You'd Better Have Tested Backups...

PGConf US 2016

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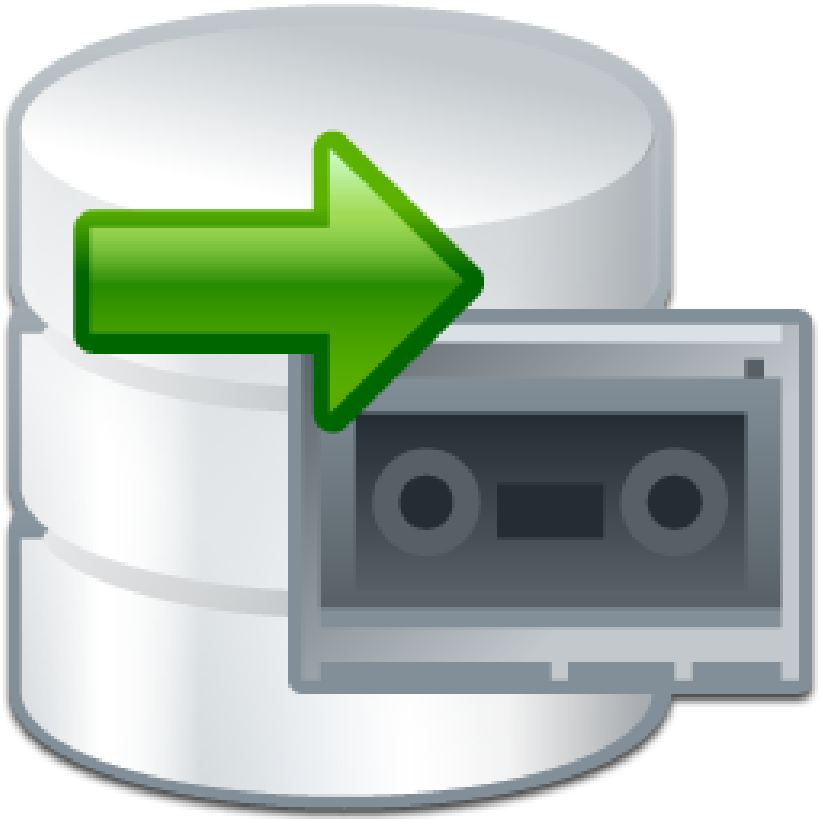
April 20, 2016

Le Bon Coin

PostgreSQL Major Contributor

- `pgloader`
- `prefix`, `skytools`
- `apt.postgresql.org`
- `CREATE EXTENSION`
- `CREATE EVENT TRIGGER`
- *Bi-Directional Réplication*
- `pginstall`

You'd Better Have Tested Backups...



