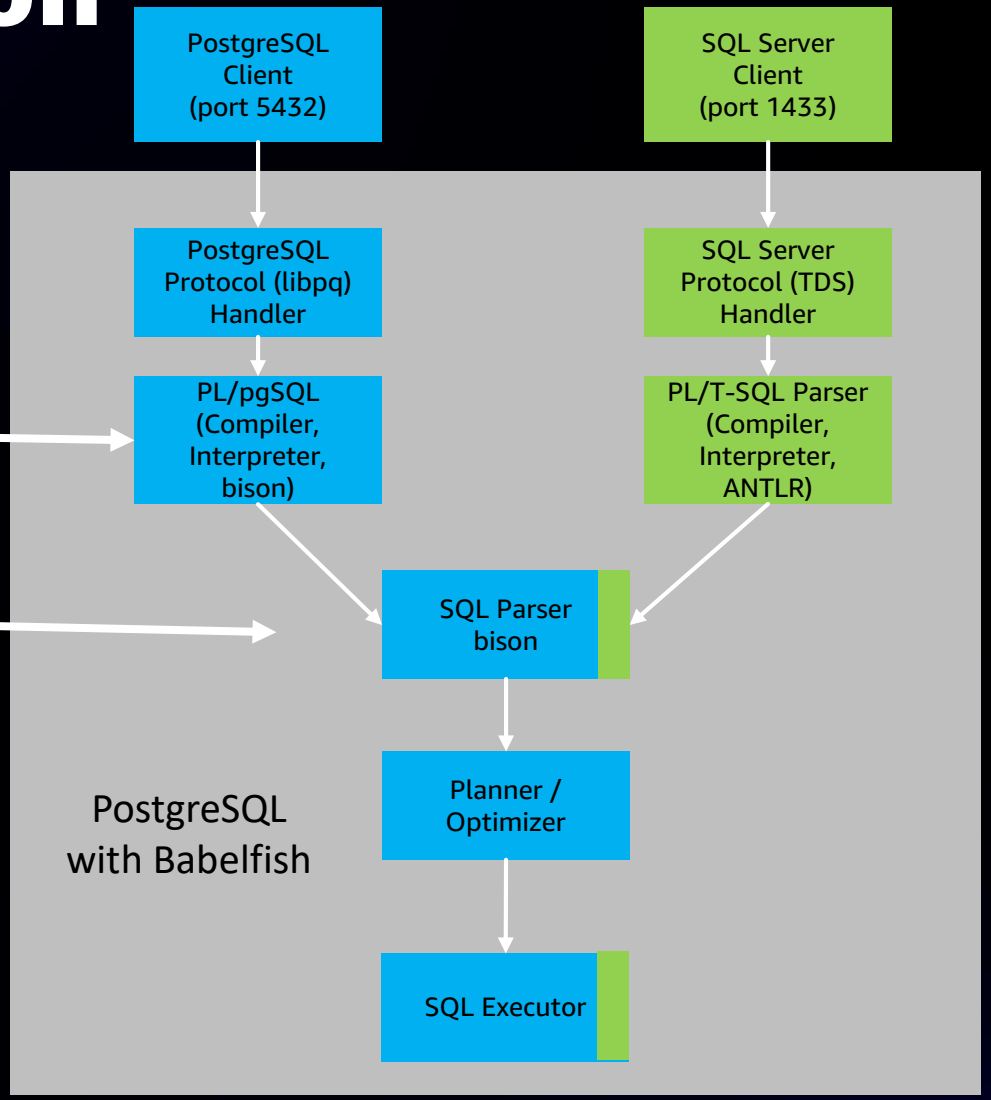
T-SQL Extension

QUERY 1:

SELECT * FROM products WHERE category_id = 1;

Validate syntax
Find identifiers and keywords.
OUTPUT: Raw Parse Tree

Add detailed info
Table OID, column name, column type
OUTPUT: Query Tree



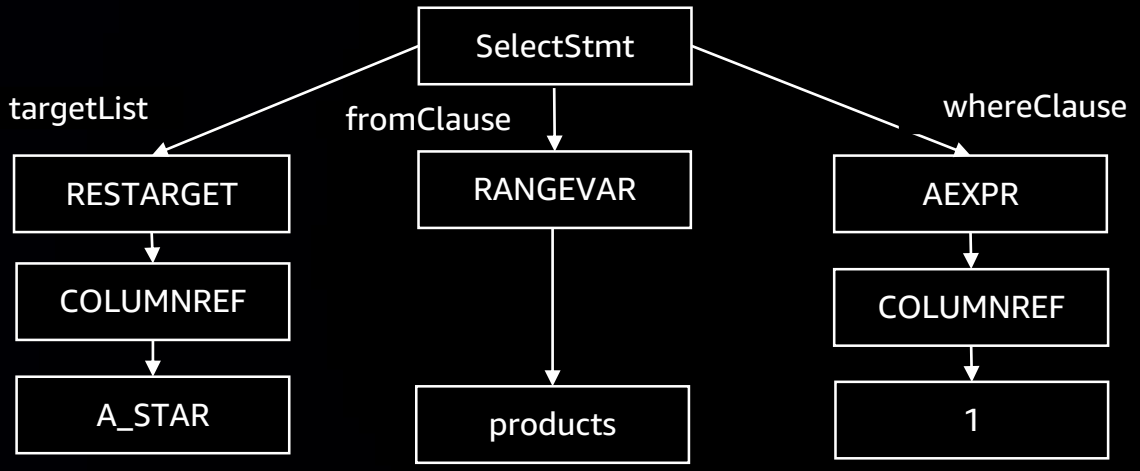

```
DECLARE @id int = 100

IF (@a = 42)
BEGIN
  PRINT @a
  DELETE customer WHERE customer_id=@id
END
```

