PostgreSQL 9.1 - what's new

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PostgreSQL 9.1

- Released September 12th
- Yes, that means production ready
- *This is what you should be using!*
- At least if you're building new
Many new features

- Replication and Backup
- Security
- Performance
- SQL and application functionality
Most probable app-breaker

- `standard_conforming_strings` is now **on by default**

- This means:
  ```sql
  postgres=# select 'O\'Brien';
  postgres'#
  ```

- Make sure you use:
  ```sql
  postgres=# SELECT 'O''Brien', E'O\'Brien';
  O'Brien | O'Brien
  ```
Replication and backup

- Biggest features in 9.0 were (arguably):
  - Streaming Replication
  - Hot Standby
- Many rough edges
- Management and monitoring functionality based on real world experience
Replication and backup

- Replication is now a separate permission
- Superuser not required/recommended

```
postgres=# CREATE USER replica WITH REPLICATION;
```

- Superusers granted replication permission by default
  - Can be revoked
Replication monitoring

- View all replication sessions from master
  
  ```sql
  postgres=# SELECT * FROM pg_stat_replication;
  .... | 2011-02-07 12:52:20.141376+01 | STREAMING | 0/13000B70
  ```

- View transaction replay *timestamp* on slave
  
  ```sql
  postgres=# SELECT pg_last_xact_replay_timestamp();
  2011-02-07 12:47:36.608706+01
  ```
Hot Standby conflict mgmt

- Query conflicts are the big issue with HS
  - Optional feedback loop added
  - Monitors for query conflicts

postgres=# select datname, conflicts FROM pg_stat_database;
  postgres |         79

postgres=# SELECT * FROM pg_stat_database_conflicts;
  datname          | postgres
  confl_tablespace | 1
  confl_lock       | 3
  confl_snapshot   | 74
  confl_bufferpin  | 1
  confl_deadlock   | 0
Streaming base backup

- Used for backups
  - No need to set archive_command in small deployments
  - No need for complicated scripts
  - No need for SSH/rsync/whatever access
  - Write to directory or native tarfiles
  - Just:

    `pg_basebackup -D /some/where -x`
Streaming base backup

- Used for deploying replicas:
  - No need to use backups/log archiving
  - Single command deployment of slave
  - Just create `recovery.conf`
- Runs over libpq protocol
- Supports all authentication and encryption options
- Requires `REPLICATION` privilege and `walsender`
Detailed recovery control

- Ability to pause during recovery
- With hot standby, data can be reviewed
- Addition of “named restore points” during normal operation

`SELECT pg_create_restore_point('before_stupid')`
Synchronous replication

- Current solutions are asynchronous
- Sync often wanted for data security
- “Semi-sync” for decent performance
- Controllable *per transaction*
- Mix of sync and async fully supported
Many new features

- Replication and Backup
- **Security**
- Performance
- SQL and application functionality
Server auth on unix sockets

• Previously, peer could only be verified from server to client
• Now we can specify
  
  `dbname=foo requirepeer=postgres`

• Avoids local attacks
• For TCP, use SSL certificate validation
SE-PGSQL

- Integrates with SE-Linux
- Label based security
- Umm. Yeah, go try it.
Many new features

- Replication and Backup
- Security
- **Performance**
- SQL and application functionality
More monitoring points

- `pg_stat_*_tables` added counters
  - Number of vacuum
  - Number of analyze
  - Differentiated by regular and background processes
  - Helps tuning autovacuum
More monitoring points

- `pg_stat_bgwriter` counts fsync requests
- Detect when background processes aren't keeping up
- `fsync()` by backends is very bad
Unlogged tables

- Create tables without writing to WAL
  - Considerable performance increase for large loading or changes
- Truncate on crash recovery
- *Not* included in log based replication
- No way (yet) to convert between logged and unlogged
KNN-GiST

- “ORDER BY for GiST”
- Fast, indexed, “K-Next-Neighbour” search
- Full awesomeness requires PostGIS 2.0
- For example, “the 10 graphical objects closest to this point”

```
SELECT * FROM t
ORDER BY pos <-> myposition
LIMIT 10
```
Many new features

- Replication and Backup
- Security
- Performance
- SQL and application functionality
SQL/MED

- “Managed External Data”
- Core parts completed and included!
- Table-like access to external data
  - Other PostgreSQL servers (“dblink”)
  - CSV files (without COPY)
  - Any other data sources (“Foreign Data Wrappers”)
Serializable Snapshot Isolation

- True SERALIZABLE transactions
- Low overhead
- Old behavior still there as REPEATABLE READ
- Not supported on Hot Standby slaves
PK functional dependencies

- Functional dependencies on PRIMARY KEYs are recognized for GROUP BY
- No more

```
postgres=# SELECT uid,first,last FROM users GROUP BY uid;
ERROR:  column "users.first" must appear in the GROUP BY clause or be used in an aggregate function at character 12
```

- Only recognizes PRIMARY KEY, not UNIQUE constraints or indexes
Per column collation

- Before 8.4, collation was per cluster
- Since 8.4, it's per database
- Now moving to per column
- One column English, another Danish
- Controls sort order and upper/lower

```sql
CREATE TABLE t (
    a text,
    b text COLLATE "sv_SE"
)
```
Triggers on VIEWS

- INSTEAD OF triggers only
- Can be used to implement UPDATEable views
- Much nicer to work with than RULEs
- Gets the whole modified view row, figures out the rest
Writable CTEs!

- Nicer way to write “subqueries” for DML

```sql
WITH del_post AS (
    DELETE FROM posts
    WHERE created<now()-'6 months' RETURNING *
)
SELECT user_id, count(*) FROM del_post
GROUP BY user_id
```

- “Anything” supported, joins etc
- Can even be made recursive!
Writable CTEs!

- Nicer way to write “subqueries” for DML

```sql
WITH del_post AS (
    DELETE FROM posts
    WHERE created<now()-'6 months' RETURNING *
),
per_user AS (
    SELECT user_id, count(*) FROM del_post
    GROUP BY user_id
)
UPDATE counts c
SET post_count=post_count-per_user.count
FROM per_user WHERE per_user.user_id=c.user_id
```
Extensions

- Wrap extensions (contrib, postgis etc)
- Distinct objects containing schema items
- Controlled dump/reload/upgrade

```
CREATE EXTENSION pgcrypto;

ALTER EXTENSION pgcrypto
  UPGRADE TO <newversion>;
```
Thank you!

Questions?

http://2011.pgconf.eu/feedback/

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