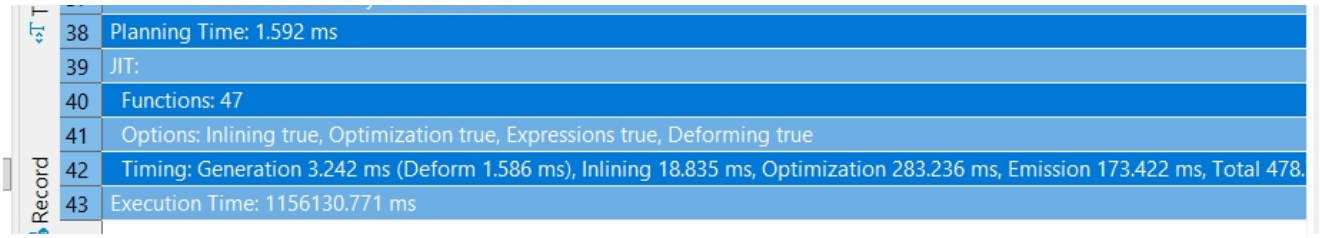
## VIEW ACTIVE PRODUCTS

Овој view прикажува листа на сите активни производи кои се достапни за продажба. За секој производ се прикажуваат основни информации како наслов, цена, валута, локација и главна слика (thumbnail). Дополнително се пресметува и поле low_stock кое означува дали производот има мала залиха (5 или помалку парчиња).

```sql
-- преглед на сите активни продукти
CREATE OR REPLACE VIEW vw_active_products AS
SELECT
    p.product_id,
    p.title,
    p.price,
    p.currency,

    CASE
        WHEN p.quantity <= 5 THEN 1
            ELSE 0
        END AS low_stock,

    ( SELECT pi.image_url
         FROM productimages pi
         WHERE pi.product_id = p.product_id
         ORDER BY pi.image_id
         LIMIT 1) AS thumbnail,

    --za filter
    u.user_id AS seller_id,
    c.category_id,
    p.location


FROM product p
JOIN category c ON c.category_id = p.category_id
JOIN appuser u ON u.user_id = p.seller_id
WHERE p.is_active = 1 AND p.quantity > 0 AND u.is_active = 1;
```

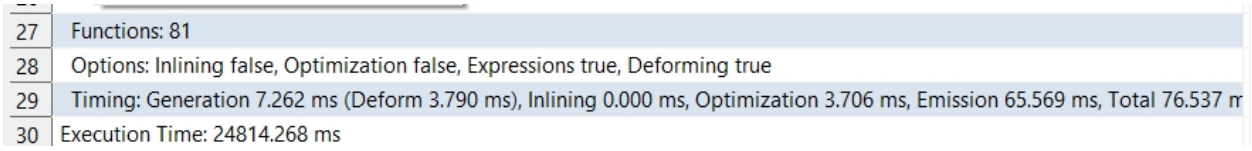
### *Оптимизација*

Беше



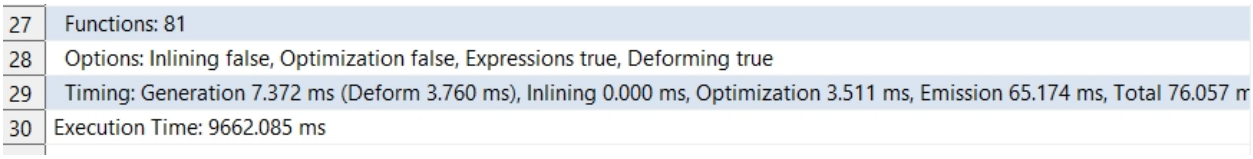
Додадовме индекс

```
CREATE INDEX idx_productimages_product_id ON productimages(product_id);
```




Додадовме индекс

```
CREATE INDEX idx_appuser_is_active ON appuser(is_active);
```



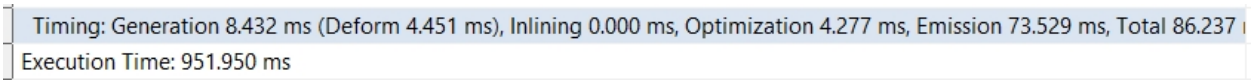

За пребарување активни продукти според категорија:

```
EXPLAIN ANALYZE
SELECT * FROM vw_active_products
WHERE category_id = 60;
```

Додадовме индекс

```
CREATE INDEX idx_product_category_id ON product(category_id);
```

И добивме:



