

**TUGAS**  
**MANAJEMEN BASIS DATA**



Disusun Oleh  
**Affandika Febrian Putra Yunanto**  
**21091397030**

**D4 MANAJEMEN INFORMATIKA**  
**PROGAM VOKASI**  
**UNIVERSITAS NEGERI SURABAYA**  
**2022**

Referensi Link 1 : <https://mikehillier.com/articles/managing-hierarchical-data-in-mysql/>

## The Adjacency List Model

```
MariaDB [(none)]> use bismillah
Database changed
MariaDB [bismillah]> CREATE TABLE category(
->     category_id INT AUTO_INCREMENT PRIMARY KEY,
->     name VARCHAR(20) NOT NULL,
->     parent INT DEFAULT NULL
-> );
Query OK, 0 rows affected (0.063 sec)

MariaDB [bismillah]>
MariaDB [bismillah]> INSERT INTO category VALUES(1,'ELECTRONICS',NULL),(2,'TELEVISIONS',1),(3,'TUBE',2),
->     (4,'LCD',2),(5,'PLASMA',2),(6,'PORTABLE ELECTRONICS',1),(7,'MP3 PLAYERS',6),(8,'FLASH',7),
->     (9,'CD PLAYERS',6),(10,'2 WAY RADIOS',6);
Query OK, 10 rows affected (0.009 sec)
Records: 10  Duplicates: 0  Warnings: 0

MariaDB [bismillah]>
MariaDB [bismillah]> SELECT * FROM category ORDER BY category_id;
+-----+-----+-----+
| category_id | name                | parent |
+-----+-----+-----+
| 1 | ELECTRONICS         | NULL   |
| 2 | TELEVISIONS        | 1      |
| 3 | TUBE                | 2      |
| 4 | LCD                 | 2      |
| 5 | PLASMA              | 2      |
| 6 | PORTABLE ELECTRONICS | 1      |
| 7 | MP3 PLAYERS         | 6      |
| 8 | FLASH               | 7      |
| 9 | CD PLAYERS          | 6      |
| 10 | 2 WAY RADIOS        | 6      |
+-----+-----+-----+
10 rows in set (0.001 sec)
```

## Retrieving a Full Tree

```
MariaDB [bismillah]> SELECT t1.name AS lev1, t2.name as lev2, t3.name as lev3, t4.name as lev4
-> FROM category AS t1
-> LEFT JOIN category AS t2 ON t2.parent = t1.category_id
-> LEFT JOIN category AS t3 ON t3.parent = t2.category_id
-> LEFT JOIN category AS t4 ON t4.parent = t3.category_id
-> WHERE t1.name = 'ELECTRONICS';
+-----+-----+-----+-----+
| lev1    | lev2                | lev3    | lev4    |
+-----+-----+-----+-----+
| ELECTRONICS | PORTABLE ELECTRONICS | MP3 PLAYERS | FLASH   |
| ELECTRONICS | TELEVISIONS         | TUBE       | NULL    |
| ELECTRONICS | TELEVISIONS         | LCD        | NULL    |
| ELECTRONICS | TELEVISIONS         | PLASMA     | NULL    |
| ELECTRONICS | PORTABLE ELECTRONICS | CD PLAYERS | NULL    |
| ELECTRONICS | PORTABLE ELECTRONICS | 2 WAY RADIOS | NULL    |
+-----+-----+-----+-----+
6 rows in set (0.013 sec)
```

## Finding all the Leaf Nodes

```
MariaDB [bismillah]> SELECT t1.name FROM
-> category AS t1 LEFT JOIN category as t2
-> ON t1.category_id = t2.parent
-> WHERE t2.category_id IS NULL;
```

name
TUBE
LCD
PLASMA
FLASH
CD PLAYERS
2 WAY RADIOS

6 rows in set (0.001 sec)

