

**TUGAS BESAR**

**MANAJEMEN BASIS DATA**



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**PROGRAM STUDI TEKNIK INFORMATIKA**  
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# BAB 1

## STUDI LITERATUR

### 1.1 Tuning : Indexing

Index adalah objek dalam sistem database yang dapat mengoptimalkan kinerja database dengan meminimalkan jumlah akses disk yang diperlukan saat permintaan diproses. Teknik ini dapat digunakan untuk mencari dan mengakses data dalam database dengan cepat berdasarkan kolom tertentu. Tanpa adanya index pada database, kinerja database sangat menurun dengan sangat signifikan. Hal ini dikarenakan resource CPU banyak digunakan untuk pencarian data atau pengaksesan query SQL dengan metode table-scan. Index membuat pencarian data akan lebih cepat dan tidak banyak menghabiskan resource CPU.

Index diperlukan saat ada kondisi tabel dengan kapasitas besar, kolom sering digunakan sebagai kondisi dalam query. Ada beberapa perbedaan clustered index dan non clustered index pada sql server yaitu dalam clustered index hanya terdiri dalam satu tabel atau hanya dapat diterapkan satu kali pada satu tabel, sedangkan pada nonclustered index boleh lebih dari satu(banyak).

### 1.2 Tuning : Setting Configuration DBMS

Persyaratan tuning juga harus mencatat konfigurasi perangkat keras dan perangkat lunak yang akan dilakukan tuning. Perangkat lunak seperti Database Management Server yang digunakan. Performansi dapat dipengaruhi oleh desain fisik database, termasuk normalisasi dan penyimpanan disk, jumlah table, desain indexs, dan penggunaan DDL serta parameter terkait.

## BAB II

### DESKRIPSI PERCOBAAN

#### 2.1. Tuning : Indexing

Dengan menggunakan database yang sudah ditentukan dan untuk melakukan tuning index, maka diperlukan data waktu sebelum di tuning dan sesudah dituning untuk dapat membandingkan keduanya, akan dijelaskan pada deskripsi di bawah ini :

```
MariaDB [mbd1] CREATE INDEX ind_student ON student(ID, TOT_CRED) USING BTREE;
Query OK, 0 rows affected (0.57 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [mbd1] CREATE INDEX ind_TAKES ON takes(ID) USING BTREE;
Query OK, 0 rows affected (0.32 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [mbd1] CREATE INDEX ind_TAKES ON takes(ID,course_id) USING BTREE;
ERROR 1061 (42000): Duplicate key name 'ind_TAKES'
MariaDB [mbd1] CREATE INDEX ind_TAKES2 ON takes(ID,course_id) USING BTREE;
Query OK, 0 rows affected (0.35 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [mbd1] CREATE INDEX ind_course ON section(course_id) USING BTREE;
Query OK, 0 rows affected (0.24 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [mbd1]
```

2.1.1. Data 1 (advisor = 100, student = 100, section = 200,takes = 200)

1. Dengan menggunakan query 1 (SELECT \* FROM student) Waktu eksekusi sebelum dituning :

```
70699 | Kiki | SS | 104 |
72489 | Budi | FR | 44 |
7329 | Josu | ED | 75 |
76184 | Kiki | DF | 37 |
78794 | Ande | ED | 74 |
79130 | Johan | RQ | 54 |
80542 | Josu | FR | 49 |
81149 | rahmat | RQ | 49 |
81270 | Budi | DF | 40 |
82905 | Johan | SS | 73 |
85154 | Kiki | ED | 23 |
86681 | Kiki | FR | 85 |
88094 | Ahmad | KL | 56 |
8932 | Yohan | DE | 53 |
90922 | Budi | DF | 121 |
94142 | Budi | DF | 22 |
9416 | Ande | DE | 49 |
96246 | Josu | RR | 97 |
97733 | Johan | GT | 70 |
98776 | rahmat | RQ | 128 |
99123 | Johan | FR | 93 |
+-----+-----+-----+-----+
100 rows in set (0.00 sec)

MariaDB [mbd1]
```

