Celebrating its 15th Anniversary: Pgpool-II Past, Present and Future

Part 2: New Features of Pgpool-II 4.0

December 11, 2018
PGConf.ASIA

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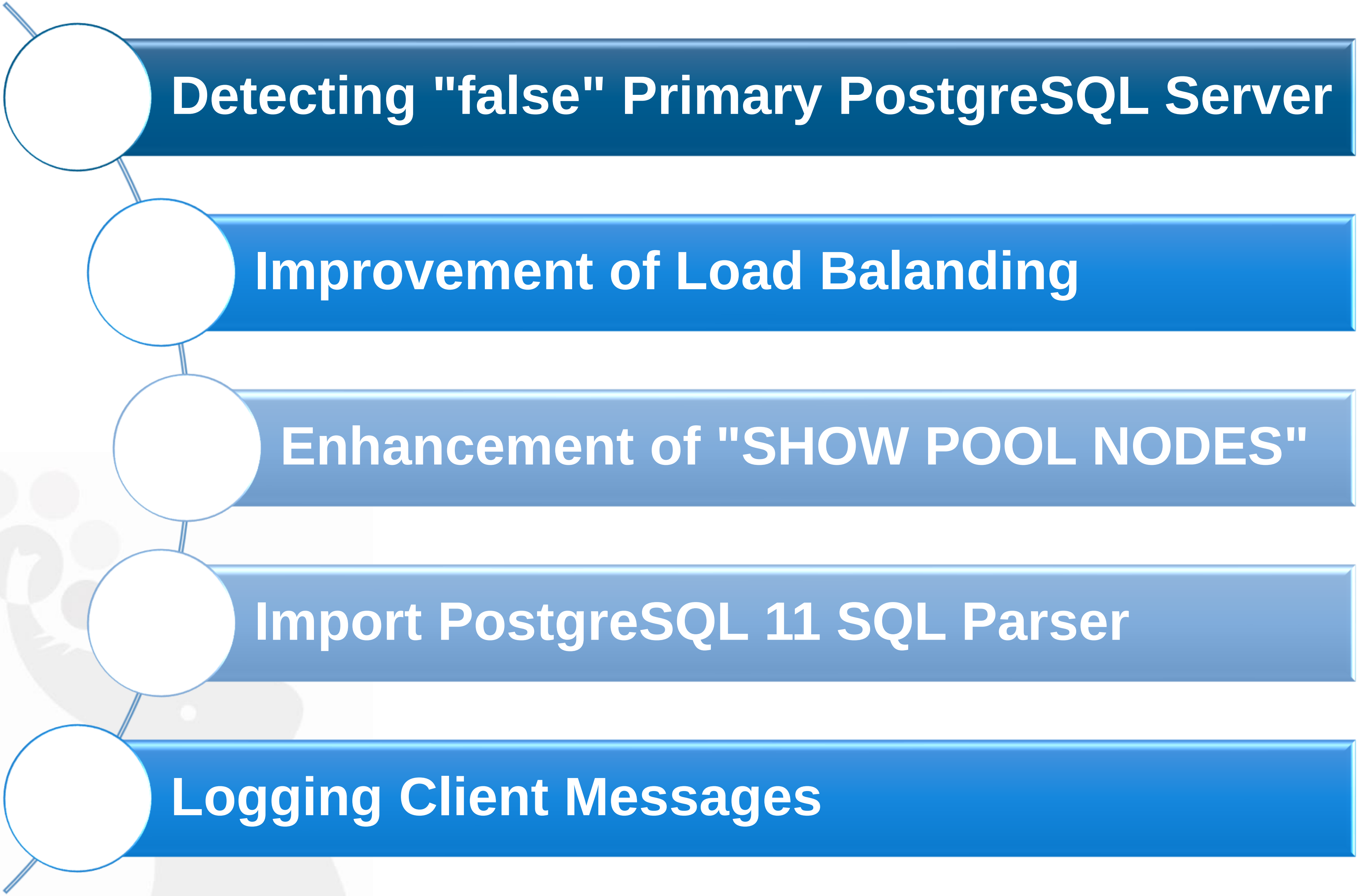
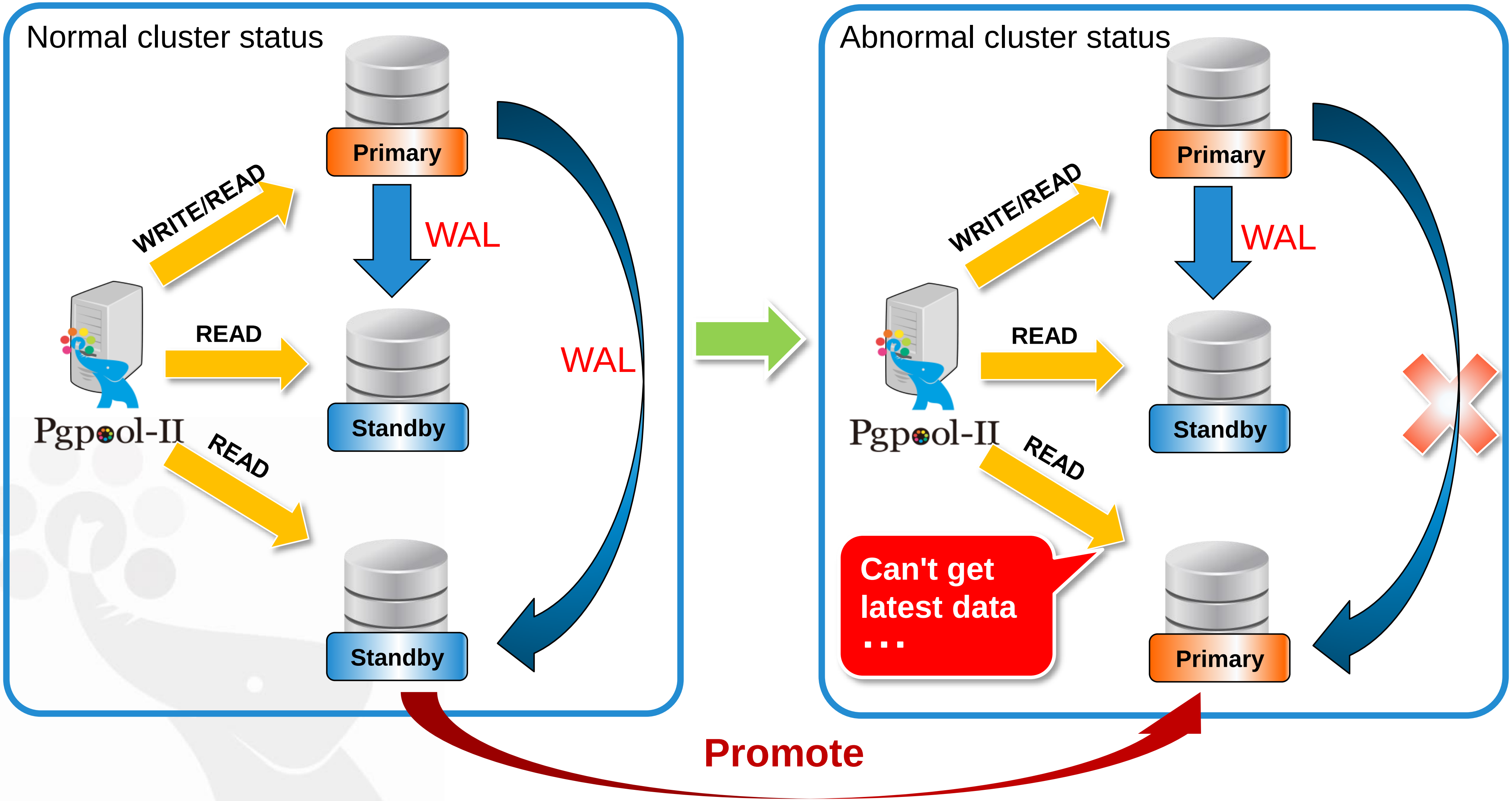
New Features of Pgpool-II 4.0



