

## Tutorial 6

### Unit Testing dan Load Testing Web App Sederhana

#### Ringkasan:

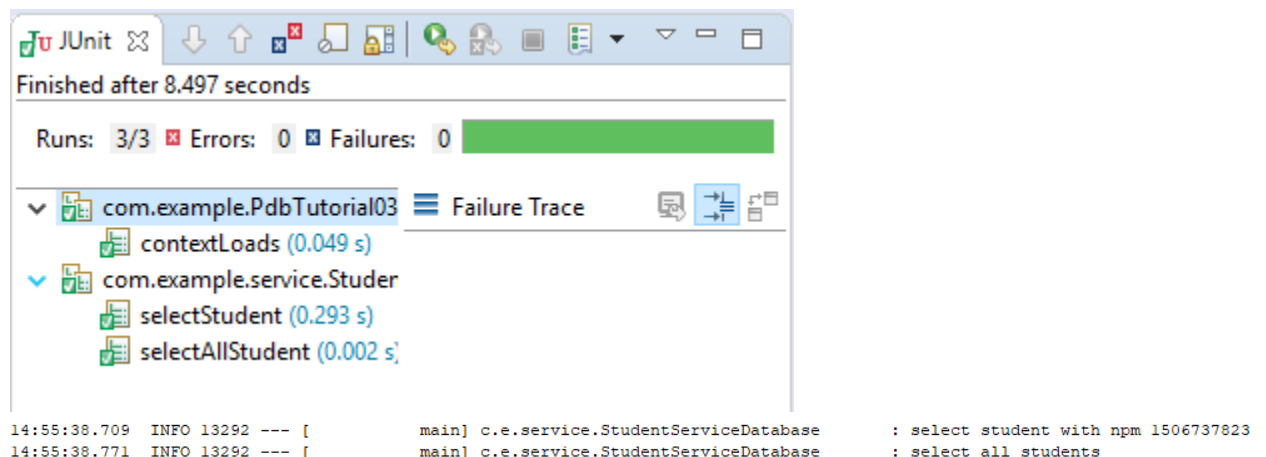
- Unit Testing dilakukan pada setiap fungsi dan method yang diimplementasi untuk memastikan kesesuaian dengan output actual dengan yang diharapkan. Unit testing pada tutorial kali ini dilakukan dengan JUnit
- Pada tutorial kali ini mempelajari mengenai load testing menggunakan Apache JMeter untuk mengukur performa web. Load testing mengakses web secara bersamaan (multithreading) dengan parameter yang telah ditentukan dan menghitung response time-nya.

#### Latihan Unit Testing

1. Tambahkan code berikut pada StudentServiceDatabaseTest dan jelaskan apa yang terjadi pada method tersebut berikut dengan hasil testing-nya!

Jawab:

Method selectStudent ini awalnya membuat sebuah 2 buah list dari model student dengan nama studentModels dan checks yang berisi objek student. Ketika studentMapper.selectAllStudents() dipanggil makalist studentModels akan dikembalikan. Deklarasi list test akan menyimpan kembalian dari method studentService.selectAllStudents() yang berupa list student. Kemudian fungsi assertEquals digunakan untuk membandingkan isi actual dari fungsi selectAllStudents yang disimpan pada variable test dengan masing-masing hasil yang diharapkan dari penjalanan fungsi tersebut.