Waktu eksekusi sesudah dituning :

```

70699 | Kiki | SS | 104
72489 | Budi | FR | 44
7329 | Josu | ED | 75
76184 | Kiki | DF | 37
78794 | Ande | ED | 74
79130 | Johan | RQ | 54
80542 | Josu | FR | 49
81149 | rahmat | RQ | 49
81270 | Budi | DF | 40
82905 | Johan | SS | 73
85154 | Kiki | ED | 23
86681 | Kiki | FR | 85
88094 | Ahmad | KL | 56
8932 | Yohan | DE | 53
90922 | Budi | DF | 121
94142 | Budi | DF | 22
9416 | Ande | DE | 49
96246 | Josu | RR | 97
97733 | Johan | GT | 70
98776 | rahmat | RQ | 128
99123 | Johan | FR | 93
+-----+
100 rows in set (0.00 sec)
MariaDB [mbd]>

```

2. Dengan menggunakan query 2 (SELECT \* FROM student WHERE tot\_cred > 30)

Waktu eksekusi sebelum menggunakan tuning :

```

68195 | Adri | GT | 58
68227 | Josu | GO | 124
70699 | Kiki | SS | 104
72489 | Budi | FR | 44
7329 | Josu | ED | 75
76184 | Kiki | DF | 37
78794 | Ande | ED | 74
79130 | Johan | RQ | 54
80542 | Josu | FR | 49
81149 | rahmat | RQ | 49
81270 | Budi | DF | 40
82905 | Johan | SS | 73
86681 | Kiki | FR | 85
88094 | Ahmad | KL | 56
8932 | Yohan | DE | 53
90922 | Budi | DF | 121
9416 | Ande | DE | 49
96246 | Josu | RR | 97
97733 | Johan | GT | 70
98776 | rahmat | RQ | 128
99123 | Johan | FR | 93
+-----+
82 rows in set (0.00 sec)
MariaDB [mbd]>

```

Sesudah menggunakan tuning :

```
68195 | Adri | GT | 58
68227 | Josu | GO | 124
70699 | Kiki | SS | 104
72489 | Budi | FR | 44
7329 | Josu | ED | 75
76184 | Kiki | DF | 37
78794 | Ande | ED | 74
79130 | Johan | RQ | 54
80542 | Josu | FR | 49
81149 | rahmat | RQ | 49
81270 | Budi | DF | 40
82905 | Johan | SS | 73
86681 | Kiki | FR | 85
88094 | Ahmad | KL | 56
8932 | Yohan | DE | 53
90922 | Budi | DF | 121
9416 | Ande | DE | 49
96246 | Josu | RR | 97
97733 | Johan | GT | 70
98776 | rahmat | RQ | 128
99123 | Johan | FR | 93
+-----+
82 rows in set (0.00 sec)
MariaDB [mbd]>
```

3. Dengan menggunakan query 3 (SELECT `name`, department FROM student WHERE tot\_cred > 30)

Sebelum menggunakan tuning :

```
GT
GO
SS
FR
ED
DF
ED
RQ
FR
RQ
DF
SS
FR
KL
DE
DF
DE
RR
GT
RQ
FR
+-----+
82 rows in set (0.00 sec)
MariaDB [mbd]>
```

Sesudah menggunakan tuning :

```

GT
GO
SS
FR
ED
DF
ED
RQ
FR
RQ
DF
SS
FR
KL
DE
DF
DE
RR
GT
RQ
FR
+-----+
82 rows in set (0.00 sec)
MariaDB [mbd]>

```

4. Dengan menggunakan query 4 (SELECT \* FROM takes JOIN student ON takes.ID = student.ID JOIN section ON takes.course\_id = section.course\_id)

Sebelum menggunakan tuning :

```

K
| 98776 | 900 | 1 | 2 | Spring | 2008 | A | 98776 | rahmat | F
| 128 | 900 | 2 | Spring | 2006 | J | 98776 | rahmat | F
G
| 98776 | 911 | 1 | 1 | Spring | 2007 | B | 98776 | rahmat | F
| 128 | 911 | 1 | Spring | 2007 | D | 98776 | rahmat | F
K
| 98776 | 911 | 1 | 2 | Spring | 2007 | B | 98776 | rahmat | F
| 128 | 911 | 2 | Spring | 2002 | D | 98776 | rahmat | F
M
| 99123 | 704 | 1 | 1 | Fall | 2010 | B+ | 99123 | Johan | F
| 93 | 704 | 1 | Fall | 2010 | F | 99123 | Johan | F
N
| 99123 | 900 | 2 | 1 | Spring | 2006 | C | 99123 | Johan | F
| 93 | 900 | 1 | Spring | 2008 | F | 99123 | Johan | F
K
| 99123 | 900 | 2 | 2 | Spring | 2006 | C | 99123 | Johan | F
| 93 | 900 | 2 | Spring | 2006 | J | 99123 | Johan | F
G
+-----+
361 rows in set (0.01 sec)
MariaDB [mbd]>

