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How To Use pgcrypto Extension in Postgresql

MynotesoracleDBA · Follow
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Here, we are going to explore encryption and decryption using pgcrypto in detail

What is a Pgcrypto?

- The `**pgcrypto**` extension enhances PostgreSQL by introducing a suite of cryptographic functions directly within the database environment.
- It supports a broad spectrum of cryptographic operations, such as encryption and decryption, hashing, and the creation and verification of digital signatures.
- `pgcrypto` requires OpenSSL and won't be installed if OpenSSL support was not selected when PostgreSQL was built.

Source: Google

Let us see an example of using **pgcrypto** for password encryption:

S-1: Create a table

- First, we'll create a table named **Team_india**. This table will store the playername, the encrypted mobile, and an email (also encrypted for demonstration purposes).
- We'll use the `bytea` data type for the encrypted fields to accommodate binary data resulting from the encryption process.

```
CREATE TABLE Team_india(
    user_id serial PRIMARY KEY,
    Playername varchar(255) NOT NULL UNIQUE,
    Player_mobileno bytea NOT NULL,
    Player_email bytea NOT NULL
);
```

S-2: Create an extension

```
CREATE EXTENSION PGCRYPTO;
```

- Verify the extension details using **\dx** and function details **\df**

S-3: Insert Sample Data

- To insert data into our **Team_india** table, we'll encrypt the password and email fields using the `pgp_sym_encrypt` function.
- Assume we use a simple symmetric key for this example, though in a real-world scenario, key management practices would be more complex.

```
INSERT INTO Team_india ( playername, player_mobileno,player_email)
VALUES
```

```
('Dhoni', pgp_sym_encrypt('12345890', 'Team_India_Icici'), pgp_sym_encrypt('mah
('Kohli', pgp_sym_encrypt('1234567890', 'Team_India_Icici'), pgp_sym_encrypt('V
```

S-4: Querying and Decrypting Data

- When you need to authenticate a user or display their email, you will decrypt the data on the fly using the `pgp_sym_decrypt` function.
- Here's how you can retrieve and decrypt the email address of a specific user:

```
--without decryption details

select * from Team_india
;
-[ RECORD 1 ]---+------------------------------------------------------------
user_id         | 1
playername      | Dhoni
player_mobileno | \xc30d04070302a98d119eed7407fc67d23901bcedab7e27f3ce682c12f2c
player_email    | \xc30d040703025c05aa90e503958766d23f016dc0e02c65fc35d4ad79290
-[ RECORD 2 ]---+------------------------------------------------------------
user_id         | 2
playername      | Kohli
player_mobileno | \xc30d0407030270ea3745e3c4c6c37fd23b017a0da57ec482d5adb2d3dbf
player_email    | \xc30d040703029f1c48e2c47226cd7fd2430121a89f476437b01d42b04b0



--using a secret key to decryption

select playername,
pgp_sym_decrypt(player_mobileno, 'Team_India_Icici') as Mobileno,
pgp_sym_decrypt(player_email, 'Team_India_Icici') as email
from
Team_india;

-[ RECORD 1 ]------------------
playername | Dhoni
mobileno   | 12345890
email      | mahi@gmail.com
-[ RECORD 2 ]------------------
playername | Kohli
mobileno   | 1234567890
email      | Viruksha@gmail.com
```

S-5: Storing Secret Key in a View

- Sometimes, we might find it cumbersome to manually execute the select query every time. Thus, we can create a view based on the select decryption query.
- This allows anyone with access to simply read the data without needing the secret key, just by using the view.

```
CREATE VIEW team_india_key AS
SELECT
 playername,
 pgp_sym_decrypt(player_mobileno, 'Team_India_Icici') AS Mobileno,
 pgp_sym_decrypt(player_email, 'Team_India_Icici') AS email
FROM
 Team_india;
```

- However, a problem arises here: even if a user doesn't have access to this view, they can see the structure of the view. This means other users can easily obtain the secret key details.

```
\d+ team_india_key
                                View "public.team_india_key"
   Column   |          Type          | Collation | Nullable | Default | Storage
------------+------------------------+-----------+----------+---------+--------
 playername | character varying(255) |           |          |         | extende
 mobileno   | text                   |           |          |         | extende
 email      | text                   |           |          |         | extende
View definition:
 SELECT team_india.playername,
    pgp_sym_decrypt(team_india.player_mobileno, 'Team_India_Icici'::text) AS mc
    pgp_sym_decrypt(team_india.player_email, 'Team_India_Icici'::text) AS email
   FROM team_india;
```

- To mitigate this issue, we can create a separate table to store the key and then pass it into the view. This ensures that other users cannot read the stored key details.