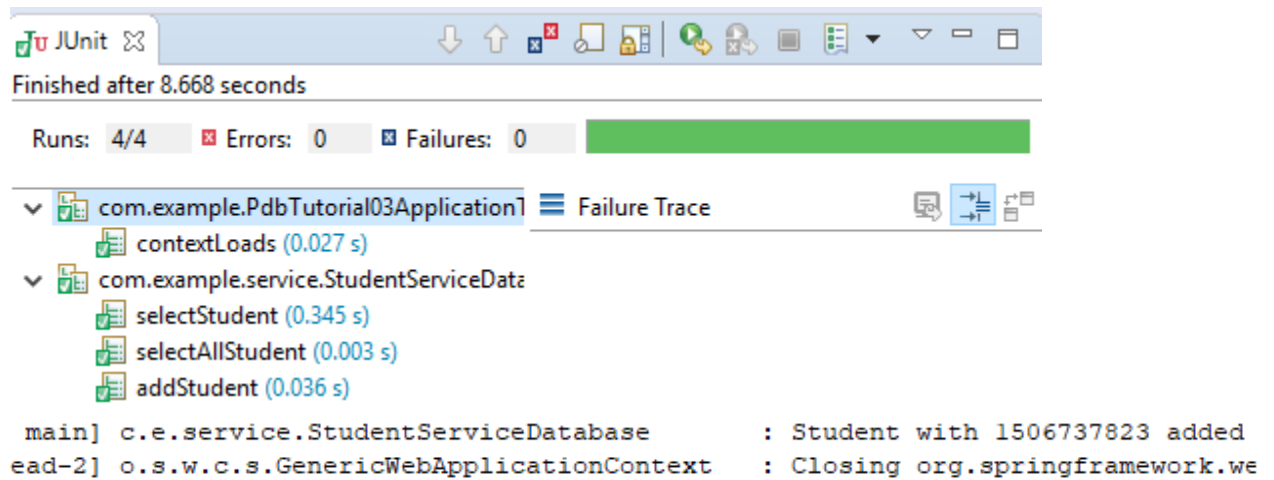


2. Tambahkan code berikut pada StudentServiceDatabaseTest dan jelaskan apa yang terjadi pada method tersebut berikut dengan hasil testing-nya!

Jawab:

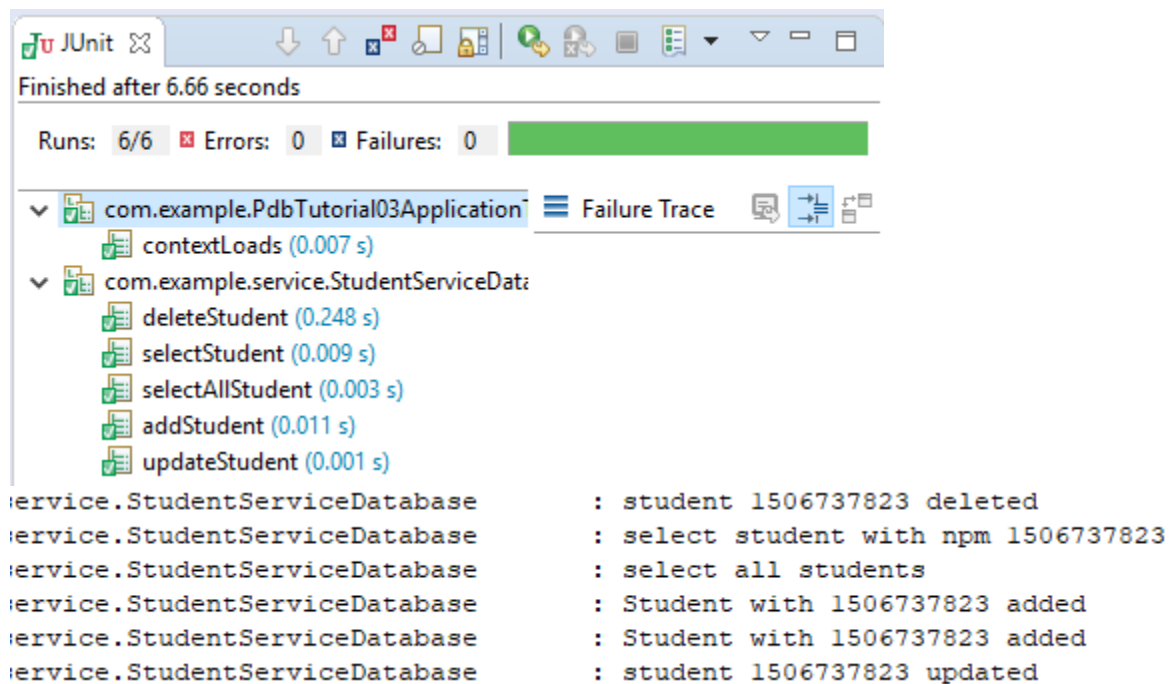
Method addStudent ini awalnya memiliki 2 objek student dengan nama studentModel dan check. Pemanggilan fungsi studentMapper.addStudent(studentModel) akan mengembalikan nilai true.