```

Sesudah menggunakan tuning :

```

K
| 98776 | 900 | 1 | 2 | Spring | 2008 | A | 98776 | rahmat | R
| 128 | 900 | 2 | Spring | 2006 | J | 877 |
G
| 98776 | 911 | 1 | 1 | Spring | 2007 | B | 98776 | rahmat | R
| 128 | 911 | 1 | Spring | 2007 | D | 971 |
K
| 98776 | 911 | 1 | 2 | Spring | 2007 | B | 98776 | rahmat | R
| 128 | 911 | 2 | Spring | 2002 | D | 632 |
M
| 99123 | 704 | 1 | 1 | Fall | 2010 | B+ | 99123 | Johan | F
| 93 | 704 | 1 | Fall | 2010 | F | 903 |
N
| 99123 | 900 | 2 | 1 | Spring | 2006 | C | 99123 | Johan | F
| 93 | 900 | 1 | Spring | 2008 | F | 903 |
K
| 99123 | 900 | 2 | 2 | Spring | 2006 | C | 99123 | Johan | F
| 93 | 900 | 2 | Spring | 2006 | J | 877 |
G
+-----+
361 rows in set (0.01 sec)
MariaDB [mbd]>

```

5. Dengan menggunakan query 5 (SELECT student.`name`,student.dept\_name,takes.sec\_id AS pengambilan,takes.semester,section.room\_number,section.building,course.course\_id,course.dept\_name FROM takes JOIN student ON takes.ID = student.ID JOIN section ON takes.course\_id = section.course\_id JOIN course ON section.course\_id = course.course\_id).

Sebelum menggunakan tuning :

```

| rahmat | RQ | 1 | Spring | 602 | F | 11
| RQ | 1 | Spring | 82 | C | 11
| rahmat | RQ | 1 | Spring | 602 | F | 23
| RQ | 1 | Spring | 903 | F | 90
| rahmat | RQ | 1 | Spring | 877 | J | 90
| FR | 1 | Spring | 971 | D | 91
| rahmat | RQ | 1 | Spring | 632 | D | 91
| GO | 1 | Spring | 903 | F | 70
| Johan | FR | 2 | Spring | 903 | F | 90
| FR | 2 | Spring | 877 | J | 90
| FR |
+-----+
361 rows in set (0.01 sec)
MariaDB [mbd]>

```



Sesudah menggunakan tuning :

```

| rahmat | RQ | 1 | Spring | 602 | F | 112
| rahmat | RQ | 1 | Spring | 82 | C | 112
| rahmat | RQ | 1 | Spring | 602 | F | 238
| rahmat | RQ | 1 | Spring | 903 | F | 900
| rahmat | RQ | 1 | Spring | 877 | J | 900
| rahmat | RQ | 1 | Spring | 971 | D | 911
| rahmat | RQ | 1 | Spring | 632 | D | 911
| Johan | FR | 1 | Fall | 903 | F | 704
| Johan | FR | 2 | Spring | 903 | F | 900
| Johan | FR | 2 | Spring | 877 | J | 900
+-----+
361 rows in set (0.01 sec)
MariaDB [mbd]>

```

2.1.2. Data 2 (advisor = 200, student = 200, section = 400,takes = 400)

1. Dengan menggunakan query 1 (SELECT \* FROM student)

Waktu sebelum dituning :

```

| 90382 | Ande | MT | 118 |
| 90724 | Budi | GF | 25 |
| 93622 | Ahmad | GT | 20 |
| 93788 | Johan | DK | 99 |
| 94319 | Budi | MT | 97 |
| 94341 | Kiki | GT | 70 |
| 95163 | Adri | RR | 81 |
| 95491 | Josu | KL | 111 |
| 96001 | Budi | KL | 97 |
| 96029 | yuyun | GO | 67 |
| 96038 | Kiki | DK | 58 |
| 96072 | Yohan | EL | 53 |
| 96232 | yuyun | EL | 105 |
| 96310 | Ande | GO | 103 |
| 96739 | Josu | KL | 48 |
| 980 | Ande | EL | 35 |
| 98085 | Johan | KL | 15 |
| 98191 | Josu | GF | 44 |
| 98540 | Johan | RR | 87 |
| 99207 | Yohan | RR | 65 |
| 99582 | Josu | KL | 4 |
+-----+
200 rows in set (0.00 sec)
MariaDB [mbd]>