- Detecting "false" Primary PostgreSQL Server
- Improvement of Load Balanding
- Enhancement of "SHOW POOL NODES"
- Import PostgreSQL 11 SQL Parser
- Logging Client Messages

Detecting "false" Primary PostgreSQL Server

Detecting "false" Primary PostgreSQL Server (1)



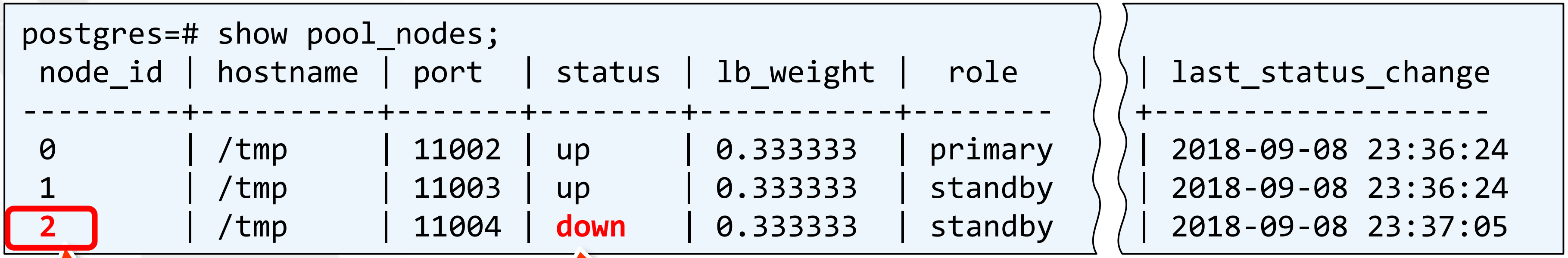
Detecting "false" Primary PostgreSQL Server (2)

How can we detect the situation and fix it?

New parameter:
detach_false_primary

- Detect the "false" Primary and detach it
- "true" primary : a Primary node which connects to all Standby nodes

  "false" primary : other than above
- Check the connectivity between Primary and Standby nodes by using "pg_stat_wal_receiver"
- Require PostgreSQL 9.6 or later

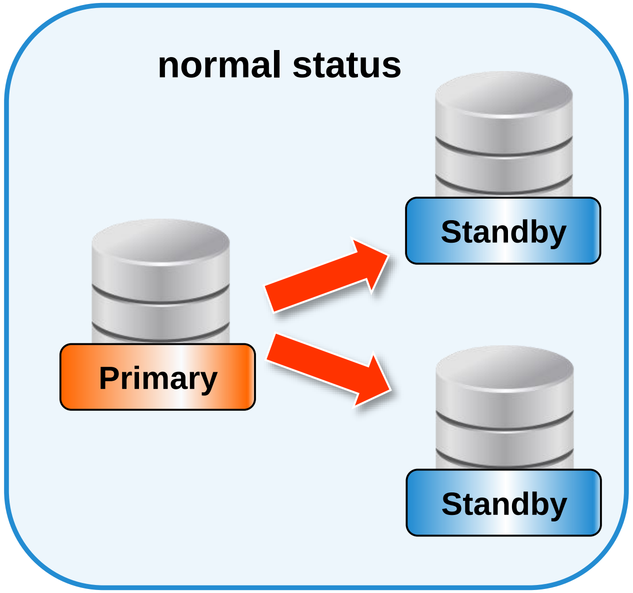


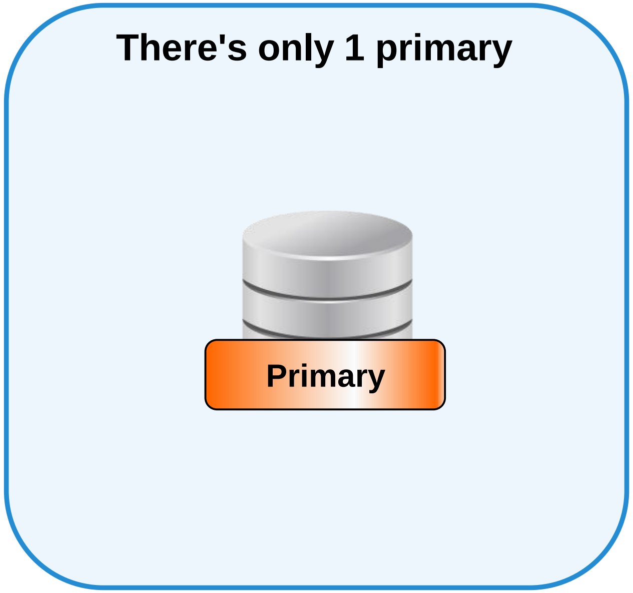
```
postgres=# show pool_nodes;
 node_id | hostname | port  | status | lb_weight |  role     | last_status_change
---------+----------+-------+--------+-----------+--------   +---------------------
 0       | /tmp     | 11002 | up     | 0.333333  | primary   | 2018-09-08 23:36:24
 1       | /tmp     | 11003 | up     | 0.333333  | standby   | 2018-09-08 23:36:24
 2       | /tmp     | 11004 | down   | 0.333333  | standby   | 2018-09-08 23:37:05
```

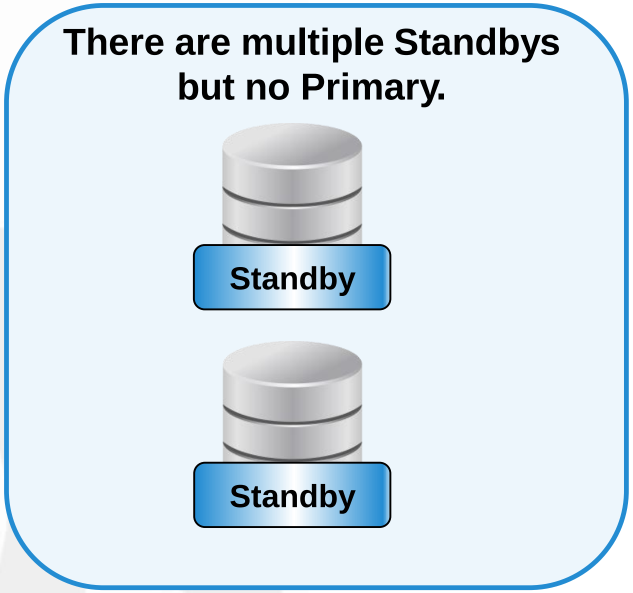
"false" Primary

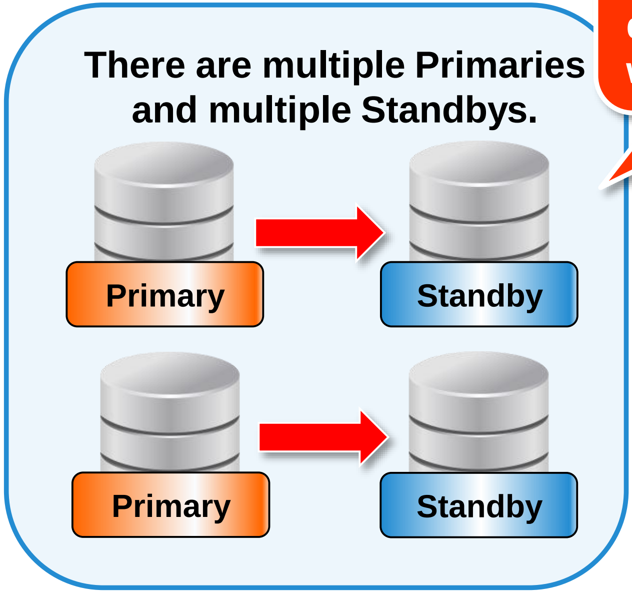
detached

Detecting "false" Primary PostgreSQL Server (3)


normal status


There's only 1 primary


There are multiple Standbys but no Primary.