## PRODUCT DETAILS

Овој view обезбедува детален приказ на избран производ. Покрај основните информации за производот, вклучува податоци за продавачот, просечна оцена, број на рецензии и листа од сите слики поврзани со производот. Наменет е за страницата со детали за производ.

```sql
-- детален преглед на избран продукт

CREATE OR REPLACE VIEW vw_product_details AS

WITH product_rating_reviews AS (
         SELECT r.product_id,
          COALESCE(avg(r.rating), 0::numeric) AS average_rating,
          count(r.review_id) AS total_reviews
          FROM review r
          GROUP BY r.product_id
        ),

         product_images AS (
         SELECT pi.product_id,
          array_agg(pi.image_url ORDER BY pi.image_id) AS images,
          min(pi.image_url::text) AS thumbnail
          FROM productimages pi
          GROUP BY pi.product_id
        )

 SELECT
    p.product_id,
    p.title,
    p.description,
    p.price,
    p.currency,
    p.created_at,
    p.location,
        CASE
            WHEN p.quantity <= 5 THEN 1
            ELSE 0
        END AS low_stock,

    c.name,

    u.username AS seller_username,
    u.first_name,
    u.last_name,


    ps.average_rating,
    ps.total_reviews,
```

```
    ps.average_rating,
    ps.total_reviews,
    i.images,
    i.thumbnail

FROM product p
JOIN category c ON c.category_id = p.category_id
JOIN appuser u ON u.user_id = p.seller_id
LEFT JOIN product_rating_reviews ps ON ps.product_id = p.product_id
LEFT JOIN product_images i ON i.product_id = p.product_id;
```

### *Оптимизација*

```
explain analyze

SELECT *

FROM vw_product_details

where product_id = 500;
```

```
6   ->  Seq Scan on category c  (cost=0.00..4.26 rows=226 width=16) (actual time=0.017..0.028 rows=113 loops=1)
7   ->  Hash  (cost=8.45..8.45 rows=1 width=96) (actual time=13.112..13.112 rows=1 loops=1)
8       Buckets: 1024  Batches: 1  Memory Usage: 9kB
9       ->  Index Scan using product_pkey on product p  (cost=0.43..8.45 rows=1 width=96) (actual time=13.103..13.105 rows=1 loops=1)
10          Index Cond: (product_id = 500)
11  ->  Index Scan using appuser_pkey on appuser u  (cost=0.42..8.44 rows=1 width=36) (actual time=0.031..0.031 rows=1 loops=1)
12      Index Cond: (user_id = p.seller_id)
13  ->  GroupAggregate  (cost=0.42..8.46 rows=1 width=44) (actual time=0.014..0.015 rows=0 loops=1)
14      ->  Index Scan using idx_review_product_id on review r  (cost=0.42..8.44 rows=1 width=12) (actual time=0.014..0.014 rows=0 loops=1)
15          Index Cond: (product_id = 500)
16  ->  GroupAggregate  (cost=10.41..10.45 rows=1 width=68) (actual time=0.042..0.042 rows=1 loops=1)
17      ->  Sort  (cost=10.41..10.42 rows=4 width=68) (actual time=0.026..0.027 rows=2 loops=1)
18          Sort Key: pi.image_id
19          Sort Method: quicksort  Memory: 25kB
20          ->  Index Scan using idx_productimages_product_id on productimages pi  (cost=0.43..10.37 rows=4 width=68) (actual time=0.014..0.016 rows=2 loops=1)
21              Index Cond: (product_id = 500)
22  Planning Time: 0.860 ms
23  Execution Time: 13.376 ms
```

Претходно направив индекс за images по product_id, па така нема потреба од дополнителна оптимизација.

## REVIEW

Овој view прикажува сите рецензии за производите. За секоја рецензија се прикажуваат оценката, коментарот, датумот на креирање и корисникот кој ја оставил рецензијата. Се користи за приказ на корисничките оценки и коментари за одреден продукт.

```
-- преглед на reviews за конкретен продукт
DROP VIEW vw_product_reviews

CREATE OR REPLACE VIEW vw_product_reviews AS
SELECT
    r.review_id,
    r.product_id,
    p.title,
    r.rating,
    r.comment,
    r.created_at,

    r.buyer_id,
    ub.username AS buyer_username,
    r.seller_id

FROM review r
JOIN product p ON p.product_id = r.product_id
JOIN appuser ub ON ub.user_id = r.buyer_id;
```

