Securing PostgreSQL with streaming replication

PostgreSQL Database Conference, UCLL campus proximus, Haasrode - Belgium
Tuesday - May 5th, 2026

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Jan Karremans

PostgreSQL person

- ~~Techie in Sales~~ Seller in Tech
- 35 years of database expertise
- 8 years of databases in Kubernetes

Enterprise Kubernetes & PostgreSQL Strategist

Field CTO | Principal Cloud Native Architect | Digital Sovereignty Advocate

ORACLE ACE Alumni

CERTIFIED kubernetes ADMINISTRATOR

TRAINED

PostgreSQL Professional Certification

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Agenda

1. **What Is Streaming Replication?**
   And why does it even matter?

2. **Single Elephant To A Herd**
   Scaling PostgreSQL safely (nearly) to infinity

3. **And This Logical Replication Thing?**
   What is it and why does that matter?

4. **What Does This Mean?**
   Even the basic functions make a difference

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The world runs on data

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and you shouldn’t
miss a speck

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Data Lives In Transactions

Change Is The Default

- Secure the changes
- “Replay” the changes
- Internal and external
- Dead and alive

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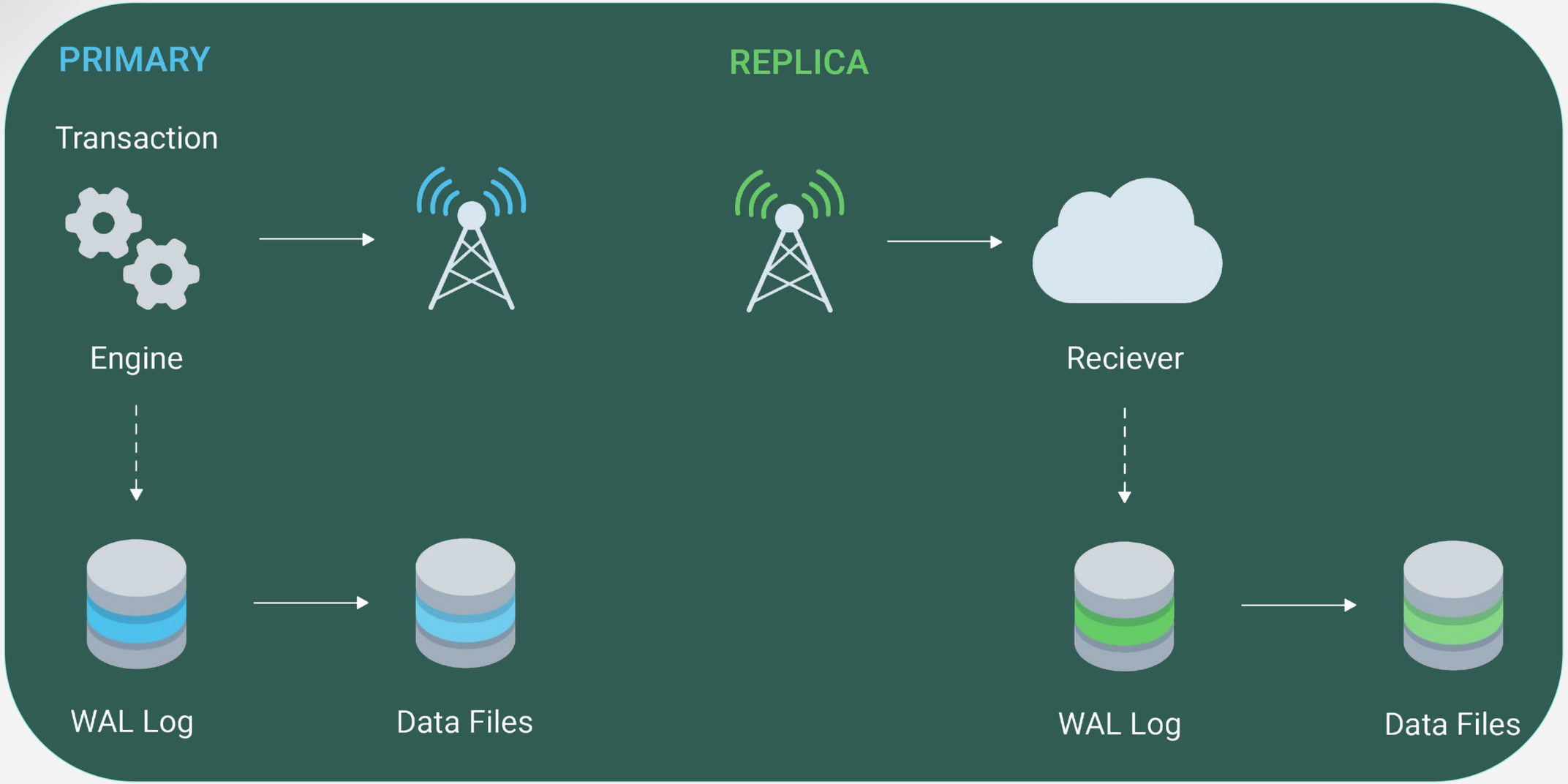
Transaction Log