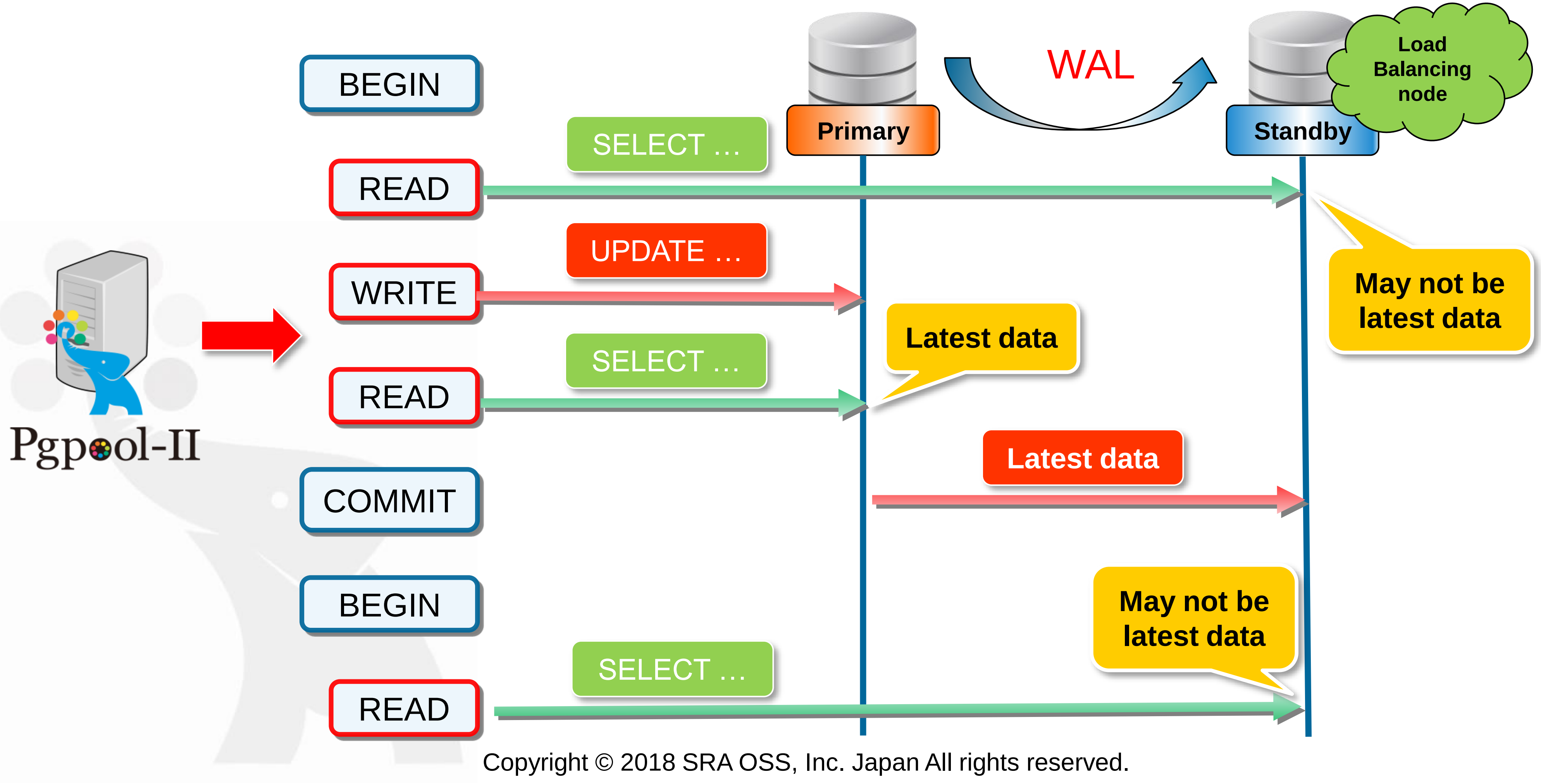

There are multiple Primaries and multiple Standbys.

In this case, the "false" primary detection doesn't work.

Improvement of load balancing (1)
disable_load_balance_on_write

Improvement of Load Balancing (1) disable_load_balance_on_write

- **Load Balancing**
  - Load balancing improves system performance by distributing READ queries to any PostgreSQL server
- **Before Pgpool-II 4.0**
  - When a WRITE query is executed inside an explicit truncation, subsequent queries will be sent to Primary in order to avoid the replication delay
  - Load balancing is performed again in subsequent explicit transactions



Improvement of Load Balancing (1) disable_load_balance_on_write

Problems until 3.7

- Although this feature maintains consistency of data, it may cause degradation of performance when load balancing can be executed
- If the delay occurs, the latest data updated on the Primary may not be visible in the Standby

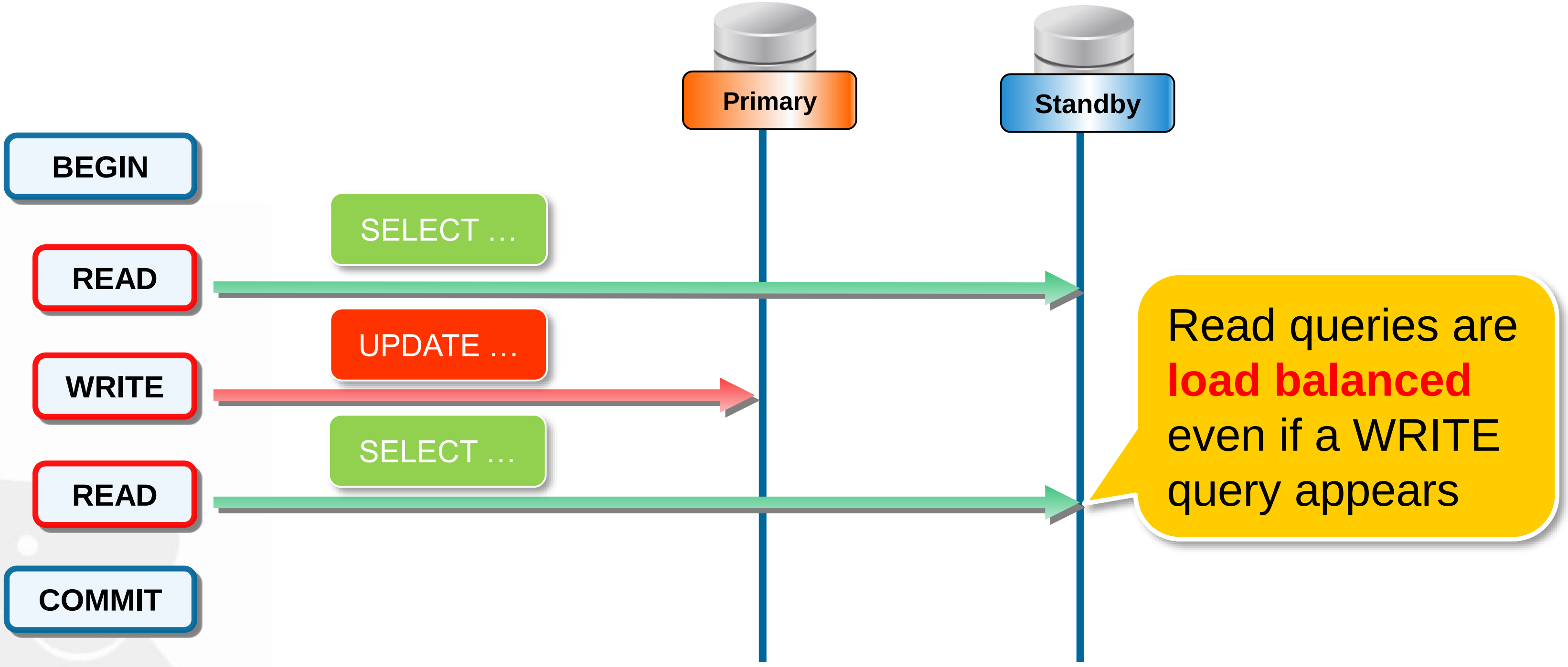
disable_load_balance_on_write

- It's possible to control the behavior of load balancing when a WRITE query is executed.
- off/transaction/trans_transaction/always