### *Оптимизација*

```
explain analyze

SELECT *

FROM vw_product_reviews

where product_id = 240446;
```

Беше

| | QUERY PLAN |
|---|---|
| 16 | -> Seq Scan on review (cost=0.00..5449.04 rows=253204 width=4) (actual time=0.006..22.187 rows=25 |
| 17 | -> Index Scan using product_pkey on product p (cost=0.43..2.11 rows=1 width=27) (actual time=0.200..0.200 rows=1 loops= |
| 18 | Index Cond: (product_id = r.product_id) |
| 19 | -> Index Scan using appuser_pkey on appuser ub (cost=0.42..0.50 rows=1 width=23) (actual time=0.003..0.003 rows=1 loops=1 |
| 20 | Index Cond: (user_id = r.buyer_id) |
| 21 | Planning Time: 0.737 ms |
| 22 | Execution Time: 2412.917 ms |

Додадовме Index: `CREATE INDEX idx_review_product_id ON review(product_id);`

```
13              Index Cond: (product_id = review.product_id)
14      ->  Index Scan using idx_review_product_id on review r  (cost=0.42..0.44 rows=1 width=62) (actual time=0.006..0.034 rows=103 loo
15          Index Cond: (product_id = p.product_id)
16   ->  Index Scan using appuser_pkey on appuser ub  (cost=0.42..0.50 rows=1 width=23) (actual time=0.003..0.003 rows=1 loops=10331)
17      Index Cond: (user_id = r.buyer_id)
18  Planning Time: 1.238 ms
19  Execution Time: 946.953 ms
```

## FAVORITES

Овој view ја прикажува листата на омилени производи за секој корисник. За секој производ се прикажуваат основни информации, thumbnail слика и индикатор за ниска залиха. Се користи за функционалноста „Favorites“.

```sql
-- преглед на листата со омилени продукти на корисникот.
CREATE OR REPLACE VIEW vw_favorites AS
SELECT
    f.user_id,

    p.product_id,
    p.title,
    p.price,
    p.currency,

    CASE
        WHEN p.quantity <= 5 THEN 1
        ELSE 0
    END AS low_stock,

    ( SELECT pi.image_url
         FROM productimages pi
         WHERE pi.product_id = p.product_id
         ORDER BY pi.image_id
         LIMIT 1) AS thumbnail

FROM favorites f
JOIN product p ON f.product_id = p.product_id;


explain analyze
SELECT *
FROM vw_favorites
where user_id = 5;
```

### *Оптимизација*

При самото креирање на табелата Favorites имавме ставено UNIQUE constraint:

uq_fav_user_product= UNIQUE (user_id, product_id)

+ го користи индексот креиран погоре idx_productimages_product_id

| | QUERY PLAN |
|---|---|
| 1 | Nested Loop (cost=0.86..193.21 rows=9 width=562) (actual time=1.006..325.849 rows=19 loops=1) |
| 2 | -> Index Only Scan using uq_fav_user_product on favorites f (cost=0.43..23.62 rows=9 width=8) (actual time=0.021..26.571 rows=19 loops=1) |
| 3 | Index Cond: (user_id = 11) |
| 4 | Heap Fetches: 15 |
| 5 | -> Index Scan using product_pkey on product p (cost=0.43..8.45 rows=1 width=42) (actual time=15.052..15.052 rows=1 loops=19) |
| 6 | Index Cond: (product_id = f.product_id) |
| 7 | SubPlan 1 |
| 8 | -> Limit (cost=10.39..10.39 rows=1 width=64) (actual time=0.694..0.694 rows=1 loops=19) |
| 9 | -> Sort (cost=10.39..10.40 rows=4 width=64) (actual time=0.693..0.693 rows=1 loops=19) |
| 10 | Sort Key: pi.image_id |
| 11 | Sort Method: top-N heapsort Memory: 25kB |
| 12 | -> Index Scan using idx_productimages_product_id on productimages pi (cost=0.43..10.37 rows=4 width=64) (actual time=0.017..0.685 rows=4 loops=19) |
| 13 | Index Cond: (product_id = p.product_id) |
| 14 | Planning Time: 0.435 ms |
| 15 | Execution Time: 325.904 ms |

## CART ITEMS

Овој view ги прикажува сите ставки кои се наоѓаат во кошничката на корисникот. За секој производ се прикажуваат количината, цената во моментот на додавање, тековната цена, пресметан subtotal и thumbnail слика. Се користи за приказ на содржината на кошничката.

```
-- преглед на сите ставки во кошничката на корисникот.
CREATE OR REPLACE VIEW vw_cart_items AS
SELECT
    ci.cart_id, --filter
    ci.cart_item_id,

    ci.product_id,
    p.title,
    p.price AS current_price,
    p.currency,
    ci.quantity,
    ci.price_at_time,

    (ci.quantity * ci.price_at_time) AS subtotal,

    (
        SELECT image_url
        FROM productimages pi
        WHERE pi.product_id = p.product_id
        ORDER BY image_id
        LIMIT 1
    ) AS thumbnail

FROM cartitems ci
JOIN product p ON p.product_id = ci.product_id
```