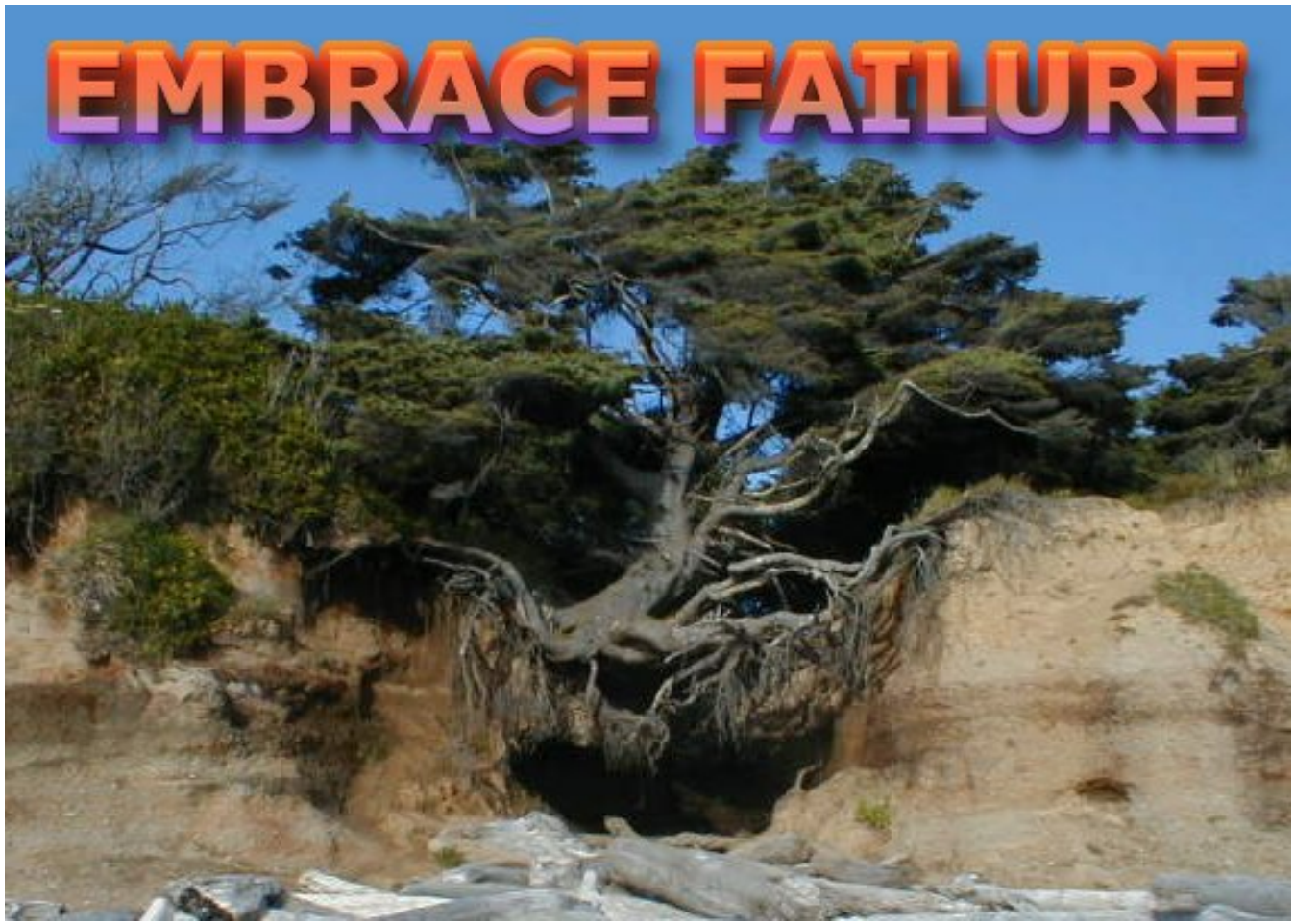
In fact, backups are not interesting

Actually, automated recovery testing

Use a battle tested tool

WHY USE BARMAN? Barman: disaster recovery for business critical PostgreSQL databases

Today we're talking about what happens when you don't



Backups? we have a shell script!

Shell Script, ENV, missing setup

```
find $BACKUP_DIR -mtime +5 | xargs rm -f
```

And now what?

Data recovery

Try to recover from what backups we do have:
only WAL files, no basebackup

- `pg_controldata` and `xlogdump`
- `initdb` then
- `hexedit pg_control`
- `59231454918425471 87` to `52 33 3D 71 52 3B 3D F3`
- then actually `F3 3D 3B 52 71 3D 33 52`
- play with the WAL we have and `pg_resetxlog`
- no luck this time, no working around missing WAL files

Back to having that PostgreSQL running

First, **backup** the physical files left available

Back to having that PostgreSQL running

logs complain about `pg_filenode.map`

```
od -j 8 -N $((512-8-8)) -td4
   < $PGDATA/global/pg_filenode.map
```

Back to having that PostgreSQL running

logs complain about pg_clog

```
> (code-char #b01010101)
#\U
```

```
for c in 0000 0001 0002 0003 0004 0005 \
         0006 0007 0008 0009 000A 000B 000C
do
    dd if=/dev/zero bs=256k count=1 | tr '\0' 'U' > $c
done
```

Now PostgreSQL starts.