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Query parsing

SELECT * FROM products WHERE category_id = 1;



Raw parse tree

```
:targetList ( {RESTARGET
:name <> :indirection <> :val
{COLUMNREF :fields (
{A_STAR
} )
:location 7
} :location 7
} )
:fromClause ( {RANGEVAR
:schemaname <> :relname products
:inh true :relpersistence p :alias <> :location 14
}
)
```

Table name

* is just an abbreviation for all the column names of a relation. It is expanded by the parser into the individual columns

Query tree

```
…..
…..
:rtable ( {RTE :alias <> :eref
{ALIAS
:aliasname tbl :colname  (“category_id"  }
:rtekind 0 :relid 18489
:relkind r
:tablesample <> …
} )
:targetList ( {TARGETENTRY :expr
{VAR
:varno 1 :varattno 1 :vartype 23
…..
…..
}
```

Table OID

Column type

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s reserved.

Migrating SQL Server database structure

Babelfish provides users with a similar “server view” as in SQL Server

- Existing T-SQL code and existing client apps do not need to be changed
- There are **master**, **tempdb**, and user databases
- Can run **CREATE DATABASE** and **USE** <database>

How this is done

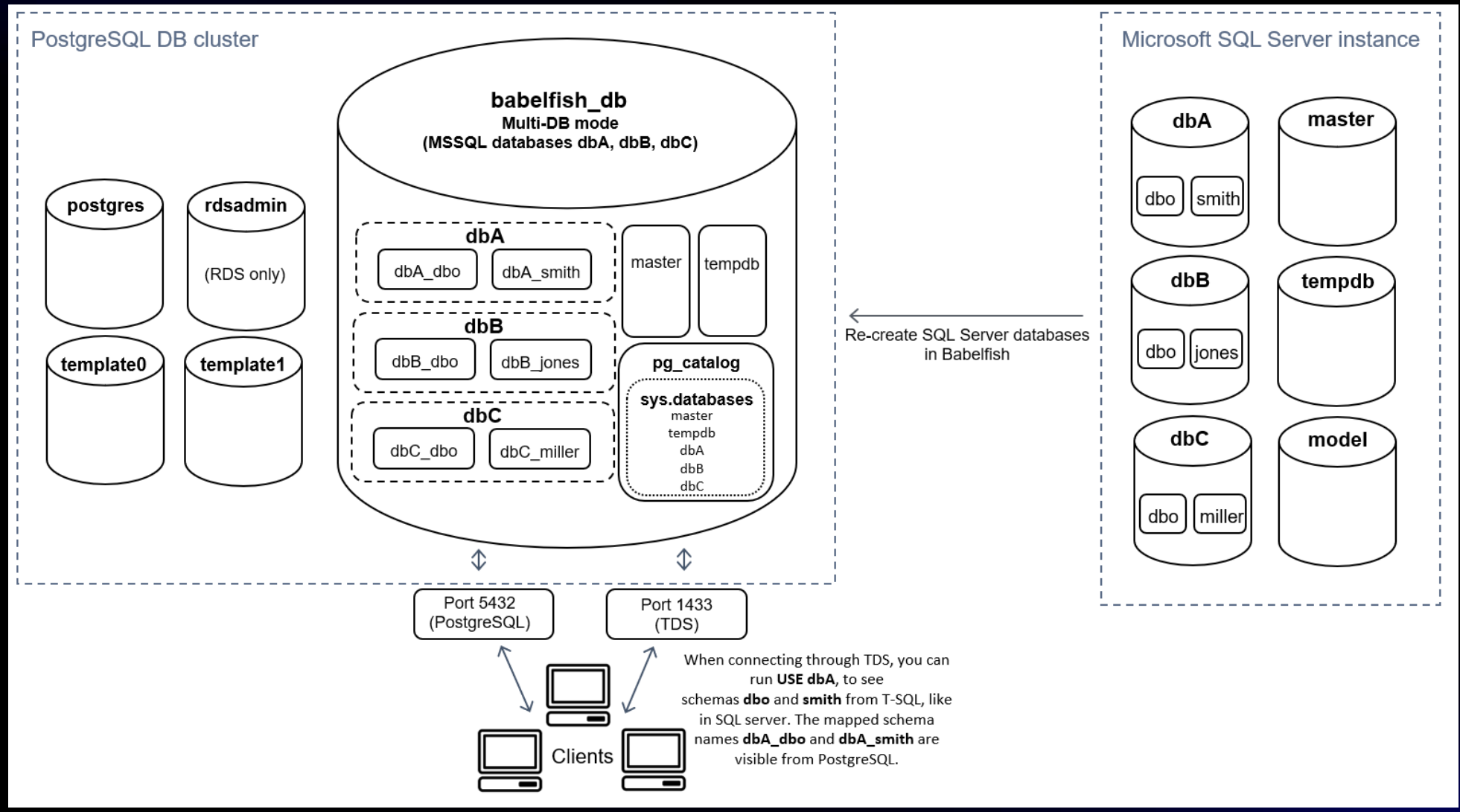
- The PostgreSQL cluster contains a PG database named **babelfish_db**
- When connecting to the TDS port, the connection is placed into the PG database
- SQL Server databases and schemas are mapped to schemas in this PG database
- The **babelfish_db** database and the schema name mapping are transparent to the T-SQL user
- Users can choose between single-db and multi-db mode, which affects the schema name mapping

