CC LAB 2 - MONOLITHIC ARCHITECTURE

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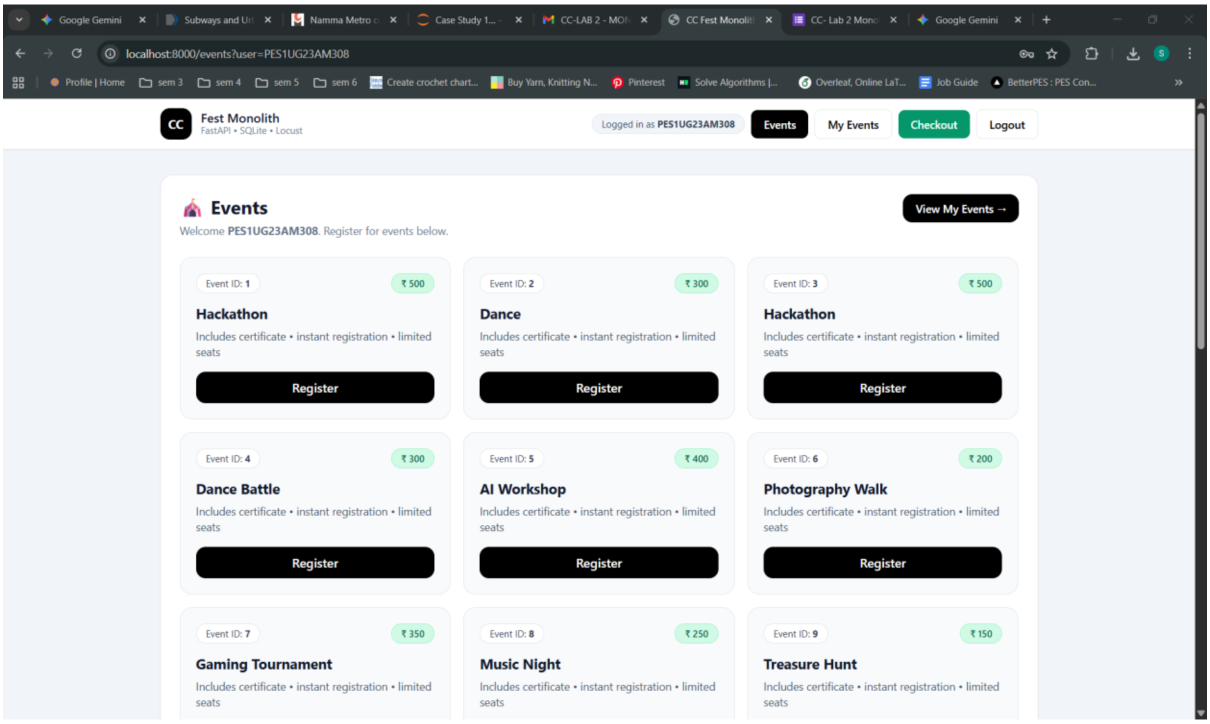
SEC- F

19-01-2026



Events

Welcome **PES1UG23AM308**. Register for events below.

Event ID: 1 ₹ 500
Hackathon
Includes certificate • instant registration • limited seats

Event ID: 2 ₹ 300
Dance
Includes certificate • instant registration • limited seats

Event ID: 3 ₹ 500
Hackathon
Includes certificate • instant registration • limited seats

Event ID: 4 ₹ 300
Dance Battle
Includes certificate • instant registration • limited seats

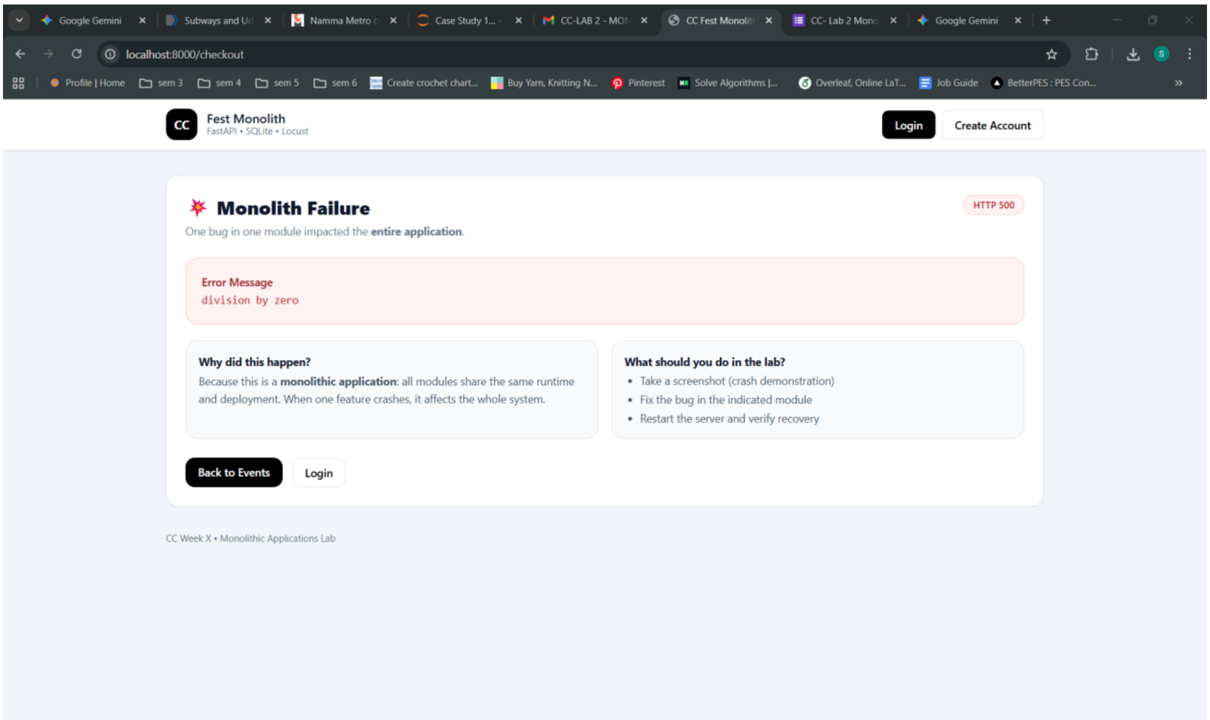
Event ID: 5 ₹ 400
AI Workshop
Includes certificate • instant registration • limited seats