Ketika dijalankan fungsi addStudent akan disimpan pada variable test. Kemudian fungsi assertThat digunakan untuk membandingkan isi actual dari fungsi addStudent yang disimpan pada variable test bernilai true(expected outcome).



3. Lakukan testing terhadap method delete student dan update student (cukup lampirkan screenshot akhir dari testing)

Jawab:



#### Latihan Load Testing

1. Screenshot hasil JMeter fitur soal latihan Load Testing nomor 1 sebelum dioptimasi (3 file)
  - jmeter\_selectStudentBerhasil

**View Results in Table**

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename   Log/Display Only: ☐ Errors ☐ Successes

Sample #	Start Time	Thread Name	Label	Sample Time(m...)	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
75	23:52:26.832	Thread Group 1...	HTTP Request	16	✓	2084	141	16	1
76	23:52:26.930	Thread Group 1...	HTTP Request	14	✓	2084	141	14	2
77	23:52:27.033	Thread Group 1...	HTTP Request	17	✓	2084	141	17	3
78	23:52:27.136	Thread Group 1...	HTTP Request	15	✓	2084	141	15	3
79	23:52:27.231	Thread Group 1...	HTTP Request	17	✓	2084	141	17	5
80	23:52:27.330	Thread Group 1...	HTTP Request	11	✓	2084	141	11	2
81	23:52:27.431	Thread Group 1...	HTTP Request	13	✓	2084	141	13	1
82	23:52:27.531	Thread Group 1...	HTTP Request	107	✓	2084	141	107	2
83	23:52:27.630	Thread Group 1...	HTTP Request	11	✓	2084	141	11	1
84	23:52:27.730	Thread Group 1...	HTTP Request	222	✓	2084	141	221	2
85	23:52:27.826	Thread Group 1...	HTTP Request	138	✓	2084	141	138	2
86	23:52:27.936	Thread Group 1...	HTTP Request	33	✓	2084	141	33	2
87	23:52:28.025	Thread Group 1...	HTTP Request	11	✓	2084	141	11	2
88	23:52:28.132	Thread Group 1...	HTTP Request	17	✓	2084	141	17	2
89	23:52:28.231	Thread Group 1...	HTTP Request	15	✓	2084	141	15	2
90	23:52:28.326	Thread Group 1...	HTTP Request	12	✓	2084	141	12	2
91	23:52:28.425	Thread Group 1...	HTTP Request	12	✓	2084	141	12	3
92	23:52:28.525	Thread Group 1...	HTTP Request	18	✓	2084	141	18	2
93	23:52:28.625	Thread Group 1...	HTTP Request	11	✓	2084	141	11	2
94	23:52:28.725	Thread Group 1...	HTTP Request	11	✓	2084	141	11	1
95	23:52:28.826	Thread Group 1...	HTTP Request	10	✓	2084	141	10	2
96	23:52:28.927	Thread Group 1...	HTTP Request	22	✓	2084	141	22	3
97	23:52:29.027	Thread Group 1...	HTTP Request	31	✓	2084	141	30	4
98	23:52:29.127	Thread Group 1...	HTTP Request	10	✓	2084	141	10	1
99	23:52:29.233	Thread Group 1...	HTTP Request	31	✓	2084	141	31	3
100	23:52:29.333	Thread Group 1...	HTTP Request	26	✓	2084	141	26	3