Improvement of Load Balancing (1) disable_load_balance_on_write

disable_load_balance_on_write = off

- □ READ queries are load balanced even if a WRITE query appears

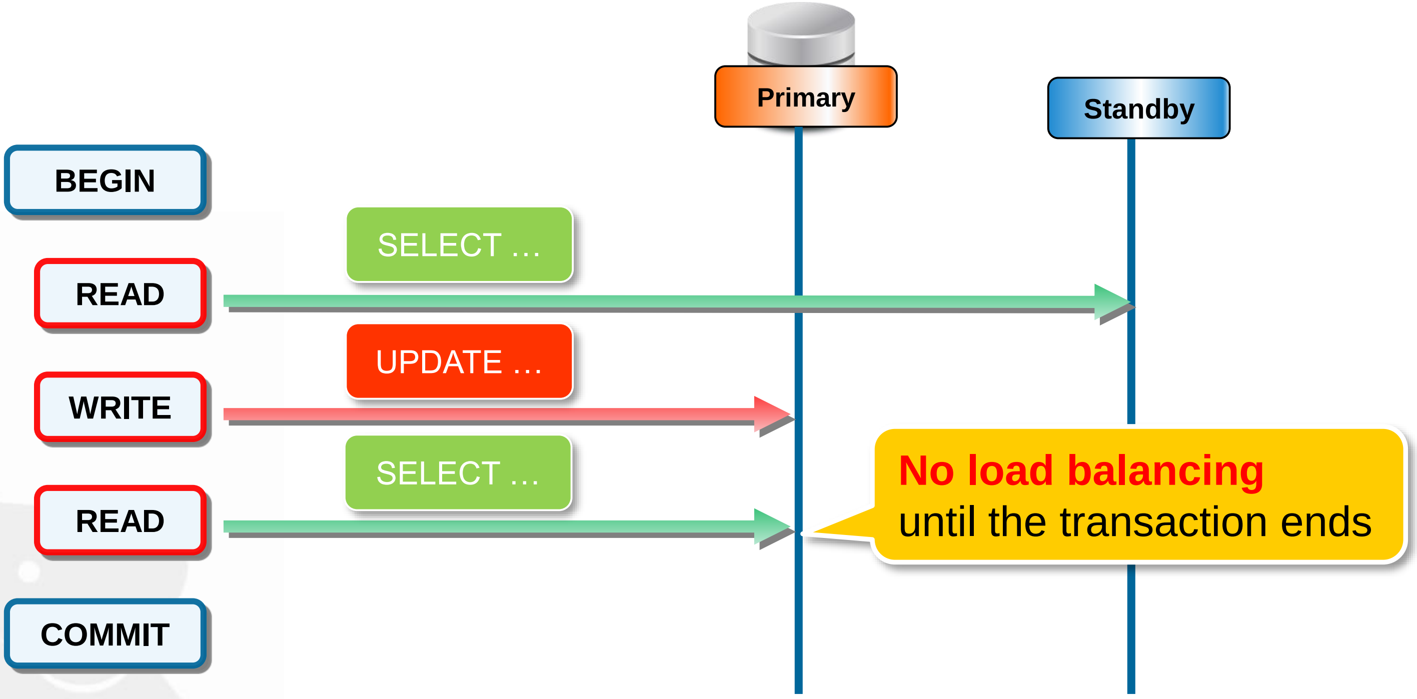


Read queries are **load balanced** even if a WRITE query appears

Improvement of Load Balancing (1) disable_load_balance_on_write

disable_load_balance_on_write = transaction

- If a WRITE query appears in an explicit transaction, the subsequent READ queries are not load balanced until the transaction ends
- Default value
- The same behavior as Pgpool-II 3.7 or before

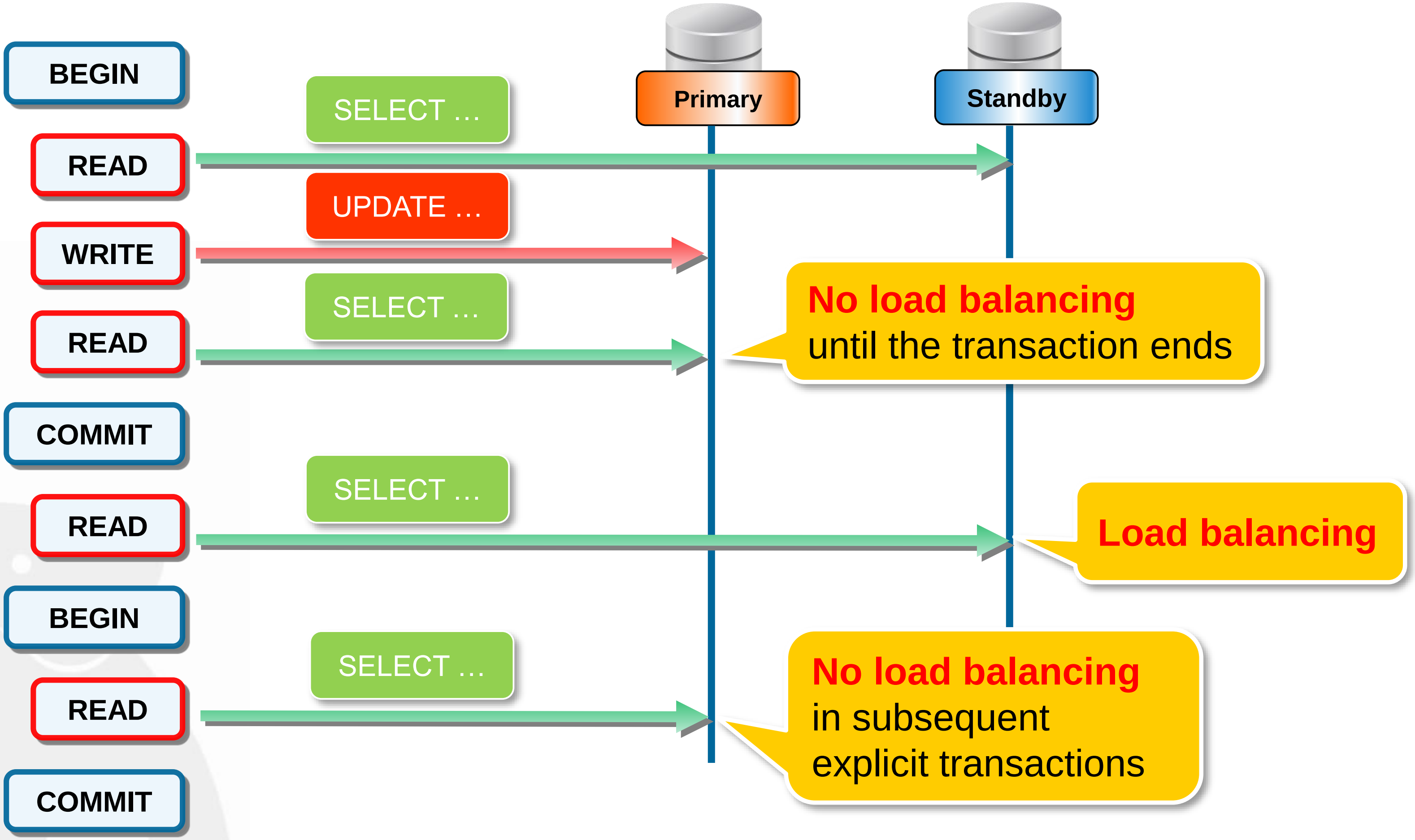


No load balancing until the transaction ends

Improvement of Load Balancing (1) disable_load_balance_on_write

disable_load_balance_on_write = trans_transaction

- □ If a WRITE query appears in an explicit transaction, the subsequent READ queries are not load balanced until the transaction ends
- □ Also, the READ queries are not load balanced in subsequent explicit transactions