Event ID: 6 ₹ 200
Photography Walk
Includes certificate • instant registration • limited seats

Event ID: 7 ₹ 350
Gaming Tournament
Includes certificate • instant registration • limited seats

Event ID: 8 ₹ 250
Music Night
Includes certificate • instant registration • limited seats

Event ID: 9 ₹ 150
Treasure Hunt
Includes certificate • instant registration • limited seats



Fest Monolith
FastAPI • SQLite • Locust

✸ **Monolith Failure**

HTTP 500

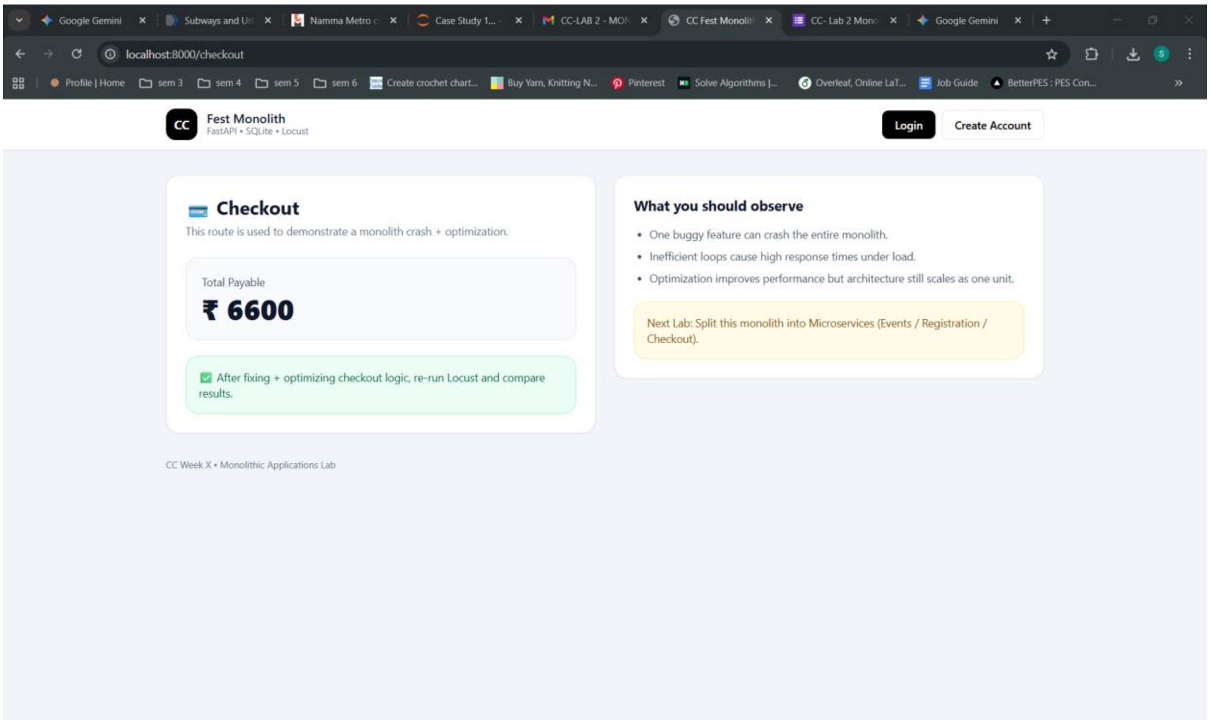
One bug in one module impacted the **entire application**.

Error Message
`division by zero`

Why did this happen?
Because this is a **monolithic application**: all modules share the same runtime and deployment. When one feature crashes, it affects the whole system.

What should you do in the lab?
- Take a screenshot (crash demonstration)
- Fix the bug in the indicated module
- Restart the server and verify recovery

CC Week X • Monolithic Applications Lab



Fest Monolith
FastAPI • SQLite • Locust

Checkout

This route is used to demonstrate a monolith crash + optimization.