Characteristics

- Binary compatible
- Works out-of-the-box
- Rock solid and super secure

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Single Lonely Cluster

- Crash recovery
- Archive recovery

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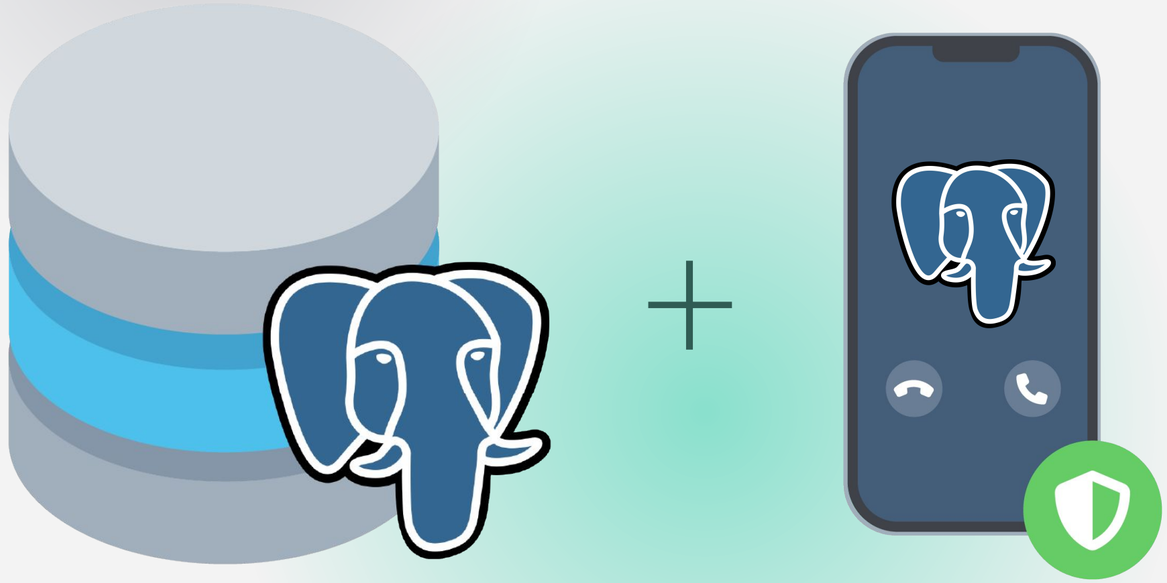
Single Lonely Cluster

With Some Support

- WAL file copy
- Transaction streaming pg_receivewal



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Primary And Replica

Primary node

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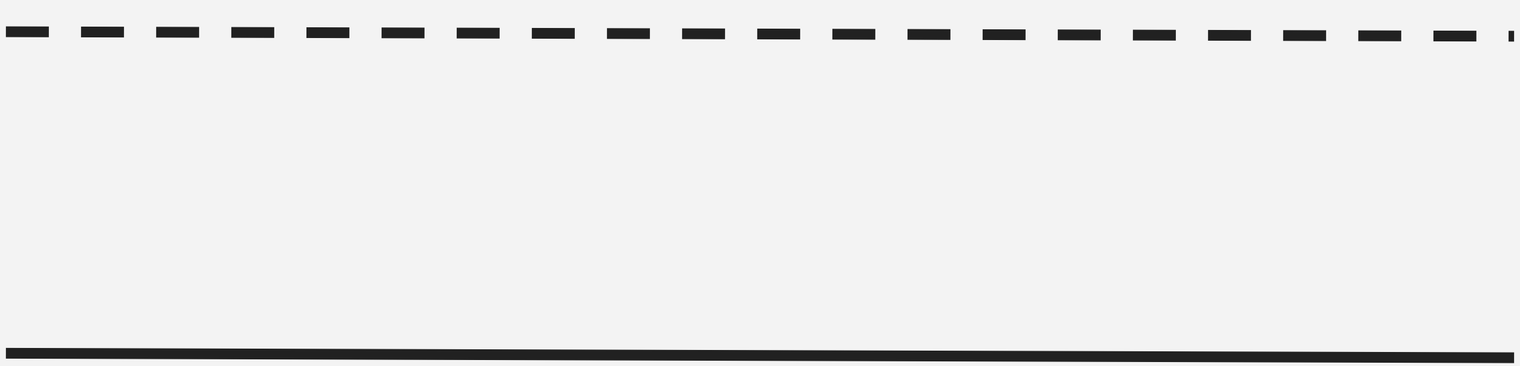
Async & Sync



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Parameter influence

- max_standby_archive_delay
- max_standby_streaming_delay
- hot_standby_feedback

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Async & Sync - Dangers

synchronous commit setting	local durable commit	standby durable commit after PG crash	standby durable commit after OS crash	standby query consistency
remote_apply	X	X	X	X
on	X	X	X	
remote_write	X	X		
local	X			
off				

CAUTION: BIAS!

