Implementing High Availability
with PostgreSQL

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PostgreSQL Major Contributor

- `pgloader`, `prefix`, `skytools`, `debian`, ...
- `CREATE EXTENSION`
- `CREATE EVENT TRIGGER`
- *Bi-Directional Replication*
- *Partitioning*

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Hi-Media (turnover scale: 200 millions €)

3 different activities to get money from the web

- Allopass, HiPay: internet (micro) payment
- Telecom Service
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- Business needs compliance
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PostgreSQL: Your data is our job

How to ensure *both duralibity* and *availability* of your data?

Usual needs:

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- Stability
- Performances
- Growth capacity (think commercial success)
- Continuity and Innovation

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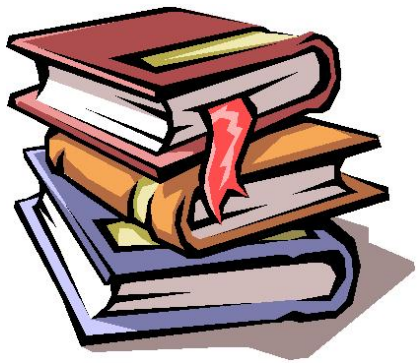
Glossary

Some vocabulary

- Availability
- Duralibity (ACID)
- Architectures
- Replications



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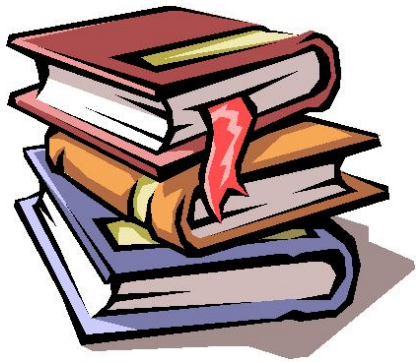

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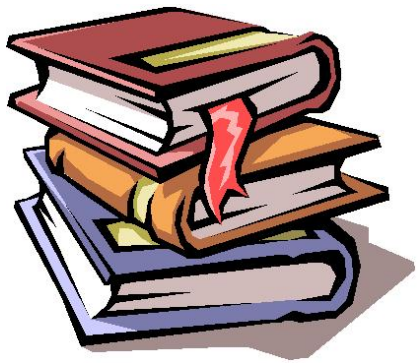

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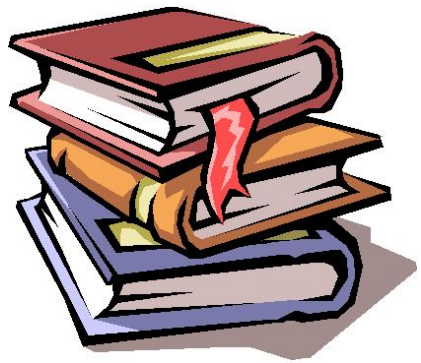

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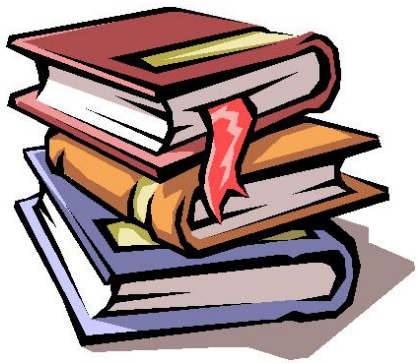

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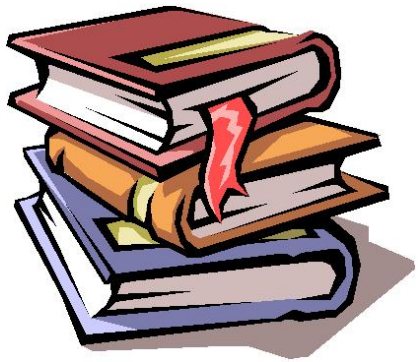
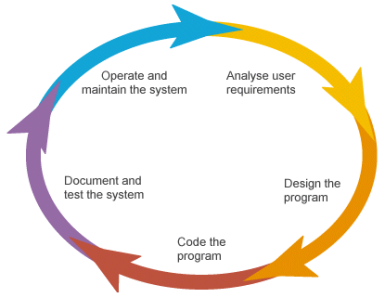


Needs first

Needs evolve, solutions must adapt

- Start simple
- Some first classic steps
- High Availability of Data
- High Availability of Services
- Read Only Load Balancing
- Read Write Load Balancing



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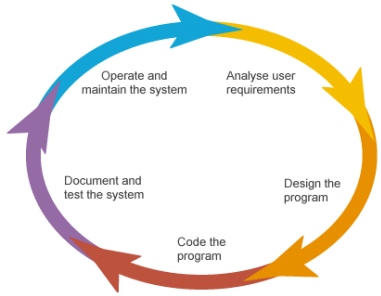

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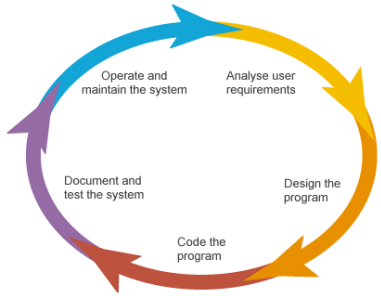
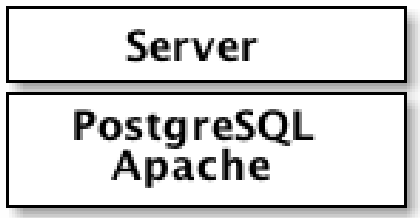
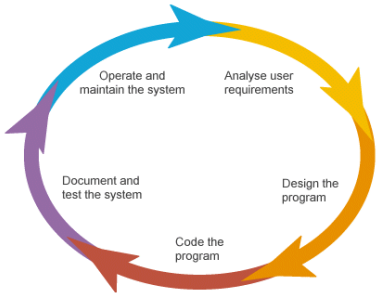


Let's start simple

Our projet life cycle

Let's start with the example of a quite simple project released as a web application seeing its needs evolve with its success.