No load balancing until the transaction ends

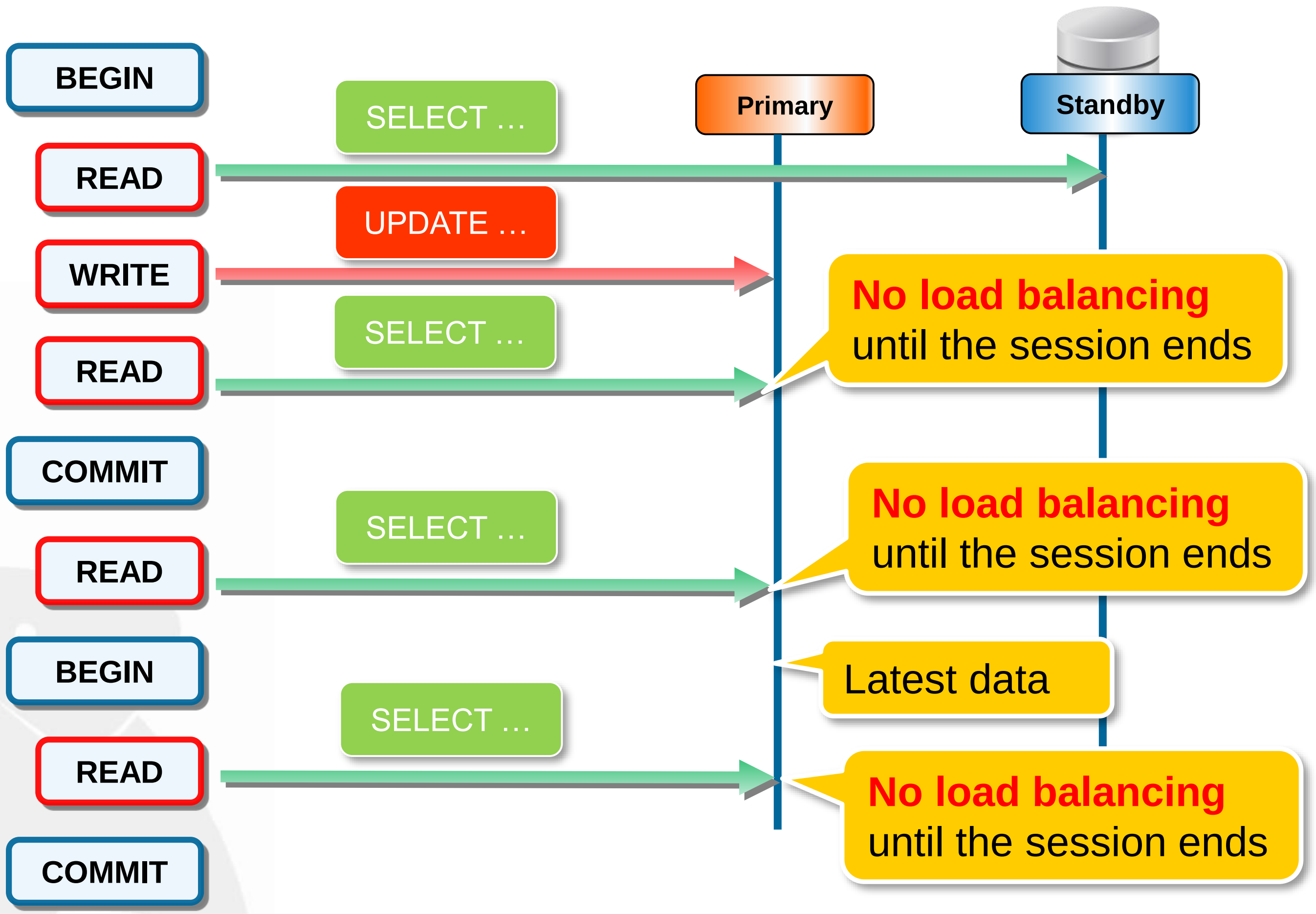
Load balancing

No load balancing in subsequent explicit transactions

Improvement of Load Balancing (1) disable_load_balance_on_write

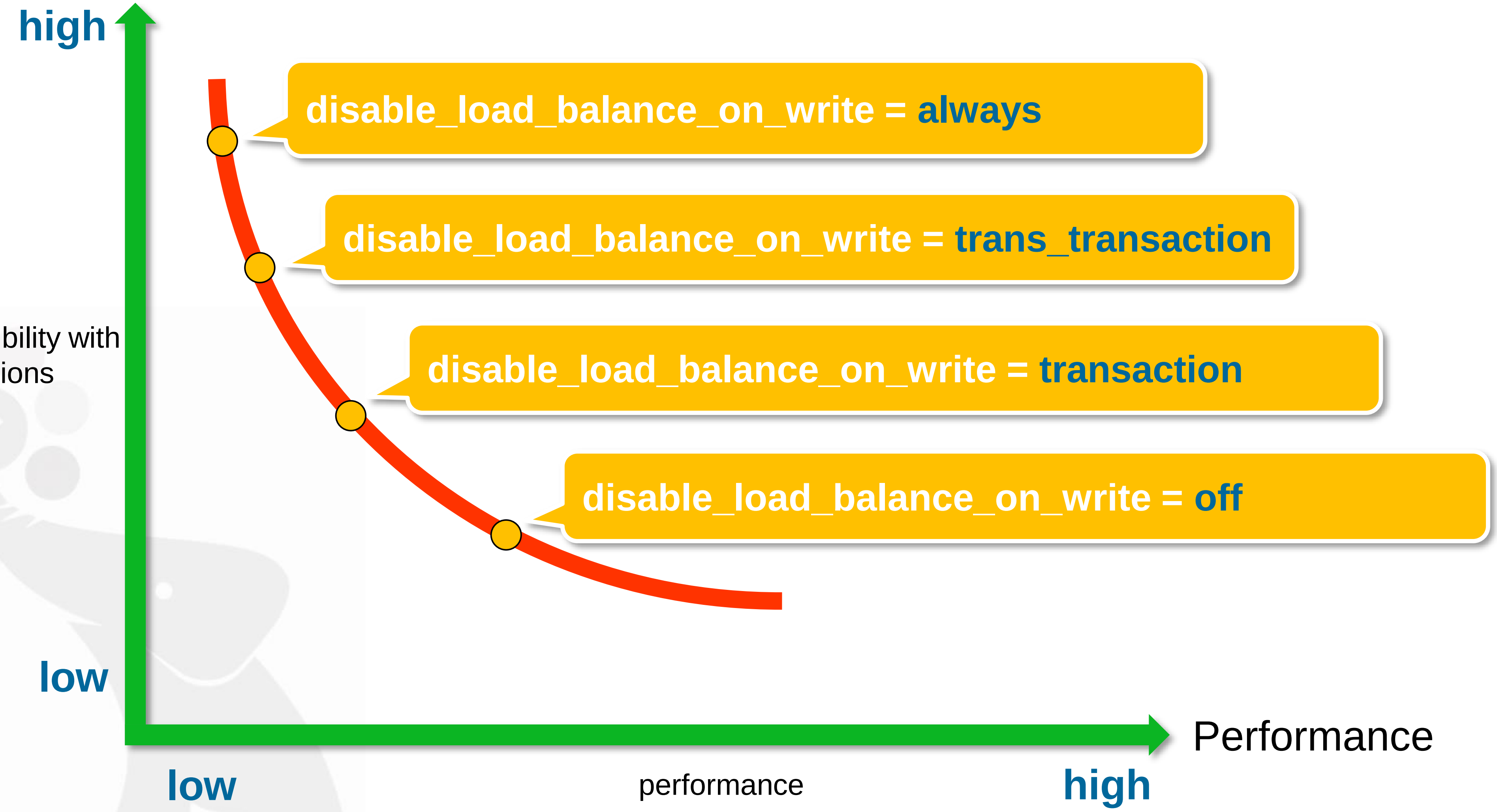
disable_load_balance_on_write = always

- If a WRITE query appears in an explicit transaction, load balancing is not performed until the session ends, regardless of whether it is in an explicit transaction or not


BEGIN
SELECT …
Primary
Standby
READ
UPDATE …
WRITE
SELECT …
No load balancing until the session ends
READ
COMMIT
SELECT …
No load balancing until the session ends
READ
BEGIN
Latest data
SELECT …
READ
No load balancing until the session ends
COMMIT

Improvement of Load Balancing (1) disable_load_balance_on_write

Compatibility with not-clustering-aware applications



disable_load_balance_on_write = always

disable_load_balance_on_write = trans_transaction

disable_load_balance_on_write = transaction

disable_load_balance_on_write = off