### *Оптимизација*

idx_cartitems_cart_id — на cart_id — за брзо земање на items по кошничка

```
explain analyze

select *

from vw_cart_items

where cart_id =92846;
```

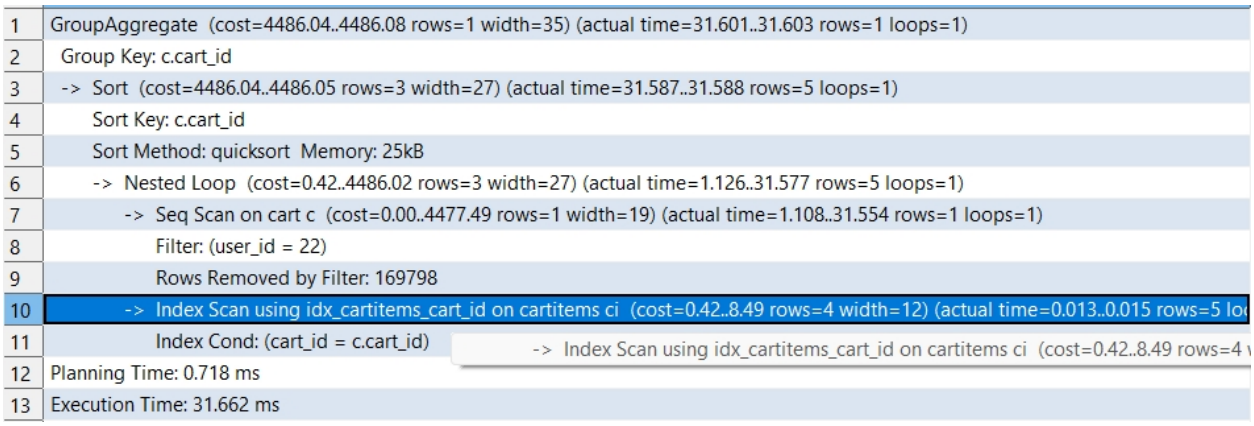
| | QUERY PLAN |
|---|---|
| 1 | Nested Loop  (cost=0.85..83.88 rows=4 width=605) (actual time=0.100..0.200 rows=5 loops=1) |
| 2 | -> Index Scan using idx_cartitems_cart_id on cartitems ci  (cost=0.42..8.49 rows=4 width=23) (actual time=0.044..0.046 rows=5 loops=1) |
| 3 | Index Cond: (cart_id = 92846) |
| 4 | -> Index Scan using product_pkey on product p  (cost=0.43..8.45 rows=1 width=38) (actual time=0.008..0.008 rows=1 loops=5) |
| 5 | Index Cond: (product_id = ci.product_id) |
| 6 | SubPlan 1 |
| 7 | -> Limit  (cost=10.39..10.39 rows=1 width=64) (actual time=0.018..0.018 rows=1 loops=5) |
| 8 | -> Sort  (cost=10.39..10.40 rows=4 width=64) (actual time=0.018..0.018 rows=1 loops=5) |
| 9 | Sort Key: pi.image_id |
| 10 | Sort Method: top-N heapsort  Memory: 25kB |
| 11 | -> Index Scan using idx_productimages_product_id on productimages pi  (cost=0.43..10.37 rows=4 width=64) (actual time=0.01 |
| 12 | Index Cond: (product_id = p.product_id) |
| 13 | Planning Time: 0.703 ms |
| 14 | Execution Time: 0.250 ms |

## CART SUMMARY

Овој view обезбедува сумиран приказ на кошничката. Ги содржи вкупната вредност на кошничката, бројот на различни ставки и вкупната количина на производи. Се користи за брз преглед пред нарачка.

```
-- сумиран приказ на кошничката.
drop view vw_cart_summary;

CREATE OR REPLACE VIEW vw_cart_summary AS
SELECT
    c.cart_id,
    c.created_at,

    c.user_id, --filter

    c.total_price AS cart_total,

    COUNT(ci.cart_item_id) AS total_items,
    SUM(ci.quantity) AS total_quantity

FROM cart c
JOIN cartitems ci ON ci.cart_id = c.cart_id

GROUP BY c.cart_id;
```

### *Оптимизација*




Го користи претходно направениот индекс за cart_items по cart_id.

Нема потреба од дополнителна оптимизација.