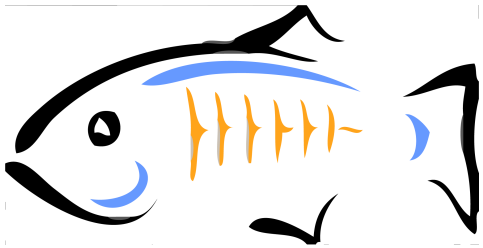




Scaling out 101

Services Availability

- Front servers are *stateless*
- Watch out for `max_connections`
- Don't you use persistent connections!
- `pgbouncer`



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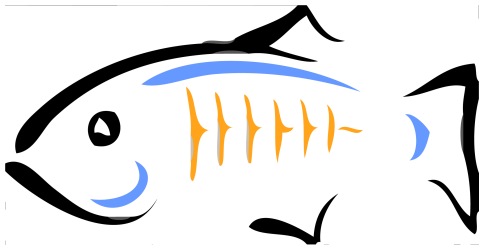

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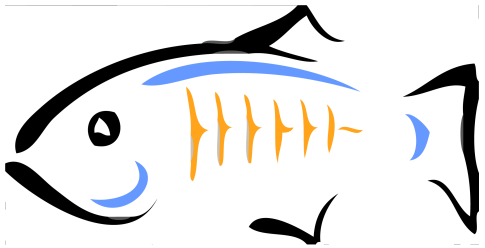
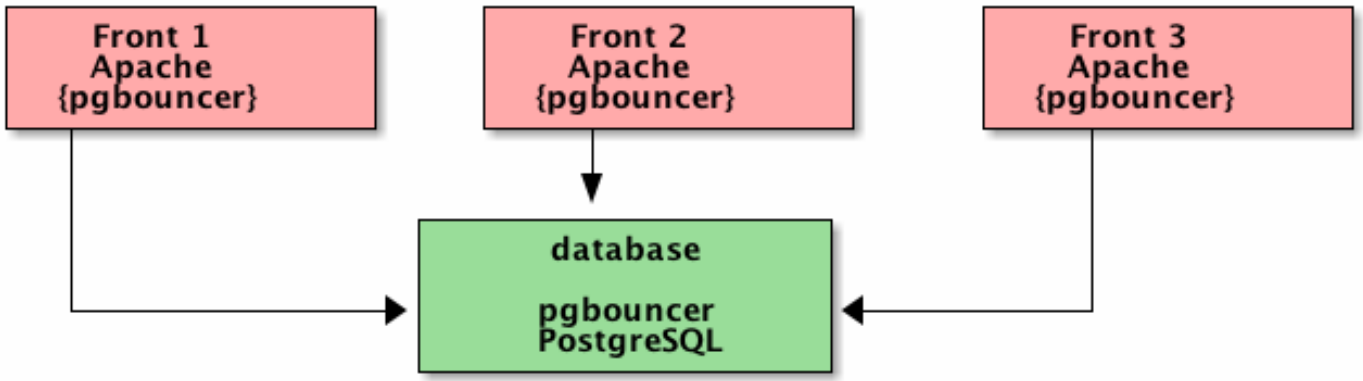