compatibility with applications

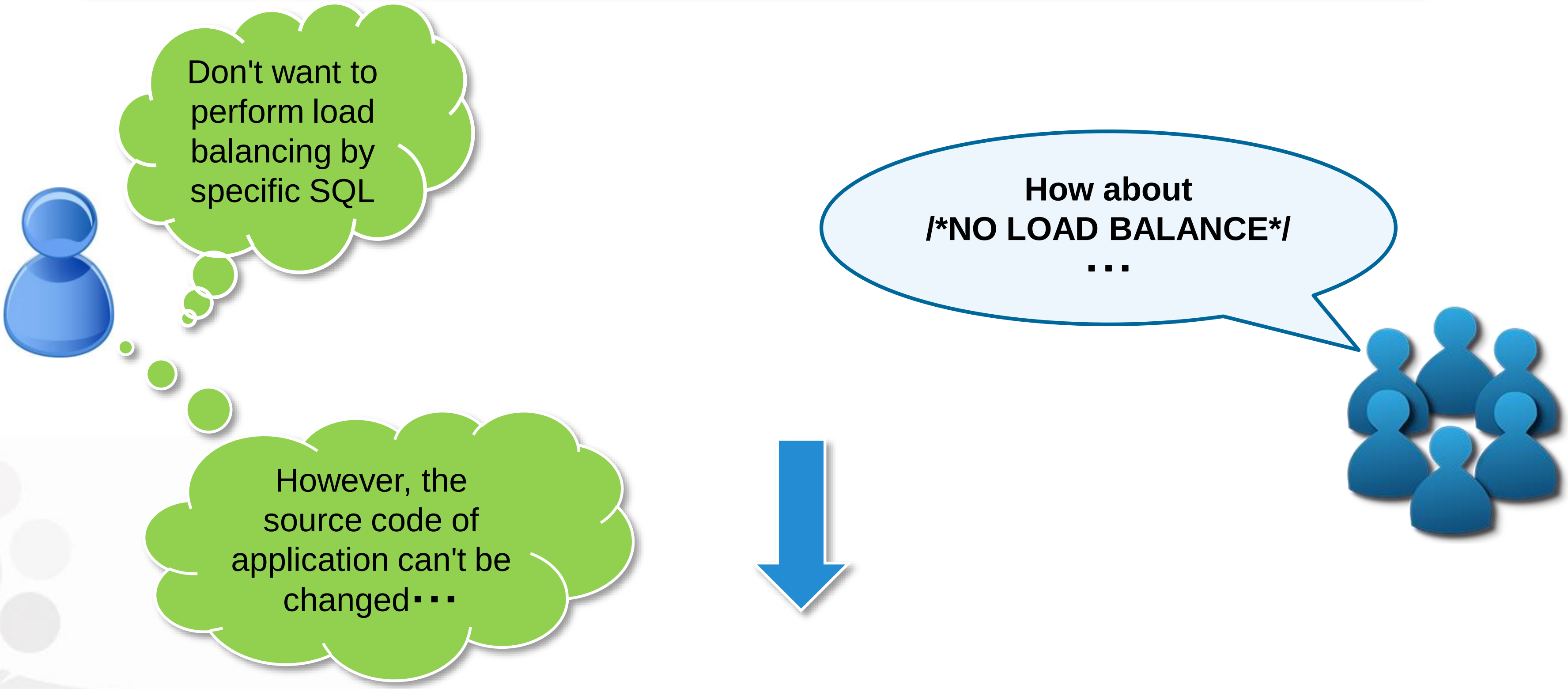
performance

Improvement of load balancing (2)

black_query_pattern_list

Improvement of Load Balancing (2) black_query_pattern_list

User's request



Don't want to perform load balancing by specific SQL

However, the source code of application can't be changed･･･

How about
/*NO LOAD BALANCE*/
･･･

New parameter:

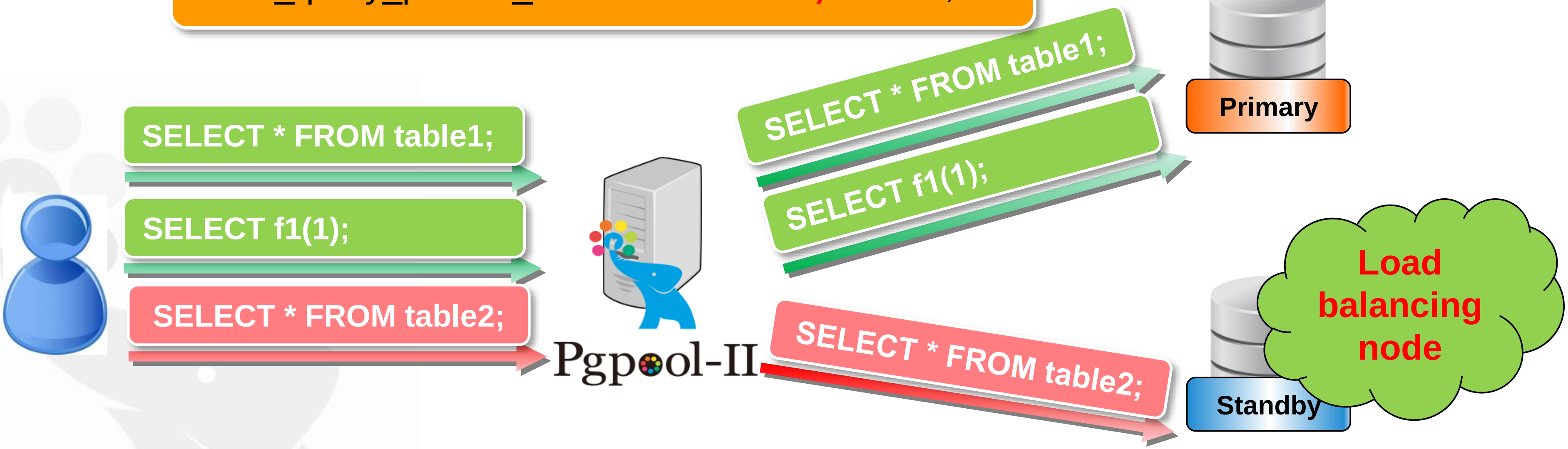
black_query_pattern_list

Improvement of Load Balancing (2) black_query_pattern_list

black_query_pattern_list

- SQLs that matched the specified SQL pattern by this parameter are sent only to the Primary
- Specify a semicolon separated list of SQL patterns
- Allow to use regular expression
- Special characters need to be escaped with "¥"

```
black_query_pattern_list = '.*table1.*;.*f1.* ';
```



Note: If SQL matches both black_query_pattern_list and white_function_list, white_function_list setting is ignored and the SQL should be sent only to the Primary node.