☐ Scroll automatically? ☐ Child samples? No of Samples 100 Latest Sample 26 Average 30 Deviation 39

- jmeter\_selectStudentGagal

**View Results in Table**

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename   Log/Display Only: ☐ Errors ☐ Successes

Sample #	Start Time	Thread Name	Label	Sample Time(m...)	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
35	23:58:48.830	Thread Group 1...	HTTP Request	12	✓	2045	142	11	1
36	23:58:48.930	Thread Group 1...	HTTP Request	11	✓	2045	142	11	1
37	23:58:49.030	Thread Group 1...	HTTP Request	9	✓	2045	142	9	1
38	23:58:49.130	Thread Group 1...	HTTP Request	12	✓	2045	142	12	2
39	23:58:49.230	Thread Group 1...	HTTP Request	9	✓	2045	142	9	1
40	23:58:49.330	Thread Group 1...	HTTP Request	13	✓	2045	142	13	2
41	23:58:49.430	Thread Group 1...	HTTP Request	68	✓	2045	142	67	4
42	23:58:49.545	Thread Group 1...	HTTP Request	29	✓	2045	142	29	2
43	23:58:49.630	Thread Group 1...	HTTP Request	14	✓	2045	142	14	3
44	23:58:49.730	Thread Group 1...	HTTP Request	10	✓	2045	142	10	2
45	23:58:49.830	Thread Group 1...	HTTP Request	10	✓	2045	142	10	2
46	23:58:49.946	Thread Group 1...	HTTP Request	16	✓	2045	142	16	2
47	23:58:50.031	Thread Group 1...	HTTP Request	15	✓	2045	142	14	3
48	23:58:50.131	Thread Group 1...	HTTP Request	15	✓	2045	142	15	1
49	23:58:50.231	Thread Group 1...	HTTP Request	10	✓	2045	142	10	1
50	23:58:50.331	Thread Group 1...	HTTP Request	10	✓	2045	142	10	1
51	23:58:50.431	Thread Group 1...	HTTP Request	13	✓	2045	142	13	2
52	23:58:50.530	Thread Group 1...	HTTP Request	13	✓	2045	142	13	1
53	23:58:50.630	Thread Group 1...	HTTP Request	15	✓	2045	142	15	1
54	23:58:50.730	Thread Group 1...	HTTP Request	11	✓	2045	142	11	1
55	23:58:50.830	Thread Group 1...	HTTP Request	8	✓	2045	142	8	1
56	23:58:50.932	Thread Group 1...	HTTP Request	25	✓	2045	142	25	1
57	23:58:51.031	Thread Group 1...	HTTP Request	13	✓	2045	142	12	2
58	23:58:51.131	Thread Group 1...	HTTP Request	16	✓	2045	142	16	2
59	23:58:51.231	Thread Group 1...	HTTP Request	8	✓	2045	142	8	1
60	23:58:51.330	Thread Group 1...	HTTP Request	9	✓	2045	142	9	2

☐ Scroll automatically? ☐ Child samples? No of Samples 100 Latest Sample 4673 Average 251 Deviation 1034

- jmeter\_selectAllStudents

**View Results in Table**

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename   Log/Display Only: ☐ Errors ☐ Successes

Sample #	Start Time	Thread Name	Label	Sample Time(ms)	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
1	00:02:13.571	Thread Group 1-2	HTTP Request	13448		1738313	133	13108	2
2	00:02:13.477	Thread Group 1-1	HTTP Request	13558		1738313	133	12839	2
3	00:02:13.774	Thread Group 1-4	HTTP Request	16845		1738313	133	13621	1
4	00:02:13.681	Thread Group 1-3	HTTP Request	17086		1738313	133	13753	1
5	00:02:13.885	Thread Group 1-5	HTTP Request	16951		1738313	133	16719	1
6	00:02:13.993	Thread Group 1-6	HTTP Request	17006		1738313	133	16738	1
7	00:02:14.087	Thread Group 1-7	HTTP Request	17092		1738313	133	16942	1
8	00:02:14.290	Thread Group 1-8	HTTP Request	16890		1738313	133	16731	1
9	00:02:14.196	Thread Group 1-8	HTTP Request	17070		1738313	133	16935	1
10	00:02:14.400	Thread Group 1...	HTTP Request	16901		1738313	133	16785	1