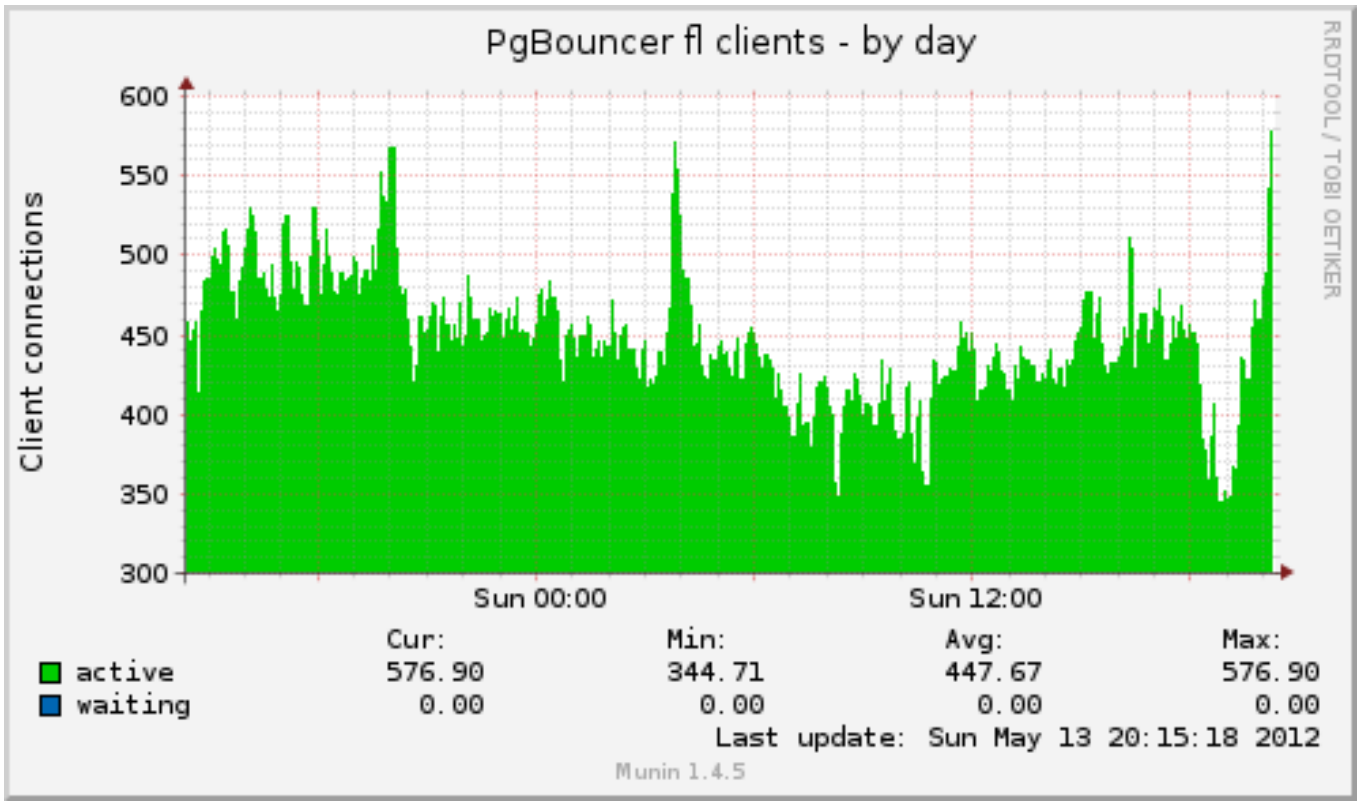
Scaling out 101

Using more than a single server and a connection pool



pgbouncer

pgbouncer is able to reuse client **and** server side connections.



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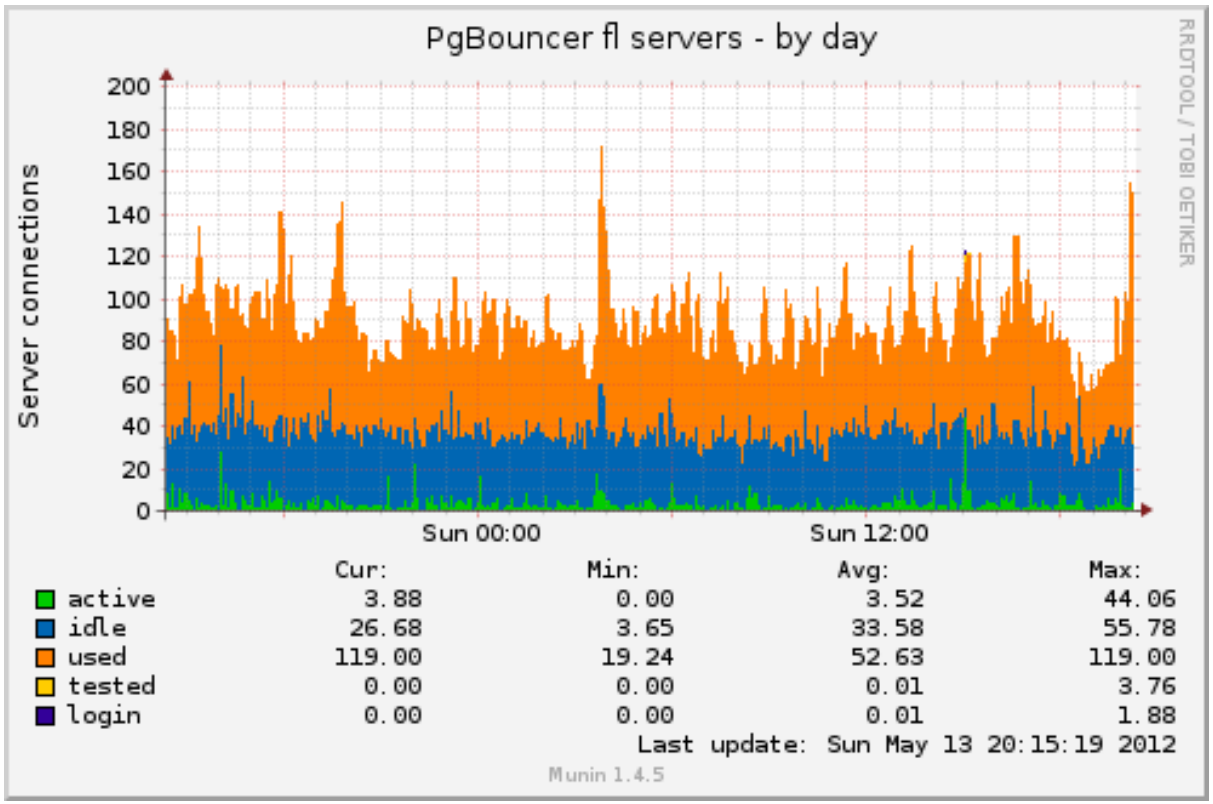

Getting serious: backups

Backup Strategy is the single most important step towards data availability

- Nightly `pg_dump -Fc`
- Don't forget `pg_dumpall -globals-only`
- Data Retention
- 7 days of nightly backups
- 7 weeks of weekly backups
- 12 months of monthly backups
- 30 years of yearly backups?