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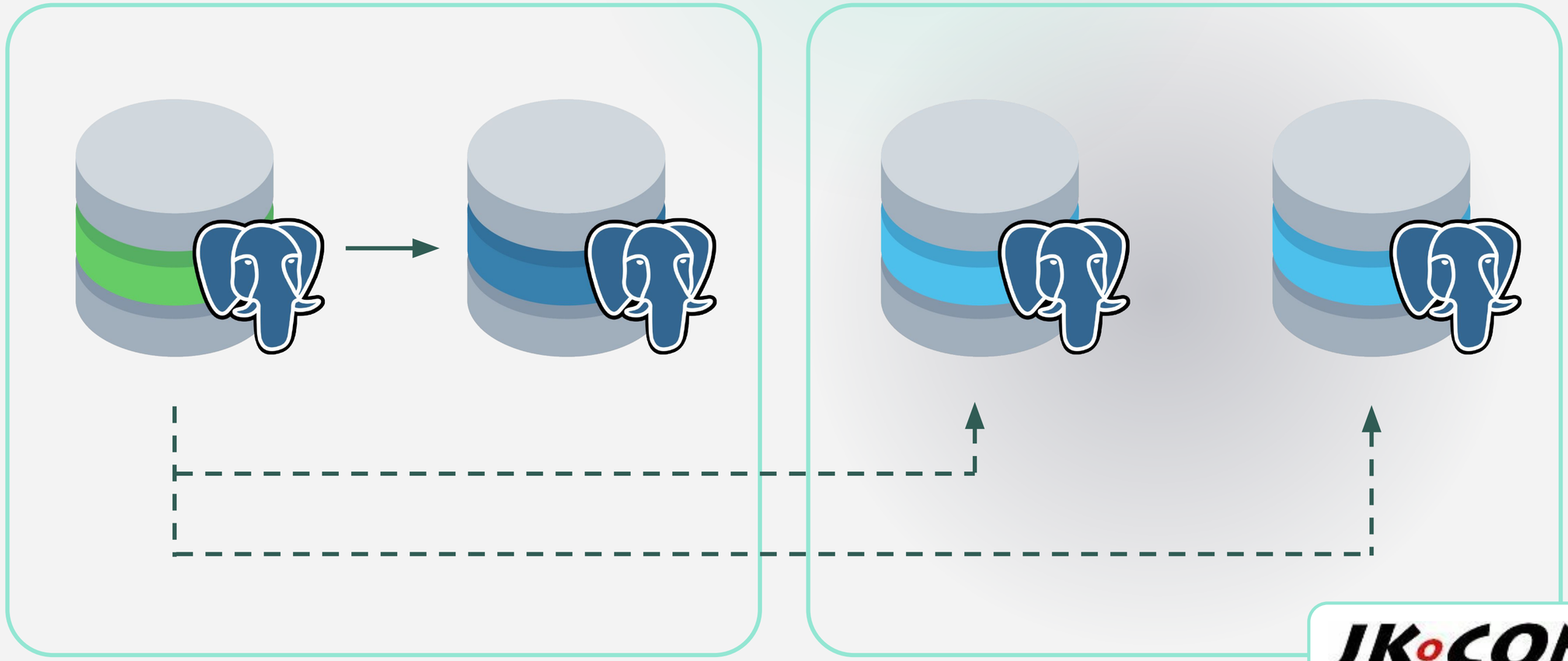
Primary And Replicas