Total Payable
₹ 6600

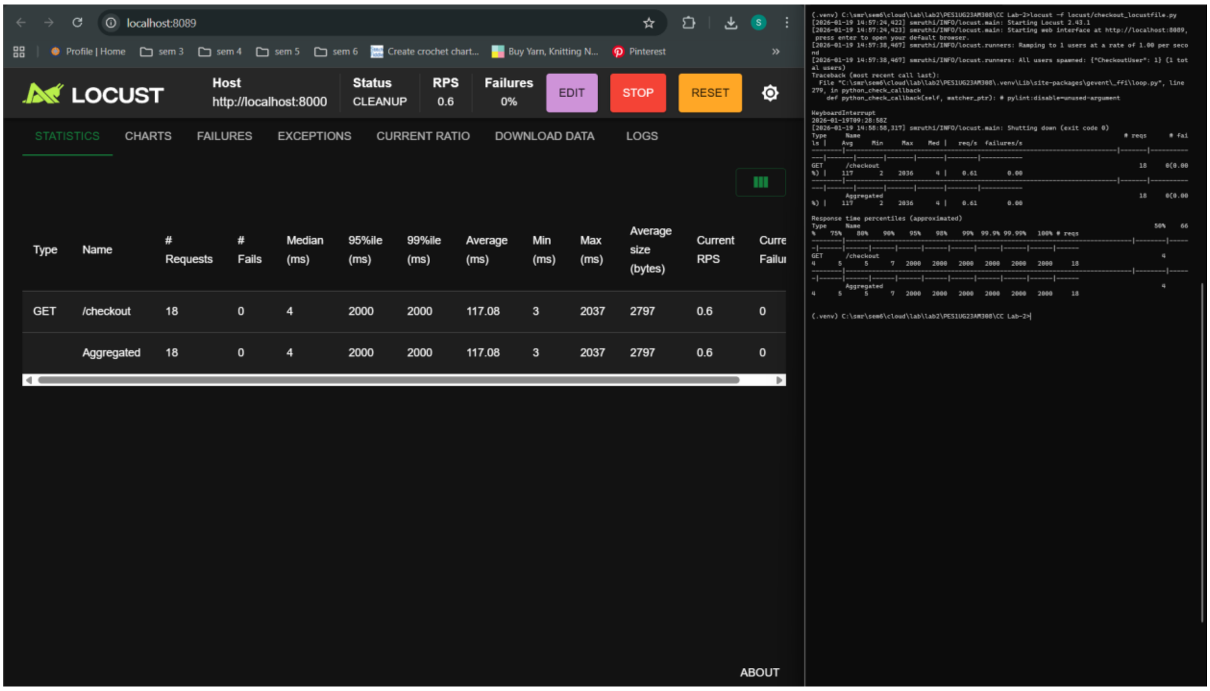
✓ After fixing + optimizing checkout logic, re-run Locust and compare results.

What you should observe
- One buggy feature can crash the entire monolith.
- Inefficient loops cause high response times under load.
- Optimization improves performance but architecture still scales as one unit.

Next Lab: Split this monolith into Microservices (Events / Registration / Checkout).