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Failover, 101

`pg_dump`, `pg_restore`

- protection against *errors and omissions*
- beware of restoring time
- still a must have for data **durability**
- what about data **availability**?

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Failover, 201

Using physical backups and *Point In Time Recovery*

- Point In Time Recovery, 8.1
- *warm standby*, 8.2
- Archiving and *crash recovery*
- `archive_command`
- `restore_command`
- `walmgr.py`, `WAL-E`

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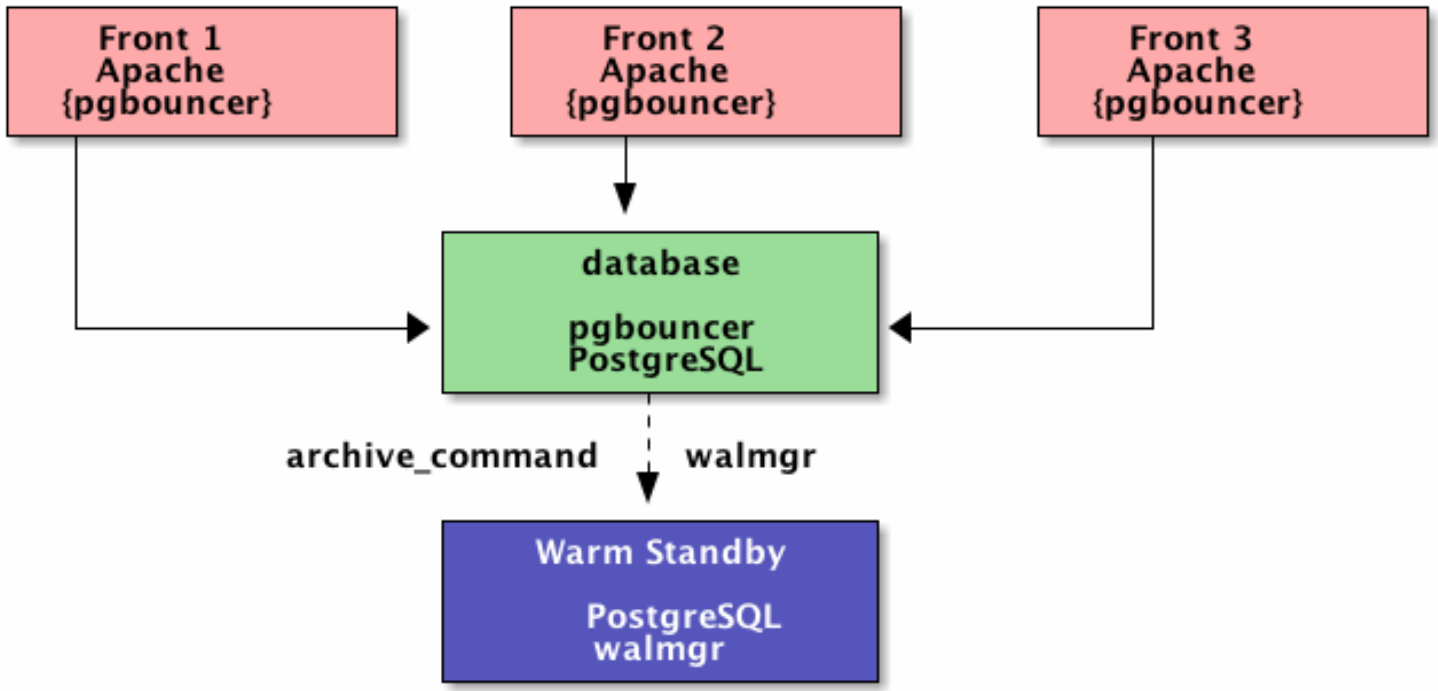
Warm Standby

Implementing *Warm Standby*



Application Split

When you have separate *backoffice* and *production* requirements

- Cross replication
- Slony, **Londiste**, Bucardo
- Specific processing, *batches*
- Off-line processing
- Still *Transactional* processing
- Skytools comes with PGQ

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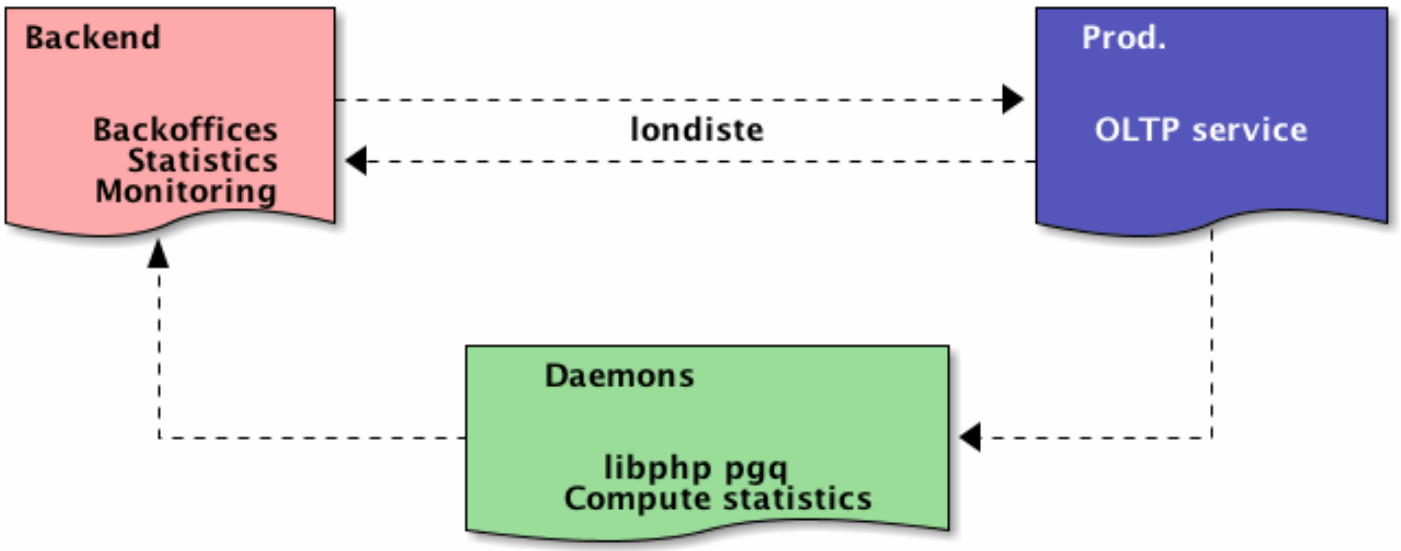
Implementing *londiste* and *PGQ*