Primary node

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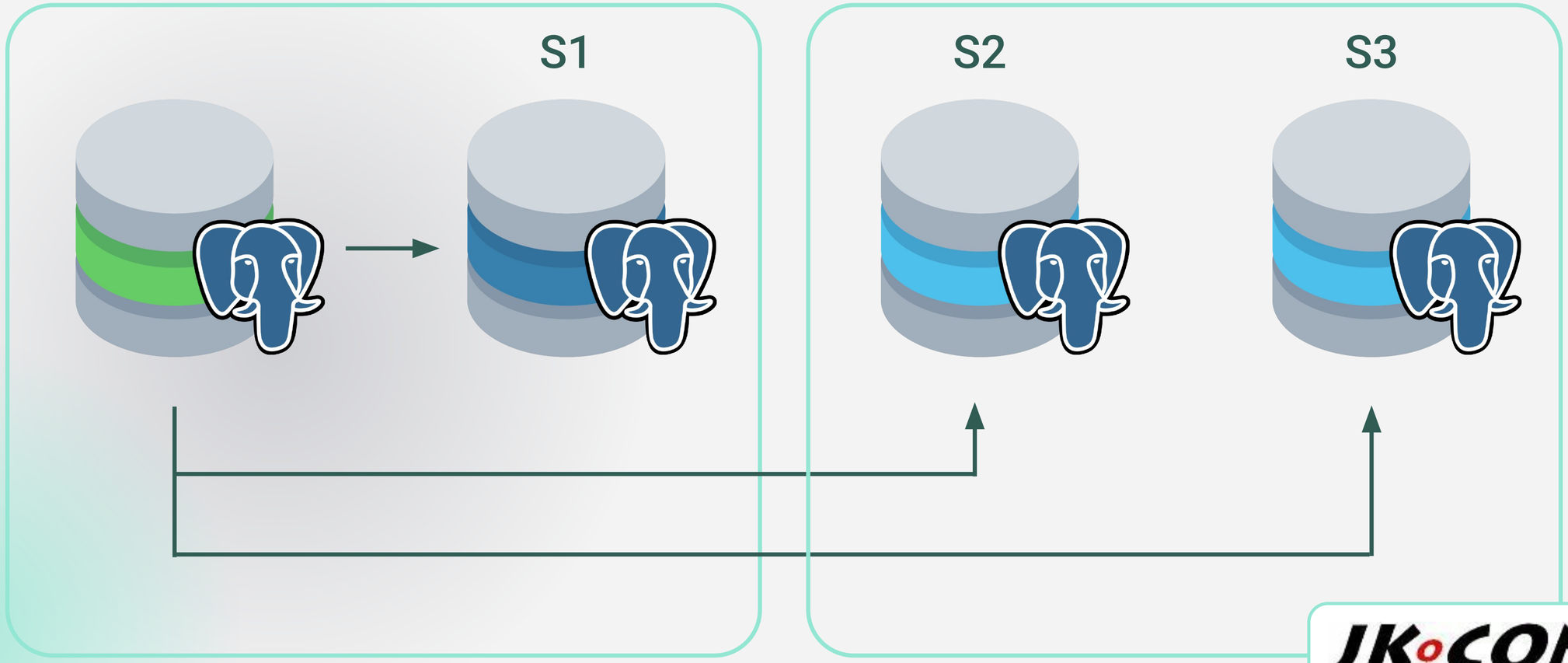
Primary And Replicas

```
synchronous_standby_names = 'FIRST 2 (S1, S2, S3)'
```



Primary node

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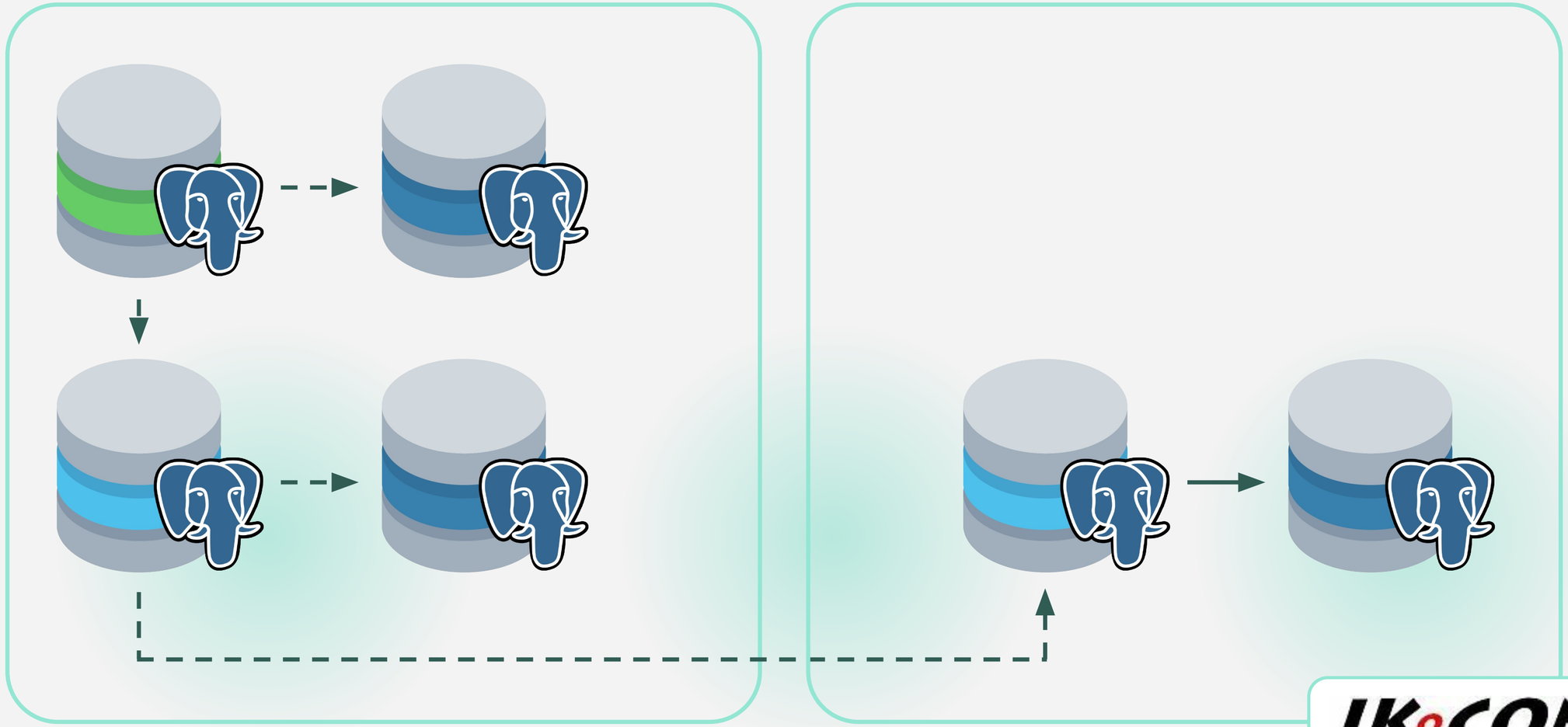
Primary And Cascading Replicas