```

Waktu sesudah dituning :

```
90382 | Ande | MT | 118
90724 | Budi | GF | 25
93622 | Ahmad | GT | 20
93788 | Johan | DK | 99
94319 | Budi | MT | 97
94341 | Kiki | GT | 70
95163 | Adri | RR | 81
95491 | Josu | KL | 111
9601 | Budi | KL | 97
96029 | yuyun | GO | 67
96038 | Kiki | DK | 58
96072 | Yohan | EL | 53
96232 | yuyun | EL | 105
96310 | Ande | GO | 103
96739 | Josu | KL | 48
980 | Ande | EL | 35
98085 | Johan | KL | 15
98191 | Josu | GF | 44
98540 | Johan | RR | 87
99207 | Yohan | RR | 65
99582 | Josu | KL | 4
+-----+
200 rows in set (0.00 sec)

MariaDB [mbd]>
```

2. Dengan menggunakan query 2 (SELECT \* FROM student WHERE tot\_cred > 30)

Waktu sebelum dituning :

```
88045 | Yohan | KL | 48
88673 | Adri | HH | 59
88827 | Kiki | MT | 96
89926 | rahmat | HH | 58
90382 | Ande | MT | 118
93788 | Johan | DK | 99
94319 | Budi | MT | 97
94341 | Kiki | GT | 70
95163 | Adri | RR | 81
95491 | Josu | KL | 111
9601 | Budi | KL | 97
96029 | yuyun | GO | 67
96038 | Kiki | DK | 58
96072 | Yohan | EL | 53
96232 | yuyun | EL | 105
96310 | Ande | GO | 103
96739 | Josu | KL | 48
980 | Ande | EL | 35
98191 | Josu | GF | 44
98540 | Johan | RR | 87
99207 | Yohan | RR | 65
+-----+
154 rows in set (0.00 sec)

MariaDB [mbd]>
```

Waktu sesudah dituning :

```
88045 : Yohan : KL : 48
88673 : Adri : HH : 59
88827 : Kiki : MT : 96
89926 : rahmat : HH : 58
90382 : Ande : MT : 118
93788 : Johan : DK : 99
94319 : Budi : MT : 97
94341 : Kiki : GT : 70
95163 : Adri : RR : 81
95491 : Josu : KL : 111
9601 : Budi : KL : 97
96029 : yuyun : GO : 67
96038 : Kiki : DK : 58
96072 : Yohan : EL : 53
96232 : yuyun : EL : 105
96310 : Ande : GO : 103
96739 : Josu : KL : 48
980 : Ande : EL : 35
98191 : Josu : GF : 44
98540 : Johan : RR : 87
99207 : Yohan : RR : 65
+-----+
154 rows in set (0.00 sec)
MariaDB [mbd]>
```

3. Dengan menggunakan query 3 (SELECT `name`, department FROM student WHERE tot\_cred > 30)

Sebelum menggunakan tuning :

```
KL
HH
MT
HH
MT
DK
MT
GT
RR
KL
KL
GO
DK
EL
EL
GO
KL
EL
GF
RR
RR
+-----+
154 rows in set (0.00 sec)
MariaDB [mbd]>
```

Sesudah menggunakan tuning :

```

KL
HH
MT
HH
MT
DK
MT
GT
RR
KL
KL
GO
DK
EL
EL
GO
KL
EL
GF
RR
RR
+-----+
154 rows in set (0.00 sec)
MariaDB [mbdl]>

```

4. Dengan menggunakan query 4 (SELECT \* FROM takes JOIN student ON takes.ID = student.ID JOIN section ON takes.course\_id = section.course\_id)