Queueing with *PGQ*

Off-line processing is better done with PGQ

- Mainly written in PLpgSQL (and C)
- Client *API* for python
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PostgreSQL 9.1 offers *Synchronous Replication* and *Hot Standby*

- Hot Standby
- *(A)*Synchronous Replication
- Standby connects with `libpq`
- `recovery.conf`
- Continue Archiving
- Switchabe **per transaction**
- Good performance level

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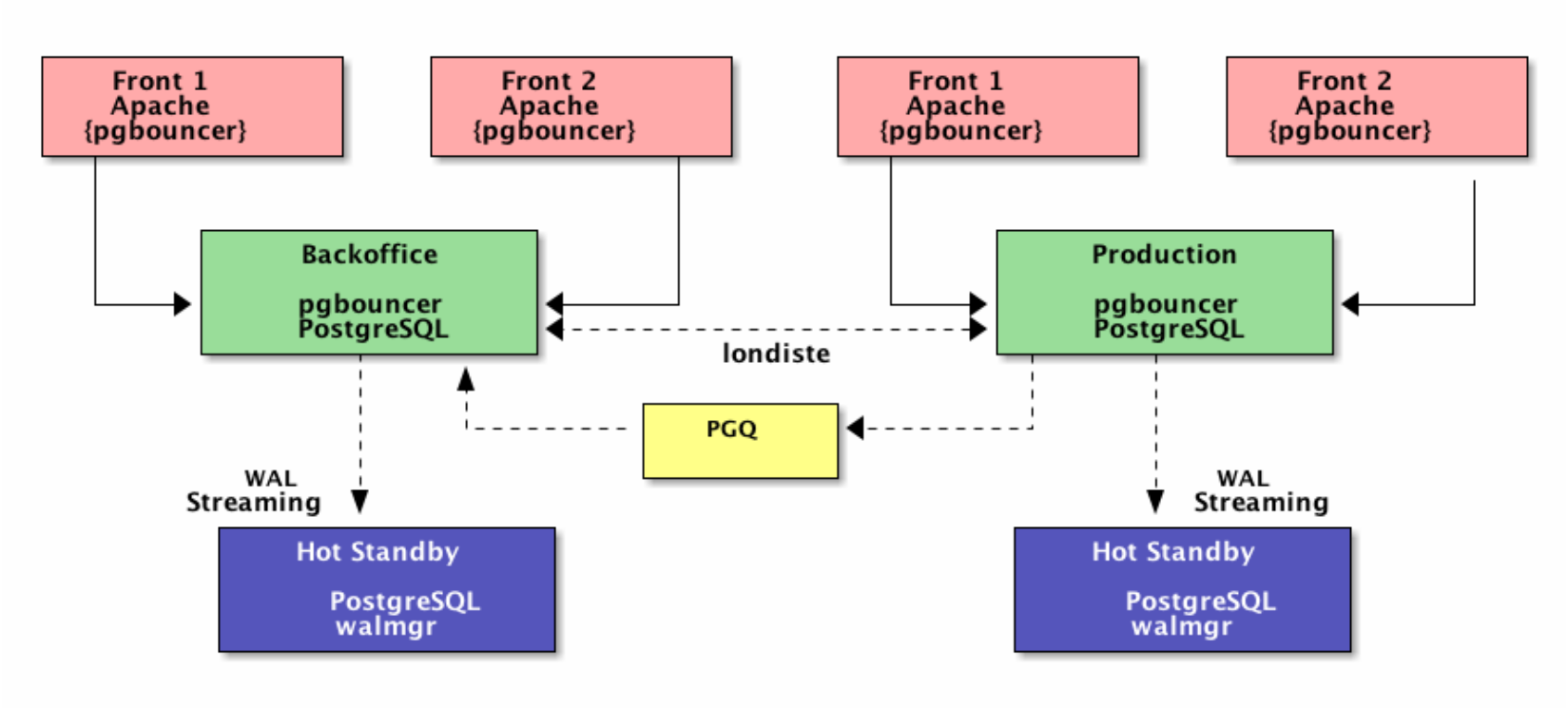
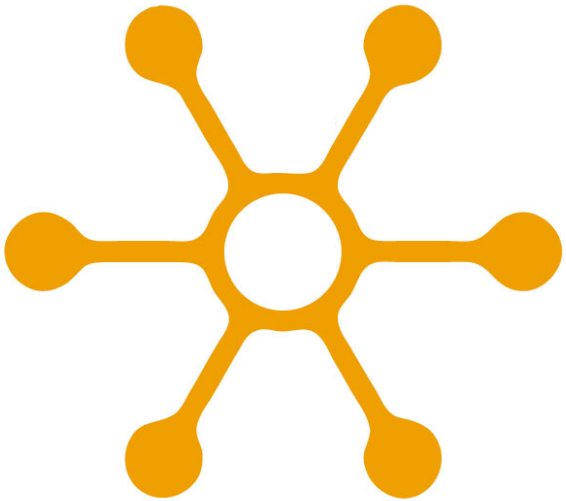