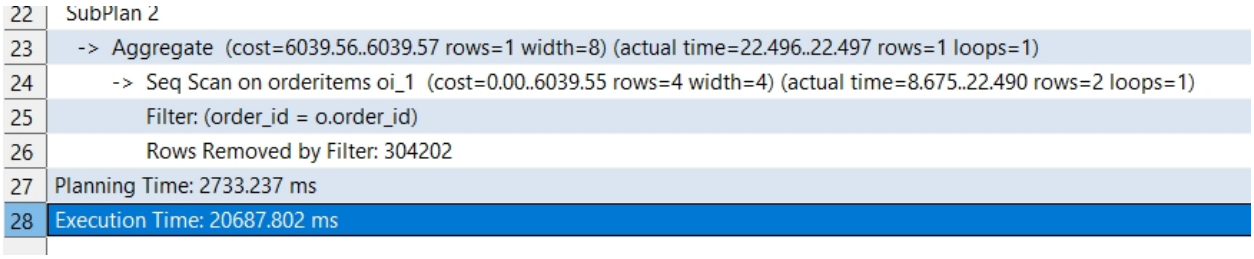
## ORDER SUMMARY

Овој view обезбедува целосен преглед на една нарачка. Покрај информациите за нарачката, содржи податоци за купувачот, адресата за достава, курирската служба, tracking бројот и статистика за бројот на производи во нарачката.

```sql
-- сумиран приказ на нарачка
CREATE OR REPLACE VIEW v_order_summary AS
SELECT
    o.order_id,
    o.created_at AS order_date,
    o.status AS order_status,
    o.total_price,

    u.first_name || ' ' || u.last_name AS buyer_name,
    ua.street || ' ' || ua.house_number AS street_address,
    ua.city,

    c.name AS carrier_name,
    s.tracking_number,

    (SELECT COUNT(*) FROM orderitems oi WHERE oi.order_id = o.order_id) AS total_items,
    (SELECT SUM(quantity) FROM orderitems oi WHERE oi.order_id = o.order_id) AS total_quantity

FROM "order" o
JOIN appuser u ON u.user_id = o.buyer_id
JOIN shipment s ON s.order_id = o.order_id
JOIN carriers c ON c.carrier_id = s.carrier_id
JOIN useraddress ua ON ua.user_address_id = s.user_address_id;
```

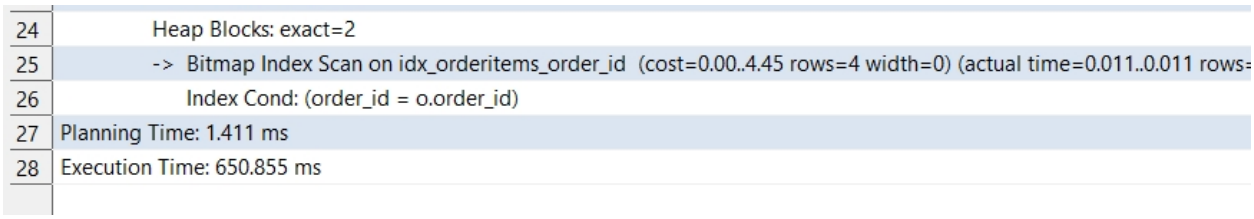
### *Оптимизација*

```
EXPLAIN ANALYZE

SELECT * FROM v_order_summary

WHERE order_id  = 80;
```




Додадовме индекс

**CREATE INDEX** idx_orderitems_order_id **ON** orderitems(order_id);




## ORDER ITEMS

Овој view ги прикажува сите производи кои припаѓаат на одредена нарачка. За секоја ставка се прикажуваат количината, цената при купување, моменталната цена и пресметаниот subtotal. Наменет е за деталниот приказ на нарачки.

```sql
CREATE OR REPLACE VIEW v_order_items AS
SELECT
    oi.order_id, -- filter
    oi.order_item_id,

    oi.product_id,
    p.title,
    p.price AS current_price,
    p.currency,
    oi.quantity,
    oi.price_at_time,

    (oi.quantity * oi.price_at_time) AS subtotal,

    (
        SELECT image_url
        FROM productimages pi
        WHERE pi.product_id = p.product_id
        ORDER BY image_id
        LIMIT 1
    ) AS thumbnail

FROM orderitems oi
JOIN product p ON p.product_id = oi.product_id;
```

### *Оптимизација*

претходно направивме idx_orderitems_order_id — на order_id — за брзо земање на items по нарачка