But is complaining about missing pg_database mappings

How to provide for your own mapping?

```
select oid, relname, pg_relation_filenode(oid)
  from pg_class
 where relname = 'pg_database';
 oid  |    relname    | pg_relation_filenode
------+---------------+----------------------
 1262 | pg_database |                12319
(1 row)
```

How to provide for your own mapping?

```
$ strings $PGDATA/global/12319
postgres
template0
template1
```

How to provide for your own mapping?

```
CREATE DATABASE ...  WITH OIDS ...;
```

Now we can connect to a database!

Only to hit a never seen before error message:

```
FATAL:  database "dbname" does not exists
DETAIL:  Database OID 17838 now seems to belong to "otherdb"
```

Start without the system indexes

Ignore system indexes when reading system tables, but still update the indexes when modifying the tables. This is useful when recovering from damaged system indexes.

```
$ pg_ctl start -o "-P"
```

Start without the system indexes

As one does.

```
$ pg_ctl start -o "-P"
$ cat > $PGDATA/postgresql.conf <<EOF
        enable_indexscan = off
        enable_bitmapscan = off
        enable_indexonlyscan = off
EOF
$ pg_ctl reload
```

Now we can query the catalogs!

psql and list tables, \dt

but

base/16384/12062 is missing

```
  select oid, relname, pg_relation_filenode(oid)
  from pg_class
 where pg_relation_filenode(oid) = 12062;
 oid  | relname | pg_relation_filenode
------+---------+----------------------
 1255 | pg_proc |                12062
(1 row)
```

We lost the system catalogs...

Copy them over from a fresh `initdb` system.

Unless you did use some extensions...

Missing pg_namespace

But the application is using *custom* schemas.

How is pg_namespace stored?

```
select oid, * from pg_namespace;
  oid  |      nspname       | nspowner |        nspacl
-------+--------------------+----------+----------------------
    99 | pg_toast           |       10 |
 11222 | pg_temp_1          |       10 |
 11223 | pg_toast_temp_1    |       10 |
    11 | pg_catalog         |       10 | {dim=UC/dim,=U/dim}
  2200 | public             |       10 | {dim=UC/dim,=UC/dim}
 11755 | information_schema |       10 | {dim=UC/dim,=U/dim}
(6 rows)
```

Figuring out the file content

```
# copy pg_namespace to stdout with oids;
99      ⇥pg_toast       ⇥10     ⇥\N
11222   ⇥pg_temp_1      ⇥10     ⇥\N
11223   ⇥pg_toast_temp_1⇥10     ⇥\N
11      ⇥pg_catalog     ⇥10     ⇥{dim=UC/dim,=U/dim}
2200    ⇥public ⇥10     ⇥{dim=UC/dim,=UC/dim}
11755   ⇥information_schema     ⇥10     ⇥{dim=UC/dim,=U/dim}
```

Add our namespaces live, with the right OIDs

```
# copy pg_namespace from stdin with oids;
Enter data to be copied followed by a newline.
End with a backslash and a period on a line by itself.
>> 16443        ⇥my_namespace    ⇥10       ⇥\N
>> \.
```