Primary node

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More Tools

PGBOUNCER

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What?

Physical

- Based in bits and bytes
- Rock solid and super secure
- Meant for technical resilience
- Seamless

Logical

- Based on transactions
- Rock solid, but with a twist
- Meant for data "manipulation"
- Has requirements

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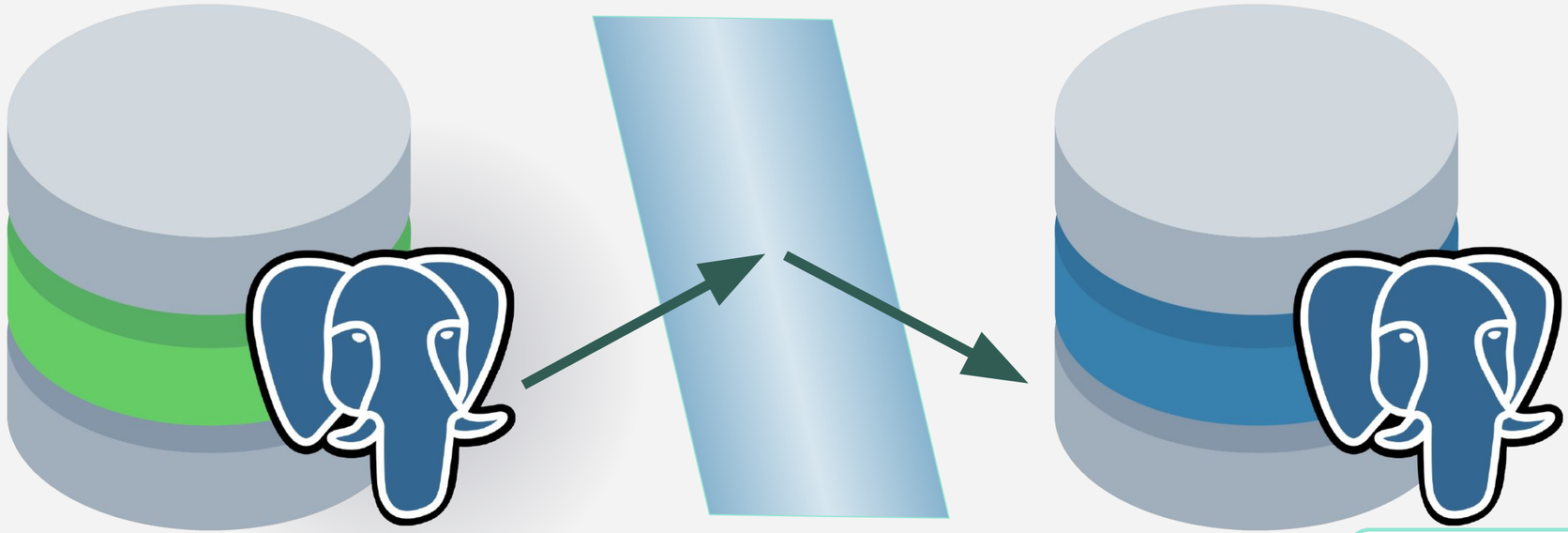
Streaming Replication