Sebelum menggunakan tuning :

```

K
| 99207 | 918 | 5 | Spring | 2010 | C | 99207 | Yohan | RR
|      | 65 | 918 | 2 | Spring | Spring | 2004 | B | 298
F
| 99207 | 918 | 5 | Spring | 2010 | C | 99207 | Yohan | RR
|      | 65 | 918 | 3 | Spring | Fall | 2001 | H | 754
M
| 99207 | 918 | 5 | Spring | 2010 | C | 99207 | Yohan | RR
|      | 65 | 918 | 4 | Spring | Fall | 2008 | F | 266
I
| 99207 | 918 | 5 | Spring | 2010 | C | 99207 | Yohan | RR
|      | 65 | 918 | 5 | Spring | Spring | 2010 | B | 42
D
| 99582 | 983 | 2 | Spring | 2001 | B | 99582 | Josu | KL
|      | 4 | 983 | 1 | Spring | Spring | 2005 | F | 62
H
| 99582 | 983 | 2 | Spring | 2001 | B | 99582 | Josu | KL
|      | 4 | 983 | 2 | Spring | Spring | 2001 | B | 298
E
+-----+
1122 rows in set (0.01 sec)
MariaDB [mbdl]>

```

Sesudah menggunakan tuning :

```

K
| 99207 | 918 | 5 | Spring | 2010 | C | 99207 | Yohan | RR
| 65 | 918 | 2 | Spring | Spring | 2004 | B | 298
F
| 99207 | 918 | 5 | Spring | 2010 | C | 99207 | Yohan | RR
| 65 | 918 | 3 | Spring | Fall | 2001 | H | 754
M
| 99207 | 918 | 5 | Spring | 2010 | C | 99207 | Yohan | RR
| 65 | 918 | 4 | Spring | Fall | 2008 | F | 266
I
| 99207 | 918 | 5 | Spring | 2010 | C | 99207 | Yohan | RR
| 65 | 918 | 5 | Spring | Spring | 2010 | B | 42
D
| 99582 | 983 | 2 | Spring | 2001 | B | 99582 | Josu | KL
| 4 | 983 | 1 | Spring | Spring | 2005 | F | 62
H
| 99582 | 983 | 2 | Spring | 2001 | B | 99582 | Josu | KL
| 4 | 983 | 2 | Spring | Spring | 2001 | B | 298
E
+-----+-----+-----+-----+-----+-----+-----+-----+
1122 rows in set (0.01 sec)
MariaDB [mbd]>

```

5. Dengan menggunakan query 5 (SELECT student.`name`,student.dept\_name,takes.sec\_id AS pengambilan,takes.semester,section.room\_number,section.building,course.course\_id,course.dept\_name FROM takes JOIN student ON takes.ID = student.ID JOIN section ON takes.course\_id = section.course\_id JOIN course ON section.course\_id = course.course\_id)

Sebelum menggunakan tuning :

```

| Yohan | RR | 5 | Fall | 204 | I | 820
| RR | 5 | Fall | 42 | B | 820
| Yohan | RR | 5 | Fall | 268 | F | 820
| RR | 5 | Spring | 266 | F | 918
| Yohan | RR | 5 | Spring | 298 | B | 918
| EL | 5 | Spring | 754 | H | 918
| Yohan | RR | 5 | Spring | 266 | F | 918
| EL | 5 | Spring | 42 | B | 918
| Yohan | RR | 5 | Spring | 62 | F | 983
| GF | 2 | Spring | 298 | B | 983
| Josu | KL | 2
| GF
+-----+-----+-----+-----+-----+-----+-----+-----+
1122 rows in set (0.01 sec)
MariaDB [mbd]>

```

Sesudah menggunakan tuning :

```

| Yohan | RR | 5 | Fall | 204 | I | 820
| RR | 5 | Fall | 42 | B | 820
| RR | 5 | Fall | 268 | F | 820
| RR | 5 | Spring | 266 | F | 918
| Yohan | RR | 5 | Spring | 298 | B | 918
| EL | 5 | Spring | 754 | H | 918
| Yohan | RR | 5 | Spring | 266 | F | 918
| EL | 5 | Spring | 42 | B | 918
| Yohan | RR | 5 | Spring | 62 | F | 983
| Josu | KL | 2 | Spring | 298 | B | 983
| GF | 2 | Spring | 298 | B | 983
+-----+
1122 rows in set (0.01 sec)
MariaDB [mbd]>