CC Week X • Monolithic Applications Lab

PART 6: Optimize the Checkout Route



Host http://localhost:8000

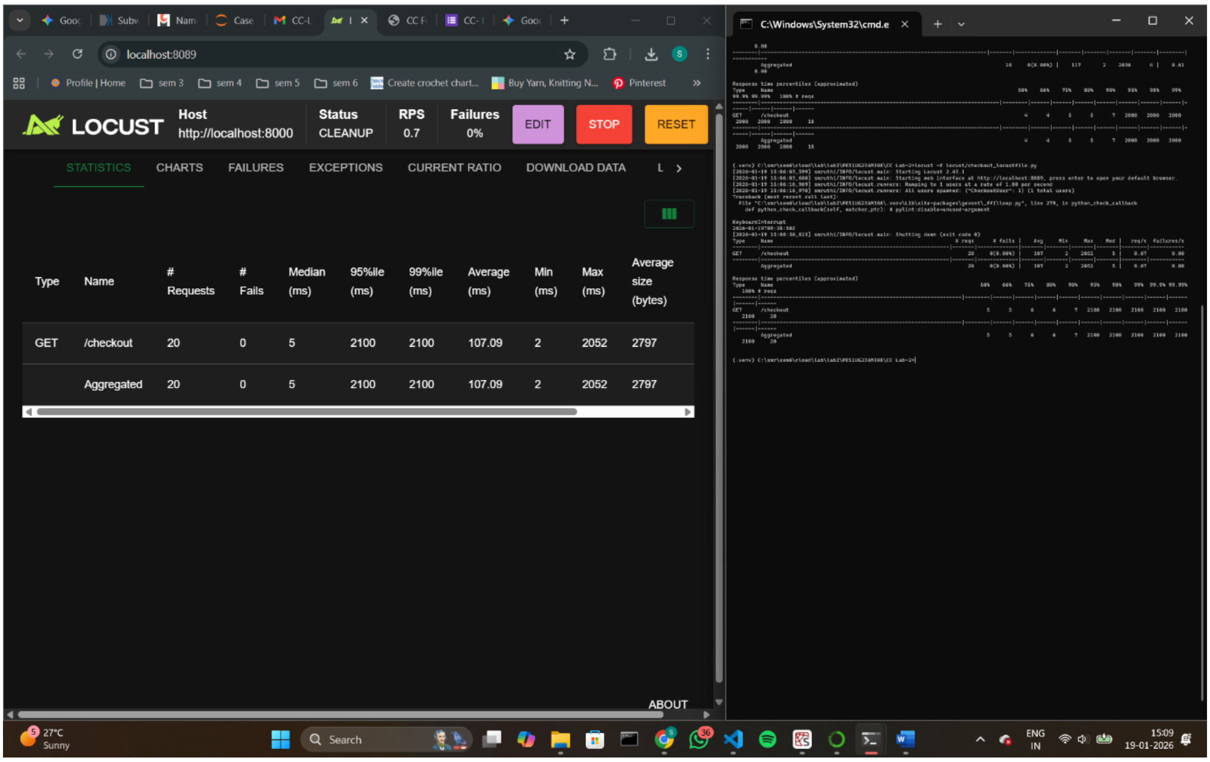
Status CLEANUP

RPS 0.6

Failures 0%

Type	Name	# Requests	# Fails	Median (ms)	95%ile (ms)	99%ile (ms)	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)	Current RPS	Curre Failu
GET	/checkout	18	0	4	2000	2000	117.08	3	2037	2797	0.6	0
	Aggregated	18	0	4	2000	2000	117.08	3	2037	2797	0.6	0

```
(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>locust -f locust/checkout_locustfile.py
[2026-01-19 14:57:24,422] smruthi/INFO/locust.main: Starting Locust 2.43.1
[2026-01-19 14:57:24,423] smruthi/INFO/locust.main: Starting web interface at http://localhost:8089,
 press enter to open your default browser.
[2026-01-19 14:57:38,467] smruthi/INFO/locust.runners: Ramping to 1 users at a rate of 1.00 per seco
nd
[2026-01-19 14:57:38,467] smruthi/INFO/locust.runners: All users spawned: {"CheckoutUser": 1} (1 tot
al users)
Traceback (most recent call last):
  File "C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\.venv\Lib\site-packages\gevent\_ffi\loop.py", line
279, in python_check_callback
    def python_check_callback(self, watcher_ptr): # pylint:disable=unused-argument

KeyboardInterrupt
2026-01-19T09:28:58Z
[2026-01-19 14:58:58,317] smruthi/INFO/locust.main: Shutting down (exit code 0)
Type     Name                                                                    # reqs      # fai
ls |    Avg     Min     Max    Med |   req/s  failures/s
--------|-----------------------------------------------------------------------|-------|----------
---|-------|-------|-------|-------|--------|-----------
GET      /checkout                                                                   18     0(0.00
%) |    117       2    2036      4 |    0.61        0.00
--------|-----------------------------------------------------------------------|-------|----------
---|-------|-------|-------|-------|--------|-----------
         Aggregated                                                                  18     0(0.00
%) |    117       2    2036      4 |    0.61        0.00

Response time percentiles (approximated)
Type     Name                                                                         50%    66
%    75%    80%    90%    95%    98%    99%  99.9% 99.99%   100% # reqs
--------|------------------------------------------------------------------------|--------|------
-|------|------|------|------|------|------|------|------|------|------
GET      /checkout                                                                     4
4      5      5      7   2000   2000   2000   2000   2000   2000     18
--------|------------------------------------------------------------------------|--------|------
-|------|------|------|------|------|------|------|------|------|------
         Aggregated                                                                    4
4      5      5      7   2000   2000   2000   2000   2000   2000     18


(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>
```



Host http://localhost:8000

Status CLEANUP

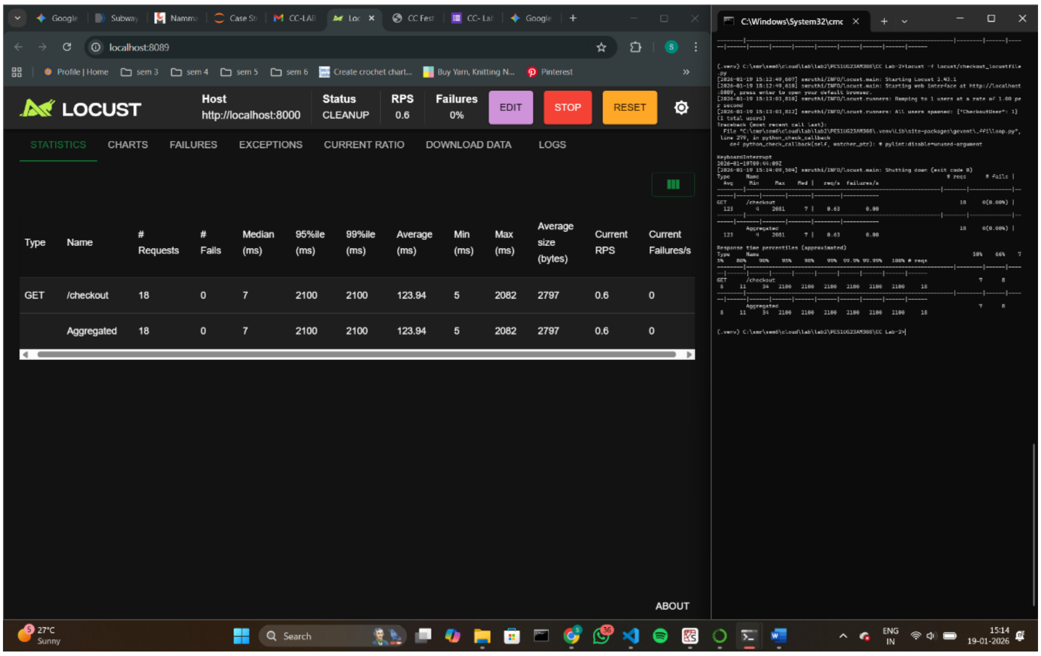
RPS 0.7

Failures 0%

Type	Name	# Requests	# Fails	Median (ms)	95%ile (ms)	99%ile (ms)	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)
GET	/checkout	20	0	5	2100	2100	107.09	2	2052	2797
	Aggregated	20	0	5	2100	2100	107.09	2	2052	2797