## Retrieving a Single Path

```
MariaDB [bismillah]> SELECT t1.name AS lev1, t2.name as lev2, t3.name as lev3, t4.name as lev4
-> FROM category AS t1
-> LEFT JOIN category AS t2 ON t2.parent = t1.category_id
-> LEFT JOIN category AS t3 ON t3.parent = t2.category_id
-> LEFT JOIN category AS t4 ON t4.parent = t3.category_id
-> WHERE t1.name = 'ELECTRONICS' AND t4.name = 'FLASH';
```

lev1	lev2	lev3	lev4
ELECTRONICS	PORTABLE ELECTRONICS	MP3 PLAYERS	FLASH

1 row in set (0.001 sec)

## The Nested Set Model

```
MariaDB [hirarkiananda]> CREATE TABLE nested_category (
-> category_id INT AUTO_INCREMENT PRIMARY KEY,
-> name VARCHAR(20) NOT NULL,
-> lft INT NOT NULL,
-> rgt INT NOT NULL
-> );
```

Query OK, 0 rows affected (0.042 sec)

```
MariaDB [hirarkiananda]>
```

```
MariaDB [hirarkiananda]> INSERT INTO nested_category VALUES(1,'ELECTRONICS',1,20),(2,'TELEVISIONS',2,9),(3,'TUBE',3,4),
-> (4,'LCD',5,6),(5,'PLASMA',7,8),(6,'PORTABLE ELECTRONICS',10,19),(7,'MP3 PLAYERS',11,14),(8,'FLASH',12,13),
-> (9,'CD PLAYERS',15,16),(10,'2 WAY RADIOS',17,18);
```

Query OK, 10 rows affected (0.005 sec)

Records: 10 Duplicates: 0 Warnings: 0

```
MariaDB [hirarkiananda]>
```

```
MariaDB [hirarkiananda]> SELECT * FROM nested_category ORDER BY category_id;
```

category_id	name	lft	rgt
1	ELECTRONICS	1	20
2	TELEVISIONS	2	9
3	TUBE	3	4
4	LCD	5	6
5	PLASMA	7	8
6	PORTABLE ELECTRONICS	10	19
7	MP3 PLAYERS	11	14
8	FLASH	12	13
9	CD PLAYERS	15	16
10	2 WAY RADIOS	17	18

10 rows in set (0.001 sec)

```
MariaDB [hirarkiananda]> _
```

Activate Windows  
Go to Settings to activate

## Retrieving a Full Tree

```
MariaDB [hirarkiananda]> SELECT node.name
-> FROM nested_category AS node,
->      nested_category AS parent
-> WHERE node.lft BETWEEN parent.lft AND parent.rgt
->      AND parent.name = 'ELECTRONICS'
-> ORDER BY node.lft;
+-----+
| name |
+-----+
| ELECTRONICS |
| TELEVISIONS |
| TUBE |
| LCD |
| PLASMA |
| PORTABLE ELECTRONICS |
| MP3 PLAYERS |
| FLASH |
| CD PLAYERS |
| 2 WAY RADIOS |
+-----+
10 rows in set (0.003 sec)
```

## Finding all the Leaf Nodes

```
MariaDB [hirarkiananda]> SELECT name
-> FROM nested_category
-> WHERE rgt = lft + 1;
+-----+
| name |
+-----+
| TUBE |
| LCD |
| PLASMA |
| FLASH |
| CD PLAYERS |
| 2 WAY RADIOS |
+-----+
6 rows in set (0.001 sec)
```

## Retrieving a Single Path

```
MariaDB [hirarkiananda]> SELECT parent.name
-> FROM nested_category AS node,
->      nested_category AS parent
-> WHERE node.lft BETWEEN parent.lft AND parent.rgt
->      AND node.name = 'FLASH'
-> ORDER BY parent.lft;
+-----+
| name |
+-----+
| ELECTRONICS |
| PORTABLE ELECTRONICS |
| MP3 PLAYERS |
| FLASH |
+-----+
4 rows in set (0.001 sec)
```