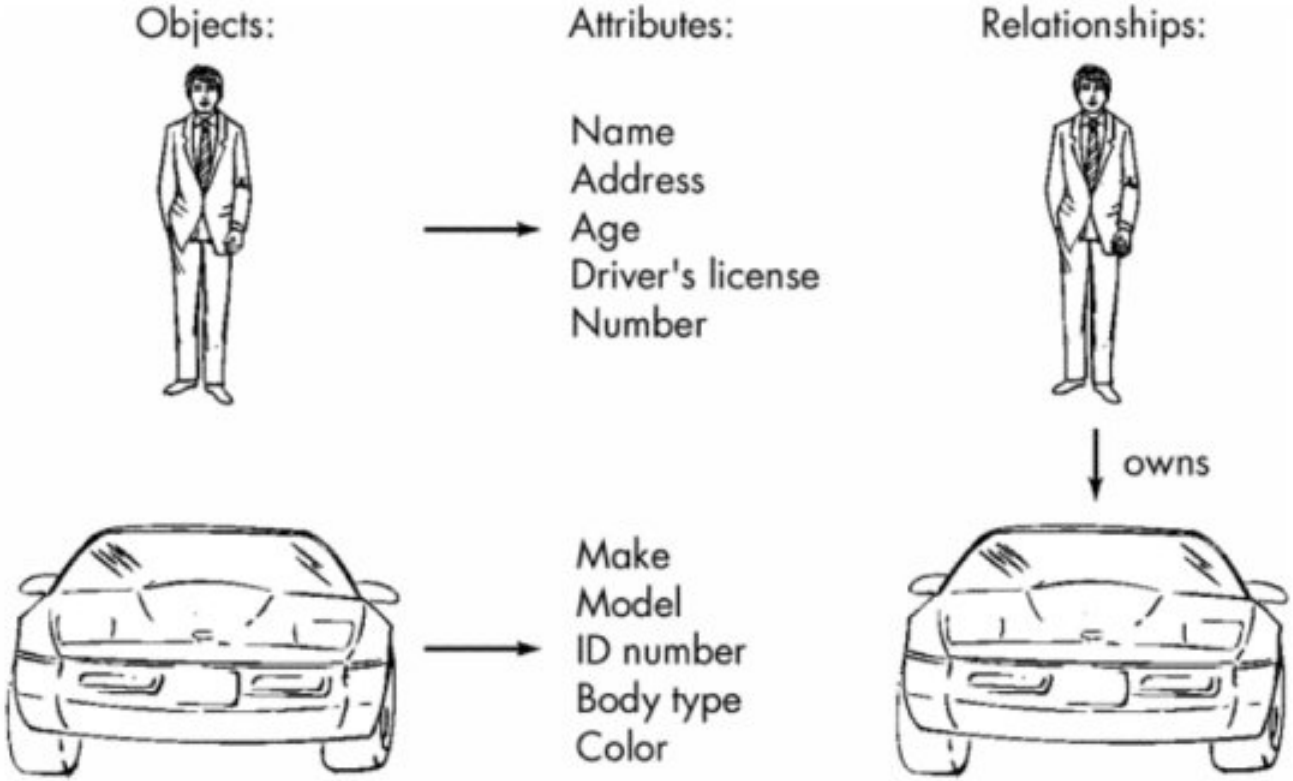
Wait, where the OID is coming from?

```
# select c.oid, relname, relnamespace, nspname
    from            pg_class c
         left join pg_namespace n
                on n.oid = c.relnamespace
   where relname = 'bar';

  oid  | relname | relnamespace | nspname
-------+---------+--------------+---------
 16446 | bar     |        16443 |
(1 row)
```

Now we can query the catalogs

But what we want is the data, not the metadata.



We are lucky here!

We didn't lose pg_attribute, only pg_attrdef

```
# \d a
                        Table "public.a"
 Column |  Type   |                     Modifiers
--------+---------+-----------------------------------------------
 id     | integer | not null default nextval('a_id_seq'::regcl
 f1     | text    |
Indexes:
    "a_pkey" PRIMARY KEY, btree (id)
```

What's pg_attrdef like already?

```
#  select adrelid, adnum, adsrc
     from pg_attrdef
    where adrelid = 'public.a'::regclass;
 adrelid | adnum |                adsrc
---------+-------+-------------------------------
   16411 |     1 | nextval('a_id_seq'::regclass)
(1 row)
```