```

2.1.3. Data 3 (advisor = 500, student = 500, section = 1000,takes = 1000)

1. Dengan menggunakan query 1 (SELECT \* FROM student)

Waktu sebelum dituning :

```

| 97234 | Ahmad | GF | 102
| 97425 | rahmat | DE | 42
| 97579 | Josu | KL | 28
| 97589 | Budi | GF | 12
| 97913 | Budi | GF | 109
| 98125 | yuyun | DE | 51
| 9816 | Budi | WW | 79
| 98190 | Ande | BN | 85
| 98395 | Yohan | EL | 104
| 98410 | yuyun | GO | 4
| 98506 | rahmat | EL | 90
| 98662 | Adri | FR | 0
| 98701 | Johan | FR | 8
| 98972 | Yohan | RR | 8
| 99225 | yuyun | EL | 18
| 9946 | Johan | GF | 70
| 99541 | yuyun | DE | 30
| 99731 | rahmat | DE | 64
| 99734 | Kiki | WW | 14
| 99752 | yuyun | BN | 3
| 99945 | Ande | FR | 68
+-----+
500 rows in set (0.09 sec)
MariaDB [mbd]>

```

Waktu sesudah dituning :

```
97234 | Ahmad | GF | 102
97425 | rahmat | DE | 42
97579 | Josu | KL | 28
97589 | Budi | GF | 12
97913 | Budi | GF | 109
98125 | yuyun | DE | 51
9816 | Budi | WW | 79
98190 | Ande | BN | 85
98395 | Johan | EL | 104
98410 | yuyun | GO | 4
98506 | rahmat | EL | 90
98662 | Adri | FR | 0
98701 | Johan | FR | 8
98972 | Johan | RR | 8
99225 | yuyun | EL | 18
9946 | Johan | GF | 70
99541 | yuyun | DE | 30
99731 | rahmat | DE | 64
99734 | Kiki | WW | 14
99752 | yuyun | BN | 3
99945 | Ande | FR | 68
+-----+
500 rows in set (0.00 sec)
MariaDB [mbd]>
```

2. Dengan menggunakan query 2 (SELECT \* FROM student WHERE tot\_cred > 30)

Waktu sebelum dituning :

```
93998 | Ande | ED | 117
94698 | yuyun | DE | 43
95447 | Budi | GO | 111
95486 | Josu | DE | 100
9594 | Johan | RR | 37
95977 | Josu | FR | 82
96871 | Budi | WW | 127
96891 | yuyun | FR | 124
96896 | Adri | GF | 109
97188 | Adri | KL | 116
97234 | Ahmad | GF | 102
97425 | rahmat | DE | 42
97913 | Budi | GF | 109
98125 | yuyun | DE | 51
9816 | Budi | WW | 79
98190 | Ande | BN | 85
98395 | Johan | EL | 104
98506 | rahmat | EL | 90
9946 | Johan | GF | 70
99731 | rahmat | DE | 64
99945 | Ande | FR | 68
+-----+
386 rows in set (0.00 sec)
MariaDB [mbd]>
```



Waktu sesudah dituning :

```
93998 | Ande | ED | 117 |
94698 | yuyun | DE | 43 |
95447 | Budi | GO | 111 |
95486 | Josu | DE | 100 |
9594 | Yohan | RR | 37 |
95977 | Josu | FR | 82 |
96871 | Budi | WW | 127 |
96891 | yuyun | FR | 124 |
96896 | Adri | GF | 109 |
97188 | Adri | KL | 116 |
97234 | Ahmad | GF | 102 |
97425 | rahmat | DE | 42 |
97913 | Budi | GF | 109 |
98125 | yuyun | DE | 51 |
9816 | Budi | WW | 79 |
98190 | Ande | BN | 85 |
98395 | Yohan | EL | 104 |
98506 | rahmat | EL | 90 |
9946 | Johan | GF | 70 |
99731 | rahmat | DE | 64 |
99945 | Ande | FR | 68 |
+-----+
386 rows in set (0.00 sec)
MariaDB [mbd]>
```

3. Dengan menggunakan query 3 (SELECT `name`, department FROM student WHERE tot\_cred > 30)

Sebelum menggunakan tuning :

```
ED |
DE |
GO |
DE |
RR |
FR |
WW |
FR |
GF |
KL |
GF |
DE |
GF |
DE |
WW |
BN |
EL |
EL |
GF |
DE |
FR |
+-----+
386 rows in set (0.00 sec)
MariaDB [mbd]>
```



Sesudah menggunakan tuning :

```

ED
DE
GO
DE
RR
FR
WW
FR
GF
KL
GF
DE
GF
DE
WW
BN
EL
EL
GF
DE
FR
+-----+
386 rows in set (0.00 sec)
MariaDB [mbd]>

```

4. Dengan menggunakan query 4 (SELECT \* FROM takes JOIN student ON takes.ID = student.ID JOIN section ON takes.course\_id = section.course\_id)