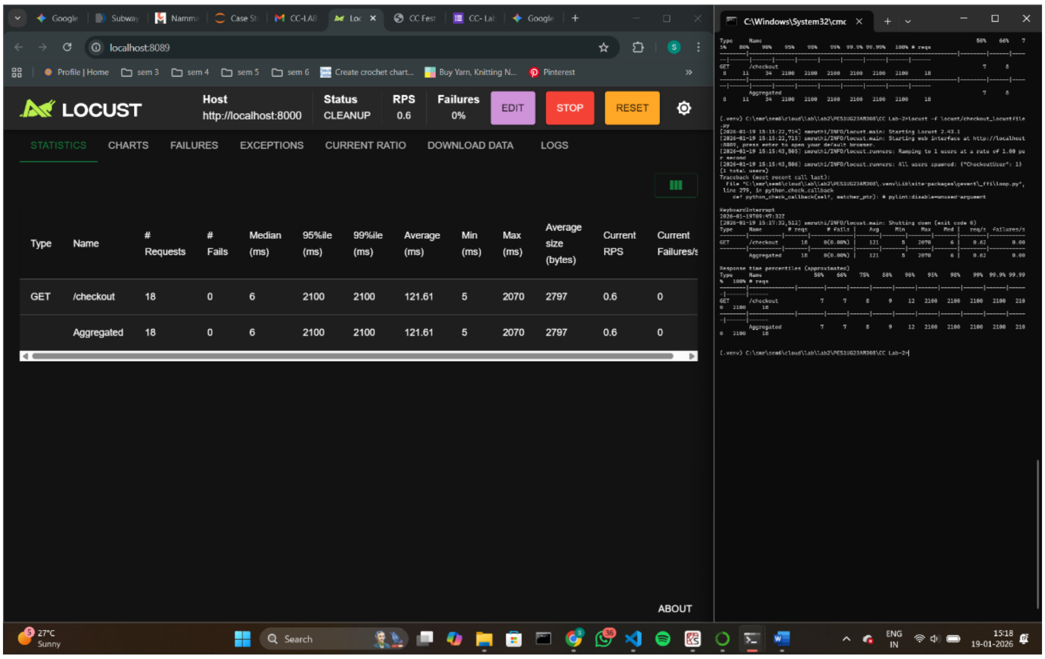
```
      0.00
--------|------------------------------------------------------------|-------|------------|-------|-------|-------|-------|--------|
----------
         Aggregated                                                     18     0(0.00%) |    117       2    2036      4 |    0.61
      0.00

Response time percentiles (approximated)
Type     Name                                                               50%    66%    75%    80%    90%    95%    98%    99%
99.9% 99.99%   100% # reqs
--------|--------------------------------------------------------------|--------|------|------|------|------|------|------|------|-
-----|------|------|------
GET      /checkout                                                            4      4      5      5      7   2000   2000   2000
 2000   2000   2000     18
--------|--------------------------------------------------------------|--------|------|------|------|------|------|------|------|-
-----|------|------|------
         Aggregated                                                           4      4      5      5      7   2000   2000   2000
 2000   2000   2000     18


(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>locust -f locust/checkout_locustfile.py
[2026-01-19 15:06:03,599] smruthi/INFO/locust.main: Starting Locust 2.43.1
[2026-01-19 15:06:03,600] smruthi/INFO/locust.main: Starting web interface at http://localhost:8089, press enter to open your default browser.
[2026-01-19 15:06:16,969] smruthi/INFO/locust.runners: Ramping to 1 users at a rate of 1.00 per second
[2026-01-19 15:06:16,970] smruthi/INFO/locust.runners: All users spawned: {"CheckoutUser": 1} (1 total users)
Traceback (most recent call last):
  File "C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\.venv\Lib\site-packages\gevent\_ffi\loop.py", line 279, in python_check_callback
    def python_check_callback(self, watcher_ptr): # pylint:disable=unused-argument

KeyboardInterrupt
2026-01-19T09:38:58Z
[2026-01-19 15:08:58,823] smruthi/INFO/locust.main: Shutting down (exit code 0)
Type     Name                                                       # reqs      # fails |    Avg     Min     Max    Med |   req/s  failures/s
--------|----------------------------------------------------------|-------|-------------|-------|-------|-------|-------|--------|-----------
GET      /checkout                                                      20     0(0.00%) |    107       2    2052      5 |    0.67        0.00
--------|----------------------------------------------------------|-------|-------------|-------|-------|-------|-------|--------|-----------
         Aggregated                                                     20     0(0.00%) |    107       2    2052      5 |    0.67        0.00

Response time percentiles (approximated)
Type     Name                                                          50%    66%    75%    80%    90%    95%    98%    99%  99.9% 99.99%
   100% # reqs
--------|----------------------------------------------------------|--------|------|------|------|------|------|------|------|------|------
|------|------
GET      /checkout                                                       5      5      6      6      7   2100   2100   2100   2100   2100
   2100     20
--------|----------------------------------------------------------|--------|------|------|------|------|------|------|------|------|------
|------|------
         Aggregated                                                      5      5      6      6      7   2100   2100   2100   2100   2100
   2100     20


(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>
```