S-6: Create a table to store secret-key values

```
create table Team_india_keys (
    key_id integer NOT NULL,
    secret_key text NOT NULL,
    CONSTRAINT Team_india_keys_pk PRIMARY KEY (key_id)
    );


INSERT INTO Team_india_keys (key_id, secret_key) VALUES (1, 'Team_India_Icici')
```

S-7: Decrypt the values

- We can decrypt the values like below without using them anywhere

```
select playername,
pgp_sym_decrypt(player_mobileno, dec_key.seckey) as Mobileno,
pgp_sym_decrypt(player_email, dec_key.seckey) as email
from
Team_india
cross join
(select secret_key as seckey from Team_india_keys) as dec_key;

 playername |  mobileno  |       email
------------+------------+--------------------
 Dhoni      | 12345890   | mahi@gmail.com
 Kohli      | 1234567890 | Viruksha@gmail.com
(2 rows)
```

- You can also create a view based on the above select query. This ensures that non-privileged users cannot read the secret key value unless they have access to the `**Team_india_keys**` table.

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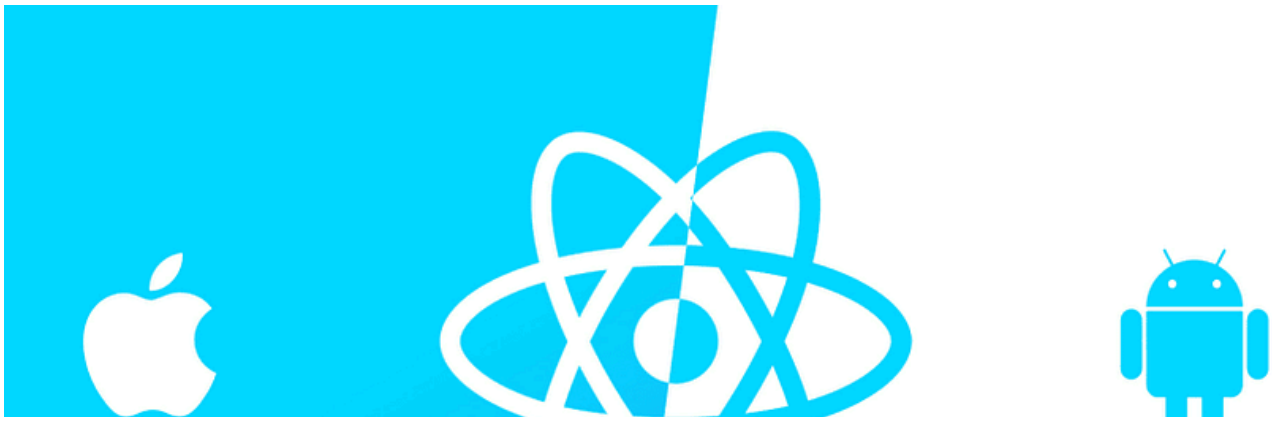