Нема потреба од дополнителна оптимизација.

```
13          Sort Method: quicksort  Memory: 25kB
14          ->  Index Scan using idx_productimages_product_id on productimages pi  (cost=0.43..10.37 rows=4 width=64) (ac
15              Index Cond: (product_id = p.product_id)
16  Planning Time: 2829.747 ms
17  Execution Time: 333.912 ms
```

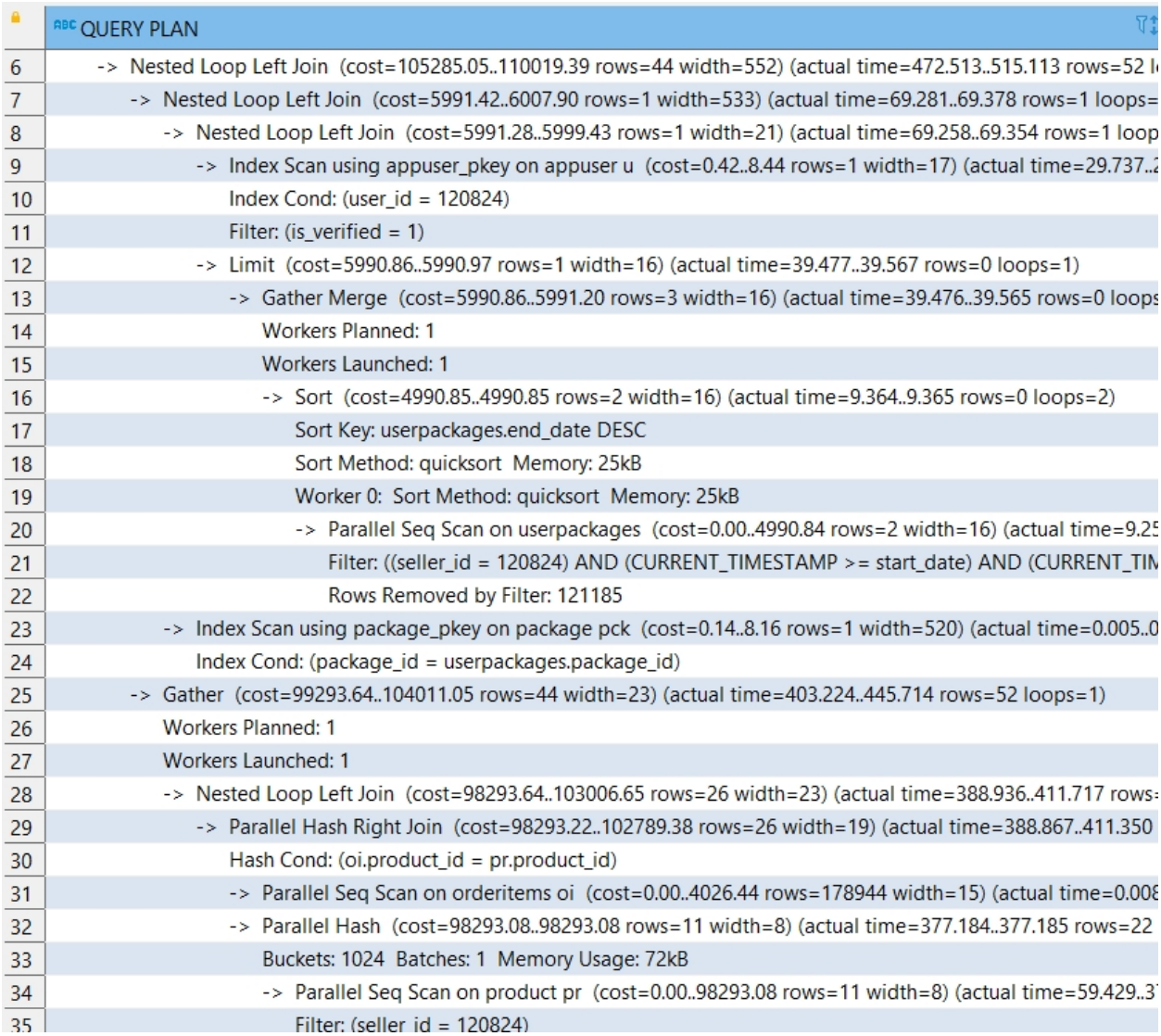
## SELLER DASHBOARD

Овој view претставува dashboard за продавачите и прикажува агрегирани статистики за нивните производи. Вклучува вкупен број производи, број на продадени артикли, вкупен приход, просечна оцена од рецензии и активниот пакет на продавачот. Се користи за анализа на продажбата и перформансите на продавачите.

```sql
-- dashboard приказ со статистики за продуктите на одреден продавач
CREATE OR REPLACE VIEW v_seller_dashboard AS
WITH active_package AS (
    SELECT DISTINCT ON (seller_id)
        seller_id,
        package_id
    FROM UserPackages
    WHERE CURRENT_TIMESTAMP BETWEEN start_date AND end_date
    ORDER BY seller_id, end_date DESC
)
SELECT
    u.user_id                                   AS seller_id,
    u.first_name,
    u.last_name,
    COUNT(DISTINCT pr.product_id)               AS total_products,
    SUM(oi.quantity)                            AS total_sales,
    SUM(oi.quantity * oi.price_at_time)         AS total_revenue,
    ROUND(AVG(r.rating), 2)                     AS avg_rating,
    pck.name                                    AS package_name
FROM AppUser u
LEFT JOIN Product pr     ON pr.seller_id    = u.user_id
LEFT JOIN OrderItems oi  ON oi.product_id   = pr.product_id
LEFT JOIN Review r       ON r.product_id    = pr.product_id
LEFT JOIN active_package ap ON ap.seller_id = u.user_id
LEFT JOIN Package pck    ON pck.package_id  = ap.package_id
WHERE u.is_verified = 1
GROUP BY u.user_id, u.first_name, u.last_name, pck.name;



EXPLAIN ANALYZE
SELECT *
FROM v_seller_dashboard
WHERE seller_id = 120824;
```

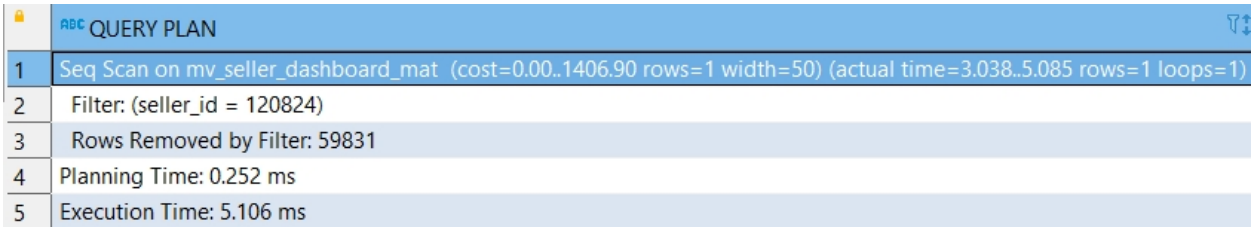
### *Оптимизација*

Времето беше лошо бидејќи прави Parallel Seq Scan на **userpackages**, **product**, **orderitems**



| | QUERY PLAN |
|---|---|
| 6 | -> Nested Loop Left Join (cost=105285.05..110019.39 rows=44 width=552) (actual time=472.513..515.113 rows=52 l |