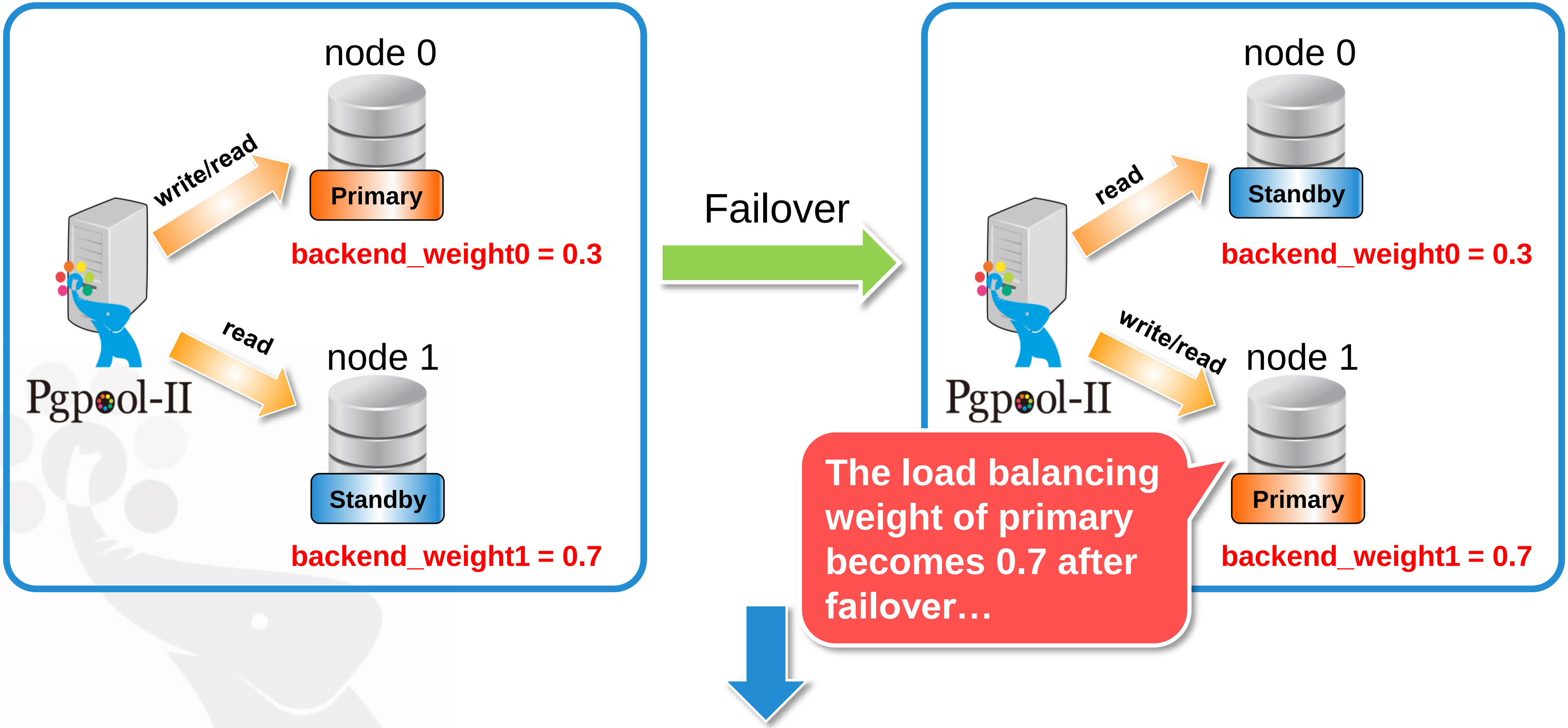
Improvement of load balancing (3)

Specify load balancing weight by load balancing parameters

Improvement of Load Balancing (3) Specify load balanc weight

Send 30% READ query to Primary

- **backend_weight0 = 0.3**
- **backend_weight1 = 0.7**



The load balancing weight of primary becomes 0.7 after failover…

Keep the load balancing weight of the Primary in a constant value

Improvement of Load Balancing (3) Specify load balance weight

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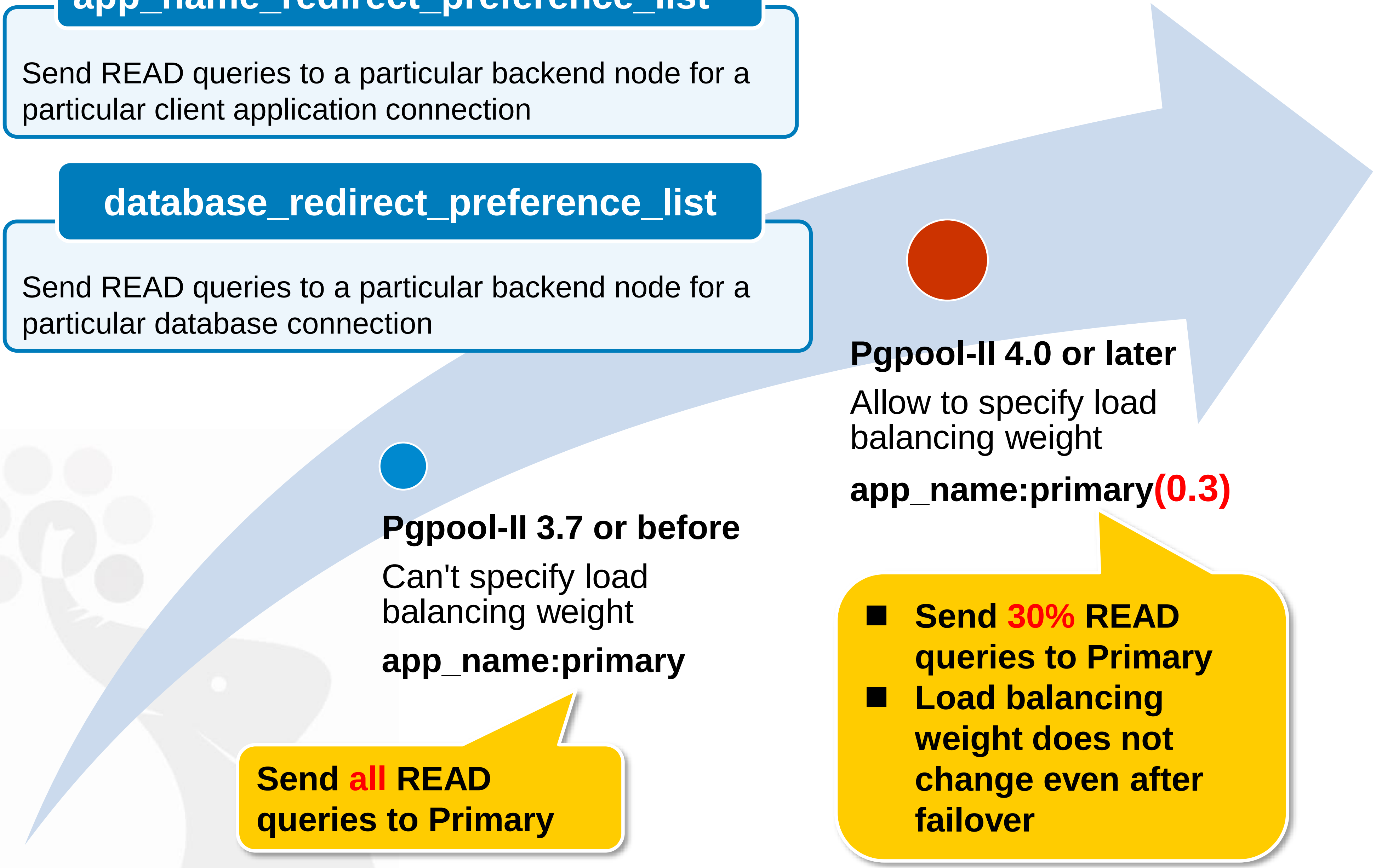
app_name_redirect_preference_list