## Finding the Depth of the Nodes

```
Select XAMPP for Windows - mysql -u root -p

MariaDB [hirarkiananda]> SELECT node.name, (COUNT(parent.name) - 1) AS depth
-> FROM nested_category AS node,
->      nested_category AS parent
-> WHERE node.lft BETWEEN parent.lft AND parent.rgt
-> GROUP BY node.name
-> ORDER BY node.lft;
+-----+-----+
| name          | depth |
+-----+-----+
| ELECTRONICS    | 0     |
| TELEVISIONS    | 1     |
| TUBE           | 2     |
| LCD            | 2     |
| PLASMA         | 2     |
| PORTABLE ELECTRONICS | 1     |
| MP3 PLAYERS    | 2     |
| FLASH          | 3     |
| CD PLAYERS     | 2     |
| 2 WAY RADIOS   | 2     |
+-----+-----+
10 rows in set (0.005 sec)

MariaDB [hirarkiananda]> SELECT CONCAT( REPEAT(' ', COUNT(parent.name) - 1), node.name) AS name
-> FROM nested_category AS node,
->      nested_category AS parent
-> WHERE node.lft BETWEEN parent.lft AND parent.rgt
-> GROUP BY node.name
-> ORDER BY node.lft;
+-----+
| name          |
+-----+
| ELECTRONICS    |
| TELEVISIONS    |
| TUBE           |
| LCD            |
| PLASMA         |
| PORTABLE ELECTRONICS |
| MP3 PLAYERS    |
| FLASH          |
| CD PLAYERS     |
| 2 WAY RADIOS   |
+-----+
10 rows in set (0.003 sec)

MariaDB [hirarkiananda]>
```

Activate Windows  
Go to Settings to activate Windows.

## Depth of a Sub-Tree

```
MariaDB [hirarkiananda]> SELECT node.name, (COUNT(parent.name) - (sub_tree.depth + 1)) AS depth
-> FROM nested_category AS node,
->      nested_category AS parent,
->      nested_category AS sub_parent,
->      (
->          SELECT node.name, (COUNT(parent.name) - 1) AS depth
->          FROM nested_category AS node,
->               nested_category AS parent
->          WHERE node.lft BETWEEN parent.lft AND parent.rgt
->          AND node.name = 'PORTABLE ELECTRONICS'
->          GROUP BY node.name
->          ORDER BY node.lft
->      ) AS sub_tree
-> WHERE node.lft BETWEEN parent.lft AND parent.rgt
->      AND node.lft BETWEEN sub_parent.lft AND sub_parent.rgt
->      AND sub_parent.name = sub_tree.name
-> GROUP BY node.name
-> ORDER BY node.lft;
+-----+-----+
| name          | depth |
+-----+-----+
| PORTABLE ELECTRONICS | 0     |
| MP3 PLAYERS    | 1     |
| FLASH          | 2     |
| CD PLAYERS     | 1     |
| 2 WAY RADIOS   | 1     |
+-----+-----+
5 rows in set (0.011 sec)
```

## Find the Immediate Subordinates of a Node

```
MariaDB [hirarkiananda]> SELECT node.name, (COUNT(parent.name) - (sub_tree.depth + 1)) AS depth
-> FROM nested_category AS node,
->      nested_category AS parent,
->      nested_category AS sub_parent,
->      (
->          SELECT node.name, (COUNT(parent.name) - 1) AS depth
->          FROM nested_category AS node,
->               nested_category AS parent
->          WHERE node.lft BETWEEN parent.lft AND parent.rgt
->                AND node.name = 'PORTABLE ELECTRONICS'
->          GROUP BY node.name
->          ORDER BY node.lft
->      ) AS sub_tree
-> WHERE node.lft BETWEEN parent.lft AND parent.rgt
->       AND node.lft BETWEEN sub_parent.lft AND sub_parent.rgt
->       AND sub_parent.name = sub_tree.name
-> GROUP BY node.name
-> HAVING depth <= 1
-> ORDER BY node.lft;
+-----+-----+
| name | depth |
+-----+-----+
| PORTABLE ELECTRONICS | 0 |
| MP3 PLAYERS | 1 |
| CD PLAYERS | 1 |
| 2 WAY RADIOS | 1 |
+-----+-----+
4 rows in set (0.007 sec)
```