Route 1: /events



Type	Name	# Requests	# Fails	Median (ms)	95%ile (ms)	99%ile (ms)	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)	Current RPS	Current Failures/s
GET	/checkout	18	0	7	2100	2100	123.94	5	2082	2797	0.6	0
	Aggregated	18	0	7	2100	2100	123.94	5	2082	2797	0.6	0

```
(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>locust -f locust/checkout_locustfile
.py
[2026-01-19 15:12:49,607] smruthi/INFO/locust.main: Starting Locust 2.43.1
[2026-01-19 15:12:49,610] smruthi/INFO/locust.main: Starting web interface at http://localhost
:8089, press enter to open your default browser.
[2026-01-19 15:13:03,810] smruthi/INFO/locust.runners: Ramping to 1 users at a rate of 1.00 pe
r second
[2026-01-19 15:13:03,812] smruthi/INFO/locust.runners: All users spawned: {"CheckoutUser": 1}
(1 total users)
Traceback (most recent call last):
  File "C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\.venv\Lib\site-packages\gevent\_ffi\loop.py",
 line 279, in python_check_callback
    def python_check_callback(self, watcher_ptr): # pylint:disable=unused-argument

KeyboardInterrupt
2026-01-19T09:44:09Z
[2026-01-19 15:14:09,504] smruthi/INFO/locust.main: Shutting down (exit code 0)
Type     Name                                                            # reqs      # fails |
  Avg     Min     Max    Med |   req/s  failures/s
--------|------------------------------------------------------------|-------|-------------|--
-----|-------|-------|-------|--------|-----------
GET      /checkout                                                         18     0(0.00%) |
  123       4    2081      7 |    0.63        0.00
--------|------------------------------------------------------------|-------|-------------|--
-----|-------|-------|-------|--------|-----------
         Aggregated                                                        18     0(0.00%) |
  123       4    2081      7 |    0.63        0.00

Response time percentiles (approximated)
Type     Name                                                                    50%    66%    7
5%    80%    90%    95%    98%    99%  99.9% 99.99%   100% # reqs
--------|------------------------------------------------------------|--------|------|----
--|------|------|------|------|------|------|------|------
GET      /checkout                                                                 7      8
 8     11     34   2100   2100   2100   2100   2100   2100     18
--------|------------------------------------------------------------|--------|------|----
--|------|------|------|------|------|------|------|------
         Aggregated                                                                7      8
 8     11     34   2100   2100   2100   2100   2100   2100     18

(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>
```



Type	Name	# Requests	# Fails	Median (ms)	95%ile (ms)	99%ile (ms)	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)	Current RPS	Current Failures/s
GET	/checkout	18	0	6	2100	2100	121.61	5	2070	2797	0.6	0
	Aggregated	18	0	6	2100	2100	121.61	5	2070	2797	0.6	0