☐ Scroll automatically? ☐ Child samples? No of Samples 10 Latest Sample 16901 Average 10204 Deviation 1393

2. Screenshot hasil JMeter fitur soal latihan Load Testing nomor 2 setelah dioptimasi (3 file)
  - jmeter\_selectStudentBerhasil

**View Results in Table**

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename   Log/Display Only: ☐ Errors ☐ Successes

Sample #	Start Time	Thread Name	Label	Sample Time(m...	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
1	00:04:43.482	Thread Group 1...	HTTP Request	51		2084	141	51	16
2	00:04:43.620	Thread Group 1...	HTTP Request	7		2084	141	7	1
3	00:04:43.709	Thread Group 1...	HTTP Request	8		2084	141	8	1
4	00:04:43.809	Thread Group 1...	HTTP Request	9		2084	141	9	2
5	00:04:43.882	Thread Group 1...	HTTP Request	9		2084	141	9	2
6	00:04:44.024	Thread Group 1...	HTTP Request	9		2084	141	8	1
7	00:04:44.117	Thread Group 1...	HTTP Request	9		2084	141	9	1
8	00:04:44.210	Thread Group 1...	HTTP Request	8		2084	141	8	1
9	00:04:44.318	Thread Group 1...	HTTP Request	8		2084	141	8	1
10	00:04:44.411	Thread Group 1...	HTTP Request	8		2084	141	8	1
11	00:04:44.520	Thread Group 1...	HTTP Request	10		2084	141	10	1
12	00:04:44.628	Thread Group 1...	HTTP Request	7		2084	141	7	1
13	00:04:44.712	Thread Group 1...	HTTP Request	8		2084	141	8	1
14	00:04:44.811	Thread Group 1...	HTTP Request	8		2084	141	8	1
15	00:04:44.911	Thread Group 1...	HTTP Request	9		2084	141	9	2
16	00:04:45.011	Thread Group 1...	HTTP Request	18		2084	141	18	2
17	00:04:45.111	Thread Group 1...	HTTP Request	9		2084	141	9	2
18	00:04:45.212	Thread Group 1...	HTTP Request	9		2084	141	9	0
19	00:04:45.311	Thread Group 1...	HTTP Request	10		2084	141	10	2
20	00:04:45.412	Thread Group 1...	HTTP Request	9		2084	141	9	1
21	00:04:45.512	Thread Group 1...	HTTP Request	11		2084	141	11	1
22	00:04:45.613	Thread Group 1...	HTTP Request	11		2084	141	10	1
23	00:04:45.713	Thread Group 1...	HTTP Request	41		2084	141	41	1
24	00:04:45.812	Thread Group 1...	HTTP Request	8		2084	141	8	1
25	00:04:45.913	Thread Group 1...	HTTP Request	10		2084	141	10	2
26	00:04:46.014	Thread Group 1...	HTTP Request	14		2084	141	14	1

☒ Scroll automatically? ☐ Child samples? No of Samples 100 Latest Sample 10 Average 10 Deviation 6

- jmeter\_selectStudentGagal

View Results in Table

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename

Browse...