Scaling Writes

PL/proxy

- *Scale-up* or *Scale-out*?
- *Remote Procedure Call*
- *Sharding*
- Distributed database
- Autonomous Transactions
- Stored Procedures



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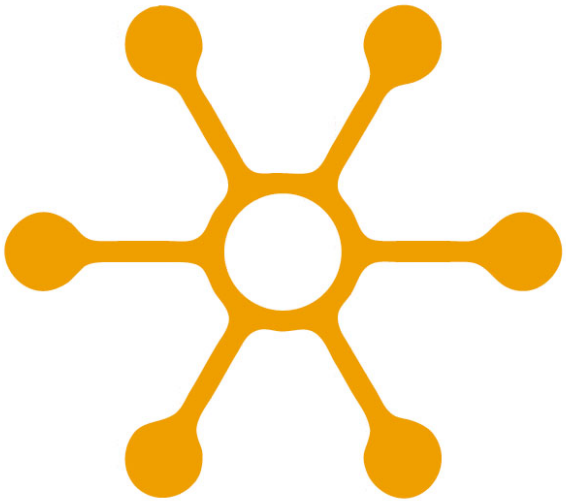

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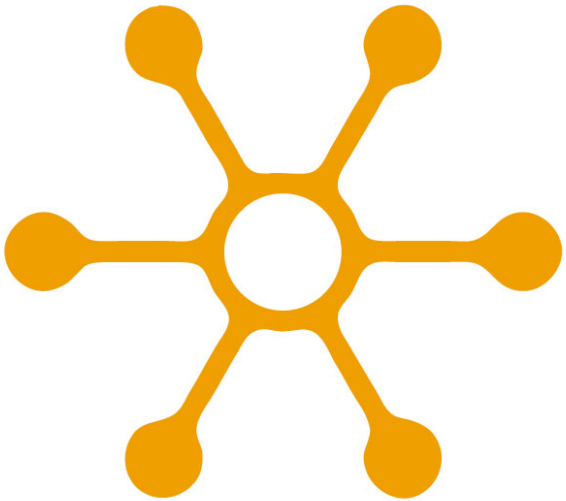

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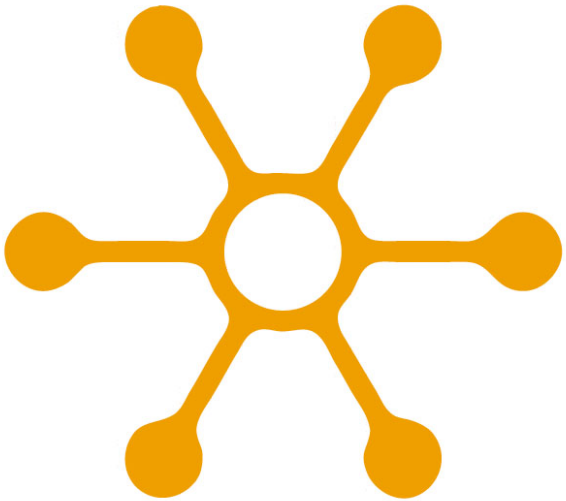

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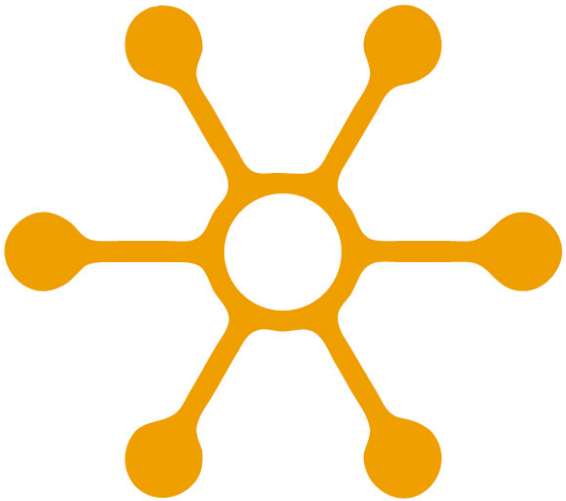
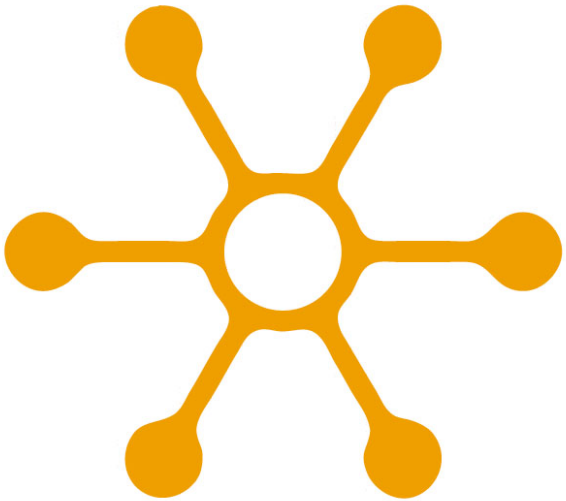


PL/Proxy

Installing plproxy

Example (install.sql)

```
=# create extension plproxy;
=# create extension hashlib;
```



PL/Proxy

pl/proxy is the integrated sharding layer. Now you have to write all your SQL in server side functions.