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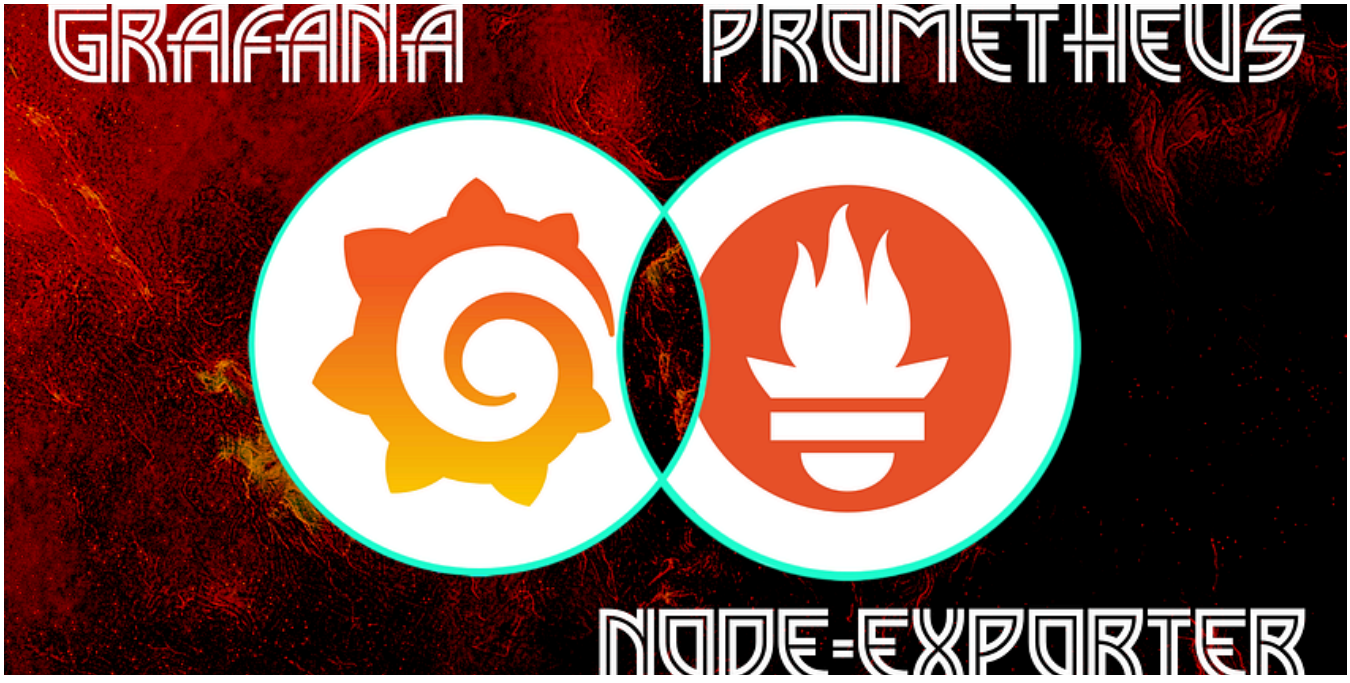

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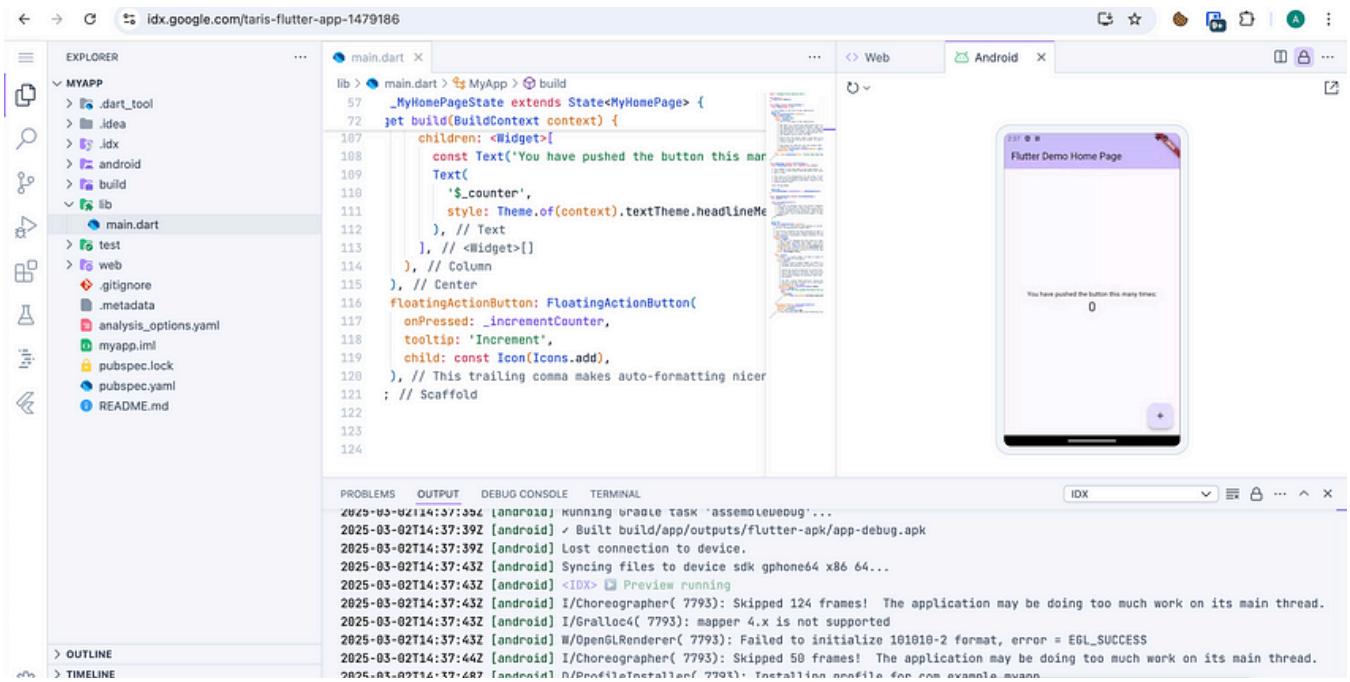