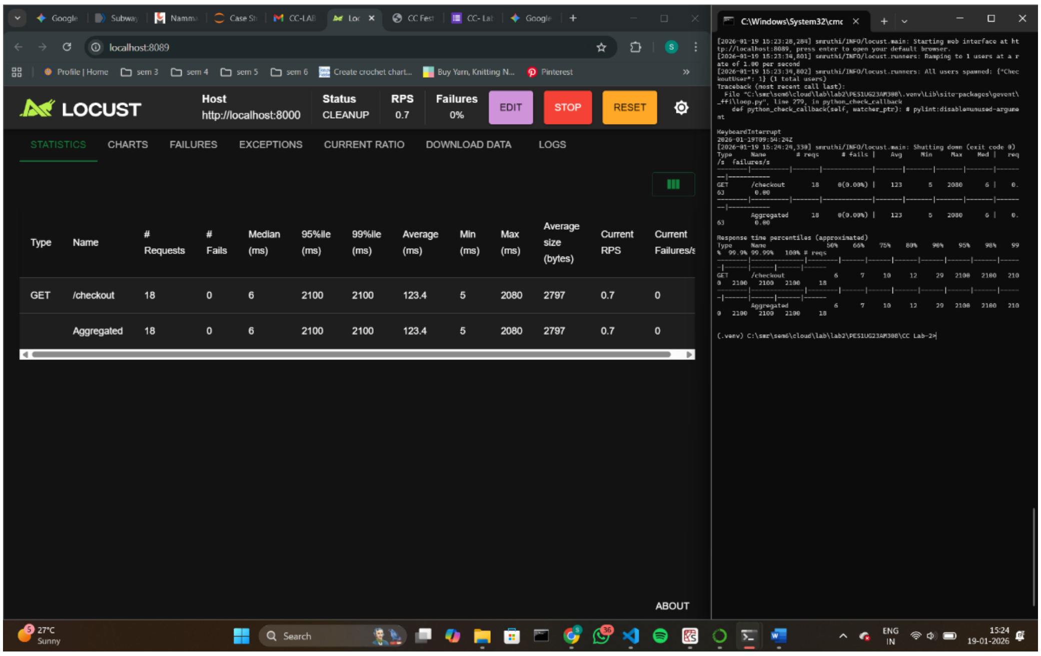
```
Type     Name                                                                    50%    66%    7
5%    80%    90%    95%    98%    99%  99.9% 99.99%   100% # reqs
--------|------------------------------------------------------------|--------|------|----
--|------|------|------|------|------|------|------|------
GET      /checkout                                                                 7      8
 8     11     34   2100   2100   2100   2100   2100   2100     18
--------|------------------------------------------------------------|--------|------|----
--|------|------|------|------|------|------|------|------
         Aggregated                                                                7      8
 8     11     34   2100   2100   2100   2100   2100   2100     18

(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>locust -f locust/checkout_locustfile
.py
[2026-01-19 15:15:22,714] smruthi/INFO/locust.main: Starting Locust 2.43.1
[2026-01-19 15:15:22,715] smruthi/INFO/locust.main: Starting web interface at http://localhost
:8089, press enter to open your default browser.
[2026-01-19 15:15:43,605] smruthi/INFO/locust.runners: Ramping to 1 users at a rate of 1.00 pe
r second
[2026-01-19 15:15:43,606] smruthi/INFO/locust.runners: All users spawned: {"CheckoutUser": 1}
(1 total users)
Traceback (most recent call last):
  File "C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\.venv\Lib\site-packages\gevent\_ffi\loop.py",
 line 279, in python_check_callback
    def python_check_callback(self, watcher_ptr): # pylint:disable=unused-argument

KeyboardInterrupt
2026-01-19T09:47:32Z
[2026-01-19 15:17:32,512] smruthi/INFO/locust.main: Shutting down (exit code 0)
Type     Name          # reqs      # fails |    Avg     Min     Max    Med |   req/s  failures/s
--------|-------------|-------|-------------|-------|-------|-------|-------|--------|-----------
GET      /checkout         18     0(0.00%) |    121       5    2070      6 |    0.62        0.00
--------|-------------|-------|-------------|-------|-------|-------|-------|--------|-----------
         Aggregated        18     0(0.00%) |    121       5    2070      6 |    0.62        0.00

Response time percentiles (approximated)
Type     Name                 50%    66%    75%    80%    90%    95%    98%    99%  99.9% 99.99
%   100% # reqs
--------|-------------|--------|------|------|------|------|------|------|------|------|------
-|------|------
GET      /checkout              7      7      8      9     12   2100   2100   2100   2100   210
0   2100     18
--------|-------------|--------|------|------|------|------|------|------|------|------|------
-|------|------
         Aggregated             7      7      8      9     12   2100   2100   2100   2100   210
0   2100     18

(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>
```

The bottleneck: The bottleneck was a computational overhead caused by a large for loop performing millions of modulo operations. This blocked the event loop, preventing the server from handling concurrent requests efficiently.

Changes made: I ensured the "waste" loop (for i in range(3000000): waste += i % 3) was removed or remained commented out. I also verified that the database connection is handled efficiently without unnecessary re-querying.

Why the performance improved: Removing the loop shifted the operation from CPU-bound (slow) to I/O-bound (fast). The server no longer spends millions of cycles on useless math, allowing it to respond immediately after fetching data from the database.