Example (admin/change_group_status.sql)

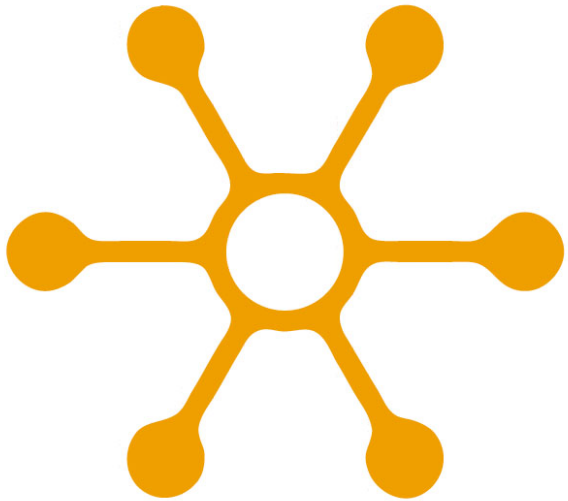
```
create or replace function admin.change_group_status
(
    user_name text, status integer
)
returns void as $BODY$
    CLUSTER 'fl_cluster';
    RUN ON hash_string(user_name, 'lookup3le');
$BODY$;
```

Distributed Sequences 1/2

Same schema on every node, best to avoid overlapping sequences.

Example (distributing sequence)

```
ALTER SEQUENCE foo_id_seq
  INCREMENT BY 16;
```



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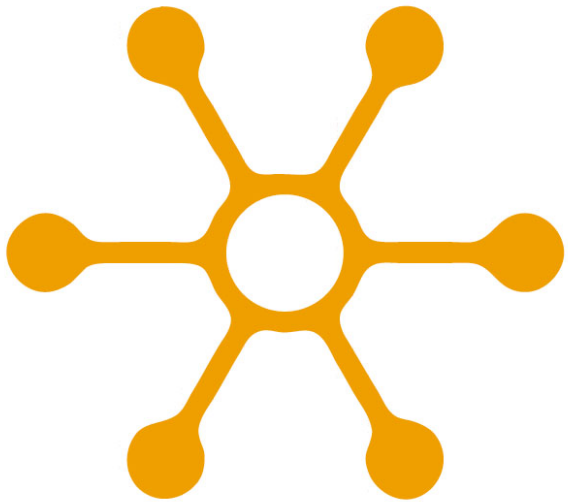

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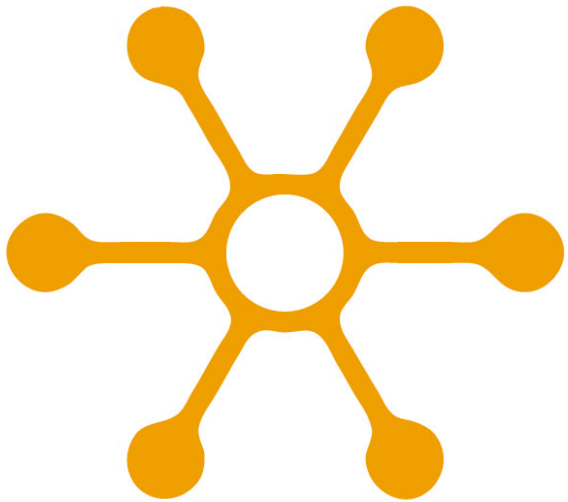