| 7 | -> Nested Loop Left Join (cost=5991.42..6007.90 rows=1 width=533) (actual time=69.281..69.378 rows=1 loops= |
| 8 | -> Nested Loop Left Join (cost=5991.28..5999.43 rows=1 width=21) (actual time=69.258..69.354 rows=1 loop |
| 9 | -> Index Scan using appuser_pkey on appuser u (cost=0.42..8.44 rows=1 width=17) (actual time=29.737..2 |
| 10 | Index Cond: (user_id = 120824) |
| 11 | Filter: (is_verified = 1) |
| 12 | -> Limit (cost=5990.86..5990.97 rows=1 width=16) (actual time=39.477..39.567 rows=0 loops=1) |
| 13 | -> Gather Merge (cost=5990.86..5991.20 rows=3 width=16) (actual time=39.476..39.565 rows=0 loops |
| 14 | Workers Planned: 1 |
| 15 | Workers Launched: 1 |
| 16 | -> Sort (cost=4990.85..4990.85 rows=2 width=16) (actual time=9.364..9.365 rows=0 loops=2) |
| 17 | Sort Key: userpackages.end_date DESC |
| 18 | Sort Method: quicksort Memory: 25kB |
| 19 | Worker 0: Sort Method: quicksort Memory: 25kB |
| 20 | -> Parallel Seq Scan on userpackages (cost=0.00..4990.84 rows=2 width=16) (actual time=9.25 |
| 21 | Filter: ((seller_id = 120824) AND (CURRENT_TIMESTAMP >= start_date) AND (CURRENT_TIM |
| 22 | Rows Removed by Filter: 121185 |
| 23 | -> Index Scan using package_pkey on package pck (cost=0.14..8.16 rows=1 width=520) (actual time=0.005..0 |
| 24 | Index Cond: (package_id = userpackages.package_id) |
| 25 | -> Gather (cost=99293.64..104011.05 rows=44 width=23) (actual time=403.224..445.714 rows=52 loops=1) |
| 26 | Workers Planned: 1 |
| 27 | Workers Launched: 1 |
| 28 | -> Nested Loop Left Join (cost=98293.64..103006.65 rows=26 width=23) (actual time=388.936..411.717 rows= |
| 29 | -> Parallel Hash Right Join (cost=98293.22..102789.38 rows=26 width=19) (actual time=388.867..411.350 |
| 30 | Hash Cond: (oi.product_id = pr.product_id) |
| 31 | -> Parallel Seq Scan on orderitems oi (cost=0.00..4026.44 rows=178944 width=15) (actual time=0.008 |
| 32 | -> Parallel Hash (cost=98293.08..98293.08 rows=11 width=8) (actual time=377.184..377.185 rows=22 |
| 33 | Buckets: 1024 Batches: 1 Memory Usage: 72kB |
| 34 | -> Parallel Seq Scan on product pr (cost=0.00..98293.08 rows=11 width=8) (actual time=59.429..3 |
| 35 | Filter: (seller_id = 120824) |