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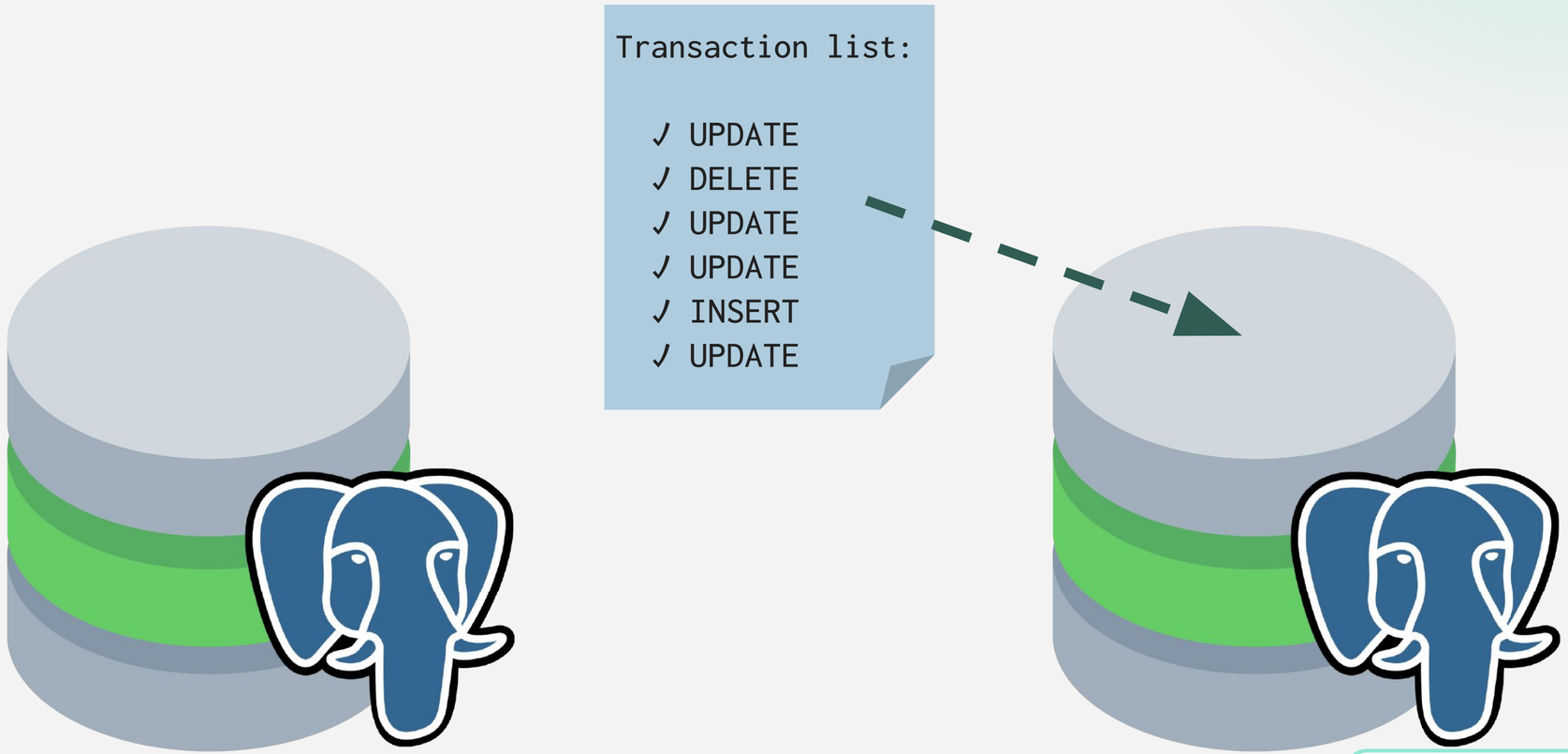
Logical Replication



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Logical Replication

Transaction list:

- ✓ UPDATE
- ✓ DELETE
- ✓ UPDATE
- ✓ UPDATE
- ✓ INSERT
- ✓ UPDATE

Transaction list:

- ✓ UPDATE
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- ✓ UPDATE
- ✓ INSERT
- ✓ UPDATE