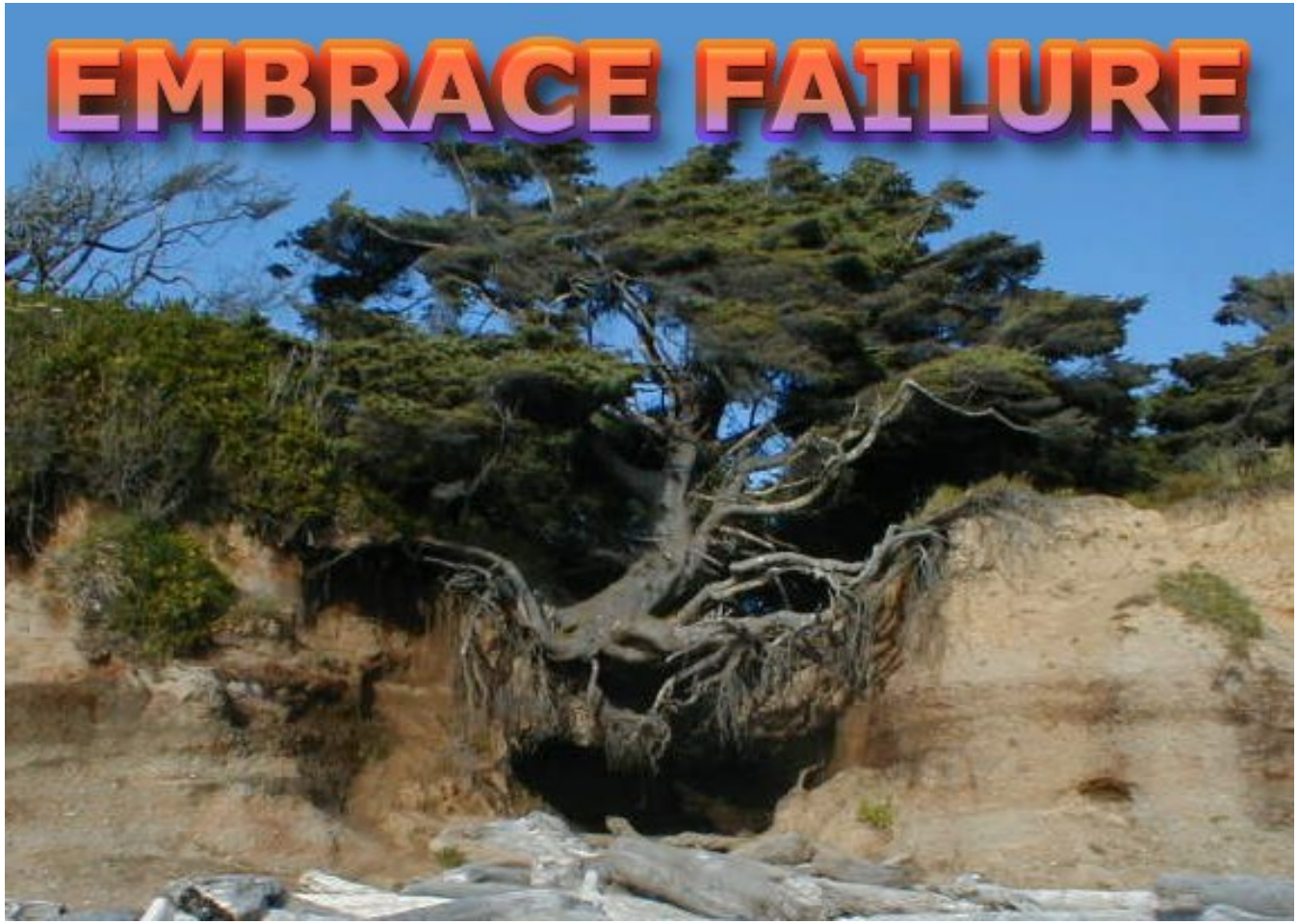
What's pg_attrdef like already?

```
# select attnum, atthasdef
    from pg_attribute
   where      attrelid = 'public.a'::regclass
         and atthasdef;
 attnum | atthasdef
--------+-----------
      1 | t
(1 row)
```

We are not creating new data in that instance, right?

```
# update pg_attribute
    set atthasdef = false
  where attrelid = 'my_namespace.bar';
```

PostgreSQL is amazingly resilient



You should have a proper *recovery plan*.

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Questions?

Now is the time to ask!