Sebelum menggunakan tuning :

```

O
| 99734 | 341 | 1 | 5 | Spring | 2006 | C- | 99734 | Kiki | W
| 14 | 341 | 5 | 5 | Fall | 2006 | B | 418
H
| 99945 | 929 | 5 | 1 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 1 | 1 | Fall | 2004 | I | 475
B
| 99945 | 929 | 5 | 2 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 2 | 2 | Spring | 2001 | H | 532
L
| 99945 | 929 | 5 | 3 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 3 | 3 | Fall | 2008 | B | 418
P
| 99945 | 929 | 5 | 4 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 4 | 4 | Spring | 2003 | A | 464
D
| 99945 | 929 | 5 | 5 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 5 | 5 | Fall | 2002 | H | 532
A
+-----+
6097 rows in set (0.04 sec)
MariaDB [mbd]>

```

Sesudah menggunakan tuning :

```

0
| 99734 | 341 | 1 | Spring | 2006 | C- | 99734 | Kiki | W
| 14 | 341 | 5 | Fall | 2006 | B | 418 |
H
| 99945 | 929 | 5 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 1 | Fall | 2004 | I | 475 |
B
| 99945 | 929 | 5 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 2 | Spring | 2001 | H | 532 |
L
| 99945 | 929 | 5 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 3 | Fall | 2008 | B | 418 |
P
| 99945 | 929 | 5 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 4 | Spring | 2003 | A | 464 |
D
| 99945 | 929 | 5 | Fall | 2002 | A | 99945 | Ande | F
| 68 | 929 | 5 | Fall | 2002 | H | 532 |
A
+-----+
6097 rows in set (0.04 sec)
MariaDB [mbd]>

```

5. Dengan menggunakan query 5 (SELECT student.`name`,student.dept\_name,takes.sec\_id AS pengambilan,takes.semester,section.room\_number,section.building,course.course\_id,course.dept\_name FROM takes JOIN student ON takes.ID = student.ID JOIN section ON takes.course\_id = section.course\_id JOIN course ON section.course\_id = course.course\_id)

Sebelum menggunakan tuning :

```

| Yohan | KL | 4 | Fall | 464 | A | 97
| WW | 5 | Spring | 523 | G | 97
| yuyun | WW | 5 | Spring | 999 | I | 97
| yuyun | WW | 5 | Spring | 523 | G | 97
| yuyun | WW | 5 | Spring | 418 | B | 97
| yuyun | WW | 5 | Spring | 44 | I | 97
| yuyun | WW | 5 | Spring | 464 | A | 97
| yuyun | GO | 1 | Spring | 464 | A | 99
| yuyun | GO | 1 | Spring | 475 | I | 99
| yuyun | GO | 1 | Spring | 475 | I | 99
+-----+
6097 rows in set (0.10 sec)
MariaDB [mbd]>

```

Sesudah menggunakan tuning :

```
| Yohan | KL | 4 | Fall | 464 | A | 97
| WW |
| yuyun | WW | 5 | Spring | 523 | G | 97
| WW |
| yuyun | WW | 5 | Spring | 999 | I | 97
| WW |
| yuyun | WW | 5 | Spring | 523 | G | 97
| WW |
| yuyun | WW | 5 | Spring | 418 | B | 97
| WW |
| yuyun | WW | 5 | Spring | 44 | I | 97
| WW |
| yuyun | WW | 5 | Spring | 464 | A | 97
| WW |
| yuyun | GO | 1 | Spring | 464 | A | 99
| WW |
| yuyun | GO | 1 | Spring | 475 | I | 99
| WW |
| yuyun | GO | 1 | Spring | 475 | I | 99
| WW |
+-----+-----+-----+-----+-----+-----+
6097 rows in set (0.03 sec)
MariaDB [mbd]>
```

## BAB III

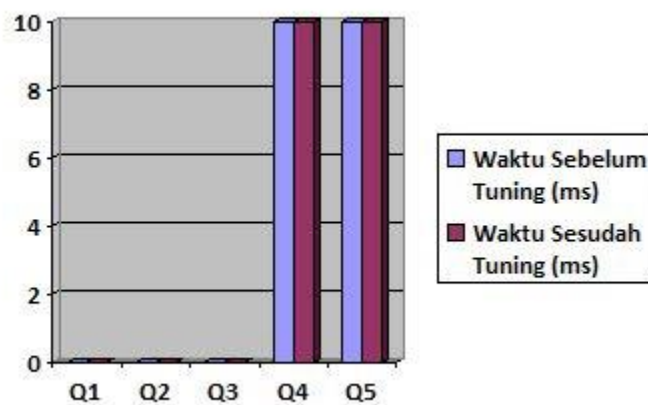
### HASIL DAN PEMBAHASAN

#### 3.1. Hasil

Tabel hasil :