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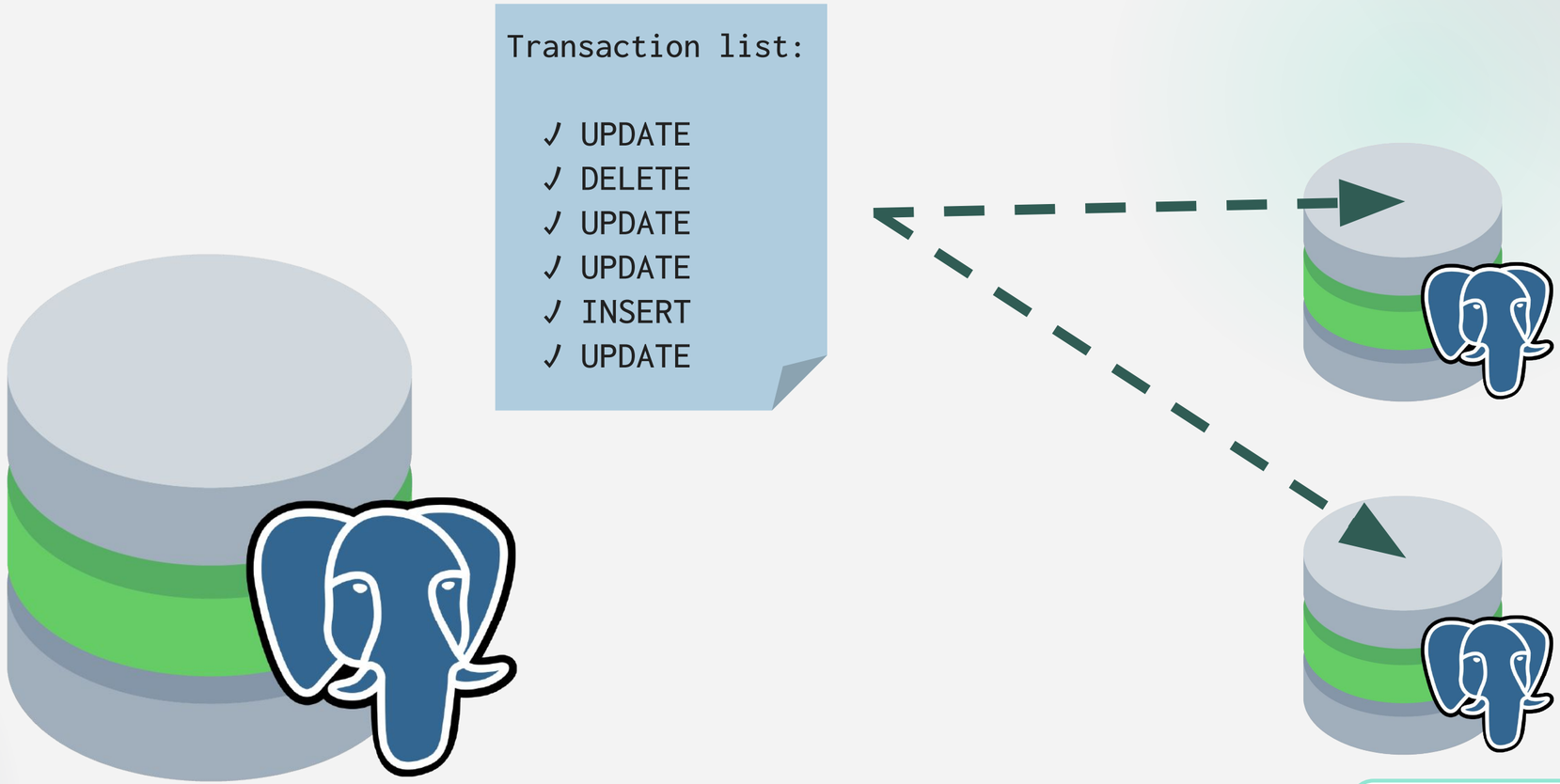
Logical Replication