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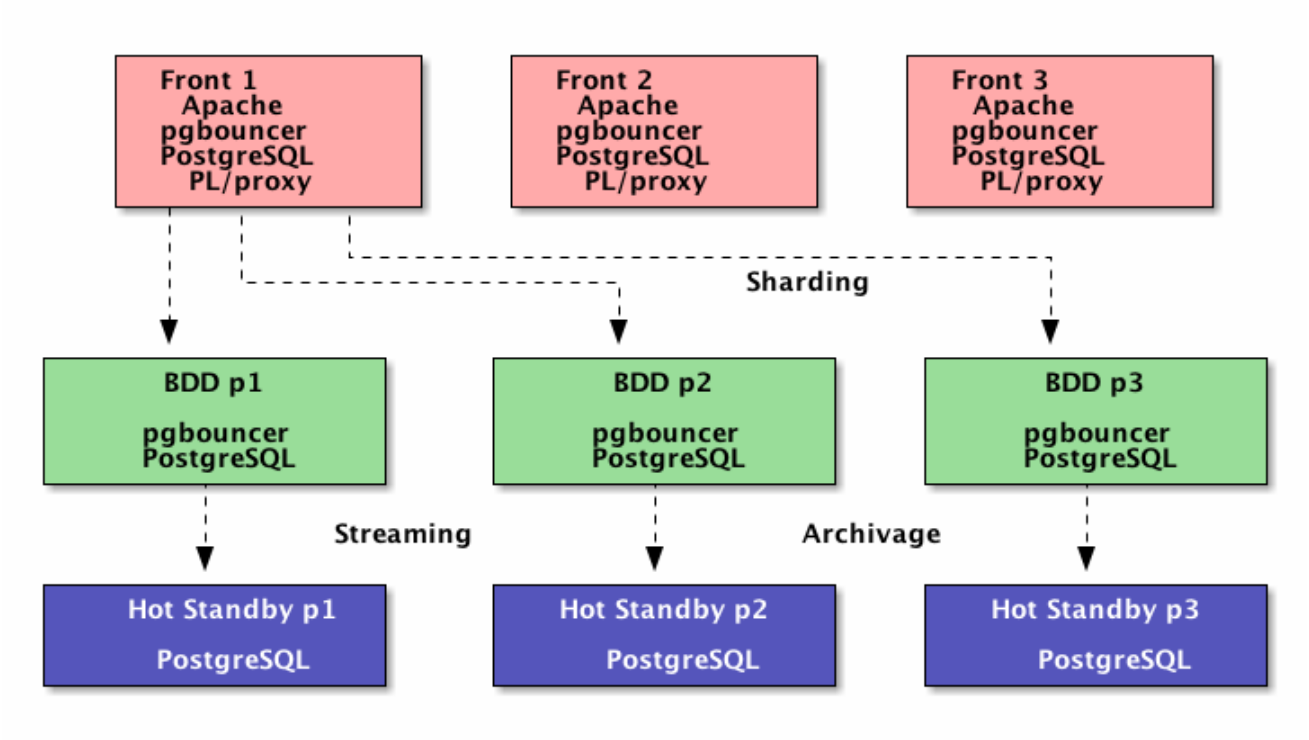
Scaling Writes

Implementing `plproxy`



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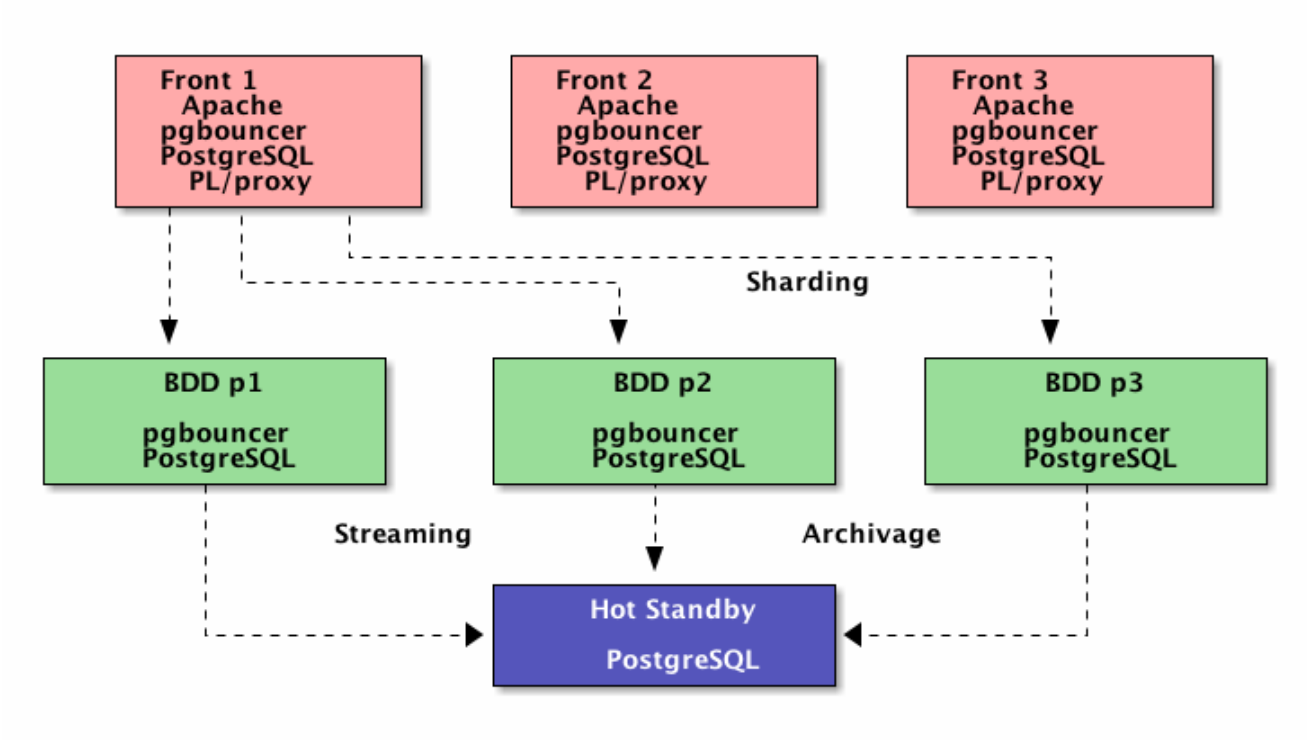

Distributed High Availability

Retrospective and Future of PostgreSQL Replication

- **8.1**, PITR
- 8.2, Warm Standby
- 8.3, pg_standby
- 9.0, Hot Standby
- 9.1, Synchronous Replication
- 9.2, Cascading Replication
- 9.3, Bi-Directional Replication

Distributed High Availability

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- **8.2**, Warm Standby
- 8.3, `pg_standby`
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Questions?

Meet with us on the booth, join us in the *Hallway Track*!

Want to win a blue elephant?

`http://2012.pgconf.eu/feedback/`