Решение: Материјализирано view



| | QUERY PLAN |
|---|---|
| 1 | Seq Scan on mv_seller_dashboard_mat (cost=0.00..1406.90 rows=1 width=50) (actual time=3.038..5.085 rows=1 loops=1) |
| 2 | Filter: (seller_id = 120824) |
| 3 | Rows Removed by Filter: 59831 |
| 4 | Planning Time: 0.252 ms |
| 5 | Execution Time: 5.106 ms |

## USER PROFILE

Овој view обезбедува комплетен приказ на кориснички профил. Покрај основните податоци за корисникот, содржи примарна адреса на живеење и вкупен број направени нарачки. Се користи за страницата со профил на корисникот.

```sql
-- преглед на кориснички профил

CREATE OR REPLACE VIEW v_user_profile as

WITH primary_location AS (
    SELECT user_id, city || ', ' || country AS location
    FROM UserAddress
    WHERE is_primary = 1
),
user_orders AS (
    SELECT buyer_id, COUNT(*) AS total_orders
    FROM "order"
    GROUP BY buyer_id
)
SELECT
    u.user_id,
    u.first_name,
    u.last_name,
    u.email,
    u.phone_number,
    pl.location AS primary_location,
    uo.total_orders,
    u.created_at
FROM AppUser u
LEFT JOIN primary_location pl   ON pl.user_id   = u.user_id
LEFT JOIN user_orders uo        ON uo.buyer_id  = u.user_id;
```

## *Оптимизација*

### Првично

```
1  Nested Loop Left Join  (cost=1000.42..11206.82 rows=1 width=107) (actual time=2747.501..2747.625 rows=1 loops=1)
2    ->  Nested Loop Left Join  (cost=1000.42..8812.05 rows=1 width=81) (actual time=2501.392..2501.514 rows=1 loops=1)
3          ->  Index Scan using appuser_pkey on appuser u  (cost=0.42..8.44 rows=1 width=67) (actual time=0.032..0.037 rows=1 loops=1)
4                Index Cond: (user_id = 600)
5          ->  Gather  (cost=1000.00..8803.60 rows=1 width=18) (actual time=2501.345..2501.461 rows=1 loops=1)
6                Workers Planned: 2
7                Workers Launched: 2
8                ->  Parallel Seq Scan on useraddress  (cost=0.00..7803.50 rows=1 width=18) (actual time=1707.226..2492.091 rows=0 loops=3)
9                      Filter: ((is_primary = 1) AND (user_id = 600))
10                     Rows Removed by Filter: 166533
11   ->  GroupAggregate  (cost=0.00..2394.75 rows=1 width=12) (actual time=246.099..246.100 rows=1 loops=1)
12         ->  Seq Scan on "order"  (cost=0.00..2394.74 rows=1 width=4) (actual time=117.940..246.090 rows=1 loops=1)
13               Filter: (buyer_id = 600)
14               Rows Removed by Filter: 119102
15 Planning Time: 102.717 ms
16 Execution Time: 2747.816 ms
```

### Решение: Материјализирано view

```
1  Seq Scan on mv_user_profile_mat  (cost=0.00..5508.00 rows=1 width=90) (actual time=10.041..25.556 rows=1 loops=1)
2    Filter: (user_id = 1)
3    Rows Removed by Filter: 199999
4  Planning Time: 0.251 ms
5  Execution Time: 25.580 ms
```