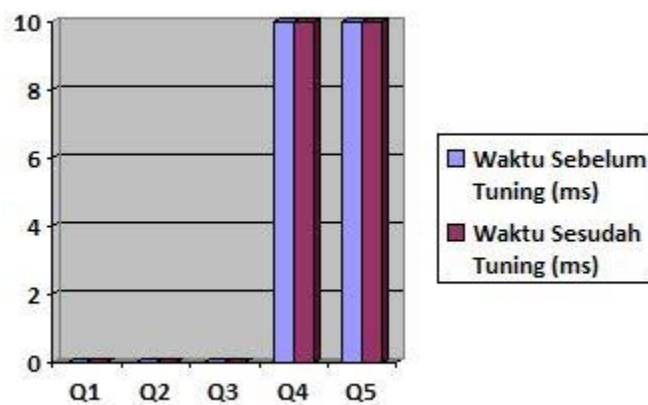
Data ke-	Waktu eksekusi sebelum tuning (ms)					Waktu eksekusi sesudah tuning (ms)				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
1	0	0	0	10	10	0	0	0	10	10
2	0	0	0	10	10	0	0	0	10	10
3	90	0	0	40	100	0	0	0	40	30

Tabel 1



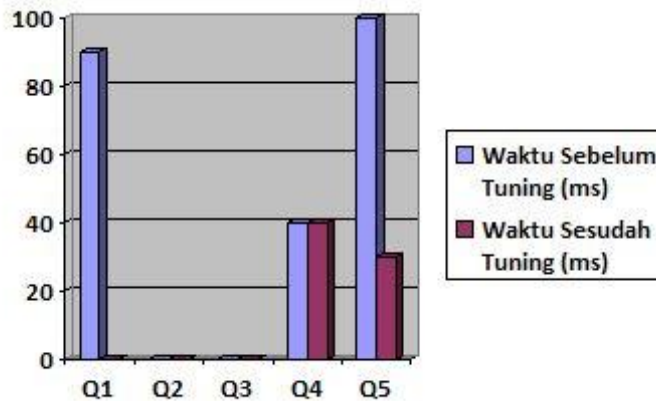
Tabel 1 berisi data 1 yaitu advisor = 100, student = 100, section = 200, takes = 200

Tabel 2



Tabel 2 berisi data 2 yaitu advisor = 200, student = 200, section = 400,takes =400

Tabel 3



Tabel 3 berisi data 3 yaitu advisor = 500, student = 500, section = 1000,takes =1000

### 3.2. Pembahasan

Berdasarkan tabel hasil dan grafik hasil diatas, dapat dilihat bahwa pada Data 1 dan 2 memiliki hasil yang sama sebelum dan sesudah tuning, tetatpi pada data 3 terjadi perbedaan yang cukup jauh. Hasil query sesudah dituning cukup jauh berbeda dengan sebelum tuning, hasil sesudah tuning menghasilkan waktu yang lebih sedikit. Untuk itu, maka diperlukan tuning agar dapat mempercepat waktu eksekusi data, dalam hal ini saya menggunakan teknik B-Tree untuk tuning index yang sangat berguna pada saat memilih row yang sesuai dengan kriteria tertentu. Index jenis B-Tree dapat dibuat dengan perintah CREATE INDEX. Setelah menggunakan teknik di atas, maka didapatkan waktu eksekusi sesudah dituning menjadi jauh lebih kecil, bahkan mencapai 0 ms.

Dari pembahasan di atas, dapat disimpulkan bahwa tuning dapat digunakan untuk meningkatkan kecepatan dalam eksekusi data sehingga pada akhirnya data dapat dihasilkan secara lebih cepat dan sesuai dengan kebutuhan pengguna.

## Daftar Pustaka

Cecilia, C., Mihai, G. (2011). Increasing Database Performance using Indexes, Database Systems Journal.

<https://pojokprogrammer.net/content/performance-tuning-sederhana-di-mysqlmenggunakan-index>

<https://www.i-3.co.id/2016/10/07/index-pada-database/>