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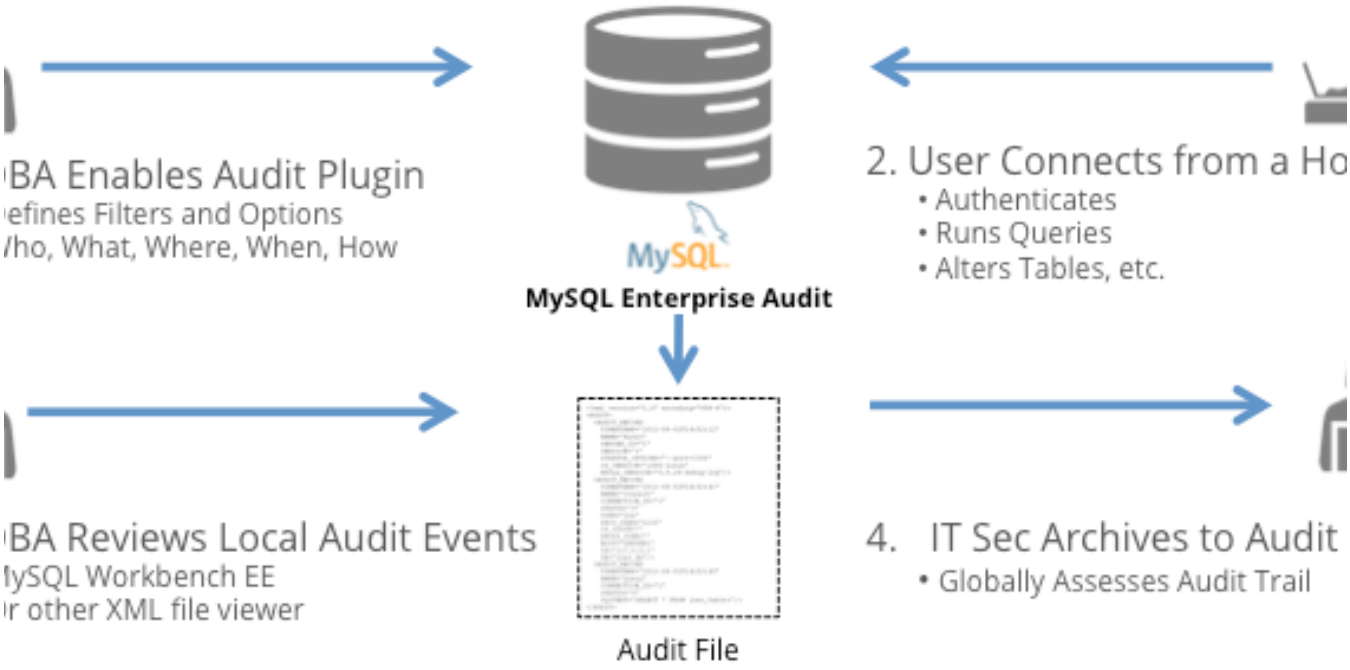

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