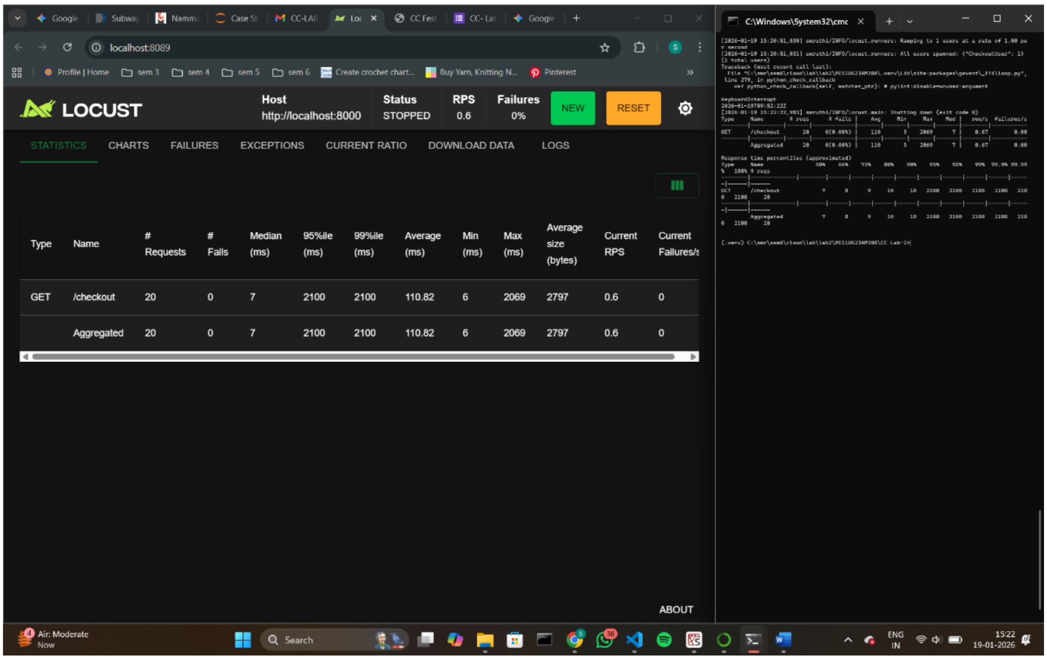
Route 2: /my-events



LOCUST | Host: http://localhost:8000 | Status: CLEANUP | RPS: 0.7 | Failures: 0%

Type	Name	# Requests	# Fails	Median (ms)	95%ile (ms)	99%ile (ms)	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)	Current RPS	Current Failures/s
GET	/checkout	18	0	6	2100	2100	123.4	5	2080	2797	0.7	0
	Aggregated	18	0	6	2100	2100	123.4	5	2080	2797	0.7	0

```
[2026-01-19 15:23:28,284] smruthi/INFO/locust.main: Starting web interface at ht
tp://localhost:8089, press enter to open your default browser.
[2026-01-19 15:23:34,801] smruthi/INFO/locust.runners: Ramping to 1 users at a r
ate of 1.00 per second
[2026-01-19 15:23:34,802] smruthi/INFO/locust.runners: All users spawned: {"Chec
koutUser": 1} (1 total users)
Traceback (most recent call last):
  File "C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\.venv\Lib\site-packages\gevent\
_ffi\loop.py", line 279, in python_check_callback
    def python_check_callback(self, watcher_ptr): # pylint:disable=unused-argume
nt

KeyboardInterrupt
2026-01-19T09:54:24Z
[2026-01-19 15:24:24,330] smruthi/INFO/locust.main: Shutting down (exit code 0)
Type     Name         # reqs      # fails |    Avg     Min     Max    Med |    req
/s  failures/s
--------|-----------|--------|-------------|-------|-------|-------|-------|------
--|-----------
GET      /checkout       18     0(0.00%) |    123       5    2080      6 |    0.
63       0.00
--------|-----------|--------|-------------|-------|-------|-------|-------|------
--|-----------
         Aggregated      18     0(0.00%) |    123       5    2080      6 |    0.
63       0.00

Response time percentiles (approximated)
Type     Name                  50%    66%    75%    80%    90%    95%    98%    99
%  99.9% 99.99%   100% # reqs
--------|----------------|--------|------|------|------|------|------|------|-----
-|------|------|------|------
GET      /checkout               6      7     10     12     29   2100   2100   210
0   2100   2100   2100     18
--------|----------------|--------|------|------|------|------|------|------|-----
-|------|------|------|------
         Aggregated              6      7     10     12     29   2100   2100   210
0   2100   2100   2100     18


(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>
```



LOCUST | Host: http://localhost:8000 | Status: STOPPED | RPS: 0.6 | Failures: 0%

Type	Name	# Requests	# Fails	Median (ms)	95%ile (ms)	99%ile (ms)	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)	Current RPS	Current Failures/s
GET	/checkout	20	0	7	2100	2100	110.82	6	2069	2797	0.6	0
	Aggregated	20	0	7	2100	2100	110.82	6	2069	2797	0.6	0

```
[2026-01-19 15:20:51,030] smruthi/INFO/locust.runners: Ramping to 1 users at a rate of 1.00 pe
r second
[2026-01-19 15:20:51,031] smruthi/INFO/locust.runners: All users spawned: {"CheckoutUser": 1}
(1 total users)
Traceback (most recent call last):
  File "C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\.venv\Lib\site-packages\gevent\_ffi\loop.py",
 line 279, in python_check_callback
    def python_check_callback(self, watcher_ptr): # pylint:disable=unused-argument

KeyboardInterrupt
2026-01-19T09:52:22Z
[2026-01-19 15:22:22,983] smruthi/INFO/locust.main: Shutting down (exit code 0)
Type     Name         # reqs      # fails |    Avg     Min     Max    Med |   req/s  failures/s
--------|-----------|-------|-------------|-------|-------|-------|-------|--------|-----------
GET      /checkout      20     0(0.00%) |    110       5    2069      7 |    0.67        0.00
--------|-----------|-------|-------------|-------|-------|-------|-------|--------|-----------
         Aggregated     20     0(0.00%) |    110       5    2069      7 |    0.67        0.00

Response time percentiles (approximated)
Type     Name                  50%    66%    75%    80%    90%    95%    98%    99%  99.9% 99.99
%   100% # reqs
--------|----------------|--------|------|------|------|------|------|------|------|------|-----
-|------|------
GET      /checkout               7      8      9     10     18   2100   2100   2100   2100   210
0   2100     20
--------|----------------|--------|------|------|------|------|------|------|------|------|-----
-|------|------
         Aggregated              7      8      9     10     18   2100   2100   2100   2100   210
0   2100     20


(.venv) C:\smr\sem6\cloud\lab\lab2\PES1UG23AM308\CC Lab-2>
```

The bottleneck: The bottleneck was an artificial delay created by a dummy counter loop (for _ in range(1500000): dummy += 1). This caused high latency for every user trying to view their registered events.

Changes made: I deleted the dummy loop and the associated logic. I also ensured the SQL JOIN query is as lean as possible to minimize the time the database spends searching the registrations table.

Why the performance improved: The performance improved because the execution time per request dropped significantly. By eliminating the manual loop, the response time is now dictated only by the speed of the SQL query, leading to higher Requests Per Second (RPS) in Locust.