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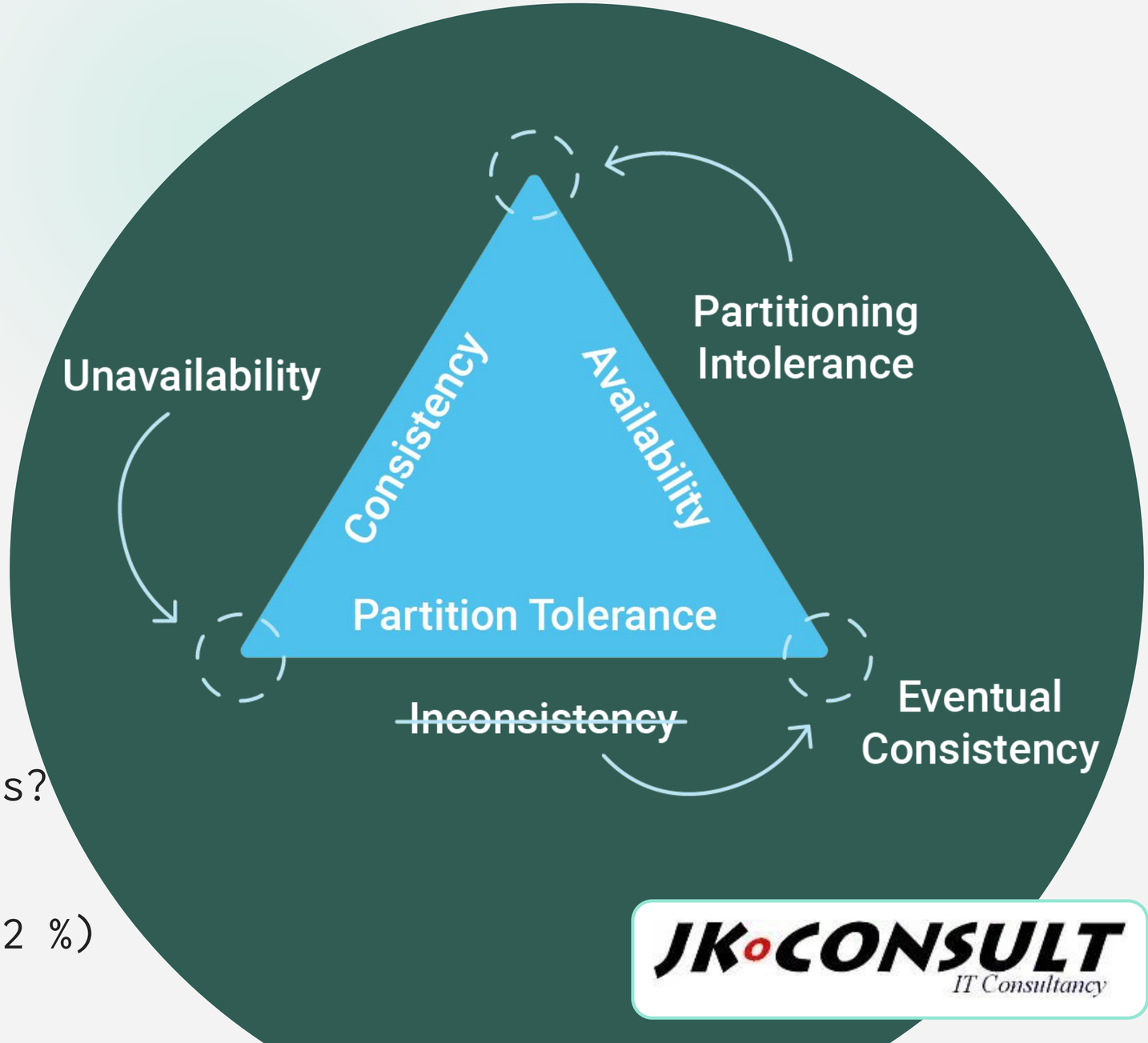
Risks

- Conflicts
- Logical corruption
- Conflicts
- Conflicts
- Conflicts

Requirements

- Is your application "aware"?
- How do you deal with sequences?
- Can be extremely useful
- If your use case needs it (1-2 %)



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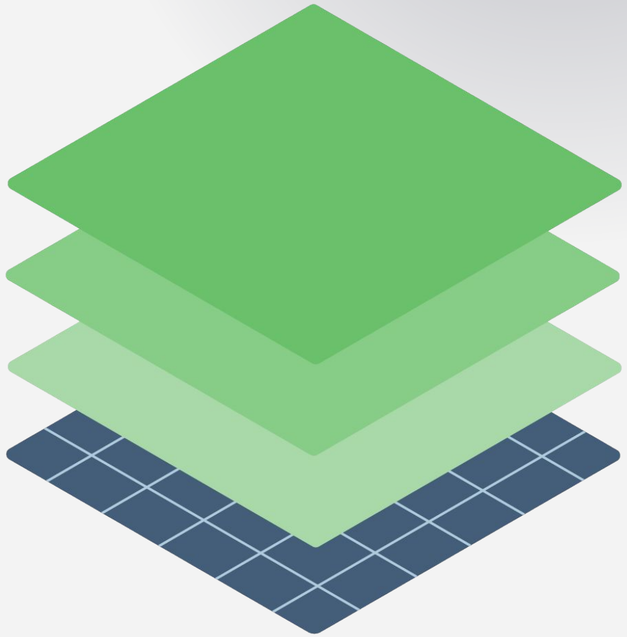
Solid Foundation

- Toolbox for creativity
- Rock solid and super secure
- Data protection knows no bounds
- From simple DR to global data protection strategies



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Corollaries

Quoting The Legendary Ants Aasma

- PostgreSQL ecosystem has a solution for almost any problem you need to solve.
- For many specific tasks, there is something else out there that can do it better.
- However PostgreSQL will still get it done well enough.
- Very likely somebody has already made it do it and posted about it on the internet.

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The Winning Formula

Quoting The Legendary Ants Aasma

1. Default to “Just use PostgreSQL”.
2. Use it until it no longer works.
3. Optimize until it works again.
4. Move the part that is hard to a special purpose tool.

If you are lucky, step 4 is never needed.

If it is, you arrive with knowledge and resources to tackle the problem correctly.

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PostgreSQL is the best because it is good enough for the task you didn't know you had

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