## Aggregate Functions in a Nested Set

```
MariaDB [hirarkiananda]> CREATE TABLE product
-> (
->     product_id INT AUTO_INCREMENT PRIMARY KEY,
->     name VARCHAR(40),
->     category_id INT NOT NULL
-> );
ERROR 1050 (42S01): Table 'product' already exists
MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> INSERT INTO product(name, category_id) VALUES('20" TV',3),('36" TV',3),
-> ('Super-LCD 42"',4),('Ultra-Plasma 62"',5),('Value Plasma 38"',5),
-> ('Power-MP3 5gb',7),('Super-Player 1gb',8),('Porta CD',9),('CD To go!',9),
-> ('Family Talk 360',10);
Query OK, 10 rows affected (0.010 sec)
Records: 10 Duplicates: 0 Warnings: 0

MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> SELECT * FROM product;
+-----+-----+-----+
| product_id | name | category_id |
+-----+-----+-----+
| 1 | 20" TV | 3 |
| 2 | 36" TV | 3 |
| 3 | Super-LCD 42" | 4 |
| 4 | Ultra-Plasma 62" | 5 |
| 5 | Value Plasma 38" | 5 |
| 6 | Power-MP3 5gb | 7 |
| 7 | Super-Player 1gb | 8 |
| 8 | Porta CD | 9 |
| 9 | CD To go! | 9 |
| 10 | Family Talk 360 | 10 |
| 11 | 20" TV | 3 |
| 12 | 36" TV | 3 |
| 13 | Super-LCD 42" | 4 |
| 14 | Ultra-Plasma 62" | 5 |
| 15 | Value Plasma 38" | 5 |
| 16 | Power-MP3 5gb | 7 |
| 17 | Super-Player 1gb | 8 |
| 18 | Porta CD | 9 |
| 19 | CD To go! | 9 |
| 20 | Family Talk 360 | 10 |
+-----+-----+-----+
20 rows in set (0.001 sec)
```

Activate Windows  
Go to Settings to activate Windows.

```
MariaDB [hirarkiananda]> SELECT parent.name, COUNT(product.name)
-> FROM nested_category AS node,
->      nested_category AS parent,
->      product
-> WHERE node.lft BETWEEN parent.lft AND parent.rgt
->       AND node.category_id = product.category_id
-> GROUP BY parent.name
-> ORDER BY node.lft;
+-----+-----+
| name | COUNT(product.name) |
+-----+-----+
| TELEVISIONS | 10 |
| TUBE | 4 |
| ELECTRONICS | 20 |
| LCD | 2 |
| PLASMA | 4 |
| MP3 PLAYERS | 4 |
| PORTABLE ELECTRONICS | 10 |
| FLASH | 2 |
| CD PLAYERS | 4 |
| 2 WAY RADIOS | 2 |
+-----+-----+
10 rows in set (0.003 sec)
```

## Adding New Nodes

```
MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> UPDATE nested_category SET rgt = rgt + 2 WHERE rgt > @myRight;
Query OK, 6 rows affected (0.008 sec)
Rows matched: 6 Changed: 6 Warnings: 0

MariaDB [hirarkiananda]> UPDATE nested_category SET lft = lft + 2 WHERE lft > @myRight;
Query OK, 5 rows affected (0.003 sec)
Rows matched: 5 Changed: 5 Warnings: 0

MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> INSERT INTO nested_category(name, lft, rgt) VALUES('GAME CONSOLES', @myRight + 1, @myRight + 2);
Query OK, 1 row affected (0.005 sec)

MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> UNLOCK TABLES;SELECT CONCAT( REPEAT( ' ', (COUNT(parent.name) - 1) ), node.name) AS name
Query OK, 0 rows affected (0.000 sec)

      -> FROM nested_category AS node,
      ->         nested_category AS parent
      -> WHERE node.lft BETWEEN parent.lft AND parent.rgt
      -> GROUP BY node.name
      -> ORDER BY node.lft;
+-----+
| name |
+-----+
| ELECTRONICS |
| TELEVISIONS |
| TUBE |
| LCD |
| PLASMA |
| GAME CONSOLES |
| PORTABLE ELECTRONICS |
| MP3 PLAYERS |
| FLASH |
| CD PLAYERS |
| 2 WAY RADIOS |
+-----+
11 rows in set (0.002 sec)
```