Send READ queries to a particular backend node for a particular client application connection

database_redirect_preference_list

Send READ queries to a particular backend node for a particular database connection



Pgpool-II 3.7 or before

Can't specify load balancing weight

app_name:primary

Send all READ queries to Primary

Pgpool-II 4.0 or later

Allow to specify load balancing weight

app_name:primary(0.3)

- **Send 30% READ queries to Primary**
- **Load balancing weight does not change even after failover**

Enhance SHOW POOL_NODES command

Add "last_status_change" Column

Add "last_status_change" Column

last_status_change:
Time when "status" or "role" changed

- unused
- connect_wait
- up
- down
- quarantine

- primary
- standby

Be useful when failover happens and need to find out the cause in pgpool log file

```
postgres=# show pool_nodes;
 node_id | hostname | port  | status | lb_weight |  role    | last_status_change
---------+----------+-------+--------+-----------+--------  +--------------------
 0       | /tmp     | 11002 | up     | 0.500000  | primary  | 2018-09-10 10:36:24
 1       | /tmp     | 11003 | up     | 0.500000  | standby  | 2018-09-10 10:36:24
```

```
$ pcp_node_info -U pengbo -p 11001 -n 0
/tmp 11002 2 0.500000 up primary 0 2018-09-10 10:37:36
```

Also added to PCP and pgpool_adm

```
test=# SELECT * FROM pcp_node_info(0,'',11001,'pengbo','pengbo');
 host | port  |      status        | weight |  role   | replication_delay | last_status_change
------+-------+--------------------+--------+---------+ ------------------+-------------------
 /tmp | 11002 | Connection in use  |      0 | Primary |                 0 | 2018-09-10 11:06:18
```

Import PostgreSQL 11 SQL Parser

Import PostgreSQL 11 SQL Parser

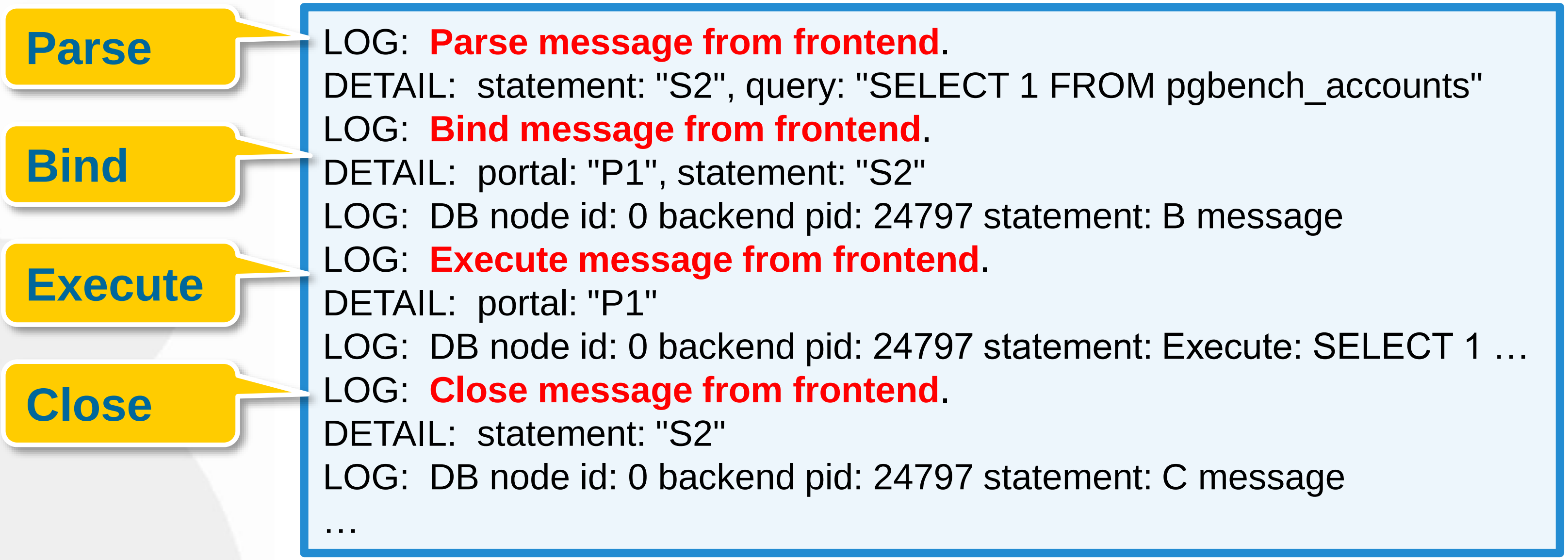
- Pgpool-II has SQL parser
  - To accurately parse the SQLs
  - To rewrite the query
- In every major release, we import the latest version of PostgreSQL's SQL parser to Pgpool-II
- Import PostgreSQL 11 parser to Pgpool-II 4.0
  - CREATE/ALTER/DROP PROCEDURE
  - CALL
  - ALTER/DROP ROUTINE
  - CREATE INDEX ... INCLUDE ...
  - { RANGE | ROWS | GROUPS } frame_start [frame_exclusion]
  - VACUUM/ANALYZE <table1>, <table2>

Logging Client Messages

Logging Client Messages

- Client messages
  - Messages from the client to Pgpool-II
- 3.7 or before
  - In order to record the client message, it was necessary to enable the debug messages
  - This prodoces huge amount of debug logs
- New parameter: log_client_messages
  - If log_client_messages = on, only client messages can be logged without debugging messages

log_client_messages = on



```
LOG:  Parse message from frontend.
DETAIL:  statement: "S2", query: "SELECT 1 FROM pgbench_accounts"
LOG:  Bind message from frontend.
DETAIL:  portal: "P1", statement: "S2"
LOG:  DB node id: 0 backend pid: 24797 statement: B message
LOG:  Execute message from frontend.
DETAIL:  portal: "P1"
LOG:  DB node id: 0 backend pid: 24797 statement: Execute: SELECT 1 …
LOG:  Close message from frontend.
DETAIL:  statement: "S2"
LOG:  DB node id: 0 backend pid: 24797 statement: C message
…
```

Incompatible changes

- Recovery script now accepts 5 parameters
  - $5: node number to be recovered
  - Existing pgpool_recovery () function can be used if you don't care about information provided by the 5th parameter
- Change of parameter name
  - **fail_over**_on_backend_error => **failover**_on_backend_error
  - Now a warning message is displayed when old config name fail_over_on_backend_error is used instead of failover_on_backend_error
- Allow to specify AES encrypted password in pgpool.conf

Thank you!