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Migrating SQL Server database structure

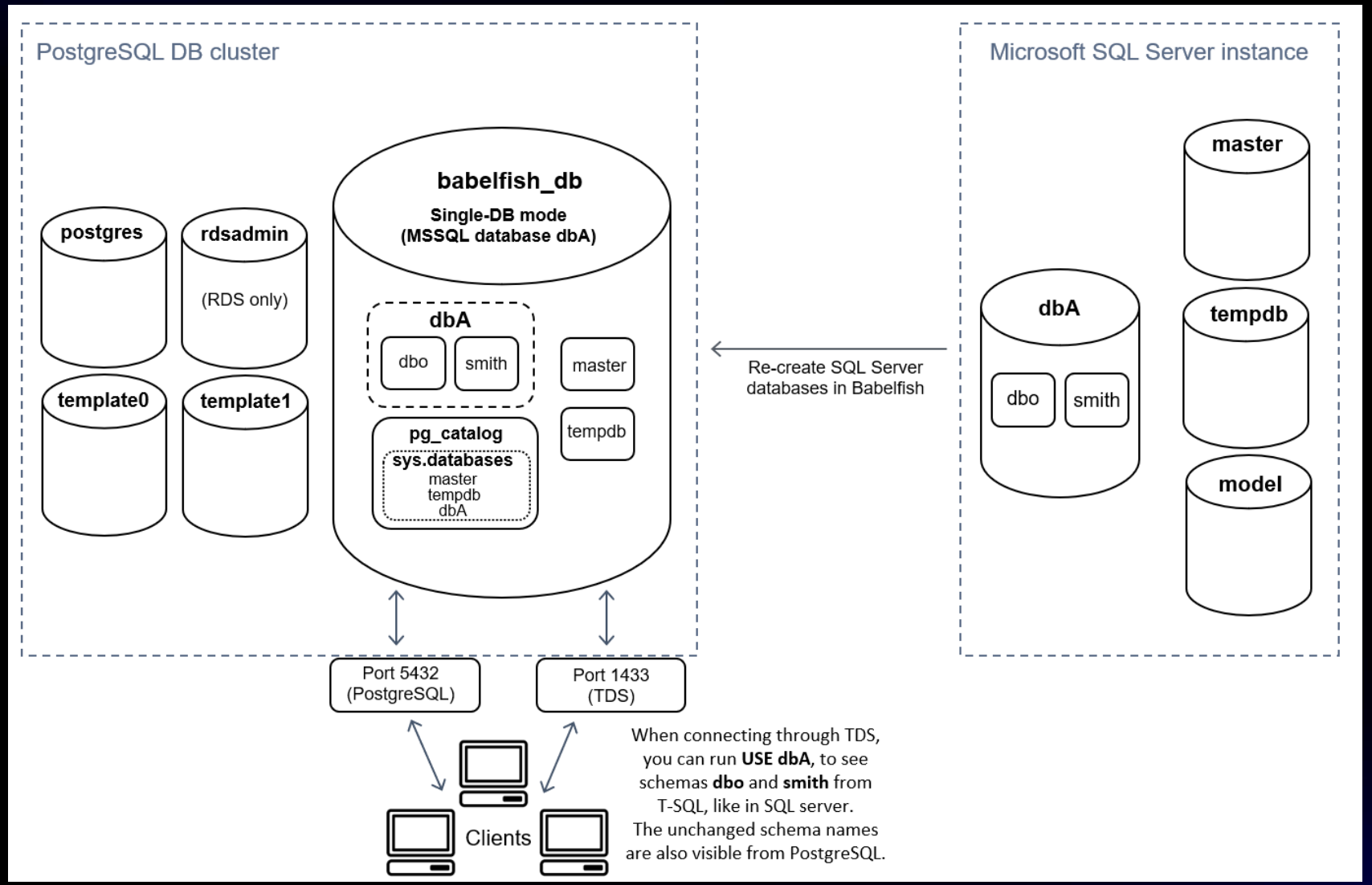
Multi-db mode: schema names from SQL Server user DB are mapped to different PG schema names



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Migrating SQL Server database structure

Single-db mode: schema names from SQL Server user DB remain unchanged in PG



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Thank you!

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