Activate Windows

Go to Settings to activate Windows.

```
MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> UPDATE nested_category SET rgt = rgt + 2 WHERE rgt > @myLeft;
Query OK, 3 rows affected (0.004 sec)
Rows matched: 3 Changed: 3 Warnings: 0

MariaDB [hirarkiananda]> UPDATE nested_category SET lft = lft + 2 WHERE lft > @myLeft;
Query OK, 0 rows affected (0.002 sec)
Rows matched: 0 Changed: 0 Warnings: 0

MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> INSERT INTO nested_category(name, lft, rgt) VALUES('FRS', @myLeft + 1, @myLeft + 2);
Query OK, 1 row affected (0.012 sec)

MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> UNLOCK TABLES;SELECT CONCAT( REPEAT( ' ', (COUNT(parent.name) - 1) ), node.name) AS name
Query OK, 0 rows affected (0.000 sec)

      -> FROM nested_category AS node,
      ->         nested_category AS parent
      -> WHERE node.lft BETWEEN parent.lft AND parent.rgt
      -> GROUP BY node.name
      -> ORDER BY node.lft;
+-----+
| name |
+-----+
| ELECTRONICS |
| TELEVISIONS |
| TUBE |
| LCD |
| PLASMA |
| GAME CONSOLES |
| PORTABLE ELECTRONICS |
| MP3 PLAYERS |
| FLASH |
| CD PLAYERS |
| 2 WAY RADIOS |
| FRS |
+-----+
12 rows in set (0.003 sec)
```

Activate Windows

Go to Settings to activate Windows.

## Deleting Nodes

```
XAMPP for Windows - mysql -u root -p
-> WHERE name = 'GAME CONSOLES';
+-----+-----+-----+
| @myLeft := lft | @myRight := rgt | @myWidth := rgt - lft + 1 |
+-----+-----+-----+
| 10 | 11 | 2 |
+-----+-----+-----+
1 row in set (0.001 sec)

MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> DELETE FROM nested_category WHERE lft BETWEEN @myLeft AND @myRight;
Query OK, 1 row affected (0.005 sec)

MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> UPDATE nested_category SET rgt = rgt - @myWidth WHERE rgt > @myRight;
Query OK, 7 rows affected (0.007 sec)
Rows matched: 7 Changed: 7 Warnings: 0

MariaDB [hirarkiananda]> UPDATE nested_category SET lft = lft - @myWidth WHERE lft > @myRight;
Query OK, 6 rows affected (0.005 sec)
Rows matched: 6 Changed: 6 Warnings: 0

MariaDB [hirarkiananda]>
MariaDB [hirarkiananda]> UNLOCK TABLES;SELECT CONCAT( REPEAT( ' ', (COUNT(parent.name) - 1) ), node.name) AS name
Query OK, 0 rows affected (0.000 sec)

-> FROM nested_category AS node,
-> nested_category AS parent
-> WHERE node.lft BETWEEN parent.lft AND parent.rgt
-> GROUP BY node.name
-> ORDER BY node.lft;
+-----+
| name |
+-----+
| ELECTRONICS |
| TELEVISIONS |
| TUBE |
| LCD |
| PLASMA |
| PORTABLE ELECTRONICS |
| MP3 PLAYERS |
| FLASH |
| CD PLAYERS |
| 2 WAY RADIOS |
| FRS |
+-----+
11 rows in set (0.001 sec)
```

Activate Windows  
Go to Settings to activate Windows.