Log/Display Only:

Errors

Successes

Configure

Sample #	Start Time	Thread Name	Label	Sample Time(m...	Status	Bytes	Sent Bytes	Latency	Connect Time(...
1	23:55:56.696	Thread Group 1...	HTTP Request	35		2045	142	35	2
2	23:55:56.791	Thread Group 1...	HTTP Request	10		2045	142	10	1
3	23:55:56.900	Thread Group 1...	HTTP Request	9		2045	142	9	1
4	23:55:56.996	Thread Group 1...	HTTP Request	11		2045	142	11	1
5	23:55:57.096	Thread Group 1...	HTTP Request	13		2045	142	13	1
6	23:55:57.207	Thread Group 1...	HTTP Request	17		2045	142	17	1
7	23:55:57.301	Thread Group 1...	HTTP Request	11		2045	142	11	1
8	23:55:57.411	Thread Group 1...	HTTP Request	22		2045	142	22	1
9	23:55:57.495	Thread Group 1...	HTTP Request	20		2045	142	20	1
10	23:55:57.601	Thread Group 1...	HTTP Request	12		2045	142	12	1
11	23:55:57.701	Thread Group 1...	HTTP Request	23		2045	142	23	1
12	23:55:57.795	Thread Group 1...	HTTP Request	13		2045	142	12	1
13	23:55:57.895	Thread Group 1...	HTTP Request	10		2045	142	9	2
14	23:55:57.995	Thread Group 1...	HTTP Request	16		2045	142	15	1
15	23:55:58.095	Thread Group 1...	HTTP Request	11		2045	142	11	1
16	23:55:58.195	Thread Group 1...	HTTP Request	8		2045	142	8	1
17	23:55:58.295	Thread Group 1...	HTTP Request	10		2045	142	10	2
18	23:55:58.396	Thread Group 1...	HTTP Request	9		2045	142	9	1
19	23:55:58.496	Thread Group 1...	HTTP Request	9		2045	142	9	1
20	23:55:58.595	Thread Group 1...	HTTP Request	8		2045	142	8	1
21	23:55:58.695	Thread Group 1...	HTTP Request	9		2045	142	9	2
22	23:55:58.795	Thread Group 1...	HTTP Request	36		2045	142	36	2
23	23:55:58.912	Thread Group 1...	HTTP Request	16		2045	142	16	1
24	23:55:59.010	Thread Group 1...	HTTP Request	11		2045	142	11	2
25	23:55:59.110	Thread Group 1...	HTTP Request	9		2045	142	9	2
26	23:55:59.211	Thread Group 1...	HTTP Request	24		2045	142	24	1

Scroll automatically?

Child samples?

No of Samples 100

Latest Sample 12

Average 18

Deviation 20

- jmeter\_selectAllStudents

View Results in Table

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename

Browse...

Log/Display Only:

Errors

Successes

Configure

Sample #	Start Time	Thread Name	Label	Sample Time(ms)	Status	Bytes	Sent Bytes	Latency	Connect Time(...
1	00:08:20.045	Thread Group 1-1	HTTP Request	8633		1738313	133	8111	2
2	00:08:20.146	Thread Group 1-2	HTTP Request	8932		1738313	133	8552	1
3	00:08:20.240	Thread Group 1-3	HTTP Request	9372		1738313	133	8786	1
4	00:08:20.334	Thread Group 1-4	HTTP Request	9407		1738313	133	9014	1
5	00:08:20.443	Thread Group 1-5	HTTP Request	9650		1738313	133	9161	1
6	00:08:20.552	Thread Group 1-6	HTTP Request	9873		1738313	133	9559	1
7	00:08:20.756	Thread Group 1-8	HTTP Request	9811		1738313	133	9433	1
8	00:08:20.646	Thread Group 1-7	HTTP Request	9940		1738313	133	9578	1
9	00:08:20.849	Thread Group 1-9	HTTP Request	10129		1738313	133	9983	1
10	00:08:20.943	Thread Group 1...	HTTP Request	10118		1738313	133	9949	1

Scroll automatically?

Child samples?

No of Samples 10

Latest Sample 10118

Average 9886

Deviation 474

Optimasi dilakukan dengan memberikan index pada kolom npm sehingga proses pencarian student semakin cepat dan mengurangi average time. Dapat dilihat pada gambar bahwa average time menjadi semakin kecil setelah pemberian index